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# Child Behavior Problems, Teacher Executive Functions, and Teacher Stress in Head Start Classrooms

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## Abstract

**Research Findings—**The current article explores the relationship between teachers' perceptions of child behavior problems and preschool teacher job stress, as well as the possibility that teachers' executive functions moderate this relationship. Data came from 69 preschool teachers in 31 early childhood classrooms in 4 Head Start centers and were collected using Web-based surveys and Web-based direct assessment tasks. Multilevel models revealed that higher levels of teachers' perceptions of child behavior problems were associated with higher levels of teacher job stress and that higher teacher executive function skills were related to lower job stress. However, findings did not yield evidence for teacher executive functions as a statistical moderator.

**Practice or Policy—**Many early childhood teachers do not receive sufficient training for handling children's challenging behaviors. Child behavior problems increase a teacher's workload and consequently may contribute to feelings of stress. However, teachers' executive function abilities may enable them to use effective, cognitive-based behavior management and instructional strategies during interactions with students, which may reduce stress. Providing teachers with training on managing challenging behaviors and enhancing executive functions may reduce their stress and facilitate their use of effective classroom practices, which is important for children's school readiness skills and teachers' health.

Emerging research in early childhood education suggests that teachers play a critical role in creating and maintaining high-quality early education environments (Rhodes & Huston, 2012), which in turn are important for children's cognitive, language, and social-emotional development (Burchinal et al., 2000; Mashburn et al., 2008; Peisner-Feinberg et al., 2001; Vandell & Wolfe, 2000). Yet teachers' abilities to provide high-quality learning environments may be hampered if they are too highly stressed (Friedman-Krauss, Raver, Morris, & Jones, in press). Thus, understanding the correlates of preschool teacher job stress

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as well as possible protective factors against escalating stress is crucial for children's school readiness and development during preschool as well as the teacher's own health and well-being. In the current study, we consider characteristics of both children (i.e., behavior problems) and teachers (i.e., their cognitive regulation or executive function abilities) within the classroom context that might be expected to be associated with teachers' job stress. In light of the high rates of turnover among the early childhood workforce (Rhodes & Huston, 2012; Whitebook & Sakai, 2003), understanding the dynamics between children and teachers within the classroom that are associated with teacher job stress, either positively or negatively, deserves attention.

Several theoretical frameworks can be leveraged to help understand the ways in which teachers may experience higher versus lower levels of stress within the classroom. For example, Jennings and Greenberg (2009) proposed a model of the prosocial classroom that provides a framework for understanding the transactional relationships between characteristics of children and teachers within the context of a preschool classroom. In their model, teachers' social-emotional well-being and competence and students' social-emotional competence are bidirectionally related through their influence on classroom quality. Socially and emotionally competent preschool teachers can positively influence children's social-emotional skills, including reducing their behavior problems, by forming positive relationships with them and providing a calm, structured learning environment. These teachers tend to exhibit self-awareness, social awareness, responsible decision making, self-management, and relationship management. That is, they are happy, exhibit prosocial behaviors toward their students and coworkers, and consider the consequences of their decisions for others (Jennings & Greenberg, 2009; Zins, Weissberg, Wang, & Walberg, 2004), all of which are important for the classroom context and children's development.

However, given the bidirectional influences of teacher and child characteristics, the prosocial classroom model also suggests that children's behavior problems affect teachers' abilities to provide a high-quality environment. That is, high levels of child behavior problems can lead to a chaotic classroom environment and increasing levels of teacher stress. *Teacher job stress* can be defined as conditions in the workplace (i.e., in the classroom) that negatively influence physiological, psychological, and social well-being (Curbow, Spratt, Ungaretti, McDonnell, & Breckler, 2000; Zhai, Raver, & Li-Grining, 2011). *Job stress* can also be defined as the experience of negative emotions that arise from work (Klassen & Chiu, 2010) and is often associated with emotional exhaustion and burnout (Jennings & Greenberg, 2009). According to Lazarus's transactional model of stress and coping, teachers' feelings of stress result from their subjective interpretation of events (i.e., child behavior problems) as obstructing achievement of goals (i.e., leading class-room activities; Lazarus, 1991; Spilt, Koomen, & Thijs, 2011). Preschool teachers, especially those charged with educating at-risk children, may feel stressed because of the combination of dealing with child behavior problems, low pay, long hours, and little support (Zhai et al., 2011).

Thus, we can also draw from theoretical frameworks deployed to understand burnout among teachers: The concept of a "burnout cascade" suggests a cyclical relationship between escalating child behavior problems and escalating teacher stress (Jennings & Greenberg, 2009; Maslach & Jackson, 1981). *Burnout* can be defined as "a syndrome of emotional

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exhaustion and cynicism that occurs frequently among individuals who do 'people work' of some kind" (Maslach & Jackson, 1981, p. 99) and aptly applies to early childhood educators. Stress is likely one cause of teacher burnout (Jennings & Greenberg, 2009).

The question then becomes: Are some teachers more susceptible than others to this "burnout" cascade, including greater susceptibility to the influence of child behavior problems? Recent studies have found support for ways in which teachers' own psychological characteristics, including higher levels of depressive symptoms and lower levels of self-efficacy, serve as powerful predictors of teachers' subjective evaluations of conflict with children (Hamre, Pianta, Downer, & Mashburn, 2008; Mashburn, Hamre, Downer, & Pianta, 2007). One protective psychological factor may be adults' capacity to marshal their attention, working memory, and impulses (referred to as their *executive function skills*) to manage the many cognitively and emotionally demanding tasks of teaching and managing a busy classroom (Raver, Blair, & Li-Grining, 2012). Based on previous research that has found negative associations between stress and executive function skills (Koso & Hansen, 2006; Leskin & White, 2007), we posit that the relationship between child behavior problems and teacher stress may be attenuated for teachers with higher executive function skills. Before turning to a review of prior research on the role of teachers' executive functions, we first briefly review the literature on the ways in which child behavior problems may increase teacher stress, particularly in the context of early childhood settings.

## CHILD BEHAVIOR PROBLEMS AND TEACHER STRESS

Despite an abundance of research linking children's behavior problems and their own and their peers' social-emotional and cognitive development (e.g., Aizer, 2008; Dmitrieva, Steinberg, & Belsky, 2007; Duncan et al., 2007; Fantuzzo, Bulotsky-Shearer, Fusco, & McWayne, 2005; Goldstein, Arnold, Rosenberg, Stowe, & Ortiz, 2001; Hanish, Martin, Fabes, Leonard, & Herzog, 2005; Hinshaw, 1992; National Institute of Child Health and Human Development Early Child Care Research Network, 2004; Neidell & Waldfogel, 2008), less work has focused on the association between child behavior problems and teacher social-emotional well-being, or stress. In light of evidence that the social-emotional well-being of early childhood teachers is important for young children's social-emotional and academic outcomes (Denham, Bassett, & Zinsser, 2012; Jennings & Greenberg, 2009), understanding the association between child behavior problems and teacher job stress can provide critically important information for policy and professional development.

