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Self-Regulation and Economic Stress in Children of Hispanic Immigrants and Their Peers: Better Regulation at a Cost?

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Abstract

Research Findings—Although there is a well-established relationship between economic stress and children's self-regulation, few studies have examined this relationship in children of Hispanic immigrants (COHIs), a rapidly growing population. In a sample of preschool children ($N = 165$), we examined whether economic stress predicted teacher evaluations of children's self-regulation, whether economic stress predicted children's physiological reactivity (via cortisol levels), and whether economic stress had a similar effect on self-regulation and children's cortisol for COHI versus nonimmigrant children. Greater economic stress was associated with poorer child self-regulation and heightened physiological reactivity across a challenging classroom task for the sample as a whole. However, when we examined children by group, greater economic stress was associated with poorer teacher-reported self-regulation for nonimmigrant children only. In contrast, greater economic stress was related to greater cortisol reactivity across a challenge task for COHIs but not for nonimmigrants.

Practice or Policy—Results demonstrate the importance of considering physiological indices of self-regulation (heightened stress physiology), in addition to traditional external indices (teacher report), when assessing self-regulation or risk more generally among preschool samples that are diverse in terms of ethnicity, economic risk, and parents' nativity.

A core set of personal attributes and abilities, including cognitive and behavioral control, are increasingly understood as critical for school readiness, perhaps even above and beyond preacademic skills (Eisenberg, Valiente, & Eggum, 2010; see Raver, 2002, and Ursache, Blair, & Raver, 2012, for reviews). Self-regulation is particularly important, as it not only relates to young children's current experience in the classroom (Fabes et al., 1999) but also predicts later academic and socioemotional outcomes (Sektan, McClelland, Acock, & Morrison, 2010). Children living in families with high economic stress are at greater risk for poor self-regulation (Evans & English, 2002; Mistry, Benner, Biesanz, Clark, & Howes, 2010), and constructs of self-regulation may differ across diverse economic and cultural groups (Raver, 2004). However, very little is known about self-regulation in children of

Hispanic immigrants (COHIs) in the context of center-based child care (and consequently how easy or difficult their transition to formal schooling may be). Understanding how self-regulation in COHIs differs from that in nonimmigrant children is important, as COHIs are a growing population in early child care settings, are overrepresented among children living with economic stress, are often subject to additional sociocultural stressors (Capps, Fix, Ost, Reardon-Anderson, & Passel, 2005; Fortuny, Hernandez, & Chaudry, 2010) and because the research base has largely ignored them.

Self-regulation

Though self-regulation is a multidimensional construct, it commonly includes the regulation of cognitions (e.g., McClelland et al., 2007), behaviors (e.g., Wanless, McClelland, Tominey, & Acock, 2011), and emotions (e.g., Liebermann, Giesbrecht, & Müller, 2007). A wealth of research has demonstrated the benefits of self-regulation in early childhood and across the lifespan (Blair & Diamond, 2008; Eisenberg et al., 2010; Henry, Caspi, Moffitt, Harrington, & Silva, 1999; Vitaro, Brendgen, Larose, & Trembaly, 2005; Wrosch, Dunne, Scheier, & Schulz, 2006). Conceptualizations of self-regulation, though varied, often include the ability to demonstrate inhibitory control (e.g., refrain from impulsive or reactive emotional and motor behaviors; Fabes et al., 1999), attentional control (e.g., block outside distractions and focus on one object or task), and emotional self-regulation (Cole, Martin, & Dennis, 2004). For the current article we utilize a framework offered by Blair and colleagues that integrates across systems and proposes a developmental model that defines *self-regulation* as “the primarily volitional management of arousal or activity in attention, emotion, and stress response systems in ways that facilitate the use of [executive function] abilities in the service of goal-directed actions” (Ursache et al., 2012, p. 123). In this developmental model of self-regulation, these authors argue that executive functions are the top-down, volitional component of self-regulation. Executive functions are described as reciprocally related to and dependent on the bottom-up and less volitional responses to the environment that occur via attention, emotion, and stress response systems. An important component of this model is its focus on the role of contextual demands in stimulating appropriate levels of arousal that facilitate executive functions and subsequent academic engagement and achievement. In this view, when contextual demands are appropriate (stress is managed, adults model good self-regulation, demands and expectations are developmentally appropriate and clear), young children are more likely to reach appropriate, moderate levels of arousal that facilitate learning and engagement rather than being either over- or understimulated.

Assessing self-regulation

Common approaches to the evaluation of self-regulation include teacher and/or parent report of emotional and behavioral components of self-regulation as well as game-like scored or rated assessments. Many studies have assessed teacher or parent reports of components of self-regulation using instruments like the Caregiver-Teacher Report Form (C-TRF; Achenbach & Edelbrock, 1986), the Child Behavior Checklist (Achenbach, 1991), the Children's Behavior Questionnaire (Rothbart, Ahadi, Hershey, & Fisher, 2001), or the Preschool Learning Behaviors Scale (McDermott, Leigh, & Perry, 2002). Similarly, game-like tasks include, for example, the Kiddie Continuous Performance Test (K-cpt; Conners,

2001) to assess attention problems; the Snack or Gift Delay (Kochanska, Murray, & Harlan, 2000) to assess inhibitory control; or structured test batteries such as the Preschool Self-Regulation Assessment (Smith-Donald, Raver, Hayes, & Richardson, 2007) to assess emotional, attentional, and behavioral domains of self-regulation. Structured assessments have the advantage of providing a more objective assessment of children's regulatory capacities, whereas teacher reports have the advantage of also providing a window on the fit between the child and the classroom. That is, teachers' evaluations of children's self-regulation may be important whether or not they accurately reflect children's actual underlying abilities.

