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RESEARCH ARTICLE

Quantitative and Qualitative Factors Related to the Effectiveness of a Preschool Behavioral Regulation Intervention

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The present study examined quantitative and qualitative factors related to the effectiveness of a behavioral regulation intervention using classroom games with 65 prekindergarteners. Previous research indicated that participation in an intervention was related to behavioral regulation gains for children who started the year with low levels of these skills and significant letter-word identification gains for all children in the intervention (Tominey & McClelland, 2011). Children from low-income families experienced smaller intervention-related gains than their peers. In the present paper, we examined how child and family factors predicted children's initial levels of behavioral regulation. Additionally, we analyzed qualitative fieldnotes looking for behaviors that could explain the reduced intervention effects experienced by children from low-income families. Results of a logistic regression indicated that maternal education significantly predicted behavioral regulation at the beginning of the prekindergarten year. Moreover, qualitative analyses revealed relations between off-task behaviors exhibited during intervention sessions (including spillover effects) and children's family income level. Findings underscore the importance of targeting children from low-income families and those with low levels of maternal education for behavioral regulation interventions. Implications for future applications of the intervention include increasing the number of intervention sessions and embedding behavioral regulation activities into prekindergarten classrooms.

Keywords: Preschool curriculum, self-regulation, behavioral regulation, intervention, qualitative methods, preschool

Behavioral regulation is an important component of school readiness and critical for academic success (Blair, 2002; Cooper & Farran, 1988; Eisenberg, Smith, Sadovsky, & Spinrad, 2004; McClelland, Cameron, Wanless, & Murray, 2007; Valiente, Lemery-Chalfant, & Castro, 2007). Teachers are reporting, however, that many children enter school with poor regulatory abilities (Rimm-Kaufman, Pianta, & Cox, 2000) and, as a result, these children have difficulties transitioning to and succeeding within academically-focused environments (Howse, Lange,

Farran, & Boyles, 2003; M. M. McClelland, Morrison, & Holmes, 2000). This is problematic because early academic skills serve as building blocks for future learning. Children who fail to acquire early skills (such as in reading and in math) are likely to face achievement gaps that can persist and increase throughout their schooling (Entwisle & Alexander, 1993). Children from low-income families are most at risk for entering school with poor behavioral regulation (Dearing, Berry, & Zaslow, 2006; Howse, Lange et al., 2003) and thus are an especially important population to target for intervention.

In recent years, a number of preschool interventions have emerged that target self-regulation (including behavioral regulation) prior to school entry (Diamond, Barnett, Thomas, & Munro, 2007; Domitrovich, Cortes, & Greenberg, 2007; Pears, Fisher, & Bronz, 2007; Tominey & McClelland, 2011). Some intervention programs have been developed for children with identified risk factors (e.g., children exhibiting overt aggressive behaviors, children in foster care), whereas others have been developed for use in preschool classrooms with the intent that all children will participate in and benefit from the activities (e.g., Second Step, Tools of the Mind). Because of the importance of self-regulation for academic success and the high number of children with poor regulatory abilities in preschool, the latter approach is gaining in popularity. Few studies, however, have investigated how interventions targeting classrooms with children at varying levels of behavioral regulation and from diverse backgrounds might lead to varying levels of effectiveness. It is critical to identify factors related to intervention effectiveness in order to develop and refine programs that maximize the effects for all children.

In the present study, we examine an intervention aimed at improving preschoolers' behavioral regulation skills using circle time games (Tominey & McClelland, 2011). We examine quantitative and qualitative factors related to varying levels of intervention effects exhibited by children in the study related to their initial behavioral regulation abilities and family income level.

DEFINITION OF BEHAVIORAL REGULATION

We define behavioral regulation as the integration of attention, working memory, and inhibitory control (McClelland, Cameron, Wanless et al., 2007; Ponitz et al., 2008). These behavioral components of self-regulation are important for planning and executing goal-directed activities (Blair, 2002). Within the classroom, attention skills help children filter important information from distractions and switch focus from one task to another (Rothbart & Posner, 2005; Rueda, Posner, & Rothbart, 2005). Building upon attention abilities, working memory allows children to remember information (to which they attended) in order to follow instructions and complete multi-step tasks (Adams, Bourke, & Willis, 1999). Requiring both attention and working memory, inhibitory control refers to the ability to stop a dominant response (e.g., running outside when the bell rings) in order to demonstrate a more appropriate behavior (e.g., putting away toys first) (McClelland, Cameron, Wanless et al., 2007; Rennie, Bull, & Diamond, 2004). Taken together, attention, working memory, and inhibitory control are important for school readiness and academic success (Baumeister & Vohs, 2004; McClelland, Cameron, Connor et al., 2007; McClelland, Cameron, Wanless et al., 2007). The circle time games used in this study were designed to help children practice the integration of these skills.

BEHAVIORAL REGULATION AND ACADEMIC ACHIEVEMENT

Early behavioral regulation skills predict both short- and long-term academic outcomes. Studies have found significant relations between preschool behavioral regulation and academic achievement in preschool (Blair & Razza, 2007; McClelland, Cameron, Connor et al., 2007), elementary school (Liew, McTigue, Barrois, & Hughes, 2008; McClelland, Acock, & Morrison, 2006; McClelland et al., 2000; Valiente et al., 2007), and even high school and college completion (McClelland, Piccinin, & Stallings, 2013; Vitaro, Brendgen, & Larose, 2005). Studies suggest that children with poor behavioral regulation have difficulty succeeding in structured classroom settings (Alexander, Entwisle, & Dauber, 1993; Ladd, 2003). The components of behavioral regulation: attention (Blair & Razza, 2007; Howse, Lange et al., 2003), working memory (Gathercole, 2008; Gathercole & Pickering, 2000), and inhibitory control (Blair & Razza, 2007), have been independently identified as predictors of math and reading in preschool and elementary school. Additionally, many studies have found significant relations between academic outcomes and measures that integrate these skills. For example, in a study examining kindergarteners' behavioral regulation, a composite behavioral regulation score from teacher ratings of impulsivity, planning abilities, and attention significantly predicted academic outcomes over the kindergarten year (Howse, Calkins, Anastopoulos, Keane, & Shelton, 2003). In another study, kindergarten work-related skills (another composite score taken from teacher ratings of behavioral regulation skills including paying attention to instructions and complying with teacher requests) predicted math and literacy skills between kindergarten and sixth grade and growth in these same skills from kindergarten to second grade (McClelland et al., 2006). Together, these results provide evidence that children with poor behavioral regulation may be at risk of experiencing academic difficulties.

