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Observers' reports of self-regulation: Measurement invariance across sex, low-income status, and race/ethnicity

M. Paula Daneri [a,*], Michael J. Sulik [b], C. Cybele Raver [a], Pamela A. Morris [c]

[a] Department of Applied Psychology, 196 Mercer Street, 8th floor, New York University, New York City, NY 10012, USA
[b] Institute of Human Development and Social Change, 196 Mercer Street, 8th floor, New York University, New York City, NY 10012, USA
[c] Department of Applied Psychology, 82 Washington Square East, Pless Hall, New York, NY 10003, USA

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ABSTRACT

Few assessments of self-regulation for preschool-aged children have been validated for use in socioeconomically and racially/ethnically diverse populations. We address this gap by exploring the validity of the Preschool Self-Regulation Assessment – Assessor Report (PSRA-AR), an observer report of children's global self-regulation ability, using data from a population-based sample drawn from a large and diverse school district. We found that a three factor structure - representing attention regulation, impulse control, and positive engagement - fit the data well for the entire sample. Then, using multigroup confirmatory factor analyses, we found full scalar invariance across sex and low-income status. Scalar invariance held for all but one item across Black, White, and Hispanic children. These findings suggest that the PSRA-AR is valid for use with children of diverse socioeconomic and racial/ethnic backgrounds. Moreover, the PSRA-AR was moderately correlated with direct assessments of executive function and academic ability, including early math and reading.

1. Introduction

Research on school readiness suggests that self-regulation—which encompasses the ability to control thoughts, behaviors, and emotions—enables young children to successfully transition to formal schooling (Blair, 2002). Better self-regulation ability in preschool is associated with better socioemotional outcomes and academic competence (Blair & Razza, 2007; Diamond, 2016). Given the important role that self-regulation plays in promoting academic competence and rising interest among policy and research communities in measuring it, a critical next step is to ensure that measures of self-regulation demonstrate robust psychometric properties. In this study we aim to take this important empirical step by establishing the psychometric validity for the Preschool Self-Regulation Assessment - Assessor Report (PSRA-AR), an observer rating instrument that measures various aspects of children's self-regulation. Specifically, we will examine the factor structure of the PSRA-AR; test measurement invariance across sex, low-income status, and race/ethnicity; and examine associations with direct assessments of cognitive regulation and academic competence using a large, socioeconomically and racially/ethnically diverse population-based sample.

1.1. Self-regulation

Recent research suggests that successful self-regulation is influenced both by a volitional system and by reactive, automated systems (Vohs & Baumeister, 2004). The more volitional and "top down" system involving brain regions such as the prefrontal cortex and anterior cingulate cortex is referred to by many investigators as effortful control (Eisenberg et al., 2004). Effortful control has been defined as "the efficiency of executive attention - including the ability to inhibit a dominant response and/or to activate a subdominant response, to plan, and to detect errors" (Rothbart & Bates, 2007, p. 129). Measurement of effortful control frequently focuses on the ability to control attention and to consciously inhibit behavior.

Recent work by Eisenberg et al. (2013) has also highlighted the importance of individual differences in the way that children experience the "pull" of distracting or rewarding stimuli as a related but distinct process from effortful control. Those individual differences in impulsivity, which are more automated than those subserving effortful control, may make it more difficult for some children to exert effortful control as compared to their less impulsive, more placable peers - previous research suggests that while this "reactive control" dimension of behavioral self-regulation is moderately correlated with children's executive attention and inhibitory control it is distinct from those abilities (Carver, 2005).

Children's self-regulation is also influenced by an emotionally-based system of regulation. This system, anchored in limbic as well as cortical

* Corresponding author at: 196 Mercer Street, 8th floor, New York University, New York City, NY 10012, USA.
E-mail addresses: Paula.daneri@nyu.edu (M.P. Daneri), Michael.sulik@nyu.edu (M.J. Sulik), Cybele.raver@nyu.edu (C.C. Raver), pamela.morris@nyu.edu (P.A. Morris).

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brain regions, focuses on the extent to which children are able to engage positively with their learning environments on the one hand and to modulate anxiety, distress, and frustration in those environments, on the other (Fantuzzo, Bulotsky-Shearer, Fusco, & McWayne, 2005; Raver, Garner, & Smith-Donald, 2007). Three decades of research on child temperament clearly demonstrate that children enter the classroom setting with different psychobiologically-anchored profiles of emotional response (or negative reactivity) to new and challenging situations, task-demands, and people (Calkins, 1994; Rothbart, Ahadi, & Hershey, 1994). Those individual differences in children's reactivity and regulation of negative and positive emotion are readily perceived and interpreted by teachers and play an important role in shaping children's educational outcomes (Lerner, Lerner, & Zabski, 1985; O'Connor, Cappella, McCormick, & McClowry, 2014). For example, children's positive emotion regulation in the context of learning (including sociability with their adult caregivers as well as motivation and pride in completing tasks) is viewed by teachers as key to students' classroom engagement and foundational to their school readiness (Berhenke, Miller, Brown, Seifer, & Dickstein, 2011; Ryan & Deci, 2000). In addition, children's capacity to manage their emotions has been found to be clearly associated with their learning-related behaviors and with teachers' perceptions of classroom adjustment (Denham, Bassett, Zinsser, & Wyatt, 2014). In one recent study, for example, Head Start-enrolled preschoolers' observed displays of pride, persistence, and anxiety each played a role in predicting teachers' reports of work-related learning skills, in addition to serving as significant predictors of social competence (Berhenke et al., 2011). Given the importance of young children's socioemotional competence for their everyday classroom experiences as well as their learning, many measures of school readiness include at least a few items that tap this dimension of regulation (Gresham & Elliott, 1990).