Though not traditionally included under the rubric of self-regulation, stress reactivity is explicitly included in the framework provided by Ursache et al. (2012) that we utilize here. In line with this more integrated perspective, the connections between stress system activation and behavioral assessments of self-regulation were examined in two seminal longitudinal studies of poverty and children's development—Evans's study of rural poverty (Evans, 2003; Evans & English, 2002; Evans & Schamberg, 2009) and the Family Life Project (Blair et al., 2011)—and the sometimes complex relationships between stress physiology, emotionality, and self-regulation in children have been extensively studied (e.g., Kagan & Snidman, 1991; Kochanska, Coy, & Murray, 2001; Stifter & Corey, 2001).

Assessing stress physiology

Assessing salivary cortisol provides a simple, noninvasive index of stress system functioning and a window into a child's internal regulation, particularly in response to the context in which it is assessed. Once a threat is perceived, the stress management system is activated, eliciting a physiological cascade. In response to a challenge, a mild to moderate increase in cortisol followed by downregulation of the stress response system has been associated with positive outcomes (Blair, Granger, & Razza, 2005). In contrast, either higher (e.g., exaggerated response or failure to down-regulate) or lower (e.g., failure to mount a response) levels of cortisol in response to a challenge are considered maladaptive and suggest a less flexible stress response system (McEwen, 1998).

Self-regulation and academic success

In line with the framework discussed in Ursache et al. (2012), young children's self-regulation has a positive impact on their classroom success, broadly defined (Eisenberg et al., 2010). In particular, better self-regulation in young children has been shown to predict better school readiness and later academic success (e.g., Monette, Bigras, & Guay, 2011; Sektnan et al., 2010). For example, toddlers with higher and more rapidly increasing self-regulation skills show better cognitive school readiness (Brophy-Herb, Zajicek-Farber, McKelvey, Bocknek, & Stansbury, 2013). Furthermore, preschool and kindergarten children who exhibit fewer problem behaviors and more self-control have higher academic achievement, as assessed by scores on reading and math tests, later in life (Agostin & Bain, 1997; Blair & Razza, 2007; McClelland, Acock, & Morrison, 2006). It has been posited that better self-regulation, or the ability to modulate reactivity and appropriately direct attention,

may result in better academic outcomes in part through better access to the material/learning environment.

Greater academic achievement for children with higher self-regulation has also been attributed to more positive interactions in the classroom. For example, children who enter kindergarten with higher self-regulation are perceived more positively by their teachers in terms of their behavioral and cognitive control as well as their work habits later in the school year (Rimm-Kaufman, Curby, Grimm, Nathanson, & Brock, 2009). Those children perceived by their teachers as higher in self-control and work habits were subsequently rated as more engaged in the classroom by their teachers (Rimm-Kaufman et al., 2009). Furthermore, Fabes and colleagues (1999) showed that children with higher self-regulation abilities were more successful at inhibiting their frustration and aggression in daily high-intensity peer interactions. Differences in self-regulation ability can have far-reaching effects; for example, various studies have demonstrated the long-term impact of young children's regulatory abilities, showing that social and behavioral problems associated with poor self-regulation predict adjustment problems in middle childhood (e.g., Campbell, 1994; Ladd, Birch, & Buhs, 1999; Schwartz, McFadyen-Ketchum, Dodge, Pettit, & Bates, 1999).

Self-regulation in economically disadvantaged and ethnic minority children

Poor self-regulation in young children has been consistently linked with several indices of experienced poverty (Evans & English, 2002; Evans & Kim, 2013; Sektnan et al., 2010). Low-income children have been identified as having poorer self-regulation than their economically advantaged counterparts in samples of ethnically and linguistically diverse preschoolers (Wanless et al., 2011) and among rural Caucasian American elementary school students (Evans & English, 2002). Children living in poverty and ethnic minority children are also more likely to be identified by teachers as having greater deficits in self-regulation skills and greater difficulty meeting the demands of the classroom (Lee & Burkam, 2002; Rimm-Kaufman, Pianta, & Cox, 2000). In addition, multiple indicators of poverty, including higher economic vulnerability and economic stress, are associated with poorer attentional and behavioral self-regulation among young children (Mistry et al., 2010). The importance of self-regulation for later outcomes has also been documented in economically disadvantaged and ethnic minority children. For example, in a sample of children born to adolescent mothers, primarily African American and experiencing low socioeconomic status, self-regulatory abilities partially accounted for the relationship between reading readiness at age 5 and reading competence at age 14 (Smith, Borkowski, & Whitman, 2008). Similarly, Sektnan and colleagues (2010) demonstrated that risk factors such as a low income-to-needs ratio were related to poorer behavioral self-regulation skills in young children, which were in turn associated with academic achievement in first grade.

Some work has suggested that children's self-regulation may mediate the relationship between adversity and later outcomes. For example, among low-income Head Start preschoolers, children's self-regulation (as measured by inhibitory control) accounted for the relationship between family adversity and school readiness at the end of the year (Brown, Ackerman, & Moore, 2013).

Sektnan and colleagues (2010) speculated that high-risk low-income children may not have as many resources and/or opportunities to develop, promote, and practice their self-regulation skills as higher income children. Furthermore, they speculated that low-income children may develop behavioral strategies adaptive for high-risk environments but not necessarily for the classroom. These could include more externalizing behaviors, perhaps sometimes useful in environments with more threat, but they could also include an emphasis on tracking threat in the environment and avoiding punishment and thus a more vigilant and withdrawn profile.