The bulk of the extant research has examined teachers' roles in affecting children's outcomes while neglecting to examine the role children play in shaping teachers' outcomes. Yet theory suggests that the relationship between characteristics of children, such as behavior problems, and characteristics of teachers, such as emotional job stress, is likely bidirectional. That is, this relationship may be driven by escalating levels of conflict in the classroom as both child behavior problems and teacher stress increase. The transactional model of coercive cycles of adult-child conflict (Snyder, Cramer, Afrank, & Patterson, 2005) provides a framework for why children's behavior problems lead to higher levels of teacher job stress: As child behavior problems increase and become more difficult to manage, both children and teachers may resort to increasingly emotionally negative and hostile behaviors

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in attempt to control a given interaction, which leads to escalating conflict (Patterson, 1996; Patterson & Yoerger, 2002) and teacher job stress.

The literature points to another possible explanation for this hypothesized relationship between child behavior problems and teacher job stress: Teachers may tailor their levels and types of support to individual children, targeting more support to children with higher levels of behavior problems (Thijs, Koomen, & van der Leij, 2006). Coping with children's behavior problems in this way may be more demanding on teachers' emotional, attentional, and cognitive resources and may consequently exacerbate teachers' stress (see Raver et al., 2012, for review). Furthermore, teachers face the unique challenge that they cannot simply walk away from a misbehaving child despite their own feelings of negative emotionality (Jennings & Greenberg, 2009), which perhaps further increases their feelings of stress.

Although a broader literature has found associations between children's behavior problems and other constructs related to teacher well-being, including greater conflict in the student-teacher relationship (Hamre et al., 2008; Henricsson & Rydell, 2004), lower job satisfaction (Kontos & Stremmel, 1988), and increased burnout (Hastings & Bham, 2003; Hastings & Brown, 2002), to our knowledge there have been only a handful of studies to empirically address the association between child behavior problems and teacher stress. For example, studies have found that higher levels of behavior problems were associated with higher levels of teacher-reported stress among teachers of 3- to 18-year-old children with autism spectrum disorders (Lecavalier, Leone, & Wiltz, 2006) and low-income urban 3- and 4-year-old minority children (Friedman-Krauss et al., in press). Zhai and colleagues (2011) found evidence that an intervention to improve preschool teachers' management of behavior problems resulted in lower job stress. The same intervention also resulted in decreases in children's behavior problems over the preschool year (Raver et al., 2009). Although the researchers have not empirically tested to see whether the decrease in children's behavior problems is a mechanism for the concurrent decreases in teacher job stress, the evidence supports this hypothesis. The current study builds on this evidence by examining the association between child behavior problems and teacher stress among a population of midwestern Early Head Start and Head Start children and their teachers.

Additional evidence for the hypothesized association between child behavior problems and teacher stress comes from the literature on child behavior problems and parent stress. Given that preschool teachers spend increasingly more time caring for young children, the parenting literature offers insight into the role that child behavior problems may play in influencing stress among early childhood teachers (Denham et al., 2012). Several studies, including some with low-income samples, have demonstrated an association between child behavior problems and parent stress (e.g., Campbell, Pierce, Moore, Marakovitz, & Newby, 1996; Gross, Sambrook, & Fogg, 1999). Thus, the robust relationship between child behavior problems and parent stress provides evidence for a similar pattern among preschool teachers and their young students.

Although there is evidence to suggest a relationship between child behavior problems and teacher stress, knowledge about the characteristics of teachers that may influence this association is still lacking. Specifically, teachers are likely to vary in their ability to be

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resilient against rising negative emotionality in response to child behavior problems and to maintain low or moderate levels of stress (Raver et al., 2012). Thus, the current article aims to add to the research base by examining how teachers' executive function skills may serve as a protective psychological resource against escalating teacher stress in the face of child behavior problems.

## TEACHER EXECUTIVE FUNCTION ABILITIES AS A PROTECTIVE PSYCHOLOGICAL RESOURCE

Research on individuals' cognitive regulation, or executive function, provides a helpful lens through which to examine teachers' psychological resources in the face of environmental demands. Executive functions are higher order, top-down, cognitive processes that are important for planning, attention, problem solving, organizing information, resisting impulses, and goal-directed behavior (Blair & Ursache, 2011). The predominant tripartite model of executive function divides them into three components: working memory (the ability to mentally hold and use information), inhibitory control (the ability to resist impulses or the ability to suppress a dominant response in favor of a more appropriate, subdominant response), and cognitive flexibility or set shifting (the ability to flexibly shift one's attentional focus; Blair & Ursache, 2011; Garon, Bryson, & Smith, 2008; Raver et al., 2012). All three components of executive function may be associated with teachers' job stress in the context of child behavior problems in a preschool classroom. For example, teachers with greater working memory may be better able to remember and implement a positive, effective behavior management strategy. Teachers with greater inhibitory control may be better able to override an automatic tendency to use a less adaptive behavior management strategy in favor of a more effective and cognitively based strategy. And teachers with greater cognitive flexibility may be more efficient at maintaining control and awareness of the whole classroom when dealing with one misbehaving child.

Taken together, executive function abilities may facilitate early childhood teachers' use of higher order, cognitive processes to deal with child behavior problems in a thoughtful, appropriate, planned manner rather than using automatic but less appropriate responses. For example, a teacher with high executive function skills might be able to deal constructively with a misbehaving child by talking to the child, without letting the incident detract him or her from an activity or the broader classroom happenings. In contrast, a teacher with low executive function skills might respond automatically by raising his or her voice at the misbehaving child and losing track of the activity, which could result in a chaotic classroom atmosphere and increased teacher stress. Teachers with higher executive functions may also be better able to use classroom and behavior management strategies recently learned, for example, in the context of an intervention (Raver et al., 2012). Thus, high executive functions may serve as a protective factor for teachers of children with challenging behaviors by enabling them to use cognitive control in response to emotionally arousing events (i.e., behavior problems; Raver et al., 2012).

