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Changing Teacher–Child Dyadic Interactions to Improve Preschool Children's Externalizing Behaviors

Amanda P. Williford, Jennifer LoCasale-Crouch, Jessica Vick Whittaker, Jamie DeCoster, Karyn A. Hartz, Lauren M. Carter, Catherine Sanger Wolcott, and Bridget E. Hatfield
University of Virginia

A randomized controlled trial was used to examine the impact of an attachment-based, teacher–child, dyadic intervention (Banking Time) to improve children's externalizing behavior. Participants included 183 teachers and 470 preschool children (3–4 years of age). Classrooms were randomly assigned to Banking Time, child time, or business as usual (BAU). Sparse evidence was found for main effects on child behavior. Teachers in Banking Time demonstrated lower negativity and fewer positive interactions with children compared to BAU teachers at post assessment. The impacts of Banking Time and child time on reductions of parent- and teacher-reported externalizing behavior were greater when teachers evidenced higher-quality, classroom-level, teacher–child interactions at baseline. An opposite moderating effect was found for children's positive engagement with teachers.

Supportive and sensitive teacher–child interactions and relationships are critical for children's academic and social development (Hamre, 2014; Sabol & Pianta, 2012). Effective teacher–child relationships form through repeated interactions characterized by shared emotional engagement, teachers' sensitivity and responsiveness, and low conflict. These relationships are particularly salient resources for children who, for various reasons (e.g., low achievement or display of externalizing behavior problems), are likely to experience the classroom setting as socially or academically challenging (Baker, Grant, & Morlock, 2008; Hamre & Pianta, 2005).

When children displaying externalizing behaviors (e.g., impulsivity, hyperactivity, noncompliance, and aggression) are paired with teachers who establish a positive emotional bond with them and meet their behavioral and regulatory needs, they display declines in aggression and greater social-emotional development (Baker et al., 2008). However, children who display the externalizing behavior problems are more likely to experience interactions with their teachers marked by higher levels of conflict, resulting in increased externalizing behavior and lower achievement (Doumen et al., 2008). Thus, targeting the quality of teacher–child interactions holds promise as an early intervention strategy.

Banking Time (Pianta & Hamre, 2001) is an attachment-based, dyadic intervention intended to improve the quality of teachers' interactions with a specific child (Pianta, 1999). Relational interactions between a teacher and child contribute to the creation of the child's internal working model of the relationship (Pianta, 1999). When a teacher is sensitive and responsive to and accepting of a child, it promotes feelings of attachment and security toward the teacher. This, in turn, allows a child to engage more fully in learning activities, which supports his or her school adjustment (Pianta, 1999).

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Correspondence concerning this article should be addressed to Amanda P. Williford, Center for Advanced Study of Teaching and Learning, University of Virginia, 246 Ruffner Hall, PO Box 800784, Charlottesville, VA 22908-0784. Electronic mail may be sent to williford@virginia.edu.

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In Banking Time, teachers observe and engage a child in play using a set of specific techniques for interacting with and interpreting a child's behavior. These reciprocal exchanges during sessions are hypothesized to influence each individual's cognitive model of their relationship, creating a set of more positive expectations that guide subsequent behavior and perceptions in the classroom (Pianta, 1999). This attachment perspective emphasizes that the qualities of information—or *how* it is exchanged (e.g., tone of voice, contingency)—is as important as *what* is said or done. Teachers are highly constrained in their interactions to promote sensitivity to and acceptance of the child to provide new information to the teacher and child about one another. The intention is to disrupt the expectations and behavior cycles that result in negative teacher–child interactions and children's escalating externalizing behavior.

Previous studies provide preliminary support for the use of Banking Time. In a nonexperimental study of 252 teachers, use of Banking Time was associated with greater teacher-reported closeness with students (Driscoll, Wang, Mashburn, & Pianta, 2011). In another study, head start teachers assigned to Banking Time (n = 20) versus a control condition (n = 9) reported increased relationship closeness and improvements in children's frustration tolerance, task orientation, and reduced conduct problems (Driscoll & Pianta, 2010). More recently, in a randomized controlled trial (RCT), Vancraeyveldt et al. (2015) combined an adapted version of Banking Time with teacher training and behavior modification techniques, and it was effective in reducing teacher's report of children's externalizing behavior as reported by 175 teachers. Follow-up analyses indicated that positive effects were present after the first component (adapted Banking Time) was implemented. In this study, we used a multimethod, multi-informant RCT in a diverse sample to investigate whether teachers' implementation of Banking Time: (a) improved preschool children's externalizing behavior problems and (b) improved the quality of teacher–child interactions.

