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Behavior Problems in Learning Activities and Social Interactions in Head Start Classrooms and Early Reading, Mathematics, and Approaches to Learning

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Abstract. Relations between early problem behavior in preschool classrooms and a comprehensive set of school readiness outcomes were examined for a stratified random sample ($N = 256$) of 4-year-old children enrolled in a large, urban school district Head Start program. A series of multilevel models examined the unique contribution of early problem behavior in structured learning activities, peer interactions, and teacher interactions to reading, mathematics, and approaches to learning at the end of the year, accounting for child demographic variables (child age, sex, and ethnicity). Early problem behavior in structured learning activities consistently predicted lower academic outcomes (early reading and mathematics ability) as well as lower motivation, attention, and persistence in academically focused tasks. Early problem behavior in peer situations predicted lower attitude toward learning, reflecting children's difficulties self-regulating and engaging appropriately in socially mediated classroom learning activities. Implications for intervention within early childhood educational programs serving low-income children are discussed.

A growing body of early childhood research provides empirical evidence that preschool problem behavior negatively influences school readiness in multiple domains (Bowman, Donovan, & Burns, 2001; Denham, 2006; Raver, 2002; Thompson & Raikes, 2007). Prevalence estimates in urban early childhood educational programs suggest that as many as 30% of children exhibit moderate to clinically significant emotional and behavioral needs (Barbarin, 2007; Feil et al., 2005; Qi & Kaiser, 2003). Unfortunately, programmatic resources to address children's needs are scarce. Referrals for psychological evaluations through early intervention often take many months and access to individual psychological

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service providers who work with young children is limited (Cooper et al., 2008).

For children living in urban poverty, it is essential that problem behavior is identified early when classroom-based interventions can be most effective (Bowman et al., 2001; Klein & Knitzer, 2007). Logically, early intervention efforts are dependent upon the availability of psychometrically sound and developmentally appropriate measurement tools for diverse low-income populations (Nuttall, Romero, & Kalesnik, 1999; U.S. Department of Health and Human Services, 2001). In large early childhood programs, teacher or parent rating scales are often the most efficient and cost-effective mechanisms for identifying children in need of intervention (McDermott, 1993). However, the validity of data from parent or teacher rating scales with low-income minority preschool populations has been called into question (Lopez, Tarullo, Forness, & Boyce, 2000; U.S. Department of Health and Human Services, 2001). The most commonly available measures identify problem behavior via checklists of psychiatric symptoms that identify the type of internalizing or externalizing problem (e.g., Reynolds & Kamphaus, 2002; Achenbach, 1991). Empirical studies suggest that when asked to use these measures early childhood educators underreport problem behavior to avoid stigmatizing children with labels that are not linked to classroom-based services (Lutz, 1999; Mallory & Kearns, 1988; Piotrkowski, Collins, Knitzer, & Robinson, 1994). In addition, checklist measures have been criticized because they (a) require teachers to infer children's internal thoughts or feelings, and (b) do not consider the classroom context within which behavior problems occur (Fantuzzo & Mohr, 2000; Friedman & Wachs, 1999; McDermott, 1993). Understanding where problem behaviors are the most challenging to children within daily classroom learning activities and social interactions is critical to inform developmentally appropriate classroom interventions that can reach diverse, low-income children (Cooper et al., 2008; Klein & Knitzer, 2007; Meisels, 1997).

A contextual assessment approach is needed to identify where problem behavior occurs within the preschool classroom, and to examine the influence of problems within classroom contexts on academic and learning-related skills recognized as important dimensions of school readiness (Kagan, Moore, & Bredekamp, 1995). Below, we present a developmental and ecological model that guides our research and then summarize early childhood research that examines the relationship between preschool problem behavior, and academic and learning-related readiness skills (Kagan et al., 1995). In addition, we critique the extant literature and provide a rationale for a more contextually relevant approach to examine classroom problem behavior and its effects on the school readiness of diverse low-income children.