Despite this theoretical rationale for preschool teachers' executive function abilities as a protective factor against escalating stress in the context of child behavior problems, to our

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knowledge the association between teachers' executive function skills and teachers' job stress has not been tested empirically. The current study expands on this theoretical basis by empirically testing the association between preschool teachers' executive functions and their job stress. We hypothesize that teachers' cognitive regulation, identified as their executive function abilities, is one key buffering or protective characteristic that helps some teachers more than others in coping with the emotional and psychological challenges of child behavior problems.

## RESEARCH GOALS

First, the current study aims to fill a gap in the existing literature by determining whether higher levels of Head Start teachers' perceptions of child behavior problems are significantly associated with Head Start teachers' reports of higher levels of job stress. Second, we examined the association between teacher executive function abilities and teachers' perceptions of their job stress. We hypothesized that teachers with higher levels of executive function skills would report lower levels of job stress. We utilized both a self-report measure of executive function as well as two direct assessments of executive function. Third, we tested whether teacher executive function skills moderated the hypothesized relationship between teachers' perceptions of child behavior problems and teacher job stress. We hypothesized that the relationship between teachers' perceptions of child behavior problems and teacher job stress would be positive and stronger among teachers with low compared to high executive function abilities. However, teachers with high executive function skills might demonstrate greater resilience to the challenges and difficulties of managing large numbers of children and behavior problems through the use of cognitive strategies, and the association between child behavior problems and job stress might be weaker for this group.

In order to address our hypotheses and accomplish our research goals, we utilized Web-based surveys and Web-based direct assessment tasks to collect information on teachers' perceptions of child behavior problems, teacher job stress, and teacher executive function from a sample of Head Start and Early Head Start teachers.

## METHOD

### Sample

The current study used data collected from teachers in Head Start and Early Head Start classrooms in centers run by one umbrella nonprofit child development center in Ohio. Through a collaboration with the administrative staff, we were able to collect data in four Head Start centers across two counties. Head Start is a national program run by the Administration for Children and Families whose purpose is to enhance the school readiness skills of low-income 3- and 4-year-olds (Puma et al., 2010). Early Head Start, another national program, provides center-based and home-visiting services to low-income children and their parents from birth (or prenatally) through age 3 (Raikes, Brooks-Gunn, & Love, 2013). Both programs are based on a whole child model and provide comprehensive services, including education; medical, dental, and mental health care; nutrition; and parental involvement activities. All children and teachers included in the current study were in center-based classrooms.

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There were 97 teaching staff (lead teachers, assistant teachers, and teacher aides) in 35 classrooms in four centers. The majority of the classrooms ($n$ = 30) were Head Start classrooms, serving 3- and/or 4-year-olds; the remaining were Early Head Start classrooms ($n$ = 5), serving infants and toddlers. A total of 69 teachers (71%) volunteered to participate in the study. Of these, 29 were lead teachers, 24 were assistant teachers, and 16 were teacher aides; 56 were Head Start teachers and 13 were Early Head Start teachers. Teachers in 31 of the 35 classrooms (89%) participated in the study. The number of teachers per classroom participating in the study ranged from 1 to 3, with an average of 2.23 teachers per classroom.

The majority of the teaching staff, 63 (91%), were female. Moreover, 33 teachers (48%) reported their race/ethnicity as African American/Black, and 30 teachers (43%) reported their race/ethnicity as White. Of the remaining teaching staff, 2 (3%) reported their race/ethnicity as Hispanic, 2 (3%) reported biracial, and 2 (3%) refused to report their race/ethnicity. In addition, 28 teaching staff (41%) reported having earned a bachelor's degree or higher; 18 (26%) reported having earned an associate's degree, which includes a Child Development Associate degree; and 23 (33%) reported having completed only a high school diploma and/or some college. Classrooms had an average of 14.4 children, ranging from 8 to 24.

## Procedures

All data were collected using Web-based questionnaires and Web-based direct assessment tasks. Teaching staff in four centers were invited to participate in the study through fliers created by the researchers and distributed by center administrators. Fliers provided information about the purpose of the study, a unique identifier for each teacher, and the researchers' contact information. The fliers also informed teachers about what participation would entail and directed teachers to the website through which they could access the questionnaires and tasks. Administrative staff at the centers were knowledgeable about the study and were available to answer questions about the study. Teaching staff who participated in the study received a $10 gift card as a thank you for their participation.

Teaching staff logged onto the website to complete the study and had access to computers in their classroom. They could complete the questionnaires and tasks at any time but were advised to do so all in one session of approximately 20 min. All data were collected using an Internet Explorer browser on PCs. Teaching staff used their unique identifier to log into the website and never provided any personally identifying information. The unique identifier was linked to their classroom in order to link their data to classroom-level indicators. All Web data were collected and transmitted using a secure server.

## Measures

Teaching staff completed questionnaires and two cognitive direct assessment tasks via the online platform. They also provided information about their own demographic characteristics as well as information about their classroom during the fall of the school year.

**Questionnaires—**Teachers completed a slightly modified version of the Child Care Worker Job Stress Inventory (Curbow et al., 2000) as a measure of their job stress. We

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created a job stress subscale using five items (Cronbach's $\alpha$ = .61) from the modified measure that we believed, based on a priori theoretical beliefs, would best capture the stressors a teacher may experience due to managing child behavior problems in the classroom. Items are reported on a 5-point Likert scale. Higher scores reflect higher levels of job stress (1 = rarely, 3 = sometimes, and 5 = most of the time). A mean of the five job stress items was computed and used in the analyses. Items included in our job stress scale are "Children with behavior problems are hard to deal with," "There are major sources of stress in the children's lives that I can't do anything about," "All the children need attention at the same time," "My class-room becomes so noisy that I feel very irritated," and "How much control do you have over the following things at work: getting children to do what you want" (reverse-coded). This measure of job stress specifically measures emotionally upsetting challenges faced by teachers of preschool-age students. Although Cronbach's alpha was slightly below the generally accepted limit of .70, a Cronbach's alpha of .60 has also been accepted in the field (see Zhai et al., 2011). The use of our job stress scale can be further justified in light of its association with the Emotional Support domain from the Classroom Assessment Scoring System (La Paro, Pianta, & Stuhlman, 2004) in previous research that found an association between high levels of teacher job stress and lower classroom emotional support (Friedman-Krauss et al., in press).[1]

Teachers next completed a 6-item self-report of their own executive function problems using the WebExec (Cronbach's $\alpha$ = .89). The WebExec was designed to be administered in an online format and has high internal reliability and construct validity (Buchanan et al., 2010). Items are scored on a 4-point scale (1 = no problems experienced, 2 = a few problems experienced, 3 = more than a few problems experienced, and 4 = a great many problems experienced). Items include, for example, "Do you find yourself having problems concentrating on a task?" and "Do you find yourself acting on 'impulse'?" Items were reverse-coded so that higher scores represent lower executive function problems, or higher executive function abilities. The mean of these six reverse-coded items was used in the analyses.