To assess the impact of Banking Time, we used three conditions: Banking Time, child time (where teachers spent individual time with children without constraints), and business as usual (BAU). Including a treatment group whose teachers spent an equal amount of time with children provided a unique test of two methods to improve teacher–child interactions—Banking Time where the focus was on changing the nature of teacher–child interactions to provide new information to the teacher and child, and child time where the focus was simply on increasing individual time spent with a child. We expected that implementation of Banking Time would result in declines in children's externalizing behavior and improvements in the quality of teacher–child interactions relative to teachers and children in the BAU condition. We expected that teachers and children participating in child time to show some evidence of improved behavior and interactions but to a lesser extent than Banking Time. Following the model for theorized change, we explored whether effects on child behavior were mediated by the quality of the teacher–child interactions. Finally, prior early education research has found increased treatment benefits for individuals demonstrating both greater (Morris, Millenky, Raver, & Jones, 2013; Raver et al., 2009) as well as fewer (e.g., Berlin et al., 2011; Love et al., 2002) risk factors. We hypothesized that the intervention would be most beneficial to individuals more at risk—children starting the year with higher levels of externalizing behavior and teachers with lower-quality, classroom-level, teacher–child interactions.

Method

Participants

The sample included 470 preschool children (M_{age} = 4.0 years at baseline) and 183 teachers (including replacement teachers and children) across 173 classrooms (94 programs) in three sites over 3 years (2010–2013) within two U.S. Eastern states. A mix of federal (Head Start), state, and privately funded programs participated. Participants resided in mostly urban and suburban areas and were demographically diverse. Table 1 provides program, teacher, and child demographics.

Procedures

Prior to implementation of the study, the trial was registered through the What Works Clearing House (http://ies.ed.gov/ncee/wwc). Following program approval, researchers met with teachers and obtained informed consent. Guardians of all children in participating classrooms (M = 15 children/classroom, SD = 3.7) were given a letter explaining the study, a consent form, and a family demographic survey, which they returned to their child's teacher (69% consent rate). Researchers never informed parents of their child's condition. Teachers rated all children on two externalizing behavior rating scales (Attention Deficit/

Table 1
Descriptive Statistics of the Demographic Variables at Baseline

	M (*SD*)			
Descriptive variables	Banking time (T *n* = 66) (C *n* = 168)	Child time (T *n* = 56) (C *n* = 152)	Business as usual (*T n* = 61) (C *n* = 151)	Overall (T *N* = 183) (C *N* = 471)
Classroom distribution (%)				
State-funded, head start, private	24, 21, 55	25, 18, 57	28, 18, 54	26, 19, 55
Teacher—years of education	15.6 (1.6)	15.4 (1.5)	15.3 (1.7)	15.4 (1.6)
Teacher—years of experience teaching pre-k	8.3 (7.1)	9.9 (8.1)	9.3 (8.1)	9.2 (7.7)
Teacher ethnicity (%)				
White, Black, other	48, 44, 8	58, 42, 0	55, 36, 9	53, 41, 6
Child—percentage boys	66	64	66	65
Child—age in months	48.4 (6.7)	48.3 (7.2)	49.6 (6.2)	48.7 (6.7)
Child—income to needs	1.8 (1.4)	2.0 (1.6)	1.9 (1.6)	1.9 (1.5)
Child—years of maternal education	14.1 (2.2)	14.3 (2.4)	14.0 (2.4)	14.1 (2.3)
Child—ethnicity (%)				
White, Black, Hispanic, other	36, 49, 7, 8	42, 37, 7, 14	35, 39, 10, 16	38, 42, 8, 12

Note. T = teacher; C = child.

Hyperactivity Disorder Rating Scale, 4th ed. [ADHDRS–IV], DuPaul, Power, Anastopoulos, & Reid, 1998; Oppositional Defiant Disorder Rating Scale [ODDRS], Hommersen, Murray, Ohan, & Johnston, 2006). The two boys and one girl (for better gender distribution) with the highest ratings of externalizing behavior *and* who had caregiver consent participated (see Appendix S1 Additional Information, Section A). Within classrooms, each of the three participating children was randomly assigned to one of three, 7-week windows. Teachers in the intervention conditions worked with only one child during that child's window.

Classrooms were randomly assigned to one of three conditions (Banking Time, child time, or BAU; see Appendix S1, Section B). There were no significant differences between treatment conditions on baseline program, teacher, or child demographic variables (see Table 1).

Treatment Conditions

Banking Time. Banking Time sessions are a set of time-limited (10–15 min), one-on-one meetings between a teacher and child that take place 2–3 times a week at school. Teachers implemented Banking Time with a child in a quiet area for 7 consecutive weeks during the child's randomly selected window. Researchers provided no extra personnel for use as substitutes or volunteers. Teachers were instructed to allow the child to lead the play and to limit questioning, refrain from teaching skills, and avoid adult-direct or closed-ended activities. Teachers were encouraged to use several strategies to improve the quality of teacher–child interactions: (a) observing the child's behaviors and expressed emotions, (b) narrating the child's actions, (c) labeling the child's emotions, and (d) labeling relational themes to focus on important aspects of the teacher–child relationship (e.g., "I can help you."). Teachers worked with a consultant to improve implementation fidelity. Teachers and consultants met face-to-face once every 2 weeks and had phone meetings on the alternate weeks. Teachers videotaped individual Banking Time sessions once a week and sent this footage to their consultant. The consultant used this footage to improve the teacher's implementation (see Appendix S1, Section C).