Developmental and Ecological Systems Framework

A developmental ecological model provides a conceptual framework for understanding the preschool classroom as a unique developmental setting and its dynamic proximal influence on children's behavior (Bronfenbrenner & Morris, 1998). This model suggests that in order to understand early problem behavior, assessments must consider the proximal contexts within which problem behavior occurs (Friedman & Wachs, 1999; Kontos & Keyes, 1999; McDermott, 1993), which include interactions among children, teachers, and instructional materials that serve as the primary mechanism for children's learning (Pianta, 2006). Moreover, preschool learning opportunities contain distinct developmental demands that require complex behavior and increase the likelihood of behavior problems (Kontos & Keyes, 1999). Specific social and emotional skills are required to navigate each type of preschool learning activity or social interaction, and the skills needed vary across activity setting (Kontos & Keyes, 1999). For example, during structured learning activities such as circle time children must be able to self-regulate, inhibit verbal and motor activity, listen carefully, and pay attention; in free play,

another repertoire of skills is required to initiate and maintain cooperative peer interactions. When the demands of learning situations do not match children's self-regulation, attention, cognitive skills, or motivation, behavior problems may occur (Goldstein, 1995; McEvoy & Welker, 2000).

Preschool Problem Behavior and School Readiness

Both early reading and mathematics ability have been recognized as important cognitive readiness skills for preschool children and as predictive of future academic success (Duncan et al., 2007; Kagan et al., 1995). Unfortunately, early childhood research substantiates the negative association between problem behavior and reading ability in preschool (Dominguez & Greenfield, 2009; Fantuzzo, Bulotsky, McDermott, Mosca, & Lutz, 2003; Harden et al., 2000; Lonigan et al., 1999), kindergarten (Vaughn, Hogan, Lancelotta, Shapiro & Walker, 1992; Ready, LoGerfo, Burkham, & Lee, 2005; Spira & Fischel, 2005), and first grade (Bub, McCartney, & Willett, 2007; McWayne & Cheung, 2009). Externalizing problem behavior such as aggressive or inattentive behavior has been associated with reading delays (Campbell, Shaw, & Gilliom, 2000), language deficits (Arnold, 1997; Stevenson, Richman, & Graham, 1985), and poor literacy skills (Dominguez & Greenfield, 2009). Although less research has focused on internalizing problem behavior, a recent study found that socially reticent and withdrawn behavior in the Head Start classroom were negatively associated with children's expressive and receptive vocabulary skills at the end of the year (Fantuzzo, Bulotsky et al., 2003).

Mathematics ability is also recognized as important to kindergarten readiness, but very few studies have examined the association between preschool problem behavior and mathematics skills. Three recent studies conducted in Head Start classrooms provide evidence for the negative influence of preschool problem behavior on mathematics outcomes. In a cross-sectional study, Dobbs, Doctoroff, Fisher, and Arnold (2006) found that teacher-rated problem behavior, internalizing symptoms, and attention problems predicted lower mathematics skills. In a predictive study, Dominguez and Greenfield (2009) found that teacher-rated behavioral concerns predicted lower teacher-reported mathematics skills at the end of the year, and Fantuzzo et al. (2007) found that early academically disengaged problem behavior in the Head Start classroom predicted lower mathematics ability at the end of the preschool year. This research provides evidence for the negative association between types of preschool problem behavior and early reading and mathematics ability. However, the research does not provide any information about the most behaviorally challenging classroom situations, nor does it provide information about the effects of problems occurring with these situations on children's readiness skills.

Approaches toward learning, another important dimension of school readiness for preschool children, has been identified as one of the most critical yet least understood readiness domain (Kagan et al., 1995). Approaches to learning reflect "how" children engage in learning and their enthusiasm for learning (Hyson, 2008). These include children's initiative and curiosity, engagement and persistence, and reasoning and problem-solving skills (McDermott, Green, Francis, & Stott, 2000). Few studies have examined the influence of preschool problem behavior on children's approaches to learning, particularly for low-income children. However, two recent Head Start studies provide evidence for a negative relationship between the two constructs (Dominguez & Greenfield, 2009; Fantuzzo, Bulotsky-Shearer, Fusco, & McWayne, 2005). Dominguez & Greenfield (2009) found that teacher-reported behavioral concerns predicted lower global approaches to learning outcomes. Examining multiple dimensions of learning behaviors, Fantuzzo et al. (2005) found that early aggressive problem behavior differentially predicted lower attitude toward learning, and inattentive problems predicted lower competence motivation, attention, and persistence during learning tasks. Although

this research provides evidence for the relations between types of problem behavior and children's approaches to learning, it does not provide information about the effects of problem behavior within the context of classroom social or learning situations.