Lastly, teaching staff provided a global report of their perceptions of child behavior problems in their classroom. They rated 11 items (Cronbach's $\alpha$ = .82) about child behavior problems on a 5-point scale that reflected how many children in the classroom displayed that problem. Teachers could respond that the behavior problem applied to no children, 1 child, 2–3 children, 4–5 children, or most of the children in their classroom. Higher scores reflect higher levels of child behavior problems in the classroom. Items were adapted from the Child Care Worker Job Stress Inventory (Curbow et al., 2000) and the Behavior Problems Index (Zill, 1990). Examples of items include "Children misbehave frequently" and "Children are frequently impulsive or act without thinking." The mean of these 11 items was used in the analyses.[2]

**Executive function direct assessment tasks—**Teaching staff completed the Backwards Letter Span task (Wechsler, 1945, 1974), which was adapted for use on the

[1]Results from a factor analysis of the job stress items indicated that the five items load moderately to highly on one factor.
[2]Results from a factor analysis of the behavior problems items indicated that the 11 items load moderately to highly on a single factor.

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computer. In this task, letters were flashed on the screen one at a time for 1 s. Teaching staff were asked to respond by typing the letters that they saw in reverse order. For example, in the first trial, the letters Y, S, and P were flashed on the screen one at a time and the correct response was to type "P S Y." The trials increased in difficulty as the task progressed from three to eight letters. There were two trials of each stimulus length. The task continued until both trials of one stimulus length were incorrect or until the task was completed. A trial was considered correct if all letters were correctly recalled in reverse order. We calculated the total number of letters correctly recalled by multiplying the number of trials correct by the number of letters in the trial.

Teaching staff next completed the Trail Making task (Reitan & Wolfson, 1995, 2004). They were administered Parts A and B of the Trail Making task, which had been adapted for use on the computer. In Part A of this task, teaching staff were first shown a screen that had 25 numbers enclosed in little circles. They were instructed to click using the left mouse button on each circle in ascending order (i.e., 1, 2, 3, … 23, 24, 25) as quickly as possible. An error message was displayed indicating the correct response if the teachers clicked incorrectly. They completed a second block of number trials in which the spatial arrangement of the numbers was different. The task was then repeated using 26 uppercase letters. Teaching staff were instructed to click on the circle of each letter in ascending order (i.e., A, B, C, … X, Y, Z) as quickly as possible. In Part B of the task, the numbers 1 to 13 were mixed with the letters A through M. Teaching staff were instructed to alternate between letters and numbers (i.e., 1, A, 2, B, 3, C, … 11, K, 12, L, 13, M) as quickly as possible. They completed two blocks of these trials. We calculated the average percent correct across Part A and the average percent correct across Part B. The average percent correct on Part B, the mixed trials, was used as a measure of teacher executive function. The average percent correct on Part A, the number-only and letter-only trials, was used to control for teachers' general cognitive ability.

**Demographics—**Teaching staff completed questions about their own background, including their gender, race/ethnicity, and highest degree earned. They reported whether they were a lead teacher, assistant teacher, or teacher aide. Teachers and the administrative staff each provided information about the total number of children enrolled in each classroom. They also indicated whether the classroom was a Head Start or Early Head Start classroom, which was used as an indicator of the age of the children enrolled in the classroom.

## Methodological Challenges

Our analyses rely on reports of classroom-level child behavior problems and job stress completed by teachers who participated in the study. Thus, our study's results might be influenced by selection bias if teachers who did and did not participate in this research differed on important characteristics. To address the concern for selection bias, we conducted *t* tests to test for differences in reports of child behavior problems between classrooms in which all teaching staff participated and classrooms in which at least one but not all of the teaching staff participated. There were no statistically significant differences in child behavior problems between these two types of classrooms, providing some assurance

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that teachers' participation in the study was not dependent on the level of child behavioral difficulty in the classroom.

## Analytic Approach

We used multilevel modeling to estimate the associations between teachers' perceptions of child behavior problems and teacher job stress. We then tested the association between teacher executive function, using both the self-report and direct cognitive assessments, and teacher job stress. Next we added a set of teacher- and classroom-level covariates into our models. In the last model we added an interaction between child behavior problems and teacher executive function.

Using a multilevel modeling approach allowed us to simultaneously estimate the variance associated with individual-level (within-teacher) and classroom-level (between-teachers) factors based on the specification of fixed- and random-effect variables in the model (Raudenbush & Bryk, 2002). Including indicator variables for each center additionally allowed us to control for the center in which the teaching staff worked. We estimated the association between teachers' perceptions of child behavior problems and teacher executive function and teacher job stress over and above the role of teacher characteristics (gender, race/ethnicity, highest level of education, and job type) and classroom characteristics (class size and age of students enrolled). The multilevel analyses were run in Mplus Version 6.12.

The associations between teacher job stress and teachers' perceptions of child behavior problems in the classroom and teacher executive function skills were modeled using two equations. The teacher-level (Level 1) equation used was as follows:

$$Y_{ij}=\beta_{0j}+\beta_{1j}X_{1ij}+\sum\nolimits_{m}\beta_{2j}X_{2ij}+\sum\nolimits_{n}\beta_{3j}X_{3ij}+e_{ij},$$

where $Y_{ij}$ is the job stress of teacher *i* in classroom *j;* $\beta_{1j}X_{1ij}$ is the report of child behavior problems from teacher *i* in classroom *j;* $\Sigma_m\beta_{2j}X_{2ij}$ represents the three separate measures of executive function ability for teacher *i* in classroom *j;* and $\Sigma_m\beta_{3j}X_{3ij}$ represents the sum of *n* teacher characteristics, such as gender, race/ethnicity, highest level of education, and job type. $e_{ij}$ is the random error term.

The classroom-level (Level 2) equation used was the following:

$$\beta_{0j}=\gamma_0+\sum\nolimits_{p}\gamma_{1j}W_{1j}+\sum\nolimits_{q}\gamma_{2j}W_{2j}+r_j,$$

where $\Sigma_p\gamma_{1j}W_{1j}$ represents the sum of *p* classroom characteristics such as class size and age of children for classroom *j* (i.e., whether classroom *j* is a Head Start or Early Head Start classroom). $\Sigma_q\gamma_{2j}W_{2j}$ represents indicator variables for each of the four centers. $r_j$ is a random error term.