Child time. Teachers spent individual time with children using the same schedule described above but had free choice of how to spend that time. Teachers also had access to a consultant (same schedule as described above) who encouraged them to spend time with children but provided no guidance on how to spend the time (see Appendix S1, Section D).

Business as usual. Teachers and children were assessed but no treatment was provided (see Appendix S1, Section E for implementation information).

Data Collection

Data were collected at four points during the year: baseline (at the beginning of the study before treatment was introduced), postwindow 1,

postwindow 2, and end-of-year (EOY)/postwindow 3. At baseline, child characteristics were collected via family survey, and classroom and teacher characteristics were collected via teacher report. Teacher and child outcome data were collected at baseline, prewindow, postwindow, and/or EOY via teacher report, parent report, and observation. A videotaped teacher–child structured play task (TC-SPT) was conducted at the postwindow. This study used data collected at baseline and EOY except for the structured play task which was only collected at postwindow.

Data collectors who were blind to condition received extensive training on the observation measures and were required to reach reliability prior to coding in the field. For this study, observations of teachers (Classroom Assessment Scoring System [CLASS]) were used at baseline and observations of children (Individualized CLASS [inCLASS]) were used at baseline and EOY. Each observation day lasted 3–4 hr and about 3 days per time point. Teachers were observed for approximately five cycles ($M = 4.88$, $SD = 1.78$) and children for approximately eight cycles ($M = 8.40$, $SD = 1.54$). Data collectors were also trained to administer and videotape the TC-SPT during the postwindow of the selected child.

Measures

Child Characteristics

Parents or guardians completed a demographic survey in the fall.

Moderation Variables

Children's baseline behavior. Teachers completed the ADHDRS–IV (DuPaul et al., 1998) and the ODDRS (Hommersen et al., 2006) at baseline. Both are psychometrically sound behavior rating scales used in clinical research with preschool-aged children and shown to be valid and reliable (McGoey, DuPaul, Haley, & Shelton, 2007). The ADHDRS–IV has 18 items (9 inattention and 9 hyperactivity and/or impulsivity) and the ODDRS has 8 items which were on a 4-point Likert scale. We used a summed score ($\alpha = .96$).

Quality of baseline classroom-level teacher–child interactions. The CLASS (Pianta, LaParo, & Hamre, 2008) is an observational instrument that measures classroom quality across 10 dimensions using a 7-point scale. Interrater reliability was calculated across 20% of observations (intraclass correlations [ICCs] ranged from .73 [instructional support] to .82 [emotional support]). Multiple studies have demonstrated reliability and validity of the CLASS (e.g., Hamre et al., 2013; Mashburn et al., 2008). For this study, we created uncorrelated scales under a bifactor model using confirmatory factor analysis (Gest, Madill, Zadzora, Miller, & Rodkin, 2014; Hamre, Hatfield, Pianta, & Jamil, 2014) that replicated the model Hamre et al. (2014) found best fit the data, which showed acceptable model fit for our data ($\chi^2[45] = 927.49$, $p < .001$; root mean square error of approximation = .077; comparative fit index = .979; Tucker–Lewis index (TLI) = .962; Standardized Root Mean Square Residual (SRMR) = .031). Responsive teaching and management and routines factors were used.

Child Behavior Outcomes

Adult-reported child problematic behavior. Children's externalizing behavior was assessed via parent report using the Eyberg Child Behavior Inventory (ECBI; Eyberg & Pincus, 1999) and teacher report using the Sutter-Eyberg Student Behavior Inventory–Revised (SESBI–R; Eyberg & Pincus, 1999). The ECBI ($\alpha = .95$; note reported α's are the mean of baseline and EOY when applicable) and SESBI–R ($\alpha = .97$) assess the frequency and severity of externalizing behavior and the extent parents and/or teachers find the behavior problematic. For this study, we used the Problem Behavior Scales. On the 36-item ECBI and the 38-item SESBI–R, the rater indicates whether each behavior is a problem. Higher scores indicate more severe externalizing behavior.

Observed behavior control. The inCLASS (Downer, Booren, Hamre, Pianta, & Williford, 2011) is an observational assessment of children's behavior during classroom interactions with teachers, peers, and tasks. The inCLASS measures 10 dimensions of children's behavior (7-point scale). Trained observers watch a child for 10 min and then rate the child's behavior. The inCLASS has shown construct and criterion validity (Downer, Booren, Lima, Luckner, & Pianta, 2010) and predicts growth in children's readiness skills (Williford, Maier, Downer, Pianta, & Howes, 2013; Williford, Vick Whittaker, Vitiello, & Downer, 2013).

We used the behavior control dimension (e.g., waiting for one's turn) in this study. Interrater reliability was calculated across 20% of all observations (ICC for behavior control was .75). The internal consistency was good ($\alpha = .80$).