Multisituational Assessment Approach

McDermott (1993) developed an alternative approach to studying children's classroom problem behavior that was sensitive to the learning and social demands of the classroom context, and was recently adapted for use within early childhood classrooms (Lutz, Fantuzzo, & McDermott, 2002). The Adjustment Scales for Preschool Intervention (ASPI) is a multisituational assessment of problem behavior occurring within structured learning, teacher interactions, and peer interactions within the classroom context (Bulotsky-Shearer, Fantuzzo, & McDermott, 2008). Problems in structured learning includes behavior problems within the context of academic learning activities, both teacher-initiated learning situations (e.g., sitting during teacher-directed activities, involvement in class activities, paying attention in class) and peer-mediated learning situations (e.g., taking part in games with others, free play/individual choice). Problems in peer interactions consist of peer situations (e.g., getting along with agemates, behaving in the classroom, and standing in line). Problems in teacher interaction includes situations such as talking to teacher, answering teacher questions, greeting teacher, seeking teacher help, and helping teacher with jobs.

Initial research provided evidence for the unique and differential effects of problem behavior within structured learning, teacher, and peer interactions on social and academic outcomes in preschool, above and beyond traditional ratings of externalizing and internalizing behavior (Bulotsky-Shearer et al., 2008). A clear pattern emerged where problem behavior during structured learning situations predicted lower cognitive readiness outcomes (literacy and mathematics skills), whereas problem behavior in peer interactions predicted lower social competence (interactive peer play). This was the first study to examine the unique contribution of situational problem behavior to school readiness outcomes. However, the study had several limitations. Findings were confounded by source invariance because the teacher reported on both problem behavior and children's readiness outcomes. Language and mathematics readiness skills were assessed using a global measure of cognitive skills. In addition, the statistical effects of children nested within classrooms were not accounted for in the regression models. Further research is needed to extend this initial study and examine the differential effects of situational problem behavior on a more comprehensive set of school readiness skills, using multiple measurement methods and sources, and employing a multilevel analytic model.

Study Purpose

The purpose of the present study was to address limitations in previous research and to extend initial research in several important ways. This study sought to examine the differential relations among early preschool emotional and behavioral problems within classroom situations, independent assessments of early reading and mathematics ability, and teacher ratings of approaches to learning at the end of the year. In addition, multilevel modeling was employed to examine these differential relations for a representative sample of urban Head Start children. Based on previous research, three hypotheses were generated: (a) first, that early problem behavior in structured learning situations would predict lower academic outcomes (literacy and mathematics ability); (b) second, that early problem behavior in structured learning would predict lower behavioral engagement in learning tasks (competence motivation, attention, and persistence); and (c) third, that early problem behavior in peer interactions would predict lower socially mediated learning behaviors (attitude toward learning).

Method

Participants

A stratified random sample of 257 Head Start children from a large urban school district program in the Northeast participated in this study. Children in this sample consisted of 4-year-old children targeted to go on to kindergarten in the fall. In the fall of the Head Start year, children's ages ranged from 4.05 to 5.12 years ($M = 4.65$, $SD = 0.30$). Sex was split evenly, with girls comprising 49% of the sample. The children were predominantly African American (69%), with 28% Latino, 4% Caucasian, and 1% Asian. The participants were predominantly low income, with annual income for 93% of the program's families below $15,000.

Children in the sample were enrolled in 20 schools, 78 classrooms, across the nine geographic regions. Program demographic information indicated that all teachers were credentialed in early childhood education and had at least a bachelor's degree. The majority (61%) had experience teaching in Head Start for at least 5 years. Teachers were predominantly Caucasian (62%) with 29% African American, 3% Latino, 1% Asian and 5% other.

Measures

Classroom situational problem behavior. The ASPI (Bulotsky-Shearer et al., 2008; Lutz et al., 2002) was used to assess emotional and behavioral problems within routine preschool classroom situations at the beginning of the Head Start year. The ASPI is a 144-item multidimensional instrument based on teacher observations of adaptive and maladaptive behavior across 22 routine, preschool classroom situations and 2 categories of nonsituationally specific behavior problems (e.g., unusual habits or outbursts; Lutz et al., 2002). The scale's behavioral items reflect both problem behavior (122 items) as well as more adaptive behavior (22 items) within the context of interactions with the teacher, relationships with peers, involvement in structured and unstructured classroom activities, and games and play. Teachers complete the scale by endorsing as many behaviors as apply in each of the 22 classroom situations. For example, for the situation "How does the child greet you as the teacher?" the teacher endorses as many of the following child behaviors that apply: "Greets as most other students do," "Waits for you to greet him/her first," "Does not greet you even after you greet him/her," "Seems too unconcerned about people to greet," "Welcomes you loudly," "Responds with an angry look or turns away," "Clings to you."