Next we investigated whether the relationship between teachers' perceptions of child behavior problems and teacher stress was moderated by teacher executive function skills. The interaction was included in the Level 1 equation. We grand-mean-centered teachers'

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perceptions of child behavior problems and teacher executive function abilities prior to creating the interaction term, and used these variables in the analyses. The full information maximum likelihood procedure in Mplus was used to handle missing data. Data were missing for no more than 5% of cases on any one variable, and complete data were available for most variables.

Three of the variables, teacher-reported executive function measured by the WebExec, executive function measured by the percent correct on Part B of the Trails task, and cognitive ability measured by Part A of the Trails task, were negatively skewed. Thus, these variables were transformed by taking the inverse of the reflected variable. This method decreased the skew of the three variables, and therefore the transformed variables were included in the analyses.

## RESULTS

Table 1 displays the means and standard deviations of the teacher- and classroom-level variables used in the analyses. Table 2 shows the intercorrelations between teachers' perceptions of child behavior problems, teacher executive function skills, teacher stress, and teacher- and classroom-level covariates. The three measures of executive function are weakly and nonsignificantly correlated. Notably, the percent correct on Part B of the Trail Making task was negatively correlated with the two other measures of executive function.

Table 3 shows the results from the two-level models that examined teacher- and classroom-level predictors of teacher job stress. We used multilevel modeling with teachers nested in classrooms to examine the associations between teachers' perceptions of child behavior problems and teacher executive function, and teacher stress. Based on the unconditional means models, 32% of the variance in teacher job stress was explained by the teacher's classroom (intraclass correlation coefficient = 0.32). Thus, classrooms explained a meaningful proportion of the variance in teacher job stress, and two-level models with teachers nested in classrooms were warranted. In addition, to account for the center in which the teacher worked and to control for between-center differences, we included indicator variables for each center. However, results were robust across different model specifications, including ordinary least squares regression, nesting in classrooms without controlling for the center, and nesting only in centers.

First, in Model 1, we tested the association between teachers' perceptions of child behavior problems and teacher self-reported job stress. We found that on average teachers who reported higher levels of child behavior problems in their classrooms also reported higher levels of job stress, and this relationship was statistically significant ($b = 0.76$, $SE = 0.10$, $p < .001$). Next, in Model 2, we added the three measures of teacher executive function into the model while controlling for general cognitive ability as measured by the percent correct on the letter-only and number-only trials on the Trail Making task (Part A). The association between teacher-reported classroom child behavior problems and teacher stress remained statistically significant ($b = 0.70$, $SE = 0.11$, $p < .001$) over and above teacher executive function. One of the three measures of teacher executive function ability significantly predicted teacher job stress: Teachers who had a higher percent correct on the mixed trials of

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the Trail Making task (Part B, the most difficult trials) on average reported lower levels of job stress ($b = -2.56$, $SE = 1.15$, $p = .03$) when controlling for teachers' perceptions of child behavior problems and general cognitive ability. Neither the teacher self-report of executive function (WebExec) nor the total letters correct from the Backwards Letter Span significantly predicted teacher job stress. Model fit improved from Model 1 to Model 2 with the addition of the three executive function variables. The Akaike's information criterion (AIC), a measure of model fit based on the number of model parameters and the log likelihood, decreased from 58.00 in Model 1 to 56.88 in Model 2, indicating better model fit.

In Model 3, we added teacher- and classroom-level covariates into the model. Teachers' perceptions of classroom child behavior problems continued to be significantly associated with teacher job stress ($b = 0.63$, $SE = 0.10$, $p < .001$) over and above teacher executive function abilities and the teacher- and classroom-level characteristics. Higher teacher executive function as measured by the percent correct on Part B of the Trail Making task also continued to be significantly associated with lower teacher job stress ($b = \bullet 2.30$, $SE = 1.15$, $p < .05$) over and above teacher general cognitive ability, teachers' perceptions of child behavior problems, and teacher- and classroom-level covariates. Higher scores on the WebExec (higher executive function), the teacher self-report of executive function, were also associated with lower teacher stress, but this association was only marginally significant ($b = -0.45$, $SE = 0.27$, $p = .10$). Teaching staff general cognitive ability as measured by Trail Making task Part A was also marginally associated with teacher job stress ($b = 3.59$, $SE = 1.95$, $p = .07$). Larger class sizes were significantly associated with higher levels of teacher job stress ($b = 0.05$, $SE = 0.02$, $p = .002$) when controlling for teachers' perceptions of child behavior problems, teacher executive function ability, and other teacher- and classroom-level covariates. It is important to note that class size and teacher reports of child behavior problems were weakly and nonsignificantly correlated ($r = .20$, $p < .11$). No other teacher- or classroom-level covariates were statistically significantly associated with teacher job stress. After we controlled for teacher and classroom characteristics, the random effects revealed that there was more between-teacher than between-classroom variation in teacher job stress ($e_{ij} = 0.17$, $r_j = .00$; see Table 3). The AIC for Model 3 increased to 60.76. This decline in model fit can be attributed to the addition of six new covariates into the model, only one of which was a significant predictor of teacher job stress. Despite the decrease in model fit, we kept this set of covariates in the model in order to demonstrate the role of teachers' perceptions of child behavior problems and teacher executive function skills net of these theoretically chosen teacher and classroom characteristics.

Finally, in Model 4, we added an interaction between teachers' perceptions of child behavior problems and teacher executive function as measured by the percent correct on Part B (mixed trials) of the Trail Making task in order to test for moderation of the relationship between teachers' perceptions of child behavior problems and teacher job stress. However, this interaction did not achieve statistical significance. The model fit again decreased (AIC increased to 62.68) with the addition of this interaction into the model. As testing the interaction between teachers' perceptions of child behavior problems and teacher executive function was central to our moderation hypothesis, we left the interaction in the final model.

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## DISCUSSION

In the current study we were interested in understanding the relationship between teachers' perceptions of child behavior problems and teacher job stress in the context of early childhood Head Start and Early Head Start classrooms. We also identified teacher executive function, or cognitive regulation, as an additional important correlate of teachers' feeling of job stress as well as a potential buffering factor, or moderator. That is, we hypothesized that teachers' perceptions of child behavior problems might pose less of a threat to feelings of job stress for those teachers with high levels of executive function, whereas teachers' perceptions of child behavior problems were posed to be more strongly associated with higher job stress among those teachers with low executive function skills.