As mentioned previously, when assessments of self-regulation rely on teacher reports, one possible explanation for reported deficits in self-regulation for minority and economically disadvantaged children is that these demographic groups are viewed more negatively by teachers regardless of their actual self-regulation abilities. For example, Rimm-Kaufman and colleagues (2000) demonstrated how a child's economic and minority status can influence a teacher's perception of his or her problem behaviors. Furthermore, they showed how teachers' own characteristics can influence their perceptions of children's behaviors such that in schools with a high number of minority students, non-ethnic minority teachers rated students as struggling in regulation skills (e.g., not following directions and immaturity) at greater rates than did ethnic minority teachers. The authors speculated that these discrepancies may be due to differences in cultural norms and behavioral expectations that can vary between home and school for many children.

Stress physiology and economic stress

Multiple markers of poverty have been associated not only with children's external self-regulation but also with their dysregulated stress physiology (Evans & Kim, 2007). Evans and Kim (2013), in their review of childhood poverty and self-regulation, speculated that chronic stress levels often associated with childhood poverty may disrupt the development of children's internal self-regulatory capacities. In particular, the inability to effectively predict and control the environment in low-income contexts is associated with differential utilization of the hypothalamic-pituitary-adrenal axis (Blair et al., 2011), which is involved in managing both actual and perceived threats to a child's well-being (Sapolsky, Romero, & Munck, 2000). Relative to their economically advantaged peers, children experiencing high levels of economic stress have been shown to have dysregulated stress physiology as measured by both heightened (Lupien, King, Meaney, & McEwen, 2001) and dampened (Badanes, Watamura, & Hankin, 2011; Lumeng et al., 2014; see also Gunnar & Vazquez, 2001, for a review) cortisol relative to their peers. For example, Fernald and Gunnar (2009), in their study of low-income Mexican children's salivary cortisol, found that those families who participated in a poverty alleviation program had lower salivary cortisol levels than those whose families did not participate. In addition, Cutuli, Wiik, Herbers, Gunnar, and Masten (2010), in their study of impoverished homeless children's cortisol, demonstrated that children with higher levels of stress (family-level negative life events) had higher levels of morning cortisol than those with fewer negative life events. In a preschool Head Start sample, a lower income-to-needs ratio was associated with higher cortisol at all three time points of a stress reactivity protocol (Blair et al., 2005). Together, these findings suggest that poverty-related stress activates the stress response system in children. Though a thorough

review is beyond the scope of this article, it may be the case that more chronic and severe stress exposure ultimately results in a downregulated (attenuated, hyporeactive) hypothalamic–pituitary–adrenal axis, whereas more transient and less severe stress exposure results in stress system upregulation (Gunnar & Vazquez, 2001).

Differences in children's cortisol have been associated with a range of detrimental psychological, physical, social, and academic outcomes. Specifically, cortisol dysregulation has been associated with externalizing and internalizing symptoms (Shirtcliff, Granger, Booth, & Johnson, 2005; Van Goozen, Matthys, Cohen-Kettenis, Buitelaar, & Van Engeland, 2000), later psychopathology (Alink, Cicchetti, Kim, & Rogosch, 2012; Hankin, Badanes, Abela, & Watamura, 2010), and developmental problems (Kariyawasam, Zaw, & Handley, 2002). Elevated cortisol has also been related to difficulties in school, such as lower engagement and academic competence (Obradovic, Bush, Stamperdahl, Adler, & Boyce, 2010), as well as peer rejection and aggression (Gunnar, Seban, Tout, Donzella, & van Dulmen, 2003).

Understanding self-regulation and stress physiology in different cultural contexts

Although the relationship between economic vulnerability and poorer self-regulation has been widely studied, there is a dearth of information about whether this relationship is uniform across a range of racial, ethnic, and nativity groups. Indeed, what little evidence there is suggests that there may be a lack of uniformity, perhaps particularly for children of recent immigrants and/or English language learners. For example, a recent study suggests that when rated by teachers, low-income children who are also English language learners are at increased risk for poor behavioral self-regulation (as measured by their ability to use inhibitory control, attentional skills, and working memory on short tasks) compared to their low-income English-speaking counterparts (Wanless et al., 2011). In contrast, Feyter and Winsler (2009) found that although low-income children of immigrants (defined as being first or second generation) scored lower on language and cognitive skills, they were superior on their teacher-reported socioemotional and self-regulation skills compared to nonimmigrant children.

Stress physiology is also sensitive to cultural and environmental contexts. As is the case for external self-regulation, studies are limited, and most studies that have included comparisons across ethnic or racial groups have compared African American to Caucasian American samples. Higher cortisol levels have been documented in African American adults (McCallum, Sorocco, & Fritsch, 2006), adolescents (DeSantis et al., 2007), and children (Blair et al., 2011). One study observed both higher morning and evening cortisol levels for children of immigrant parents compared to their nonimmigrant peers (Gustafsson, Gustafsson, & Nelson, 2006). These ethnic differences are likely due at least in part to sociocultural factors, as twin studies examining the heritability of diurnal stress physiology have found a genetic influence on morning, but not evening, variations in cortisol levels (Bartels, de Geus, Kirschbaum, Sluyter, & Boomsma, 2003; Kupper et al., 2005). Even in contexts relatively free of extreme forms of discrimination and prejudice, the stress

of microaggressions directed at people of color (Sue, Capodilupo, & Holder, 2008) could conceivably account for higher basal stress reactivity.