IMPROVING CHILDREN'S BEHAVIORAL REGULATION THROUGH INTERVENTION IN PRESCHOOL

In recent years, there has been an increasing emphasis on improving children's regulatory skills (including behavioral regulation) in preschool. For many children, the preschool classroom is the first academic environment in which they are asked to demonstrate these skills (Phillips, McCartney, & Sussman, 2006). Prior to preschool entry, children's behavioral regulation develops within the family context, moving from an external process (e.g., parents soothe a child through holding and rocking) to an internal process (e.g., children soothe themselves by sucking a thumb) (Kopp, 1991). Upon entering preschool, children are asked to demonstrate behavioral regulation continually through actions such as paying attention and following directions.

Preschool has also been identified as an important developmental period for brain maturation in the pre-frontal cortex, an area related to behavioral regulation (Blair, 2002). Research documents that brain maturation during this stage is accompanied by changes in children's behavioral regulation abilities. For example, attention becomes more focused, working memory improves in accuracy, and children exhibit inhibitory control skills at appropriate times with greater consistency (Blair, 2002; Landry, Smith, Swank, & Miller-Loncar, 2000). Moreover, studies are showing that each of these skills can be improved through practice (Ford, McDougall, & Evans, 2009; Landry et al., 2000). Together these factors indicate that preschool would be an ideal time to introduce interventions aimed at improving children's behavioral

regulation. An estimated 83.2% of children attend early care or education programs (Denton Flanagan & McPhee, 2009), making it likely that behavioral regulation interventions in preschool settings would reach a majority of children prior to kindergarten entry.

Several preschool interventions have emerged focusing on behavioral regulation, social competence, and improving early academic skills. One example is Tools of the Mind (Bodrova & Leong, 2009; Diamond et al., 2007), which embeds self-regulation and early academic intervention into preschool learning activities. In randomized trials, children in classrooms implementing the Tools of the Mind curriculum have shown significant improvement on computer-based executive function tasks (Diamond et al., 2007) and higher levels of teacher-reported self-regulatory skills compared to children in control classrooms (Barnett et al., 2008). Promoting Alternate Thinking Strategies (PATHS) is another classroom-based intervention targeting emotional awareness and communication, cooperation, self-regulation, self-esteem, and problem-solving. In a randomized trial of PATHS, preschool children participating in the treatment group were rated more socially competent by parents and teachers than children in the control group (Domitrovich et al., 2007). Both of these intervention programs as well as others targeting regulation skills (e.g., Second Step, (Committee for Children); Kids in Transition to School, (Pears et al., 2007)) have been tested among children from diverse socioeconomic backgrounds as well as a range of ethnicities and parental education levels (Barnett et al., 2008; Domitrovich et al., 2007), but to date, they have not tested for varying levels of intervention effectiveness across these diverse groups of children. Additionally, none of these studies have examined how children's behaviors (e.g., on- versus off-task behaviors) during intervention sessions might impact intervention effectiveness as well as how they might impact one another (i.e., spillover effects).

SPILLOVER EFFECTS

In the classroom and during intervention sessions, the behaviors of children can affect other children (e.g., spillover effects). The research on early childhood inclusive classrooms (i.e., classrooms including children with special needs as well as children without special needs) has shown that children can serve as peer models for one another to promote the development of positive social and academic outcomes (Odom & Diamond, 1998). Spillover effects are also present in non-inclusive classrooms. For example, in one study of prekindergarteners, children's receptive and expressive vocabulary skills were significantly related to their peers' expressive vocabulary (Mashburn, Justice, Downer, & Pianta, 2009). Conversely, spillover effects can lead to decreases in positive behaviors or increases in negative behaviors. For example, findings from another study revealed that preschool children had more difficulties demonstrating regulation in group settings than when they were being assessed individually (McCabe & Brooks-Gunn, 2007). Although spillover effects are clearly an important factor when examining children in group settings, few intervention studies targeting regulatory abilities (if any) have examined the relation between children's behaviors, spillover effects, and intervention effectiveness.

KINDERGARTEN READINESS STUDY PILOT BEHAVIORAL REGULATION INTERVENTION

We recently developed and implemented an intervention using circle time games intended to improve children's behavioral regulation (Tominey & McClelland, 2011). Results from a randomized trial revealed three important findings. First, children's initial levels of behavioral regulation predicted gains in these skills over the prekindergarten year. Specifically, lower initial levels of behavioral regulation predicted greater gains in these skills over the prekindergarten year. Second, children in the intervention demonstrated significant gains in letter-word identification skills compared to children in the control group. Finally, being from a low-income family (measured by enrollment in the Head Start program) predicted significantly smaller gains in behavioral regulation over the prekindergarten year. In a post-hoc analysis guided by these results, significant intervention effects were present when we divided children into two groups based on their initial behavioral regulation scores: low (at or below the 50th percentile) and high (above the 50th percentile). Treatment group participation predicted significant gains in behavioral regulation for children in the low group (Tominey & McClelland, 2011). In our post-hoc analysis, low family income again emerged as a significant control variable, showing reduced intervention effects for children from low-income families.

The variability in intervention effects based on initial behavioral regulation scores and family income level made it clear that a more thorough investigation of intervention effects was needed. In the present study, we examined quantitative and qualitative factors related to intervention effectiveness in this pilot study. First, we tested the background variables that we had collected on children (e.g., gender and maternal education) as predictors of initial behavioral regulation group (low or high). We then analyzed qualitative fieldnotes from intervention sessions to look for patterns of behavior (including spillover effects) that could help explain the reduced effects experienced by children from low-income families in comparison to their peers.

FACTORS INFLUENCING THE DEVELOPMENT OF BEHAVIORAL REGULATION

Numerous child and family factors have been found to predict the development of behavioral regulation. In the present study, we examined age, gender, family income, and maternal education as predictors of behavioral regulation group (low or high) at the beginning of the prekindergarten year, all of which have been shown to significantly predict behavioral regulation (Blair, 2002; Evans, 2004; Evans & Rosenbaum, 2008; Howse, Lange et al., 2003; Morrison, Ponitz, & McClelland, 2010; Sektnan, McClelland, Acock, & Morrison, 2010; Skibbe, Connor, Morrison, & Jewkes, 2010; Wanless, McClelland, Tominey, & Acock, 2011). Our goal was to identify factors that predicted membership in the low behavioral regulation group, which could help target children most likely to need and benefit from this or similar interventions.

FAMILY INCOME AND INTERVENTION EFFECTIVENESS

In addition to examining factors predicting behavioral regulation levels at the beginning of the prekindergarten year, we examined qualitative data from intervention sessions to help explain the

smaller intervention effects exhibited by children enrolled in Head Start (in the low behavioral regulation group) in comparison to children who were not. Although children from low-income families are more likely than their peers to struggle with behavioral regulation (Evans & Rosenbaum, 2008), these skills can mediate the relation between risk factors (e.g., low family income, low maternal education) and academic outcomes (Buckner, Mezzacappa, & Beardslee, 2009; Dearing, McCartney, & Taylor, 2009; Sektnan et al., 2010), indicating that this is an especially important population to target for intervention. Identifying behaviors related to intervention effects may lead to the refinement of the present intervention in ways that maximize intervention gains for children from diverse socioeconomic backgrounds.