### Child Behavior Problems and Teacher Job Stress

We found evidence to support our first hypothesis that higher levels of teachers' perceptions of child behavior problems in their classrooms are associated with higher levels of teacher job stress. These results were expected and are in line with previous research that has found higher levels of stress among both teachers and parents of children with greater behavior problems (e.g., Baker, Blacher, Crnic, & Edelbrock, 2002; Campbell et al., 1996; Friedman-Krauss et al., in press; Gross et al., 1999; Hastings, 2002; Lecavalier et al., 2006; Mash & Johnston, 1983). When teachers need to manage child behavior problems in addition to covering the curriculum, their psychological resources may be taxed, and the additional challenges of behavior management may detract from their instructional goals (Raver et al., 2012; Thijs et al., 2006). This problem may be compounded in cases in which early childhood teachers have not received sufficient training for dealing with behavior problems (Raver et al., 2009).

High levels of teacher job stress may be problematic for both the teachers themselves and the children in their classrooms. Between 20% and 40% of teachers report that teaching is a highly stressful profession (Cockburn, 1996; Kyriacou & Sutcliffe, 1978), which is a higher percentage than in many other professions (see Jennings & Greenberg, 2009). Moreover, teachers reported that stress was one of the top reasons for leaving their jobs (Darling-Hammond, 2001), and the rate of teacher turnover among early childhood teachers is higher than in many other human service professions, estimated to be 29% (Rhodes & Huston, 2012; Whitebook & Sakai, 2003). As stability of care is important for young children (Barnas & Cummings, 1994; Rhodes & Huston, 2012), and more experienced teachers may be more likely to provide high-quality care (Pianta et al., 2005), this high rate of teacher turnover is problematic and alarming. Teacher burnout, which includes feelings of emotional exhaustion, depersonalization, and a lack of personal accomplishment (Jennings & Greenberg, 2009; Maslach & Jackson, 1981), is another consequence of stress and may also be partially responsible for the high rates of turnover among early childhood teachers (Jennings & Greenberg, 2009; Raver et al., 2012). High levels of stress are also associated with increased health problems and reduced immune function (e.g., Adler & Newman, 2002; DeLongis, Folkman, & Lazarus, 1988; McEwen, 2000; Needle, Griffin, & Svendsen, 1981; O'Leary, 1990; Webster Marketon & Glaser, 2008). Teacher health problems are clearly a

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negative consequence for both teachers and students, particularly if the teacher is frequently absent and there is a disruption to the daily routines and learning.

Results of our study also highlight that features of teachers' preschool environments were key predictors of teachers' reports of stress. Specifically, the unconditional means models revealed that 32% of the variance in teacher job stress was attributed to the classroom in which the teacher worked. This finding is consistent with limited previous research that has shown an association between classroom structural features and teacher stress (Lambert, McCarthy, O'Donnell, & Wang, 2009). For example, features of the classroom, such as compatibility with co-teachers and physical space, may also influence teacher stress. However, our results also suggest that even when the classroom and the center are accounted for, child behavior problems remain significantly and positively associated with teacher job stress.

In addition, the relationship between teachers' perceptions of child behavior problems and teacher job stress held even when we controlled for various teacher- and classroom-level covariates, including the number of children enrolled in the classroom. Even though class size is associated with teachers' job stress, the association between teachers' perceptions of child behavior problems and teacher job stress remains significant when accounting for class size. Although we cannot make causal claims from our analyses, in addition to policies that target class size reductions, policies aimed at reducing child behavior problems, such as trainings or interventions to help teachers better manage their classrooms, may be effective at reducing teacher stress. Indeed, evidence from the Chicago School Readiness Project, a cluster randomized controlled trial, suggests that the multicomponent intervention aimed to reduce child behavior problems and improve classroom management was successful in reducing teacher stress (Zhai et al., 2011).

As our study relied on data from only one time point, it is not possible to empirically determine the directionality of the relationship between teachers' perceptions of child behavior problems and teacher job stress. In line with previous research in which child behavior problems in the fall predicted teacher job stress in the spring (Friedman-Krauss et al., in press), as well as theory, we speculate that high levels of child behavior problems may at least partially drive higher levels of teacher stress. However, we recognize that it is also possible that teacher stress may lead to increases in teachers' perceptions of child behavior problems. For example, previous research in the parenting literature has found that higher levels of parent stress predicted higher child behavior problems and lower child social competence at a later time point (Crnic, Gaze, & Hoffman, 2005; Jackson, Preston, & Franke, 2010).

There is also the possibility of a bidirectional relationship between child behavior problems and teacher job stress. According to transactional theories of development, as child behavior problems and teacher stress escalate, teachers and children may engage in interactions that become increasingly emotionally negative, reinforcing child behavior problems and increasing teacher job stress. The cyclical nature of this relationship is supported by both the transactional model of coercive cycles of adult-child conflict (e.g., Patterson, 1996; Patterson & Yoerger, 2002; Snyder et al., 2005) and the teacher burnout literature (e.g.,

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Jennings & Greenberg, 2009). A “burnout cascade” (Jennings & Greenberg, 2009) may occur when teachers become emotionally dysregulated and stressed because of child behavior problems and consequently engage in more negative and less effective interactions with children. Although our study cannot say which comes first—child behavior problems or teacher job stress—it does affirm that there is a strong, positive association between them. Future work using longitudinal data is needed to investigate the directionality of the relationship and the possibility of a bidirectional process.

### Teacher Executive Function Abilities and Teacher Job Stress

We also found evidence to support our second hypothesis that higher teacher executive function skills, measured by Part B of the Trail Making task, are associated with lower levels of teacher stress. Interestingly, teaching staff performed well on this task, responding correctly to on average 94% of the mixed letter and number trials. Despite this high average level of performance, the percent correct ranged from 69% to 100%, and teaching staff with higher executive function skills tended to report feeling less irritated by and more in control in their work with young children, even when we controlled for child behavior problems in the classroom. These findings are important in light of the limited previous research examining teachers’ executive function abilities. Executive function abilities may facilitate teachers’ use of efficient and effective classroom management and instructional strategies that attenuate their job stress. That is, teaching staff who are able to implement planned, goal-directed teaching strategies may experience less stress because they are able to accomplish their classroom goals and maintain control over the classroom. In addition, in the face of a stressor, such as high levels of behavior problems, teaching staff with high executive function (or cognitive regulation) abilities may be able to use cognitively controlled, top-down strategies to manage their emotional and behavioral responses to the stressor and consequently may be able to maintain a lower level of stress. In this way, executive function abilities may serve as a protective factor against emotional stress. In contrast, a teacher with lower levels of executive function or cognitive regulation skills may use more reactionary, bottom-up strategies to respond to the same stressor. Such strategies are more likely to exacerbate the stressor and increase the teacher’s stress level.