The developmental model of self-regulation proposed by Blair and colleagues (Ursache et al., 2012) and utilized here perhaps implicitly suggests concordance between external and internal components of self-regulation by postulating that when arousal is optimal (as measured by attentional, emotional, and stress regulation systems), executive functions in the support of goal-directed behavior are optimized as well, whereas when arousal is low or too high (presumably across systems), executive functions are compromised. However, in her 2004 review of emotional self-regulation in diverse sociocultural and socioeconomic contexts, Raver explicitly discussed the importance of attention to a lack of concordance in samples that are not White and middle class. In particular, she drew attention to the lack of concordance between felt and expressed negative emotion when children receive strong sanctions from adults against negative emotion displays.

The current study

Integrating the theoretical perspectives presented in Ursache et al. (2012) and Raver (2004), we used a multisystems assessment of self-regulation that captured both internal indicators of arousal (salivary cortisol in response to a stressor) and external indicators of behavioral control (teacher-rated self-regulation), and we explicitly examined whether these components of self-regulation were concordant or discordant as a function of stress exposure among preschoolers who were children of recent Hispanic immigrants (COHIs) versus nonimmigrant children.

Among minority children, COHIs are particularly important to study because not only are they a rapidly growing population in early childhood settings (Fortuny et al., 2010) but they also tend to live at lower socioeconomic position, have lower levels of well-being, and have poorer academic achievement and educational attainment (Capps et al., 2005). Children of recent immigrants may also face additional challenges in the classroom due to not sharing the language and culture of American schools.

First, we investigated whether economic stress predicted teacher evaluations of self-regulation in the preschool classroom, hypothesizing based on prior work that elevated levels of economic stress would relate to poorer teacher-reported self-regulation (Evans & English, 2002; Sektnan et al., 2010). Second, we examined whether economic stress predicted physiological reactivity (cortisol levels) across a challenge task in the preschool classroom, hypothesizing that higher levels of economic stress would predict greater physiological reactivity, as measured by cortisol reactivity patterns (Lupien et al., 2001). Our third aim was to examine whether the relationship between economic stress and both self-regulation and children's cortisol reactivity in the preschool classroom differed according to immigrant status (COHIs vs. their peers), hypothesizing concordant patterns of internal and external self-regulation among nonimmigrant children and discordant patterns of internal and external self-regulation among immigrant children.

Method

Participants

Data were collected on 197 participants enrolled in full-time child care. Children were excluded from analyses if the parent reported pervasive developmental disorders (PDD) or chronic illness ($n = 10$), use of steroid inhalers ($n = 17$), or use of allergy medication ($n = 5$) for the target child. The analyzed sample was 165 preschool-age children (M age = 4 years, 2 months, $SD = 7$ months; $n = 85$ [52%] female) enrolled full time in high-quality child care centers (as indexed by the Early Childhood Environment Rating Scale–Revised [Harms, Clifford, & Cryer, 1998]; $M = 5.52$, $SD = 0.58$) in a midwestern city and recruited by a bilingual and bicultural project manager. Of the sample, 27% ($n = 45$) were COHIs and 73% ($n = 120$) were children of American-born parents. COHIs were defined by the mother's nativity (born in a Latin American country), 76% of whom were of Mexican origin and 24% of whom were from other Latin American countries, such as Guatemala, Honduras, and Nicaragua. We did not directly measure children's English competency, but we did record their primary language. Specifically, 56% were monolingual English-speaking children, 31% were bilingual English language learners, and 13% were monolingual Spanish speakers. We also recorded the lead teacher's primary language. Of the total children, 73% shared their primary language with their lead teacher. Overall, 62% of families provided their income, and of these, 40% were living at or below the poverty line.

This study was approved by our university institutional review board for human subjects. Families were compensated \$110 for their participation in this portion of the study, and teachers were compensated \$5 per child.

Measures

Self-regulation—To assess teacher-reported self-regulation, encompassing both temperamental differences and problem behaviors, we formed a poor self-regulation composite score by combining teacher reports on all conceptually relevant subscales of the C-TRF (Achenbach & Edelbrock, 1986) and the Teacher-Children's Behavior Questionnaire (TCBQ; Gunnar, Tout, deHaan, Pierce, & Stansbury, 1997). The 100-question C-TRF for 1.5- to 5-year-olds asks teachers to report on their perceptions of children's emotional and behavioral difficulties using a 3-point Likert scale (0 = never true, 1 = sometimes true, 2 = very often true). The 50-question TCBQ short form for 3- to 7-year-olds asks teachers to report on 10 dimensions of a child's temperament using a Likert scale (1 = extremely untrue, 2 = quite untrue, 3 = slightly untrue, 4 = neither true nor untrue, 5 = slight true, 6 = quite true, 7 = extremely true). The C-TRF and TCBQ have demonstrated adequate reliability in samples of preschoolers. Internal consistency for the individual subscales used to compute the composite in the current sample was adequate (α s = .63–.93). See Table 1 for the correlation coefficient matrix for self-regulation components.