THE PRESENT STUDY

The present study focused on identifying factors related to the effectiveness of a prekindergarten behavioral regulation intervention. The study had two research questions. Our first research question was: *What factors predicted membership in the low behavioral regulation group and thus, that children would be in the group most likely to exhibit significant gains from intervention participation?* To answer this question, we examined quantitative child and family factors (i.e., child age, gender, family income, and maternal education) for predictors of behavioral regulation at the beginning of the prekindergarten year. We hypothesized that the group of children who began the year with low behavioral regulation would include younger children, a higher number of males and children from low-income families, and that children in this group would have lower levels of maternal education than children in the high group based on research documenting the relation between these variables and the development of behavioral regulation (Howse, Lange et al., 2003; Matthews et al., 2009; Ponitz et al., 2009; Wanless, McClelland, Tominey, & Acock, 2010; Wanless et al., 2011).

Our second research question was: *Are there behaviors that help explain the varying levels of intervention effects exhibited by children in the low behavioral regulation group when dividing children by family income?* We hypothesized that patterns of behaviors would emerge (including potential spillover effects) from the observational fieldnotes of children in the treatment group (n = 32) that might explain the smaller gains in behavioral regulation exhibited by children from low-income families in the low behavioral regulation group in comparison to their peers. Children from low-income families are more likely than their peers to have difficulties regulating their behaviors (Howse, Lange et al., 2003; Wanless et al., 2011) and thus we expected to find evidence of this during intervention sessions through qualitative analyses.

METHOD

Participants

Participants included in the first research question were 65 prekindergarten children who participated in a behavioral regulation intervention (Tominey & McClelland, 2011). Children were randomly assigned to the treatment and control groups with 32 children in the treatment group and 33 children in the control group. The average age of child at the beginning of the study was 54.5 months (SD = 3.6). Twenty-eight of the children (43%) came from low-income

families, as measured by enrollment in the Head Start program. Thirty-nine of the children were female and 26 were male.

The majority of children in the study attended preschool in classrooms located in a university child development center and laboratory school (n = 53). Placement in the center is available both to children paying tuition and available at no cost to children enrolled in the Head Start program. This arrangement provided a unique opportunity to include children coming from a range of socioeconomic backgrounds who were receiving the same quality of care. Approximately half of the children in each classroom were enrolled in Head Start. A small number of children participating in the study (n = 12) were attending a program at a second child development center. Children in the study were divided among eight classrooms. Information on classroom activities was obtained from discussions with classroom teachers. Teachers reported that they were familiar with games similar to those used in the intervention, but that they rarely implemented these games in their classrooms.

Participants included in the analysis for the second research question were the 32 children who had been randomly assigned to the treatment group. Our primary interest was children in the low initial behavioral regulation group, however, intervention sessions included children from both the low and the high groups and thus the behaviors of all children were included in our qualitative analysis to account for potential spillover effects. Although we only had spring behavioral regulation scores for 28 of these children, we chose to include children for whom we did not have complete data (children who left prior to the conclusion of the study) if they participated in the intervention sessions as their behaviors may also have had spillover effects. The average age of children in the treatment group was 54.3 months (SD = 3.3 months). Twenty of the children were female and twelve were male. Fourteen children were enrolled in the Head Start program (43.8%) and eighteen were not. The average level of maternal education was 15.6 years (SD = 3 years). None of these variables differed significantly from children in the control group (Tominey & McClelland, 2011).

Attrition

Initially, 74 children enrolled in the study. Over the school year, the total attrition was nine children: four children moved, one left school early for a family vacation, three declined to participate in the post-test, and one was withdrawn from the study by his parents because of newly-diagnosed developmental delays. The nine children who did not complete the study did not significantly differ from the overall sample on any of the measured background variables.

MEASURES

Parent Demographic Questionnaire

In the fall of the prekindergarten year, parents completed a background questionnaire in their native language (English or Spanish) containing questions about their child's age, gender, Head Start enrollment, and maternal education. Information on children's age, gender, and Head Start enrollment was also obtained and verified through the child development centers. Parent demographic questionnaires were completed and returned by 55 of the families in the study (85%),

reducing the sample size for analyses including maternal education. All of the questionnaires that were not returned (n = 10) were from low-income families and eight out of 10 of the unreturned questionnaires were also from parents of children in the low initial behavioral regulation group. The average maternal education for low-income families with children in the low initial behavioral regulation group was 11.8 years (SD = 2.3, range = 6–14 years).

Head-Toes-Knees-Shoulders Task

In the fall and spring of the prekindergarten year, the Head-Toes-Knees-Shoulders Task (HTKS) was used to assess children's behavioral regulation (Ponitz et al., 2009). The HTKS is a direct measure of behavioral regulation that assesses the integration of attention, working memory, and inhibitory control (McClelland, Ponitz, Messersmith, & Tominey, 2010; Ponitz et al., 2009). In this task, children are asked to touch their head and toes (or knees and shoulders in an alternate form), and then to do the opposite of what the experimenter says (e.g., children touch their head when asked to touch their toes). There are 20 test items, resulting in scores that range from 0 to 40 with higher scores indicating higher levels of behavioral regulation Each item has a possible score of 0, 1, or 2: 0 denotes an incorrect response (child touches the incorrect body part), 1 is considered a self-correct (child moves toward an incorrect response, but ultimately gives the correct response), and 2 points denotes a correct response without a movement toward an incorrect response. Recent studies suggest that the HTKS is a reliable and valid measure of children's behavioral regulation in diverse populations (McClelland, Cameron, Connor et al., 2007; Ponitz et al., 2008; Ponitz et al., 2009). Additionally, studies have found significant relations between parent-rated inhibitory control and attention and children's scores on the HTKS, as well as between teacher ratings of children's behavioral regulation in the classroom and scores on the HTKS (McClelland, Cameron, Connor et al., 2007; Ponitz et al., 2009). In the present study, interrater reliability on the HTKS was calculated at kappa = .92.

Observational Data

At the end of each playgroup session, the playgroup leader (the first author) recorded hand-written narratives detailing the activities used in the sessions as well as notes on each individual child from the time the playgroup session began to the time the child returned to their classroom (Emerson, 1995). The notes were a narrative of the playgroup sessions and included individualized descriptions of each child and their behavior. At the end of each day, the playgroup leader transcribed the hand-written notes into a word processing program. Each day of playgroup sessions generated approximately three pages of single-spaced typed notes, resulting in a total of 50 typed pages of fieldnotes.