We did not find evidence to support our third hypothesis that teacher executive function skills moderate the relationship between teachers’ perceptions of child behavior problems and teacher job stress. The significant, positive relationship between teachers’ perceptions of child behavior problems and teacher job stress was robust and held for all early childhood teaching staff regardless of their executive function abilities. That is, in contrast to our hypothesis, executive function skills did not attenuate the relationship between teachers’ perceptions of child behavior problems and teacher job stress.

### Future Directions and Limitations

This study found that both teachers’ perceptions of child behavior problems and teacher executive function skills are associated with early childhood teachers’ job stress in the context of Head Start classrooms. However future work is needed to elaborate on and strengthen these findings. As mentioned previously, this work is based on data collected at one time point during the fall. Future work that includes data from multiple time points, for

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example fall and spring, will be useful to disentangle the directionality of the relationships between classroom child behavior problems, teacher executive function abilities, and teacher job stress. These data would also enable researchers to predict, for example, changes in teacher job stress over the school year from changes in classroom child behavior problems. Consequently, researchers would be better able to infer both directionality and causality of the relationships between the three constructs.

Future work should also examine how teacher job stress due to child behavior problems might influence the quality of the preschool classroom environment as well as child academic and social-emotional outcomes. Previous research has demonstrated associations between teacher stress and classroom quality (Friedman-Krauss et al., in press; Li-Grining et al., 2010), as well as between classroom quality and child academic and social-emotional outcomes (e.g., Burchinal et al., 2000; Mashburn et al., 2008; Peisner-Feinberg et al., 2001; Vandell & Wolfe, 2000). However, to our knowledge, there is limited empirical research on the influence of teacher job stress on child academic and social-emotional development in preschool. It is also possible that teacher executive function abilities influence both preschool classroom quality and child outcomes because executive functions abilities are associated with teachers' abilities to use effective behavior management and instructional strategies. To our knowledge these associations have not been investigated empirically and represent an area for future research.

Another limitation of this study is the use of a teacher job stress scale that has less than optimal internal reliability. This less than optimal internal reliability of the job stress scale may be partially attributed to the use of a small number of items and suggests that there may be higher than desired levels of measurement error. However, we are confident that the high content validity and theoretical relevance of the five items selected offset the slightly lower than commonly accepted alpha of the job stress scale. Indeed, future work utilizing a different measure of teacher job stress that is less prone to measurement error is merited. One possible future direction is the use of physiological measures of teacher stress, such as cortisol, during a typical classroom day as well as following high levels of child behavior problems. Use of these physiological measures could provide interesting insight into the interrelationships between teacher stress, child behavior problems, and teacher executive functions.

In the current study, the measurement of both child behavior problems and teacher stress relied on teacher reports. Teacher perceptions of child behavior problems may be associated with teacher stress through individual differences in how teachers appraise children's behaviors. Future work could examine the relations between child behavior problems, rather than teachers' perceptions of child behavior problems, and teachers' job stress using more objective measures of child behavior problems (i.e., observations). The relationship between objective measures of child behavior problems and teacher job stress may be weaker if perceptions of child behavior problems, over and above actual child behavior problems, contribute to teacher job stress.

This study also provided insight into new ways to assess adults' executive functions, given that it relied on Web- and computer-based measurement strategies that included both self-

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report (WebExec) and direct assessment (Backwards Letter Span and Trail Making tasks). In reviewing our findings, it is clear that teachers reported generally high levels of executive function on the WebExec and that those self-reports were generally unrelated to their scores on directly assessed tasks. This finding, coupled with the ways that only Trails Part B performance was significantly associated with teacher job stress, suggests that direct assessment may be the better measurement approach when collecting data from teachers through distance or online methods. It is worth noting that the Trail Making task Part B differs from the other direct assessment of executive function in that it taps all three components of executive function (inhibitory control, attention shifting, and working memory), whereas the Backwards Letter Span may only tap into the working memory component of executive function. The association between teachers' performance on Part B of the Trail Making task and their job stress suggests that inhibitory control and cognitive set shifting may be the key ingredients to managing the multiple challenges in classroom settings, For example, teaching staff with greater executive function skills may be better able to suppress the automatic response to raise their voices when reprimanding misbehaving children in favor of a subdominant but more cognitive-based, planned strategy to respond to children's acting-out behaviors. The results are also consistent with the idea that teachers with higher executive function can better shift between disciplining a misbehaving child and providing instruction to the whole group, thus maintaining better control over the entire classroom. However, future work is needed to better understand the relationship between these three measures of executive functions. Replication of this study with different measures of executive function abilities may also help to improve researchers' understanding of the association between different measures of executive function skills and stress.

## Conclusion

The prosocial classroom model (Jennings & Greenberg, 2009) provides a theoretical model for the associations between child behavior problems, teacher executive function skills, and teacher stress in the context of a preschool classroom. The current study provides empirical evidence to support key components of that model. Both teachers' perceptions of preschoolers' behavior problems and preschool teachers' executive function abilities are associated with teacher job stress and consequently may have important implications for teachers' health and job tenure as well as children's experiences in preschool and their academic and social-emotional development. A primary goal of early childhood programs, including Head Start, is to improve children's school readiness skills. If children's academic and social-emotional development is hampered by their teachers' inability to provide an emotionally positive climate or form healthy relationships with their students, then the overarching goal of the programs may be jeopardized.

Accordingly, school readiness policies may want to incorporate foci not only on positive class-room management of children's behavior problems but also on proactive steps that teachers can take to limit burnout and feelings of stress. For example, the Foundations of Learning intervention (Morris, Raver, Millenky, Jones, & Lloyd, 2010) provided teachers with trainings on behavior management techniques and was found to benefit the classroom climate by lowering the level of conflict between teachers and students. It also may have resulted in teachers' use of more planned, appropriate, cognitive-based classroom

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management strategies and in lower job stress. Similarly, programs that provide teachers with mindfulness meditation training may be helpful in multiple respects. Mindfulness meditation includes the use of contemplative practices and is associated with greater cognitive and emotional self-regulation and lower levels of stress. Thus, mindfulness meditation could be an effective tool for teaching staff to control their emotional reactivity to child behavior problems and limit their stress arousal as well as to maintain an emotionally positive classroom environment (Jennings & Greenberg, 2009; Raver et al., 2012).

Finally, our study provides support for the use of online questionnaires and online direct assessment tasks with teaching staff. This is the first study that we are aware of to collect executive function data with early childhood teachers using direct assessments administered via the Internet. This method of data collection is both time and cost efficient for the researchers and the teaching staff. Teachers can complete the study when it is most convenient for them without being interrupted by data collectors at inopportune times. Although support of the school or center administration is important, these data collection methods have the potential to increase subject participation as well as study completion and engagement.