The poor self-regulation composite was constructed to include those scales most closely aligned with the definition of self-regulation described in Ursache et al. (2012) and included the following subscales: Emotionally Reactive, Attention Deficit/Hyperactivity Disorder, and Attention Problems from the C-TRF and Attentional Focusing, Impulsivity, and

Inhibitory Control from the TCBQ. Excluded C-TRF scales were Affective Problems, Aggressive Behavior, Anxiety Problems, Anxious/Depressed, Oppositional Defiant Problems, Pervasive Developmental Problems, Somatic Complaints, Withdrawn, and Other Problems; scales excluded from the TCBQ were Activity Level, Anger/Frustration, Approach, Falling Reactivity and Soothability, Fear, Sadness, High Intensity Pleasure, Low Intensity Pleasure, Perceptual Sensitivity, Discomfort, Smiling and Laughter, and Shyness. Two subscales, Attentional Focusing and Inhibitory Control, were reverse coded so that higher scores denoted worse indices of self-regulation. The composite was then formed by summing the *z* scores of each subscale. Higher overall scores on the poor self-regulation composite score indicate that teachers perceived the child as having lower self-regulation. To confirm that these conceptually similar scales indeed could be used to reflect a single underlying construct, we submitted these subscales to a factor analysis with varimax rotation. On inspection of the eigenvalues (using the criterion of an eigenvalue greater than 1) and the scree plot, we concluded that the subscales loaded onto a single self-regulation factor. All factor loadings were greater than .4 (range = .55–.95).

Immigration groups—Parents were asked to report on maternal birth country. From this information we grouped children as either COHIs or nonimmigrants.

Economic stress—Primary caregivers reported on their family's level of economic stress via the 54-item Multicultural Events Schedule for Adolescents for Preschoolers (MESA; Gonzales, Tein, Sandler, & Friedman, 2001). The MESA used in the current study was modified from the original for use with a younger age group by removing questions only appropriate for adolescents (Raviv & Wadsworth, 2010). Parents reported whether selected life stressors had occurred during the past 3 months of the child's life using five subscales (Family Troubles, Family Conflict, Economic Hassles, Violence Exposure, and Discrimination). We used the Economic Hassles subscale in the current analyses as an index of economic stress rather than income, which was confounded by group and also is difficult to assess accurately with immigrant samples because of unstable income, income from multiple sources, and shared income with family not in the United States. The Economic Hassles subscale includes the following eight questions: "A member of the family or household lost a job," "A member of the family or household was upset because he or she could not find work," "Your child had to wear clothes that were dirty, worn out, or don't fit," "A member of the family or household talked about having serious money problems," "Your family had to stay in a homeless shelter or public place," "Things in your home did not work the way they should (no water, no electricity, things falling apart, etc.)," "Family members could not go someplace they needed to go (work, school, doctor, etc.) because they had no transportation," and "Your child had to go without a meal because your family did not have enough money." The MESA has demonstrated adequate reliability among ethnically diverse low-income young children (Raviv & Wadsworth, 2010). Internal consistency for the MESA Economic Hassles subscale in the current sample was adequate ($\alpha = .72$).

Salivary cortisol—Children's cortisol was collected three times across a challenge task presented to the child and his or her primary teacher. Samples were collected just before the 20-min challenge (baseline), immediately after the 20-min challenge (reactivity), and 20 min

after completion of the challenge (recovery). The area under the curve with respect to ground (AUC_G) was calculated for the reactivity data (Pruessner, Kirschbaum, Meinlschmid, & Hellhammer, 2003). The saliva samples were obtained using a synthetic cotton roll (Salivettes; Sarstedt, Nuembrecht, Germany). The saliva was then extracted by centrifuging for 4 min at 2,500 rpm. The vials were frozen at -20°C until data collection was complete. The samples were then sent to the Biochemical Laboratory, Psychobiology, University of Trier, Germany, to be assayed. Samples were assayed in duplicate and using a competitive solid phase time-resolved fluorescence immunoassay with fluorometric end point detection (Höferl, Krist, & Buchbauer, 2005).

Procedure

Parents reported on their level of economic stress and family demographics by completing paper-and-pencil questionnaires in Spanish or English according to their preference. Lead teachers completed questionnaires on all children in the study. Saliva samples were taken during an adapted version of the National Institute of Child Health and Human Development Early Child Care Research Network's (1998) three-box challenge task by research assistants using simple, well-established procedures (e.g., Badanes, Dmitrieva, & Watamura, 2012; Schwartz, Granger, Susman, Gunnar, & Laird, 1998). During the challenge task the teacher and child were presented with a standardized set of materials for four successive 5-min intervals beginning with two books as a warm-up, followed by novel and interesting puppets, followed by the pair being approached by a robotic toy, and concluding with a difficult-to-open Plexiglas[®] box containing an attractive toy. The items were chosen to mimic the types of challenges children face at child care as viewed from the child's perspective (e.g., academic content, novelty, unpredictability, and frustration). Teachers were free to provide whatever support they deemed appropriate; thus, we hypothesized that the task might represent the best case scenario for the child facing a normative mild challenge at child care (with the undivided attention of his or her lead teacher). All samples were taken at least 30 min after children's snack time, mealtime, and naptime. We verified that each child's temperature was less than 99.5°F using a Genus2[™] IR tympanic thermometer for each day when samples were collected.

Preliminary analyses

We first assessed potential sex and age differences on all key study variables (self-regulation, economic stress, and all classroom cortisol values). Sex differences were found for self-regulation, $t(150) = 3.20$, $p < .001$, such that boys were rated by teachers as having poorer self-regulation compared to girls; however, there were no sex differences for parent-reported economic stress or on any cortisol values. Age was not associated with parent-reported economic stress or teacher reports of self-regulation: economic stress, $r(129) = .13$, $p = .14$; self-regulation, $r(150) = .10$, $p = .22$. This is likely due to the fact that most questions asked the rater to evaluate the child's self-regulation as appropriate or inappropriate for his or her age. Age was negatively correlated with the challenge task baseline and recovery samples and marginally negatively related to the challenge task reactivity sample, indicating that in general older children were less physiologically reactive to the challenge task: baseline, $r(150) = -.17$, $p < .05$; recovery, $r(145) = -.27$, $p < .01$; reactivity, $r(149) = -.14$, $p = .08$. No

other age or sex differences were found. Age and sex were controlled in subsequent analyses as appropriate.