Teacher–Child Interaction Outcomes

Observed quality of teachers' dyadic interactions with children. The quality of dyadic teacher–child interactions at postwindow was assessed using the TC-SPT (Whittaker, Williford, Carter, Vitiello, & Hatfield, 2016). This standardized task and associated codes were adapted from the maternal Teaching Task Rating Scale (Egeland & Heister, 1993). The TC-SPT consisted of two parts: free play and clean-up. The clean-up portion was selected because it was a situation outside of a Banking Time session designed to induce stress, similar to classroom situations where teacher–child conflict may occur (e.g., child given a directive which he or she may not want to comply). Each task was video recorded. Coders (blind to condition) rated teacher interactions with children across eight dimensions (5-point scale) that formed two subscales: positive teacher interactions and negative teacher interactions. Twenty percent of videos were double coded (ICCs were .80 for positive teacher interactions and .63 for negative teacher interactions). Subscales show construct and criterion validity (Whittaker et al., 2016).

Observed child engagement with teacher. We observed children's engagement with teachers using the inCLASS (described above) domain of positive engagement with teacher (e.g., positive affect with teacher) and the teacher conflict dimension (e.g., displays of aggression). ICCs were .77 for positive engagement with teacher and .63 for teacher conflict (which was lower due to data skewness; percent agreement was 84% [exact] and 98% [within one point]). Internal consistencies for positive engagement with teacher and teacher conflict were α = .69 and .73.

Data Analytic Strategy

An a priori power analysis was used to determine the numbers of clusters (teachers/classrooms) and children needed to achieve adequate statistical power to test the experimental intent-to-treat questions. These analyses examined the effect of Banking Time and child time against a BAU condition in children's behavior and teacher–child interaction outcomes and indicated that a sample of 150 teachers and 450 children had 80% power to detect a medium-sized effect (d = .30; see Appendix S1, Section F). Our sample of 183 teachers and 470 children exceeded this estimate. However, as expected attrition occurred over time —79% of classrooms persisted throughout the study. Teachers (n = *10*) and children (n = 29) were replaced if possible throughout the year (see Appendix S1, Section G). To account for missing data, regression models were estimated using full information maximum likelihood estimation in Mplus version 7.11 (Muthén & Muthén, 2008), which accounts for missing data by using all available data for each case when estimating parameters to adjust for potential estimate bias resulting from missing data and to increase the statistical power (Enders & Bandalos, 2001). Seven regression models were estimated at the child level, including the random effect for classroom to control for nesting of children within classrooms. Child baseline externalizing behavior, child minority ethnicity status, child age, parent years of education, and family income-to-needs ratio were used as auxiliary variables to improve the estimation of missing data. Intervention was dummy coded into two variables, BAU served as the reference group. Site, year, and window were included as blocking factors. We examined interactions between treatment and the blocking factors, but these were never significant. Baseline scores were included as a covariate to predict gains in the outcomes (except for teacher positive and negative interactions with children, which were only assessed at postwindow).

To detect the main effects of treatment condition on child behavior and teacher–child interaction outcomes, we examined whether treatment condition explained a significant amount of outcome variability. We tested whether treatment effects on child outcomes (including nonsignificant effects) were mediated by measures assessing teacher–child dyadic interactions using the test for indirect effects in Mplus. We examined whether the severity of child externalizing behavior and quality of classroom-level teacher–child interactions at baseline moderated treatment impacts. For quality of classroom-level teacher–child interactions, we tested the moderation of the two uncorrelated CLASS bifactor domains (responsive teaching and management and routines) together in the same model on each outcome. These models were conducted at the child level including the random effect for classroom, variables were centered before creating interaction terms, and control variables were included in the models. We used Wald Z tests to provide a test of the joint effect of each moderator on both dummy codes for treatment condition. We only explored effects on the individual coefficients if the overall Wald Z test was significant ($p < .05$).

Results

Descriptive statistics for outcome variables by treatment group are presented in Appendix S1 (Tables S1 and S2). There were no significant differences between treatment groups on any of the outcome variables at baseline except for inCLASS child positive engagement with teacher ($p = .001$), where children in Banking Time had lower scores than those in child time and BAU.

Standardized coefficients and effect sizes from the main effects models are presented in Table 2. Compared to children in BAU, children who participated in Banking Time were reported by teachers to display significant reductions in problematic behavior from baseline to EOY. Teachers in Banking Time displayed significantly fewer negative and fewer positive interactions with children during clean-up at posttest compared to teachers in BAU.

We tested whether treatment effects on child outcomes (including nonsignificant effects) were mediated by teacher–child interactions. None of the tests were significant (ps for all indirect effects > .05).

We tested whether treatment effects on outcomes (including nonsignificant effects) were moderated by baseline children's display of externalizing behaviors or teacher's responsive teaching and management and routines. Children's externalizing behavior did not moderate treatment effects. We did find moderated effects on child problematic behavior and children's positive engagement with teachers.

