Early Childhood Research Quarterly 44 (2018) 192–205

Contents lists available at ScienceDirect

Early Childhood Research Quarterly

Validation of the Head–Toes–Knees–Shoulders task in Native Hawaiian and non-Hawaiian children☆

Puanani J. Hee*, Yiyuan Xu, Alexander Krieg

Department of Psychology, University of Hawai'i at Mānoa, United States

ARTICLE INFO

Article history:
Received 15 June 2016
Received in revised form 3 November 2017
Accepted 28 December 2017

Keywords:
Head–Toes–Knees–Shoulders task (HTKS)
Behavioral self-regulation
Native Hawaiian

ABSTRACT

The current study examined psychometric properties, as well as convergent, discriminant, and predictive validity of the Head–Toes–Knees–Shoulders (HTKS) task with a sample of Native Hawaiian and non-Hawaiian kindergartners from a rural community in Hawai'i. There were 120 (58 girls, 62 boys; 71 Native Hawaiian, 49 non-Hawaiian) participants (M = 59.79 months; SD = 5.00). Children completed the 20-item version of the HTKS task in the fall (T1) and spring (T2) semester of kindergarten. The criterion measures for convergent validity included the Peg Tapping Task (PTT), and parent and teacher measures of attention, working memory, and inhibitory control that assessed "cool" aspects of self-regulation, whereas the criterion measures for discriminant validity included parent and teacher measures of emotional control and impulsivity that tapped "hot" aspects of self-regulation. The Test of Preschool Early Literacy (TOPEL) was used as the criterion measure for predictive validity. The results supported the one-factor model of the HTKS. The HTKS items also had satisfactory item properties based on item characteristic curves and most items did not show differential item functions (DIFs) between Native Hawaiian and non-Hawaiian children. In addition, the two-factor model of "cool" and "hot" self-regulation fit the data satisfactorily at T1 but not T2, providing modest evidence for convergent and discriminant validity. With regard to predictive validity, path analyses showed that the HTKS scores at T1 were positively associated with the TOPEL scores at T1, but not at T2 (after controlling for the TOPEL scores at T1). We discuss the importance of developing the self-regulation skills of Native Hawaiian children from at-risk backgrounds as they enter formal schooling.

Self-regulation has been established as one of the most important school readiness skills for children entering kindergarten (Blair, 2002; Duncan et al., 2007; McClelland, Acock, & Morrison, 2006). Self-regulation is associated with children's early literacy, math, and language skills (Blair & Razza, 2007; McClelland, Cameron, Connor, Farris, Jewkes, & Morrison, 2007), classroom behavior (Cameron Ponitz, McClelland, Matthews, & Morrison, 2009), and later academic success (McClelland et al., 2006; McClelland, Acock, Piccinin, Rhea, & Stallings, 2013). Despite substantial research supporting the relation between self-regulation and children's short- and long-term developmental outcomes, there are still a limited number of age-appropriate assessments of self-regulation in young children that do not rely on parents' or teachers' perception. The Head–Toes–Knees–Shoulders task (HTKS; Cameron Ponitz et al., 2009) was recently developed to address this concern, and has shown remarkable reliability and validity for young children of diverse ethnic (Cameron Ponitz et al., 2008; Cameron Ponitz et al., 2009; Caughy, Mills, Owen, & Hurst, 2013; Connor et al., 2010; Fuhs, Farran, & Nesbitt, 2015; Graziano et al., 2015; Nesbitt, Farran, & Fuhs, 2015) and cultural backgrounds (Gestsdottir et al., 2014; Lan, Legare, Cameron Ponitz, Li, & Morrison, 2011; Son, Lee, & Sung, 2013; Wanless, McClelland, Acock et al., 2011; Wanless et al., 2013). The purpose of the current study was to extend validation of the HTKS to a sample of Native Hawaiian and non-Hawaiian children from a rural community in Hawai'i.

☆ This research was supported in part by a fellowship awarded to Puanani J. Hee by the American Psychological Association Minority Fellowship Program Mental Health and Substance Abuse Services [SM060563], and by a Hawai'i Research Initiative Grant awarded to Yiyuan Xu by the Social Science Research Institute, University of Hawai'i at Mānoa.

* Corresponding author at: Department of Psychology, University of Hawai'i at Mānoa, 2530 Dole Street, Sakamaki C 400, Honolulu, HI 96822-2294, United States.
E-mail address: phee@hawaii.edu (P.J. Hee).

https://doi.org/10.1016/j.ecresq.2017.12.007
0885-2006/

1. Self-regulation among young children

Self-regulation represents a multidimensional construct that involves cognitive, behavioral, and physiological components, and enables individuals to maintain an optimal level of emotional, motivational, and cognitive arousal to adaptively modulate their behavior (Blair & Raver, 2012; McClelland, Cameron Ponitz, Messersmith, & Tominey, 2010; Vohs & Baumeister, 2011). The term self-regulation has been used to refer to both top-down planning processes and bottom-up regulation of more reactive impulses (Blair & Raver, 2012; Zelazo & Cunningham, 2007), and is sometimes used interchangeably with other related terms, such as effortful control (EC) in personality and temperament literature (Eisenberg, Valiente, & Eggum, 2010; Liew, 2012; Rothbart & Bates, 2006; Zhou, Chen, & Main, 2012), or executive function (EF) by some researchers who use cognitive and neural system approaches (Blair, Zelazo, & Greenberg, 2005; Blair & Raver, 2012). In an attempt to link these research domains, Zelazo and Carlson (2012) differentiated "hot" from "cool" aspects of EF based on the degree of motivational and emotional salience of the situation; the "hot" EF occurs in situations that are affectively and emotionally salient, such as having control over one's emotions, whereas the "cool" EF occurs in situations that are more affectively neutral and thus focus on cognitive aspects such as working memory, inhibitory control and focused attention/shifting. Although the conceptual distinction between "hot" and "cool" EF is clear (Zelazo & Carlson, 2012), there is mixed evidence in behavioral research distinguishing these two types of EFs, particularly among young children (e.g., Allan & Lonigan, 2011, 2014).