We also assessed for global group differences across all key study variables between immigrant and nonimmigrant groups. No differences were found between these groups for age, self-regulation, economic stress, baseline salivary cortisol, reactivity cortisol, recovery cortisol, or sex.

Results

All analyses were conducted with path analysis in Mplus (Muthén & Muthén, 1998) in order to take advantage of full information maximum likelihood (FIML) estimation—a theory-driven direct estimation approach that allows for modeling with partially missing cases. FIML produces unbiased estimates under data missing completely at random and missing at random (Enders & Bandalos, 2001). When data are not missing at random, using FIML shows advantages over listwise deletion and mean imputation that are equivalent to those obtained with multiple imputation techniques (Newman, 2003). All analyses involving cortisol as an outcome controlled for cortisol collection times.

For Aim 1, to examine whether economic stress was associated with teacher evaluations of self-regulation in the preschool classroom, we first tested the model estimating the effects of economic stress on self-regulation, controlling for child age and sex. The model had excellent fit, $\chi^2(1, N=165) = 0.06$, *ns*, comparative fit index (CFI) = 1, root mean square error of approximation (RMSEA) = .00. Consistent with prior research (Evans & English, 2002), greater economic stress was associated with poorer teacher-reported child self-regulation ($\beta = .18$, critical ratio [CR] 2.12, $p < .05$). We also replicated this finding with a larger sample of children who did not have cortisol data ($n = 285$; $\beta = .20$, CR = 3.15, $p < .01$).

For Aim 2, to examine whether economic stress was associated with physiological reactivity across a challenging task, we tested the model estimating the effects of economic stress on cortisol reactivity (as measured by AUC_G), again controlling for child age and sex. The model had excellent fit, $\chi^2(1, N=165) = 0.04$, *ns*, CFI = 1, RMSEA = .00. Economic stress was associated with greater reactivity ($\beta = .24$, CR = 2.89, $p < .01$). Follow-up analyses modeled cortisol scores at baseline, 20 min after the beginning of the task (reactivity), and 40 min after the beginning of the task (recovery), controlling for age and sex, to assess which of the three assessments were susceptible to economic stress. These analyses revealed that the association between economic stress and children's cortisol was driven by differences at the second time point of the challenge task (reactivity; $\beta = .21$, CR = 2.64, $p < .01$). No association was found for baseline or recovery samples ($\beta = .18$, CR = 1.64, $p = .10$; $\beta = .10$, CR = 1.10, $p = .27$, respectively).

For Aim 3, we examined whether economic stress had a similar effect on self-regulation and children's classroom cortisol for immigrant versus nonimmigrant children. This model assessed the links from economic stress, immigrant group (COHIs vs. nonimmigrant children), and their interaction with children's self-regulation, controlling for child sex and

age. The model had excellent fit, $\chi^2(4, N=165) = 0.22$, *ns*, CFI = 1, RMSEA = .008. As seen in Table 2, immigrant status moderated the relationship between economic stress and children's self-regulation ($\beta = -.18$, CR = -2.03 , $p < .05$). Specifically, among nonimmigrant children, economic stress was associated with poorer higher teacher-rated self-regulation ($b = 1.10$, $p < .001$), whereas among COHIs, higher economic stress was associated with better self-regulation ($b = -0.52$, $p < .01$; see Figure 1).

Next we tested whether the relationship between economic stress and children's physiological reactivity across a challenging classroom task varied as a function of immigrant status. The model had excellent fit, $\chi^2(8, N=152) = 5.08$, *ns*, CFI = 1, RMSEA = .00. As seen in Table 3, immigrant status moderated the relationship between economic stress and cortisol reactivity ($\beta = .48$, CR = 5.21 , $p < .001$). Among COHIs, economic stress was associated with greater cortisol reactivity ($b = 4.18$, $p < .001$), whereas among nonimmigrant children there was no association ($b = 0.11$, *ns*; see Figure 2). Cortisol reactivity was not correlated with teacher-reported self-regulation in either the immigrant ($r = .002$, $p = .99$) or nonimmigrant ($r = -.091$, $p = .34$) samples.

Discussion

A wealth of research has established the connection between economic stress and poorer self-regulation in children. The current study makes an important contribution toward understanding this area of research by including young COHIs, a largely understudied cultural group. Furthermore, the study investigated traditional measures of external self-regulation (teacher report) as well as internal self-regulation (cortisol), as proposed by Blair and colleagues (Ursache et al., 2012), to obtain a comprehensive understanding of patterns of self-regulation.