It is widely accepted that teachers play an important role in children's development. Yet little is known about how characteristics of children in a classroom influence teachers, specifically their feelings of job stress—an important but underresearched area. The current study attempts to fill this gap in the literature and provides evidence that high levels of perceived child behavior problems in a preschool classroom are associated with high levels of preschool teacher job stress. Moreover, this study is the first of which we are aware to examine the association between preschool teacher executive function or cognitive regulation abilities and job stress, finding an inverse relationship between the two constructs. Despite the use of data from only one time point, this study is a first step in understanding how characteristics of children (i.e., behavior problems) and teachers (i.e., executive functions) influence teachers' job stress in the context of Head Start classrooms. Continued work will help to establish the directionality of these relationships, which can be used to inform teacher trainings, classroom interventions, and early childhood education policy.

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## TABLE 1

Descriptive Statistics for Variables Used in Multilevel Modeling Analyses

| *Variable* | *M* | *SD* |
|---|---|---|
| Teacher characteristics (*n* = 69) | | |
| Teacher job stress | 2.59 | 0.66 |
| Teacher perceptions of child behavior problems | 2.15 | 0.56 |
| Teacher EF: WebExec | 3.51 | 0.53 |
| Teacher EF: BLS total number of letters correct | 24.70 | 21.70 |
| Teacher EF: Trails % correct Part B (mixed trials) | 0.94 | 0.08 |
| Teacher cognitive ability: Trails % correct Part A (letter-/number-only trials) | 0.98 | 0.03 |
| African American/Black | 0.48 | 0.50 |
| Female | 0.91 | 0.28 |
| Bachelor's degree or higher (%) | 0.41 | 0.49 |
| Lead teacher (%) | 0.42 | 0.50 |
| Classroom characteristics (*n* = 31) | | |
| Class size (number of children) | 14.40 | 3.93 |
| Head Start classroom (compared to Early Head Start) | 0.84 | 0.38 |

*Note.* EF = executive function; BLS = Backwards Letter Span.

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**TABLE 2**

Intercorrelations Between Child Behavior Problems, Teacher EF, Teacher Stress, and Covariates

| *Variable* | *1* | *2* | *3* | *4* | *5* | *6* | *7* | *8* | *9* | *10* | *11* | *12* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Teacher stress | — | .66*** | −.33** | −.04 | −.24* | .04 | −.22† | −.02 | −.06 | −.02 | .38*** | .21† |
| 2. Teacher perceptions of child behavior problems | | — | −.32** | −.02 | −.02 | .07 | −.10 | .02 | .03 | −.08 | .20 | .11 |
| 3. EF: WebExec | | | — | .02 | −.12 | −.06 | .17 | .09 | .02 | −.03 | −.02 | .01 |
| 4. EF: BLS | | | | — | −.01 | −.03 | .09 | .01 | −.12 | −.07 | .02 | .15 |
| 5. EF: Trails % correct Part B | | | | | — | .29* | −.15 | .13 | .19 | .07 | −.29* | −.28* |
| 6. Trails % correct Part A | | | | | | — | .11 | .16 | .13 | .04 | −.18 | .03 |
| 7. African American/Black | | | | | | | — | −.22† | −.20† | .17 | −.05 | .17 |
| 8. Female | | | | | | | | — | .26* | .05 | −.12 | −.02 |
| 9. Bachelor’s degree or higher | | | | | | | | | — | .49*** | −.17 | −.21† |
| 10. Lead teacher | | | | | | | | | | — | .08 | .04 |
| 11. Class size | | | | | | | | | | | — | .72*** |
| 12. Head Start classroom (compared to Early Head Start) | | | | | | | | | | | | — |

*Note.* EF = executive function; BLS = Backwards Letter Span.

† $p<.10$.

* $p<.05$.

** $p<.01$.

*** $p<.001$.

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**TABLE 3**

Parameter Coefficients and Standard Errors From Multilevel Modeling Analyses Examining Child Behavior Problems and Teacher EF Predicting Teacher Stress

| | Model 1 | | Model 2 | | Model 3 | | Model 4 | |
|---|---|---|---|---|---|---|---|---|
| ***Variable*** | ***b*** | ***SE*** | ***b*** | ***SE*** | ***b*** | ***SE*** | ***b*** | ***SE*** |
| Teacher characteristics | | | | | | | | |
| Teacher perceptions of child behavior problems | 0.76*** | 0.10 | 0.70*** | 0.11 | 0.63*** | 0.10 | 0.62*** | 0.11 |
| Teacher EF: WebExec | | | −0.48 | 0.30 | −0.45† | 0.27 | −0.49† | 0.27 |
| Teacher EF: BLS total number of letters correct | | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Teacher EF: Trails % correct Part B (mixed trials) | | | −2.56* | 1.15 | −2.30* | 1.15 | −2.27* | 1.04 |
| Teacher cognitive ability: Trails % correct Part A (letter-/number-only trials) | | | 1.76 | 1.90 | 3.59† | 1.95 | 3.55† | 2.15 |
| Teacher is African American/Black | | | | | −0.16 | 0.12 | −0.17 | 0.11 |
| Teacher is female | | | | | 0.05 | 0.16 | 0.02 | 0.16 |
| Bachelor’s degree or higher | | | | | −0.10 | 0.14 | −0.09 | 0.14 |
| Lead teacher | | | | | 0.04 | 0.11 | 0.03 | 0.11 |
| Behavior Problems × Teacher EF: Trails % correct Part B | | | | | | | 0.62 | 3.21 |
| Classroom characteristics | | | | | | | | |
| Class size | | | | | 0.05** | 0.02 | 0.05** | 0.02 |
| Head Start classroom (i.e., age of children in classroom) | | | | | −0.22 | 0.15 | −0.23 | 0.16 |
| Constant | 2.42*** | 0.09 | 2.79*** | 0.23 | 2.35*** | 0.30 | 2.41*** | 0.31 |
| Variance components | | | | | | | | |
| Classroom random effects | 0.01 | 0.03 | 0.01 | 0.02 | 0.00 | 0.02 | 0.00 | 0.02 |
| Residual variance | 0.21*** | 0.04 | 0.18*** | 0.04 | 0.17*** | 0.04 | 0.17*** | 0.04 |

*Note.* EF = executive function; BLS = Backwards Letter Span.

† $p<.10$.

* $p<.05$.

** $p<.01$.

*** $p<.001$.