Moderation of Child Behavior Outcomes

Teachers' management and routines at baseline moderated the impact of the intervention conditions on declines in children's problematic externalizing behavior as reported by teachers and parents. As teachers' management and proactivity increased, the effect of the Banking Time and child time on reducing children's teacher-reported problematic externalizing behavior became stronger (Wald Z [2] = 11.777, $p = .003$; Banking Time $\beta = -3.954$ $SE\{\beta\} = 1.162$, $p = .001$; child time $\beta = -2.520$, $SE\{\beta\} = 1.138$, $p = .03$; see Figure 1). The same pattern was seen for parent report of children's problematic externalizing behavior (Wald Z [2] = 11.105, $p = .004$; Banking Time $\beta = -2.414$, $SE\{\beta\} = 0.961$, $p = .01$; child time $\beta = -3.058$, $SE\{\beta\} = 0.977$, $p = .002$).

Moderation of Dyadic Teacher–Child Outcomes

Teachers' baseline responsive interactions and positive management and routines moderated the impact of Banking Time and child time on increases in children's observed positive engagement with their teachers (Wald Z [2] = 9.376, $p = .009$). This effect was opposite the effect described above. Specifically, as teachers' responsive interactions decreased, the effect of both Banking Time ($\beta = -0.156$, $SE\{\beta\} = 0.063$, $p = .01$) and child time ($\beta = -0.172$, $SE\{\beta\} = 0.075$, $p = .02$) over BAU on increases in children's positive engagement with their teachers became stronger. The same pattern was seen for teachers' baseline positive management and routines on increases in children's positive engagement with teachers (Wald Z [2] = 17.851, $p = .0001$; Banking Time $\beta = -0.235$, $SE\{\beta\} = 0.077$, $p = .002$; child time $\beta = -0.228$, $SE\{\beta\} = 0.065$, $p < .001$).

Discussion

We examined whether Banking Time, a teacher–child dyadic intervention designed to improve the

Table 2
Main Effects of Treatment Condition on Gains in Outcomes

	BT-BAU comparison			CT-BAU comparison		
Outcome	β (*SE*)	*p*	*d*	β (*SE*)	*p*	*d*
Child behavior						
Teacher report of problematic behavior	−.136 (.053)	.01	−.29	−.093 (.055)	.09	−.19
Parent report of problematic behavior	.003 (.055)	.95	.01	−.107 (.055)	.05	−.22
Observed behavior control	−.026 (.069)	.70	−.04	.057 (.062)	.36	.11
Teacher–child interactions						
Observed teacher positive interactions with child[a]	−.173 (.08)	.03	−.24	−.011 (.067)	.87	−.02
Observed teacher negative interactions with child[a]	−.155 (.06)	.009	−.29	.014 (.066)	.83	.02
Observed child positive engagement with teacher	−.046 (.061)	.45	−.08	.013 (.07)	.85	.02
Observed child conflict with teacher	−.046 (.069)	.50	−.07	−.093 (.061)	.13	−.18

Note. BAU = business as usual. [a]Outcome does not control for baseline scores (as they were not collected), so tests are based on posttest differences instead of gains.

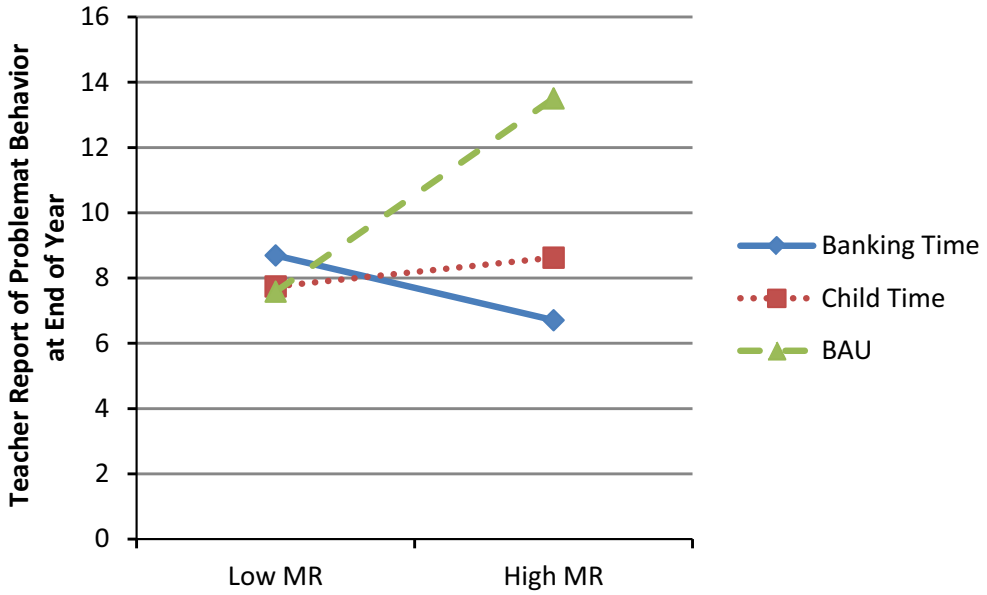

Figure 1. The moderating effect of teachers' classroom-level management and routines (MR) on teacher report of children's problematic behavior. [Color figure can be viewed at wileyonlinelibrary.com]

quality of teacher–child interactions, was effective in reducing young children's externalizing behavior problems during preschool. We used three treatment conditions to better understand the mechanism of treatment impacts on children's behavior. The results provide some support that increasing teachers' individual interactions with children who are risk for externalizing behavior problems—whether through Banking Time or child time—may improve children's behavior and interactions with teachers, and, that Banking Time may decrease teachers' negative interactions with young children who display disruptive behaviors. We found no evidence for mediation of child outcomes by teacher–child interactions. We found some differential impacts based on teacher's baseline classroom-level, teacher–child interactions.