The current study focused on behavioral self-regulation related to "cool" aspects of EF that involve directing, planning, and controlling attention, cognition, and behavior (Baumeister & Vohs, 2004; Cameron Ponitz et al., 2008), and that are often manifested in adaptive behavior within learning contexts (Cameron Ponitz et al., 2009; McClelland & Cameron, 2012). Specifically, we focused on three self-regulatory abilities, attention focusing/shifting, working memory, and inhibitory control that are particularly noteworthy in relation to young children's transition to formal schooling (Cameron Ponitz et al., 2008; McClelland et al., 2007). Attention focusing/shifting refers to the ability to simultaneously focus on a task, ignore other distractions, and flexibly shift attention to new tasks when needed (Barkley, 1997; Rothbart & Posner, 2005; Rueda, Posner, & Rothbart, 2005). Attention focusing/shifting allows children to focus on a class activity amidst distractions and transition to new classroom tasks. Working memory helps children hold and process information while absorbing new material (Gathercole & Pickering, 2000; Kail, 2003), such as recalling classroom rules while engaging in an activity. Inhibitory control allows children to hinder an initial response in favor of one that is more adaptive such as raising one's hand instead of shouting out (Dowsett & Livesey, 2000). By integrating attention focusing/shifting, working memory, and inhibitory control, young children can regulate their behavior, recall instructions, and focus on and complete tasks.

Substantial research indicates attention focusing/shifting, working memory, and inhibitory control, measured independently from one another and together, predicts school success in early childhood and beyond (Blair & Razza, 2007; Cameron Ponitz et al., 2009; Duncan et al., 2007; McClelland et al., 2007). Stronger behavioral self-regulation is related to better math and literacy achievement in preschool (Allan & Lonigan, 2011; Blair & Razza, 2007; McClelland et al., 2007) and kindergarten (Cameron Ponitz et al., 2009; Matthews, Cameron Ponitz, & Morrison, 2009; McClelland et al., 2014). The three self-regulation skills tapped by the HTKS may be particularly important for developing early literacy skills among young children. To grow their oral language and print knowledge and improve their phonological awareness (i.e., three important components of early literacy skills; Lonigan, Schatschneider, & Westberg, 2008), children need to attend to instructions and academic material, to complete a task while keeping a set of rules in mind, and self-correct. These self-regulation skills, which can be assessed by the HTKS, are assumed to play key roles both in children's ability to take advantage of instruction and in their ability to control their behavior in the classroom in adaptive and productive ways.

Behavioral self-regulation has also been identified as a protective factor for youth with demographic risk such as ethnic minority status and poverty (Evans & Rosenbaum, 2008; Sektnan, McClelland, Acock, & Morrison, 2010). For instance, in a sample of 134 low-income and Spanish English Language Learner preschoolers, McClelland and Wanless (2012) found children's higher self-regulation in the fall to be related to better academic achievement that year and during the transition to kindergarten. Similarly, in a sample of 100 preschoolers (55% minority, 51% enrolled in Head Start), Duncan, McClelland, and Acock (2017), found children's behavioral self-regulation skills to be related to their academic achievement, regardless of family income.

2. Measures of behavioral self-regulation in young children

Early assessments of self-regulation often relied on parent, teacher, or caregiver ratings, which may be susceptible to perception bias (McClelland & Cameron, 2012). These studies typically conceptualized self-regulation as part of a broader learning skills domain (e.g., Cooper & Farran, 1991), and its assessment was dependent on the context (e.g., home or school) where the child is observed (Smith-Donald, Raver, Hayes, & Richardson, 2007). Although some behavioral measures had been developed for clinical populations or for administration in a laboratory setting (Blair et al., 2005; Smith-Donald et al., 2007), they were typically lengthy, and required specialized materials and expert training (McClelland & Cameron, 2012; Schmitt, Pratt, & McClelland, 2014).

Many measures of self-regulation are not appropriate for use with young children, and the existing ones, such as delayed gratification and Stroop tasks, focus primarily on inhibitory control (e.g., Gerstadt, Hong, & Diamond, 1994; Kochanska, Murray, Jacques, Koenig, & Vandegeest, 1996; Mischel, Shoda, & Rodriguez, 1989). For instance, Diamond and Taylor (1996) developed a simple Peg Tapping Task (PTT; also known as the Pencil Tapping Task) in which children are asked to tap a peg once when the examiner taps twice, and tap twice when the examiner taps once. However, tasks such as the PTT primarily focus on young children's inhibitory control and do not examine other important aspects of self-regulation such as attention shifting. This is at odds with the notion that young children often integrate multiple aspects of self-regulation skills such as attention, working memory, and inhibitory control to solve problems (Wiebe, Epsy, & Charak, 2008; Zhou et al., 2012). The Head–Toes–Knees–Shoulders (HTKS) task was developed as an integrative measure of behavioral self-regulation (McClelland & Cameron, 2012) that is particularly easy to use because it does not place a demand on coordination of fine motor skills that may not be fully developed for many young children (Cameron Ponitz et al., 2008).

3. The Head–Toes–Knees–Shoulders (HTKS) task

The HTKS task is a brief game designed to be used with children ages four to six that does not require lengthy training or specialized material. Instead, this task relies on four paired behavioral commands presented by the examiner to the child: "touch your head," "touch your toes," "touch your shoulders," and "touch your knees." Children are first asked to respond naturally to the command and