PROCEDURE

In the fall of the prekindergarten year (September), invitations to participate were mailed to parents of all four-year-olds in the participating preschools and consent forms were collected from seventy-four families. The study was divided into three phases: pretest, intervention, and posttest.

Pretest. The first phase took place in the fall (November – December). During this time, children's behavioral regulation was assessed using the HTKS over four weeks.

Intervention. The second phase took place over winter term (January-March) to allow time for pre-testing and to accommodate teacher scheduling requests. During this phase, half of the children in each classroom were randomly assigned to participate in the intervention group. Random assignment at the individual level within classrooms was chosen because of the high variability in number of children from each classroom participating in the study (1-13 children). Additionally, the intraclass correlation on the HTKS for classroom was .06, indicating limited variability that could be explained by classroom membership in behavioral regulation and supporting our decision to randomize individually within classrooms. Children at both sites were frequently taken out of the classroom to participate in individual and small group activities so children were both accustomed to leaving the classroom and to seeing others leave the classroom throughout the school day. Although there were concerns regarding potential contamination effects, teachers reported that there was no evidence of children in the treatment group sharing intervention activities with children assigned to the control group. In addition, studies have found that when contamination effects occur because of changes in students' behavior, children assigned to the control group are more likely to act like children in the treatment group, making detection of intervention effects more difficult. These contamination effects, however, are often found to be negligible (Rhoads, 2009; Torgerson, 2001).

Posttest. The third phase took place in the spring of the pre-kindergarten year (April-May). Children's behavioral regulation was re-assessed using the HTKS. During this phase, research assistants were blind to intervention participation; those who assisted with the intervention phase of the study did not test children from classrooms in which they had previously assisted to prevent researcher bias.

INTERVENTION GAMES

Children randomly assigned to the treatment group participated in a total of sixteen playgroups over eight weeks. The playgroups were held twice weekly and each session was approximately 30 minutes. Previous research has found significant improvement in children's self-regulation and social competence in interventions of similar durations (Pears et al., 2007). The playgroup sessions were held on the same days and times each week as part of the regular preschool day. Times were chosen that best accommodated the needs of classroom teachers and did not interfere with other scheduled activities. Children were invited by playgroup leaders to attend the sessions, but were allowed to decline participation. Out of the sixteen sessions, children in the intervention group attended 5-16 sessions, with an average attendance of 11.3 sessions. The most common reason for a child to miss a session was an absence because of illness or vacation. Occasionally children declined participation because of engagement in other classroom activities.

Each playgroup session had 5-8 children and 1-2 assistant teachers. The assistant teachers were trained undergraduate student researchers who were studying early childhood education or related fields. The same researcher (the first author) led all of the playgroup sessions to ensure fidelity. The games used in the study were developed by the playgroup leader, who had previously

worked as an early childhood education teacher (Tominey & McClelland, 2011). The games were previously piloted in classrooms of children with varying ages and developmental needs. The games chosen for use in the study had shown high levels of engagement among children with demonstrated difficulty engaging in classroom activities.

Playgroup sessions were modeled after classroom circle times. Each session began with children sitting on mats and participating in a greeting song intended to help children transition to the playgroup setting. The playgroup leader then introduced the playgroup activity. Following the activity, children returned to their mats to sing a good-bye song and then returned to their classrooms. A total of six activities were presented over the 16 sessions. The activities were designed to help children develop and practice integrating attention, working memory, and inhibitory control, using easy-to-implement classroom games (Tominey & McClelland, 2011). The games helped children practice attention and working memory by requiring them to remember and follow through with continually changing multi-step instructions. Children practiced inhibitory control by starting and stopping to different cues (oral and visual), performing specific behaviors in response to cues, and performing opposite behaviors. Each game included music and movement components to promote engagement. Although little research has examined the relation between music and movement and engagement, one study found that music and movement activities, such as dance, are effective at improving preschooler's social competence (Lobo & Winsler, 2006). Additionally, classroom teachers in our study reported that the use of music and movement in circle time activities often resulted in high involvement.

One game used in the study was the *Freeze Game*. In this game, children danced when music played and froze when the teacher stopped the music. Children changed their body movements based on the speed of the songs (dancing slowly to slow songs and quickly to fast songs). Children were also asked to respond to opposite cues: dancing quickly to slow songs and slowly to fast songs. In another game, which was a variation of the popular children's game *Red Light, Green Light*, a teacher acted as a "stop light" by standing at the opposite end of the room from the children and holding up different colored construction paper circles to represent stop and go. Children responded to specific color cues (e.g., purple is "stop" and orange is "go") and then to opposite cues (e.g., purple is "go" and orange is "stop") as well as to different shapes representing stop and go (e.g., any color circle is "go" and any color square is "stop"). Children were also given the opportunity to lead activities, such as by acting as the "stop light" in the *Red Light, Purple Light* game. For a detailed description of the intervention games, see (Tominey & McClelland, 2011).

RESULTS

Descriptive Statistics for Research Question #1. Prior to running our analyses for the first research question, we examined descriptive statistics for the low and high behavioral regulation groups (low group: $n = 31$, high group: $n = 34$). The average age of children in the low and high groups was nearly identical (low group: $M = 54.6$ months, $SD = 4$; high group: $M = 54.5$ months, $SD = 3.2$). There was a slight (although non-significant) difference in gender across the two groups of children with 45% of the low-group being male ($n = 14$) and 35% of the high group being male ($n = 12$). Mothers of children in the low group had significantly lower levels of education ($M = 14.1$ years, $SD = 3.4$ years) than mothers of children in the high group ($M = 16.4$ years, $SD = 3.3$ years), $t(53) = -2.56$, $p < .05$. Forty percent of mothers with children in the low

group had a high school education or lower, whereas only 18% of mothers with children in the high group had a high school education or lower. In addition, the proportion of children in low-income families was higher in the low group (55%; $n = 17$) than in the high group (32%; $n = 11$); although this difference did not quite reach statistical significance ($z = 1.83$, $p = .07$). Moreover, maternal education level and low family income were significantly correlated ($r = -.65$, $p < .001$). Because maternal education and family income were highly correlated, to avoid issues with multicollinearity, we ran two separate analyses to examine each as a predictor of behavioral regulation. We expected that we might more easily detect relations between maternal education (a continuous variable) and children's behavioral regulation than between family income (a dichotomous variable) and behavioral regulation.

In the fall, children in the low group had an average HTKS score of .5 points ($SD = 1.3$) whereas children in the high group had an average HTKS score of 20.5 ($SD = 9.6$). In the spring, the average HTKS score in the low group was 16.9 points ($SD = 13.6$) and 26.6 points ($SD = 27.2$) in the high group. Over the course of the year, children in the low group gained an average of 16.3 points ($SD = 13.3$). In contrast, children in the high behavioral regulation group gained an average of 6.1 points over the year ($SD = 10.8$).