Teachers in Banking Time reported significant improvement in children's problematic externalizing behavior across the year. We found no differences across groups related to children's observed behavior control. In addition, we found that the effects of Banking Time and child time on reductions in children's negative behavior as reported by parents and teachers were stronger when teachers displayed more effective initial management practices. Children in classrooms where teachers used more effective management and routines may have become more responsive to their teacher's strategies, resulting in greater reductions in externalizing behavior. This speculative explanation requires future investigations to purposefully test and more precisely measure why treatment effects may differ based on the quality of teachers' initial classroom-level interactions.

We found some evidence that Banking Time impacted the quality of teacher–child interactions. Only Banking Time teachers displayed fewer negative interactions with children compared to BAU teachers. These differences were observed during a standardized task designed to elicit stress on the teacher–child dyad immediately after the intervention window ended. Banking Time teachers also displayed fewer positive interactions during the standardized task. We hypothesize that this effect may have been due to the fact that teachers in Banking Time were discouraged from engaging in some behaviors that are most often perceived as positive teacher–child interaction behaviors including asking questions, using praise, and teaching a skill. These are appropriate interaction techniques that often serve to engage and form positive relationships with children. Because young children who display externalizing behavior problems need more redirection and correction, children sometimes do not experience opportunities where they have the autonomy to lead the interaction, and adults do not have the opportunity to experience the child outside of a directive (and often negative) interaction cycle. Banking Time sessions provide this opportunity. These effects provide some support that the way Banking Time constrains teachers'

interactions with children during their play sessions is important beyond just the increase in individual time spent with a child to change teacher behavior.

We did not find main effects on differences in children's observed positive engagement with their teachers. However, we did find some moderated impacts. Specifically, the effects of both Banking Time and child time on gains in children's observed positive engagement with their teachers were stronger for teachers who displayed lower-quality classroom-level teacher–child interactions at baseline. It is possible that for teachers evidencing lower-quality teacher–child interactions in the classroom, their interactions with the selected children during Banking Time and child time were quite different in quality compared to their interactions with children as part of the regular classroom day. Through this contrast, children interacting with these teachers may have been more likely to "see" their teacher as a potential source of support in the classroom and would therefore be more likely to engage positively with the teacher in the classroom over time. This is consistent with Pianta and Hamre's (2001) theory of change for Banking Time, although it does not describe why we saw similar results for child time. These results need to be replicated before we can place a high level of confidence in them.

Using three treatment conditions provided an opportunity to test the "active ingredients" in Banking Time that would not have been possible if we had compared Banking Time to BAU only. We found some positive impacts for both child time and Banking Time in the moderation results. To reduce children's display of negative behavior, teachers may not need to dedicate as much focus on the specific Banking Time strategies and, instead, receive support to interact with children positively in activities that are enjoyable for children and teachers. However, we should also consider the evidence that suggests that Banking Time and child time produce differential impacts. Only for Banking Time teachers did we see reductions in teachers' negative interactions. We suspect that the focus of Banking Time to unconditionally accept the child may be particularly important for a child to be able to experience the teacher and the classroom as safe and secure. These results speak to the need for additional research that more comprehensively and precisely measures both the targeted child outcomes but also the processes that affect them.

Limitations

Several limitations deserve attention. First, our sample included children who displayed varying degrees of externalizing behavior. Impacts might have been stronger if we had selected only children who displayed very high levels of externalizing behavior (Morris et al., 2014; Raver et al., 2009). However, results were not moderated by child baseline externalizing behavior. Second, we examined multiple outcomes that may have increased our chances of finding treatment impacts by capitalizing on chance. Third, our child behavior improvements (both main and moderated effects) were limited to adult report. Perhaps children did not demonstrate actual improvements in their classroom behaviors and that teachers and parents only perceived these changes to the increased time teachers spent with children or spent interacting with their consultant. However, serious externalizing behaviors (e.g., yelling, hitting) are low occurring but very salient to teachers (Yudron, Jones, & Raver, 2014), and our observations may not have been precise enough to detect differences. Future work should consider assessment methods that may more precisely assess young children's externalizing behavior. Finally, attrition, which was greatest for the Banking Time and child time conditions, may have created bias in our results. As noted in Appendix S1 (Section G), attrition was not related to children's baseline disruptive behavior and the rates of teacher attrition due to feeling frustrated or overwhelmed were similar across conditions. However, we were more likely to replace teachers in classrooms who had been assigned to BAU compared to classrooms assigned to Banking Time or child time.