This exploratory article stemmed from our anecdotal evidence that the preschool children of immigrants in our sample seemed to differ in important ways from their peers. We noted that they were particularly quiet and compliant both in the classroom and in their homes but also that many of them seemed to be engaged in vigilant and onlooker behaviors while at child care. Based on knowledge that these children were often living in homes with high levels of economic stress, and that there is evidence for academic and socioemotional difficulties among COHIs (Crosnoe, 2006), we were interested in whether economic stress in this subsample would be related to concordant or discordant self-regulatory components as discussed in Raver (2004). We hypothesized that children may not show the previously documented relationship between economic stress and poor external behavioral self-regulation, but they perhaps may still evidence increased stress physiology when challenged. Results demonstrated that in the sample as a whole, economic stress predicted teacher-rated self-regulation. However, this effect was carried by the nonimmigrant children and was not true for the COHIs. This suggests that, despite this population's high risk for academic and socio-emotional difficulties, utilization of teacher-reported self-regulation as a risk factor (including the diagnostic value of reports by teachers in assessments of attention and behavioral *Diagnostic and Statistical Manual of Mental Disorders* disorders) may not be the best early indicator for COHIs. As discussed in Raver (2004), we expected that the high priority placed by their parents on external behavioral self-regulation would explain the fact

that young COHIs do not show increasingly poor behavioral regulation as experienced economic stress increases. We note, however, that COHIs did not differ as a whole from nonimmigrant children on teacher-rated self-regulation. This association only emerged as a function of increased stress exposure at home.

We reasoned that to maintain this socially and culturally desirable greater self-control in the classroom in the face of stress, children might utilize their stress physiology. Indeed, we were principally interested in whether discordance between internal and external components of self-regulation would be evident. To test this hypothesis, we utilized salivary cortisol, collected across a mild challenge at child care. COHIs exhibited heightened cortisol levels as a function of economic stress, although this was not true for their nonimmigrant peers. We interpret this difference to stem from the fact that although the task was designed to be challenging, the challenge was mild, and the lead teacher was continuously present. For nonimmigrant children, their level of economic stress at home did not influence how well they were able to handle this challenge with the one-on-one support of the teacher. For COHIs, the challenge task itself was probably particularly unfamiliar, and as their level of economic stress at home increased, they relied more on their stress physiology to handle this challenge in the classroom. Of note is the fact that most of the COHIs were not yet proficient in English and most lead teachers were not bilingual—therefore the adult supporting them during the challenge was attempting to do so in an unfamiliar language. Because these two facts—a language mismatch with their lead teacher and the relative unfamiliarity of the types of demands they face—are also present normally in the classroom, we do feel the differential stress reactivity in response to the challenge likely mirrors their daily experience and is therefore important. Activation of the stress response to handle a challenge is appropriate, but if this happens repeatedly because the environment is too challenging, costs of frequent stress system activation could accrue.

Note that these results do not directly conflict with most prior work, as we did not assess whether economic stress influenced cortisol awakening response or bedtime levels. With that type of measurement, we would expect that economic stress would influence stress physiology across nativity groups. The one study of stress reactivity in a poverty sample (Blair et al., 2005) did find that a lower income-to-needs ratio predicted higher cortisol at all three time points (baseline, reactivity, and recovery). We do not replicate those results here with our measure of economic stress exposure assessed across the past 3 months. Perhaps, as the effect is for all three time points, it in fact reflects higher basal cortisol among the children living in greater poverty rather than greater stress reactivity per se. Presumably the income-to-needs ratio as assessed by Blair et al. (2005) reflected a more stable index of poverty than our assessment of stress experienced in the past 3 months. It is interesting that in the Blair study more reactive cortisol was also associated with improved executive function. In our sample the children who were more reactive were not more regulated—in fact, the two indices were quite discordant; however, we did not objectively assess executive function.

Taken together, our results suggest that among preschoolers, economic stress may lead to difficulties with self-regulation in the classroom. For children who are outwardly well regulated, these difficulties may be detected as heightened stress physiology. Among COHIs,

it is possible that immigrant families put a premium on unobtrusive, cooperative behavior but that children still find these economic stresses difficult to manage, and this is manifested when they are challenged at child care.

Unfortunately, it was not within the scope of this study to examine what aspects of being the child of an immigrant may account for these differences. One speculation is that differences could be attributed simply to lower English proficiency and therefore the stress and wariness of navigating the classroom in an unfamiliar tongue, as suggested by Wanless and colleagues (2011). It is also possible that this difference is the compound experience of cultural, linguistic, and ethnic minority status. Note, however, that our sample as a whole also included children of minority race and ethnicity who were not the children of immigrants.

Because this study was not primarily designed to evaluate self-regulation, there are some inherent limitations in it. These include the use of a single teacher-rated composite of self-regulation and the exclusion of an objectively rated self-regulation task (e.g., attention, working memory, or cognitive flexibility tasks). However, given the paucity of research that addresses the needs of children of immigrants, these exploratory analyses suggest directions for future work on the topic. In particular, in future studies it would be helpful to include a larger sample of children of immigrants, particularly immigrants from different cultural groups and those who differ in the importance they place on self-regulation in children, and a larger comparison group of racially and ethnically matched children born to nonimmigrant parents. Another important direction would be the inclusion of more standard and objective assessments of self-regulation to parse out whether children are in fact better self-regulated, are more regulated across all environmental contexts, or are simply rated as such because they are less demonstrative. It is certainly possible that despite their better rated self-regulation in the classroom COHIs would not show the associated strengths on tasks tapping attention, working memory, or cognitive flexibility. Finally, the present study utilized parent ratings of economic stress rather than more traditional, objective measures of income or other resources. This measure was selected for several reasons. Assessing income correctly in immigrant samples is compromised by a number of factors, including (a) resource sharing (sending money to the home country and receiving neighbor/family help when needed); (b) migratory, seasonal, or unstable income, rendering single-time-point assessments inaccurate; and (c) the potential for inaccurate reporting of income due to confusion or unease reporting illegal under-the-table income. Some families also simply elected not to provide income information. Therefore, in the context of understanding stress effects on children, it was our belief that parental report of economic stress would best capture how difficult the family found it to handle their financial circumstances. Note that the majority of children in the sample were recruited from Head Start or state-supported child care centers and thus represented families at economic, educational, and social disadvantage.