Research Question #1: What factors predicted membership in the low behavioral regulation group and thus that children would be in the group most likely to exhibit significant gains from intervention participation?

To answer the first research question, we used logistic regression analyses to determine if child age, gender, Head Start enrollment, and maternal education significantly predicted whether children were in the low or high behavioral regulation group in the fall of the prekindergarten year. Because of the high correlation between maternal education level and family income, separate logistic regression analyses were run to determine the effects of each independently on children's initial levels of behavioral regulation. Results of the first logistic regression (see Table 2.1) indicated that the odds of children being in the low behavioral regulation group was 59% higher for children from low-income families than for their more advantaged peers, although this was a trend ($N = 65$; $z = -1.70$, $p = .08$). The second logistic regression indicated that maternal education significantly predicted group membership ($z = 2.10$, $p < .05$). For every additional year of maternal education, the odds that a child would be in the high behavioral regulation group increased by 22%. Child gender was not a significant predictor of low/high group membership in either analysis (ps $> .05$). Although we initially included child age (in months) in both analyses, because of the low variability in children's ages across the groups and the lack of significance ($z = -.29$, $p > .05$ and $z = .23$, $p > .05$, respectively) this variable was removed from the final models.

TABLE 1
Logistic Regression Results Examining Family Income and Maternal Education to Predict Low/High Self-Regulation at the Beginning of the Prekindergarten Year (N = 65)

	Model 1			Model 2		
Variable	Odds Ratio	95% Confidence Interval		Odds Ratio	95% Confidence Interval	
Child gender[a]	0.77	0.27	2.15	0.68	0.21	2.21
Head Start status[b]	.41[†]	0.15	1.14	-	-	-
Maternal education (years)	-	-	-	1.22*	1.01	1.48
χ^2		3.36			6.76*	
df		2			2	

[a]Child gender: 0 = *female*, 1 = *male*. [b]Head Start status: 0 = *not enrolled in Head Start*, 1 = enrolled in Head Start. [†]$p < .1$. *$p < .05$.

Descriptive Statistics for Research Question #2. Before answering the second research question, we examined descriptive statistics for children in the low behavioral regulation group, dividing children by family income and intervention group assignment. Although the small sample sizes across groups did not allow us to test for statistically significant differences, children in Head Start in both the treatment and control groups had lower average maternal education and higher numbers of school absences than their more-advantaged peers. Varying patterns of intervention effects were also present across these groups (see Figure 1). Specifically, children who were not enrolled in Head Start in the treatment group (n = 6) showed the greatest behavioral regulation gains (M = 29.2 points, SD = 4.4), followed by children not in Head Start children in the control group (n = 8, M = 20.9 points, SD = 14). Children in Head Start in the treatment group gained an average of 13.5 points (SD = 14.3), and children in Head Start in the control group gained an average of 7.5 points (SD = 8.7). Overall, children not enrolled in Head Start exhibited greater gains in behavioral regulation scores than children in Head Start regardless of intervention group. There were also differences in the variability in HTKS gains over the prekindergarten year across the four groups. Children who were not enrolled in Head Start in the treatment group demonstrated the greatest gains in behavioral regulation over the prekindergarten year, and the least variability in gain scores (SD = 4.4). The standard deviation of behavioral self-regulation in each of the other three groups was double or triple that of the children in this group. Additional descriptive statistics for children with low initial behavioral regulation, dividing children by family income and intervention group, are presented in Table 2.

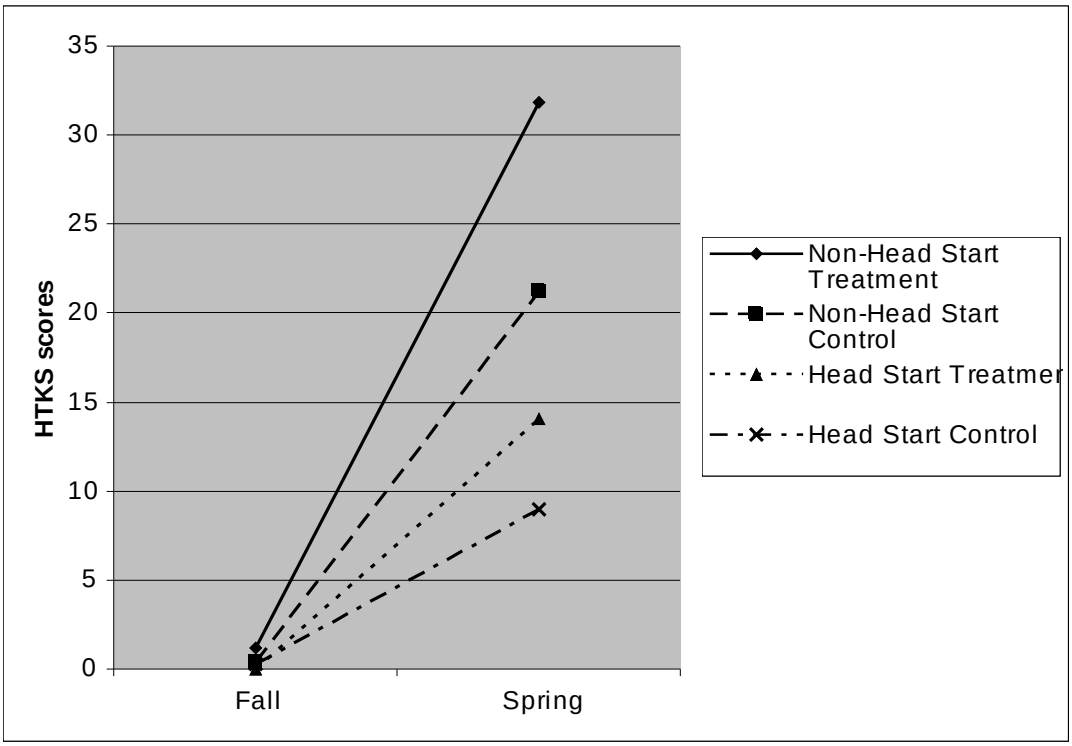

Figure 1. Fall and Spring HTKS scores for children beginning the year with behavioral regulation skills at or below the 50th percentile (n = 31) divided by Head Start enrollment and intervention group assignment.
Note. HTKS is the Head-Toes-Knees-Shoulders self-regulation task.

TABLE 2
Descriptive Statistics for Children in the Treatment and Control Groups by Family Income for Children with Low Initial Behavioral Self-Regulation (N = 31).