Conclusions

The early childhood classroom is a place where children can learn increasingly complex behavior, emotion, and cognitive control, particularly when the quality of teacher–child interactions is high (Hamre, 2014). However, preschoolers who display challenging externalizing behavior problems are at significant risk of missing critical early learning opportunities (Doumen et al., 2008). This study provides some support that interventions focused on preschool teacher–child interactions can have impacts on adults' perceptions of children's disruptive behavior and the quality of teacher–child interactions. More work is needed to better understand the mechanisms of change in Banking Time and child time as there may be ingredients that are shared (e.g., increasing positive time spent with a child) and ingredients that are unique (e.g., for Banking Time, a decrease in a teacher's negative

behaviors toward a child). In addition, results suggest that assessing teachers' baseline quality of classroom-level interactions might be important in determining which classrooms and teachers might benefit most from interventions that focus on teacher–child interactions.

References

Baker, J. A., Grant, S., & Morlock, L. (2008). The teacher–student relationship as a developmental context for children with internalizing or externalizing behavior problems. *School Psychology Quarterly*, *23*, 3–15. doi:10.10371045-3830.23.1.3

Berlin, L. J., Whiteside-Mansell, L., Roggman, L. A., Green, B. L., Robinson, J., & Spieker, S. (2011). Testing maternal depression and attachment style as moderators of early head start's effects on parenting. *Attachment & Human Development*, *13*, 49–67. doi:10.1080/14616734.2010.488122

Doumen, S., Verschueren, K., Buyse, E., Germeijs, V., Luyckx, K., & Soenens, B. (2008). Reciprocal relations between teacher–child conflict and aggressive behavior in kindergarten: A three-wave longitudinal study. *Journal of Clinical Child & Adolescent Psychology*, *37*, 588–599. doi:10.1080/15374410802148079

Downer, J. T., Booren, L. M., Hamre, B., Pianta, R. C., & Williford, A. (2011). *The Individualized Classroom Assessment Scoring (inCLASS)*. Unpublished technical manual, Curry School of Education, University of Virginia, Charlottesville, VA.

Downer, J. T., Booren, L. M., Lima, O. K., Luckner, A. E., & Pianta, R. C. (2010). The Individualized Classroom Assessment Scoring System (inCLASS): Preliminary reliability and validity of a system for observing preschoolers' competence in classroom interactions. *Early Childhood Research Quarterly*, *25*, 1–16. doi:10.1016/j.ecresq.2009.08.004

Driscoll, K. C., & Pianta, R. C. (2010). Banking time in head start: Early efficacy of an intervention designed to promote supportive teacher–child relationships. *Early Education and Development*, *21*, 38–64. doi:10.1080/10409280802657449

Driscoll, K. C., Wang, L., Mashburn, A. J., & Pianta, R. C. (2011). Fostering supportive teacher–child relationships: Intervention implementation in a state-funded preschool program. *Early Education & Development*, *22*, 593–619. doi:10.1080/10409289.2010.502015

DuPaul, G. J., Power, T. J., Anastopoulos, A. D., & Reid, R. (1998). *ADHD Rating Scale—IV: Checklists, norms, and clinical interpretation*. New York, NY: Guilford.

Egeland, B., & Heister, M. (1993). *Teaching task rating scales*. Minneapolis, MN: Institute of Child Development, University of Minnesota.

Enders, C. K., & Bandalos, D. L. (2001). The relative performance of full information maximum likelihood estimation for missing data in structural equation models. *Structural Equation Modeling*, *8*, 430–457. doi:10.1207/S15328007SEM0803_5

Eyberg, S. M., & Pincus, D. (1999). *Eyberg Child Behavior Inventory and Sutter-Eyberg Student Behavior Inventory–Revised: Professional manual*. Odessa, FL: Psychological Assessment Resources.

Gest, S. D., Madill, R. A., Zadzora, K. M., Miller, A. M., & Rodkin, P. C. (2014). Teacher management of elementary classroom social dynamics associations with changes in student adjustment. *Journal of Emotional and Behavioral Disorders*, *22*, 107–118. doi:10.1177/1063426613512677

Hamre, B. K. (2014). Teachers' daily interactions with children: An essential ingredient in effective early childhood programs. *Child Development Perspectives*, *8*, 223–230. doi:10.1111/cdep.12090

Hamre, B., Hatfield, B., Pianta, R., & Jamil, F. (2014). Evidence for general and domain-specific elements of teacher–child interactions: Associations with preschool children's development. *Child Development*, *85*, 1257–1274. doi:10.1111/cdev.12184

Hamre, B. K., & Pianta, R. C. (2005). Can instructional and emotional support in the first-grade classroom make a difference for children at risk of school failure? *Child Development*, *76*, 949–967. doi:10.1111/j.1467-8624.2005.00889.x

Hamre, B. K., Pianta, R. C., Downer, J. T., Decoster, J., Jones, S., Brown, J., . . . Hakigami, A. (2013). Teaching through interactions: Testing a developmental framework of effective teaching in over 4,000 classrooms. *Elementary School Journal*, *113*, 461–487. doi:10.1086/669616