Although cultural group differences were the primary focus of this article, it remains interesting to consider why different children may respond to stresses in their home lives such as economic pressures by either acting out or turning inward and experiencing more physiologic strain. Exploring factors such as temperament, genetic and epigenetic constraints, and family factors like maternal depression or adult antisocial personality disorder may help to clarify this question. These culturally sensitive analyses may be

instructive in attempts to account for trajectories toward child well-being and externalizing or internalizing problems, and integrating culture into models of the effects of stress, such as the adaptive calibration model (Del Giudice, Ellis, & Shirtcliff, 2011), could potentially improve their predictive ability.

From our perspective, the most important implication of this work is that COHIs may be especially likely to be neglected or overlooked for services that are needed to support their positive growth and to prevent the development of academic and socioemotional difficulties, which are known to be more common in this population (Van Hook, Brown, & Kwenda, 2004). For instance, children who are more behaviorally reserved have poorer teacher–child relationships, which have been associated with lower academic achievement (Henricsson & Rydell, 2004). This may be exacerbated in classrooms with limited resources and a high proportion of behaviorally difficult children, who may dominate the teacher’s attention.

Furthermore, these analyses suggest that at least some of the time COHIs may be outwardly well regulated in the face of stress at some cost to themselves. Indeed, maintaining chronically elevated cortisol levels at child care, and exhibiting exaggerated reactions in the face of challenge, although helpful in the short run, can result in much more extensive steroid hormone exposure, which over time can take a toll on the developing brain and body. This is because maintaining a physiologic stress response requires a great deal of energy and is accomplished at the expense of other growth and restorative processes (McEwen, 1998). Experiencing this chronic physiologic arousal early in life may be particularly costly for later physical and mental health (Johnson, Riley, Granger, & Riis, 2013). Given the importance of early identification of young children experiencing chronic physiologic stress in preventing or remediating long-term health and developmental consequences, the need for further more comprehensive work on these preliminary findings is particularly pressing. In addition, this work will become increasingly important, as COHIs are a rapidly growing proportion of children in early childhood settings (Fortuny et al., 2010).

Finally, the current study demonstrates an overall need for supportive and culturally appropriate interventions targeting vulnerable families, including recent immigrant families. Recent immigrant families may be particularly receptive to culturally tailored educational supports and other efforts by child care centers that facilitate the transition into the U.S. educational system. In particular, interventions that target parents as their child’s first and most important buffer against stress may be particularly effective at making stress that could be toxic instead tolerable (Shonkoff, Boyce, & McEwen, 2009). Furthermore, two-generation approaches may be especially well timed and well received by immigrant parents who may be seeking better opportunities for their families in their new host country.

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Figure 1.
The association between economic stress and teacher-reported poor self-regulation by immigrant status. COHI = child of Hispanic immigrants; Med = medium.

Figure 2.

The association between economic stress and cortisol reactivity (AUC_G) by immigrant status. COHI = child of Hispanic immigrants; Med = medium; AUC_G = area under the curve with respect to ground.

Table 1
Intercorrelations Among C-TRF and TCBQ Subscales Used in the Self-Regulation Composite.

Construct	1	2	3	4	5	6
1. C-TRF Emotionally Reactive	—	.69***	.62***	-.54***	.32***	-.37***
2. C-TRF ADHD		—	.96***	-.75***	.46***	-.64***
3. C-TRF Attention Problems			—	-.77***	.37***	-.68***
4. TCBQ Inhibitory Control				—	-.37***	.71***
5. TCBQ Impulsivity					—	-.25***
6. TCBQ Attentional Focusing						—

Note. C-TRF = Caregiver-Teacher Report Form TCBQ = Teacher-Children's Behavior Questionnaire; ADHD = Attention Deficit/Hyperactivity Disorder.

p < .001.

Table 2

Teacher-Reported Self-Regulation Regressed on Economic Stress, Immigrant Status, and Their Interaction.

Variable	<i>B</i>	<i>SE</i>	β	CR
Age	0.56	.52	.08	1.08
Sex	-2.20**	.72	-.22	-3.04
Economic stress	1.10**	.38	.26	2.89
Immigrant status	2.05*	.95	.18	2.16
Economic Stress $\times$ Immigrant Status	-1.62*	.80	-.18	-2.03
R^2	14			

*
 $p < .05$.**
 $p < .01$.

CR = critical ratio

Table 3

Cortisol Reactivity (AUC_G) to the Challenge Task on Economic Stress, Immigrant Status, and Their Interaction.

Variable	<i>B</i>	<i>SE</i>	β	CR
Age	-1.32 *	.51	-.20	-2.61
Sex	-0.66	.71	-.07	-0.93
Assessment time	0.03	.27	.01	0.11
Economic stress	0.11	.36	.03	0.31
Immigrant status	-1.54	.95	-.14	-1.63
Economic Stress $\times$ Immigrant Status	4.07 ***	.78	.48	5.21
R^2	.27			

Note. Challenge task cortisol was collected just before (baseline) and 20 min (reactivity) and 40 min (recovery) after beginning the challenge task. AUC_G = area under the curve with respect to ground.

*
 $p < .05$.

 $p < .001$.

CR = critical ratio.