Variables	Treatment Group (n = 12)		Control Group (n = 19)	
	Head Start (n = 6) M (SD)	Non-HS (n = 6) M (SD)	Head Start (n = 11) M (SD)	Non-HS (n = 8) M (SD)
Child age (months)	54.5 (3.7)	53.8 (3.9)	55 (4.5)	54.8 (4.2)
Child gender[a]	0.5 (0.5)	0.7 (0.5)	0.4 (0.5)	0.4 (0.5)
Maternal education[b] (years)	12 (0)	16.2 (2.9)	11.1 (2.7)	15.6 (2.8)
Absences	9.8 (8.2)	6.2 (5.3)	6.4 (5.2)	4 (3.9)
Sessions attended	10.3 (2.3)	12.7 (2.7)	0	0
Fall HTKS	0 (0)	1.8 (2.2)	.4 (.8)	.4 (1.1)
Spring HTKS	13.5 (14.3)	31 (4.1)	7.9 (8.5)	21.3 (14.2)
HTKS gain	13.5 (14.2)	29.2 (4.4)	7.6 (8.7)	20.9 (14.0)

[a]Child gender: 0 = *female*, 1 = *male*. [b]For descriptive statistics including maternal education, n = 23.

Research Question #2: Are there behaviors that explain the varying levels of intervention effects exhibited by children in the low behavioral regulation group when dividing children by family income?

To answer the second research question, qualitative fieldnotes from the intervention sessions were read and coded deductively and inductively for patterns of behavior for children in the treatment group (n = 32). First, we coded notes for children individually, specifically looking deductively for evidence of attention/focus and on- versus off-task behaviors. As additional behaviors of interest emerged from our inductive coding (e.g., children's responsiveness to teacher praise), we reread the fieldnotes and recoded for each of these behaviors across all children.

We then looked for relations between behaviors and background variables, including family income (determined by Head Start enrollment status) and initial level of behavioral regulation (high or low group). Although researchers were not blind to children's background variables several steps were taken to reduce the likelihood of bias in the recording and coding of fieldnotes. First, a playgroup assistant read through the fieldnotes written by the playgroup leader (the first author) after each session to verify accuracy. Second, the first author read and coded fieldnotes for each child individually before comparisons were made within and across subgroups of children based on their background variables. It should be noted that children enrolled in Head Start and those who were not were integrated in the same classrooms and participated in playgroup sessions together.

Findings from the Qualitative Fieldnotes

All of the children participating in the playgroups quickly incorporated the sessions into their weekly routine. By the second playgroup session, most children automatically put down their classroom activities and met the playgroup leaders at the door. Children bonded very quickly with playgroup teachers and demonstrated this by learning their names and showing physical affection (e.g., hugging, holding hands). Teachers and parents of children in the treatment group frequently commented to playgroup teachers on how much children looked forward to the playgroup sessions. Playgroup teachers communicated regularly with classroom teachers (each day that intervention sessions were held) and the program director (weekly or bi-weekly) to ensure that children were enjoying participation.

The games chosen were highly effective at promoting engagement during sessions. Children appeared to be enthusiastic about the games and often requested to replay their favorite games. It was rare for children to decline to participate in any of the games during the sessions though during the first week, children with inhibited or shy personalities would sit and watch for a short period of time before joining in activities, especially when gross motor movements were involved (e.g., dancing). In general, the gross motor activities were also the most often requested by children.

Attention and Off-task Behaviors. Because it was difficult to differentiate lack of attention from off-task behavior, we focused on recorded incidents of off-task behaviors. We specifically coded children as exhibiting off-task behaviors occasionally/sometimes if they demonstrated off-task behaviors at three or more sessions and frequently/often if they

demonstrated at least one off-task behavior at each session they attended. Two types of off-task behaviors were observed: off-task behaviors unrelated to the activities and off-task behaviors related to the activities. In general, off-task behaviors that were unrelated to the activities most often occurred during transition periods, such as when children were walking from their classroom to the playgroup room, in between the greeting song and the activity, or while instructions for the games were being explained. Examples of off-task behaviors unrelated to the activities included answering questions with off-topic comments ("Tomorrow is Saturday and we don't come to school," and "What's in those [drawers]?"), climbing and standing on chairs at the edge of the room, stacking carpet squares, and crawling under tables. Off-task behaviors related to the activities included trying to make the loudest noises, such as while playing instruments or pretending to be animals.

Imitators and Initiators. We found that children who exhibited off-task behaviors (either occasionally/sometimes or frequently/often) could be categorized as "imitators" or "initiators." Children who were imitators did not initiate off-task behaviors themselves, but copied the off-task behaviors exhibited by others. Children who were initiators were leaders in off-task behaviors and were often imitated by one or more other children. All of the children who were initiators were also imitators when other children initiated off-task behaviors. Out of the 32 children in the treatment group, seven children were characterized as initiators. Six out of the seven were enrolled in Head Start and four were in the low initial behavioral regulation group. Initiators were observed to have a higher frequency of off-task behaviors than imitators or children who were not categorized as imitators or initiators. Specifically, all of the initiators were coded as exhibiting off-task behaviors occasionally/sometimes (n = 2) or frequently/often (n = 5). Nine children were characterized as imitators. Of these children, six were enrolled in Head Start and three were not. All of the imitators exhibited off-task behaviors occasionally/ sometimes, with the exception of one child coded as exhibiting off-task behaviors frequently/often. Of the children enrolled in Head Start in the treatment group, 78.5% were coded as imitators or initiators in comparison to 11% of the children not enrolled in Head Start. Half of the children in the treatment group (n = 16) were not categorized as either imitators or initiators. Three of these children were in the low behavioral regulation group and 13 were in the high group. Additionally, only three of the 16 were enrolled in Head Start (see Table 3).

TABLE 3
Spillover Effects for Children in the Treatment Group (N = 32)

Child	Gender	Head Start	Fall HTKS	Spring HTKS	Initiator/ Imitator	Off-Task Frequency	Teacher/ Peer
A1	F	0	35	36			
A2	M	0	30	35			
A3	F	0	20	36			
A4	F	1	13	19*			
A5	M	1	12	30			
A6	F	0	12	32			
B1	F	1	32	.			
B2	F	1	14	10*			
B3	M	0	4*	34			
B4	F	1	0*	31			
B5	F	1	0*	31			
B6	M	1	0*	13*			
B7	F	1	0*	4*			
C1	F	0	32	37			
C2	M	0	22	32			
C3	F	0	20	22*			
C4	F	0	2*	35			
C5	F	1	0*	.			
D1	F	0	24	37			
D2	F	0	24	34			
D3	M	1	16	24*			
D4	F	0	10	.			
D5	M	1	6	0*			
D6	M	1	0*	2*			
D7	M	1	0*	0*			
D8	F	1	0*	.			
E1	F	0	37	28			
E2	F	0	8	4*			
E3	F	0	5*	28			
E4	M	0	0*	35			
E5	M	0	0*	28			
E6	M	0	0*	26*			

[a]Head Start: 0 = *not enrolled*, 1 = *enrolled*. [b]Initiator/Imitator: black = *initiator*, gray = *imitator*. [c]Off-Task Frequency: white = *rarely/never*, gray = *sometimes/occasionally*, black = *often*. [d]Teacher/Peer: white = *highly responsive to teacher praise*, gray = *usually responsive to peer reactions with some response to teacher praise*, black = *highly responsive to peer reactions and little or no response to teacher praise*.