Hommersen, P., Murray, C., Ohan, J. L., & Johnston, C. (2006). Oppositional defiant disorder rating scale preliminary evidence of reliability and validity. *Journal of Emotional and Behavioral Disorders*, *14*, 118–125. doi:10.1177/10634266060140020201

Love, J. M., Kisker, E. E., Ross, C. M., Schochet, P. Z., Brooks-Gunn, J., & Paulsell, D., . . . Brady-Smith, C. (2002). *Making a difference in the lives of infants and toddlers and their families: The impacts of early head start*. Vol. I–III: Final Tech. Rep. [and] appendixes [and] local contributions to understanding the programs and their impacts. Princeton, NJ: Mathematica Policy Research, Inc.

Mashburn, A. J., Pianta, R. C., Hamre, B. K., Downer, J. T., Barbarin, O. A., Bryant, D., . . . Howes, C. (2008). Measures of classroom quality in prekindergarten and children's development of academic, language, and social skills. *Child Development*, *79*, 732–749. doi:10.1111/j.1467-8624.2008.01154.x

McGoey, K. E., DuPaul, G. J., Haley, E., & Shelton, T. L. (2007). Parent and teacher ratings of attention-deficit/hyperactivity disorder in preschool: The ADHD Rating Scale–IV preschool version. *Journal of Psychopathology and Behavioral Assessment*, *29*, 269–276. doi:10.1007/s10862-007-9048-y

Morris, P., Mattera, S. K., Castells, N., Bangser, M., Bierman, K., & Raver, C. (2014). *Impact findings from the Head Start CARES Demonstration: National evaluation of*

three approaches to improving preschoolers' social and emotional competence. OPRE Report 2014–44. Washington, DC: Office of Planning, Research and Evaluation, Administration for Children and Families, U.S. Department of Health and Human Services.

Morris, P., Millenky, M., Raver, C. C., & Jones, S. M. (2013). Does a preschool social and emotional learning intervention pay off for classroom instruction and children's behavior and academic skills? Evidence from the foundations of learning project. *Early Education & Development*, *24*, 1020–1042. doi:10.1080/10409289.2013.825187

Muthén, L. K., & Muthén, B. O. (2008). *Mplus* (Version 7.11). Los Angeles, CA: Author.

Pianta, R. C. (1999). *Enhancing relationships between children and teachers*. Washington, DC: American Psychological Association. doi:10.1037/10314-000

Pianta, R. C., & Hamre, B. (2001). *Students, teachers, and relationship support (STARS)*. Lutz, FL: Psychological Assessment Resources.

Pianta, R., LaParo, K., & Hamre, B. (2008). *The Classroom Assessment Scoring System Pre-K manual*. Baltimore, MD: Brookes.

Raver, C. C., Jones, S. M., Li-Grining, C., Zhai, F., Metzger, M. W., & Solomon, B. (2009). Targeting children's behavior problems in preschool classrooms: A cluster-randomized controlled trial. *Journal of Consulting and Clinical Psychology*, *77*, 302–316. doi:10.1037/a0015302

Sabol, T. J., & Pianta, R. C. (2012). Recent trends in research on teacher–child relationships. *Attachment and Human Development*, *14*, 213–231. doi:10.1080/14616734.2012.672262

Vancraeyveldt, C., Verschueren, K., Wouters, S., Van Craeyevelt, S., Van den Noortgate, W., & Colpin, H. (2015). Improving teacher-child relationship quality and teacher-rated behavioral adjustment among externalizing preschoolers: Effects of a two-component intervention. *Journal of Abnormal Child Psychology*, *43*, 243–257. doi:10.1007/s10802-014-9892-7

Whittaker, J. V., Williford, A. P., Carter, L. M., Vitiello, V. E., & Hatfield, B. E. (2016). *Using a standardized task to assess the quality of teacher–child dyadic interactions in preschool*. Manuscript submitted for publication.

Williford, A. P., Maier, M. F., Downer, J. T., Pianta, R. C., & Howes, C. (2013). Understanding how children's engagement and teachers' interactions combine to predict school readiness. *Journal of Applied Developmental Psychology*, *34*, 299–309. doi:10.1016/j.appdev.2013.05.002

Williford, A. P., Vick Whittaker, J. E., Vitiello, V. E., & Downer, J. T. (2013). Children's engagement within the preschool classroom and their development of self-regulation. *Early Education & Development*, *24*, 162–187. doi:10.1080/10409289.2011.628270

Yudron, M., Jones, S. M., & Raver, C. C. (2014). Implications of different methods for specifying classroom composition of externalizing behavior and its relationship to social-emotional outcomes. *Early Childhood Research Quarterly*, *29*, 682–691. doi:10.1016/j.ecresq.2014.07.007

Supporting Information

Additional supporting information may be found in the online version of this article at the publisher's website:

Table S1. Descriptive Statistics for Demographic and Outcome Variables by Treatment Group.

Table S2. Correlations Among the Outcome Variables.

Appendix S1. Additional Information.