1.2. Measurement of self-regulation

Self-regulation is increasingly assessed through the use of direct assessments; those assessments are generally administered to young children in lab-based settings where researchers can control the environment. It is generally preferred to administer several direct assessments that capture various aspects of self-regulation rather than a single task in order to capture the breadth of self-regulation skills (Sulik et al., 2010). Although direct assessments offer many methodological strengths and are objective, they can be costly and time-consuming to administer and code. In addition, though direct assessments provide microanalytic precision regarding moment-by-moment changes in children's accuracy and latency to respond within a given task, they may be less informative regarding children's more molar or global profiles of self-regulation that are likely to align with children's behavior in the classroom. That is, children's performance on carefully controlled direct assessments may not fully capture their ability to self-regulate in noisy and stimulating classrooms. In short, researchers interested in individual differences in children's self-regulation in educational settings face a significant measurement challenge that cannot be readily or completely solved by the use of direct assessments.

One solution to this empirical challenge has been to develop a battery of direct assessments that can be administered in field contexts, where children's profiles of self-regulation can scored or coded in vivo by an assessor. One example is the Preschool Self-Regulation Assessment (PSRA). Smith-Donald, Raver, Hayes, and Richardson (2007) developed the PSRA battery as one of the first portable direct assessment batteries of young children's self-regulation. The PSRA was created to be an ecologically valid and low-cost measure of self-regulation for preschool-age children (Smith-Donald et al., 2007) and consists of 10 structured tasks that assess effortful control, conflict resolution, and compliance. Following the assessments, the assessor completes the PSRA-AR, a report of children's attentional, behavioral, and emotional regulation during the battery. The PSRA-AR is a 28-item report adapted from the Leiter-R social-emotional ratings scale (Roid & Miller, 1997) and the Disruptive Behavioral-Diagnostic Observation Schedule coding system (DB-DOS; Wakschlag et al., 2005) that captures more global aspects of self-regulation.

Since its publication, the PSRA battery has been widely used, particularly in large-scale data collection efforts conducted in the field (Bassett, Denham, Wyatt, & Warren-Khot, 2012; Raver et al., 2011). A recent factor analysis of the 10 PSRA structured tasks found support for a three-factor model of self-regulation composed of cool executive control, which focuses on children's ability to focus attention; hot executive control, which focuses on children's ability to delay gratification; and compliance, which focuses on children's ability to comply with directions (Denham, Warren-Khot, Bassett, Wyatt, & Perna, 2012). Moreover, this three-factor structure was invariant across educational setting (Head Start vs. private child care), but some differences emerged when comparing the equivalency of model fit between boys and girls as well as between 3- and 4-year-old children. Overall, these analyses provide evidence that the PSRA structured activities can be used with confidence across early child care and education settings, though important differences should be taken into consideration when comparing performance on specific tasks across gender and age.

1.2.1. The Preschool Self-Regulation Assessment - Assessor Report (PSRA-AR)

In tandem with the PSRA structured tasks, the PSRA-AR has also been used widely as it provides information about children's self-regulatory abilities that is complementary to, but different from, the information gained through direct assessments (Bailey, Denham, Curby, & Bassett, 2016; Ferrier, Bassett, & Denham, 2014). Past research supports the use of observer ratings of children's self-regulation as valid assessments that demonstrate predictive validity to later outcomes. For example, observer ratings of children's self-regulation during a battery of tasks at ages 3 and 5 have been found to predict wealth, health, and criminal outcomes in adulthood (Moffitt et al., 2011) - suggesting that scores from measures such as the PSRA-AR may have important implications for a variety of later outcomes.

The PSRA-AR, which can be completed in conjunction with any battery of direct assessments, is particularly useful to researchers working in schools and homes due to the ease and speed with which assessors can complete it to gain a more global understanding of children's self-regulation. Moreover, the PSRA-AR is valuable in instances when time with participants is limited and several constructs need to be assessed through direct measures such that there is not enough one-on-one time to thoroughly assess self-regulation. In the current study, we extend previous factor analytic work on the PSRA battery to the PSRA-AR using a large, population-based sample from one of the largest school districts in the United States.

The original publication of the PSRA-AR included analyses examining the measure's structure. The original authors conducted principal components analysis (PCA) on 19 of the 28 items; the other 9 items, which largely related to displays of negative emotion, were too skewed to include in factor analyses (Smith-Donald et al., 2007). This analysis revealed three factors: attention control (reflecting individual differences in children's executive attention, described earlier), impulse control (reflecting individual differences in children's inhibitory control as well as their proneness to demonstrate impulsivity), and positive versus negative emotion. Because many items had substantial cross-loadings on both the attention control and impulse control factors, for their final model the authors forced the PCA into a two factor structure that yielded an attention/impulse control factor (10 items) and a positive emotion factor (7 items) out of 17 items; the remaining 2 items did not load onto either factor. Although appropriate for the sample size of that study, PCA is limited by the fact that it does not allow for a comparison of model fit across different factor structures. In the present study, we aim to overcome this shortcoming by revealing the underlying factor structure of the PSRA-AR using confirmatory factor analysis

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