*Children at or below the 50th percentile in the fall and/or spring.

Spillover Effects within Intervention Sessions. Table 3 shows children grouped within their intervention sessions. Three groups had one initiator and two groups included two initiators. The number of imitators was higher in the groups with more than one initiator. Only one group (group C) included an initiator with no imitators. Whether or not an initiator was imitated appeared to be highly dependent on the child's peer relationships within the group. For example, one child who was coded as an initiator (Group C) was never imitated. This child had

few interactions (either positive or negative) with the other children in the group. She did not attempt to engage other children in her off-task behaviors and these behaviors appeared to bother other children (e.g., crawling on the floor pretending to be a cat while others were trying to participate in intervention games). Overall, children appeared to be indifferent to this child and her actions. Another child (an initiator in Group D) was imitated by one or more children every time he exhibited an off-task behavior. This child was well-liked by the other children. He often said words or made faces that made other children laugh and would continue these behaviors as long as he was receiving positive attention from his peers (e.g., laughing or imitation). The majority of his off-task behaviors were active attempts to engage other children. These same patterns were present throughout the fieldnotes: children who demonstrated positive social interactions were more likely to be imitated and received positive attention from their peers when exhibiting off-task behaviors. The fieldnotes revealed that children who were not coded as either imitators or initiators had reactions to the off-task behaviors of other children as well. Even if children did not imitate off-task behaviors, it was common for them to giggle, laugh, roll their eyes, or make comments (e.g., "He always does that.").

Teacher Praise versus Peer Attention. For many children, reminders from teachers to return to on-task behaviors, coupled with praise for staying on task, effectively promoted on-task behaviors during intervention sessions. A few children (n = 7), however, were not responsive to this approach. Instead, these children responded strongly to reactions from their peers (e.g., laughing or imitation). Teacher requests to return to on-task behaviors were sometimes ignored, sometimes questioned (e.g., "Why can't I…?"), and sometimes followed. Children who responded more strongly to peer than to teacher reactions were also noted to focus on aspects of the intervention games related to competition, such as moving as fast as possible or making the loudest sounds. For example, during the game *Red Light, Purple Light*, one child was heard reciting, "Blue. Blue. Blue," to himself as a reminder that blue was the color representing go. When the "blue light" was held up, he ran as fast as he could to "win," rather than using the correct action and ignoring reminders from teachers to "tiptoe." All of the children who responded to peer attention over teacher praise were enrolled in the Head Start program (see Table 3).

Relations Between Intervention Session Behaviors and Spring Behavioral Regulation. To examine the relation between intervention session behaviors and behavioral regulation gains, we identified children who ended the year (in the spring) with behavioral regulation scores at or below the 50th percentile (children with fewer than 28 points on the HTKS). Eleven of the 32 children in the treatment group ended the year with low behavioral regulation. Five of the 11 children were also in the low behavioral regulation group in the fall; the other six were initially in the high group. All of the children who were coded as initiators (except one who refused to take the assessment) were in the low group in the spring. Three of the children in the low group were coded as imitators and two were neither imitators nor initiators. All of the children coded as peer-responders (except the same child mentioned above who refused to take the spring assessment) were in the spring low group. Additionally, 73% (n = 8 out of 11) of the children in the low group at the end of the year were enrolled in Head Start (see Table 3).

DISCUSSION

In the present study, we investigated quantitative and qualitative factors related to the effectiveness of a behavioral regulation intervention. Specifically, we examined quantitative background variables (i.e., child age, gender, family income, and maternal education) that predicted low behavioral regulation at the beginning of the prekindergarten year, because children in this group showed significant gains in these skills from intervention participation. We also used qualitative fieldnotes from intervention sessions to identify behaviors related to varying levels of intervention effects exhibited by children with low behavioral regulation.

FACTORS PREDICTING LOW AND HIGH INITIAL BEHAVIORAL REGULATION SCORES

Results indicated that maternal education level was a significant predictor of children's behavioral regulation at the beginning of the prekindergarten year. Specifically, lower levels of maternal education significantly increased the odds of children beginning the year with low behavioral regulation. Low family income (strongly correlated with maternal education) was also related to children's initial behavioral regulation scores as a higher proportion of children in the low group were from low-income families than children in the high group. Although maternal education and family income were significantly correlated, the greater variability in the maternal education variable (continuous) in comparison to the family income variable (dichotomous) may have made it easier to detect a statistically significant relation with low-group membership.

Previous studies have found that maternal education is an important predictor of behavioral regulation and that low levels of maternal education are related to poor behavioral regulation (Sektnan et al., 2010). Studies have linked maternal education to family processes predicting behavioral regulation, including parenting style and home environment quality (Magnuson, 2007). Specifically, mothers with lower levels of education are more likely than mothers with higher levels of education to use an authoritarian parenting style, exhibit negativity in their interactions with children, and provide less stimulating home learning environments, all of which have been linked to poor behavioral regulation (McClelland, Cameron, Wanless et al., 2007; Raikes, Robinson, Bradley, Raikes, & Ayoub, 2007). Additionally, parental support of children's autonomy (which is positively related to maternal education) has been found to predict strong behavioral regulation in children (Bernier et al., 2010). Taken together, these studies suggest that children who have mothers with low levels of education may not experience many of the family processes at home that promote the development of behavioral regulation during this important period and therefore are more likely to enter preschool with low levels of these skills. These results highlight the importance of targeting children with low maternal education for intervention, as these children may be most likely to struggle with behavioral regulation.

Although research suggests that age is an important predictor of behavioral self-regulation development (Morrison et al., 2010; Ponitz et al., 2009), in our study, age did not significantly predict behavioral regulation scores at the beginning of the prekindergarten year. The lack of a significant relation between age and behavioral regulation was likely because there was little variability in the ages of children participating in the study. Also, contrary to research documenting gender differences in behavioral regulation development (Matthews et al., 2009), in our sample, gender was not a significant predictor of initial behavioral self-regulation group (low

or high). There was a higher percentage of boys in the low group than in the high group, however, but this difference was not statistically significant, which may have been due to the small sample size.

QUALITATIVE FINDINGS AND INTERVENTION EFFECTIVENESS

As we expected, patterns emerged from the qualitative fieldnotes revealing relations between child behaviors and family income level. Notably, the majority of children who initiated or imitated off-task behaviors were enrolled in Head Start. Moreover, in addition to exhibiting behavioral difficulties during intervention sessions, these children were likely to have low behavioral regulation at the end of the prekindergarten year. In addition, all of the children who focused on peer reactions (rather than teacher responses) and on competitive aspects of the intervention session games (rather than accuracy in following rules) were enrolled in Head Start. These behaviors (e.g., initiating off-task behaviors and responding to peers over teachers) were also related to lower behavioral regulation scores at the end of the prekindergarten year.

These findings support previous research documenting attention difficulties (measured by incidents of off-task behaviors) experienced by children in low-income families (Howse, Lange et al., 2003) and may explain why Head Start enrollment significantly predicted smaller behavioral regulation gains for children participating in the intervention. Children from higher-income families are likely have exposure to opportunities within the home that promote the development of behavioral regulation skills (Dearing et al., 2006; Lareau, 2003), and this likely contributed to their greater ability to benefit from participation in the intervention games.

Studies of older children have noted that parents from higher social class backgrounds (measured by income and education level) tend to spend more time in direct interactions with children and provide more opportunities for participation in structured adult-led activities, whereas children in families from lower social class backgrounds spend more unstructured time with peers (Lareau, 2003; Lareau & Weininger, 2008). These trends may help explain why children enrolled in Head Start were more likely than their peers to focus their attention on aspects of the games revolving around other children (e.g., competition, making the loudest sounds), behaviors which may have hindered their abilities to effectively participate in and benefit from intervention activities. Focusing on aspects of the games revolving around teachers (e.g., listening to and following directions, seeking praise and approval) gave children who were not enrolled in Head Start an advantage over their peers in benefitting from intervention participation.

CHILDREN WITH LOW AND HIGH BEHAVIORAL REGULATION AND SPILLOVER EFFECTS

There was evidence of spillover effects leading to an increase in off-task behaviors during intervention sessions. Although negative spillover effects were easier to identify in the qualitative fieldnotes, it is possible that the behaviors of children who were on-task may have had positive spillover effects leading to increases in the on-task behaviors of their peers as has been found in research on positive peer influences in the classroom (Mashburn et al., 2009; Odom & Diamond, 1998). Children exhibiting on-task behaviors by their own volition look

similar to children exhibiting on-task behaviors through imitation of their peers, making these effects difficult to detect.

LIMITATIONS

Although the present study has important implications for future applications of this and similar behavioral regulation interventions, there were a number of limitations. The primary limitation was the small sample size. The final sample size of 65 children limited our ability to perform statistical analyses on subgroups of children, such as by dividing children by family income and intervention group assignment within the group who began the year with low behavioral regulation. Qualitative fieldnotes provided additional information on patterns of behavior within these groups, however, the groups examined were small, limiting the generalizability of findings. Findings from this pilot study were recently used to inform a larger scale trial of the intervention presented in this paper with more than 260 children in Head Start settings. Implementation of the intervention on a larger scale will allow for further quantitative and qualitative analyses of intervention effects and improved generalizability. The small sample size may also have contributed to our inability to find a relation between gender and low behavioral regulation.

A second limitation of the study was that questionnaires were only returned by 55 parents of participants (85%), which further reduced our sample size for analyses including maternal education. Non-response bias appeared to be a factor as all of the unreturned questionnaires were from families that the child development centers identified as low-income (i.e., enrolled in Head Start). Additionally, the majority of the unreturned questionnaires (80%) were from families with children in the low initial behavioral regulation group making it more likely that these families may have had low maternal education. Future studies should attempt to improve questionnaire response rates among parents, especially within this demographic.

A third limitation was that the only variables collected relating to family factors were family income (measured by enrollment in Head Start) and maternal education. The results of the study found relations between intervention effects and maternal education, specifically that low maternal education predicted low behavioral regulation at the beginning of the year. Also, trajectories of behavioral regulation over the year showed patterns of intervention-related gains based on family income. Although maternal education and family income relate to numerous family factors and processes that predict the development of behavioral self-regulation (e.g., home-learning environment, parenting style), we did not have specific information on these variables and therefore could only speculate about the mechanisms through which these background variables had an impact on intervention effectiveness.

Fourth, although observational fieldnotes were written and coded as objectively as possible, researchers were not blind to children's Head Start enrollment status. This knowledge may have increased the likelihood of bias being present in the recording and coding of fieldnotes. Although bias can never entirely be eliminated, several steps were taken to reduce bias (Emerson et al., 1995), including having playgroup assistants read fieldnotes to verify accuracy and coding fieldnotes for children individually before making comparisons within and across income groups. Although we were unable to in the present study, videotaping intervention sessions may improve accuracy and objectivity by allowing for repeated viewings of the sessions and multiple coders.

Finally, future studies should include additional measures of behavioral regulation. The games used in the present study were chosen because of face validity with the HTKS task and

ease of implementation. In order to further evaluate how participation in the intervention relates to observable classroom behaviors, future studies should include a combination of direct measures, teacher reports, and classroom observations.

PRACTICAL IMPLICATIONS AND CONCLUSIONS

The findings from this study have important implications for future applications of behavioral regulation interventions. First, future applications of this or similar interventions should target children with low maternal education, as it is these children who may be most likely to enter preschool with poor behavioral regulation. Additionally, the high correlation between maternal education and family income indicates that children with low maternal education are also likely to be from low-income families and thus experience multiple risk factors, making them an especially important population to target for intervention.

Second, although children from low-income families in the treatment group showed significant gains from intervention participation, the smaller intervention effects they experienced in comparison to their peers may signal the need for home- or school-based interventions earlier than prekindergarten. Findings from the present study suggest that children from more-advantaged families have skills (e.g., more exposure to interactions with adults and learning activities) that may help them benefit more than their peers from participation in teacher-led games and activities. Promoting maternal education and developing interventions that promote parent-child interactions and high-quality home learning-environments may help all children develop the skills they need to benefit from participation in interventions such as these.

Third, children from low-income backgrounds may also benefit from increased dosage of the intervention. The finding that low family income may be related intervention effectiveness for these children suggests that they may require more practice and thus a greater frequency of behavioral regulation activities (e.g., greater numbers of intervention sessions, embedding behavioral self-regulation activities into classrooms) than their more-advantaged peers to make equivalent gains in behavioral self-regulation. In future studies, it may be beneficial to begin the intervention earlier in the school year to allow children more time to participate in these types of activities.

Findings from this study can be used to refine future applications of this or similar behavioral regulation interventions. These results also have the potential to inform preschool curricula that emphasize promoting the development of behavioral regulation to ultimately improve academic achievement. The development of behavioral regulation interventions that can be easily implemented by teachers in classroom settings is critical to ensure that all children enter school with the skills they need to benefit from classroom learning activities.

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