The ASPI was standardized on a sample of urban Head Start children and validated for use with this population. The scale was developed in partnership with Head Start teachers, special needs coordinators, and parents who created the scale content to ensure its developmental appropriateness for preschool children and scripted the items in the parlance of early childhood educators (rather than that of clinical psychologists). Construct validity studies of the ASPI with urban, low-income preschool populations have revealed three situational dimensions: Problems in Structured Learning, Peer Interactions, and Teacher Interactions (Bulotsky-Shearer et al., 2008). The three situational dimensions demonstrated adequate internal consistencies, with Cronbach alpha coefficients of .84, .81, and .75 (Problems in Structured Learning, Peer Interactions, and Teacher Interactions, respectively) and have been found to be replicable and generalizable to important subgroups of the standardization sample (i.e., younger and older children, boys and girls, African American, Latino, and Caucasian ethnicities).

Convergent and divergent validity of the three ASPI situational dimensions was established with constructs of interactive peer play and classroom learning competence in preschool (Bulotsky-Shearer et al., 2008), approaches to learning in preschool (Domínguez, Vitiello, Fuccillo, Greenfield, & Bulotsky-Shearer, 2011), interactive peer play in kindergarten (Bulotsky-Shearer, Dominguez, Bell, Rouse, & Fantuzzo, 2010), and language and literacy achievement in kindergarten and first grade (Bulotsky-Shearer & Fantuzzo,

2011). Correlations between situational dimensions and outcomes ranged from .16 to .63 with high positive associations between problems in peer interactions and socially disruptive behavior; problems in structured learning and disconnected behavior; and negative associations between problems in structured learning and cognitive skills such as language and literacy (Bulotsky-Shearer et al., 2008; Dominguez et al., 2011). For the present study, ASPI *T* scores based on an area conversion derived from the normative sample of urban Head Start children from the Northeast ($N = 829$) were used (Lutz et al., 2002).

Early reading ability. The Test of Early Reading Ability, third edition (TERA-3; Reid, Hresko, & Hammill, 2001) was used to assess early reading ability at the end of the Head Start year. The TERA-3 is a nationally standardized individually administered test of reading ability for children 3 years, 6 months, to 8 years, 6 months. It measures alphabet knowledge, knowledge of conventions of print, and construction of meaning from print. In addition to these three subscale scores, an overall standardized composite score can be derived (Reading Quotient). The normative sample was based on a stratified national sample ($N = 875$) configured on the U.S. Census. Substantial reliability exists with the Cronbach's alpha coefficient of .95. Validity is supported through correlations with established measures of academic achievement and cognitive ability. For the present study, the overall composite Reading Quotient ($M = 100$, $SD = 15$) was used as the most reliable indicator of children's reading ability.

Early mathematics ability. The Test of Early Mathematics Ability, second edition (TEMA-2; Ginsburg & Baroody, 1990) was used to assess early mathematics skills at the end of the Head Start year. The TEMA-2 is a 65-item, individually administered, nationally normed assessment of informal early mathematics (concepts of relative magnitude, counting, calculation with objects present) and formal mathematics (reading and writing numbers, number facts, calculation in symbolic form) for children 3 years to 8 years, 11 months of age. The TEMA-2 was normed on a nationally representative sample of 896 children across 27 states. Internal consistencies were high across all age ranges, as was test–retest reliability (Ginsburg & Baroody, 1990). Criterion validity was established through correlations with standardized scores on the TEMA, Diagnostic Achievement Battery (Newcomer, 2001), and Quick Score Achievement Test (Hammill, Ammer, Cronin, Mandlebaum, & Quinby, 1987). For this study, the overall composite Mathematics Quotient ($M = 100$, $SD = 15$) was used.

Approaches toward learning. The Preschool Learning Behavior Scale (PLBS; McDermott, Leigh, & Perry, 2002) was used to measure children's learning-related behaviors at the end of the Head Start year (McDermott et al., 2000). The PLBS is a 29-item nationally standardized teacher-completed rating scale of readily observable learning behaviors within the classroom. This measure was developed in collaboration with Head Start teachers and staff. Three reliable and valid dimensions have been derived: Competence Motivation, Attention/Persistence, and Attitude Toward Learning (with Cronbach's alpha coefficients of .85, .83, and .75, respectively). Sample items include "Says task is too hard without making much effort to accept it," "Accepts new tasks without fear or resistance," and "Responds without taking sufficient time to look at the problem or work out a solution." Teachers rate the child's behavior on a Likert scale, from *most often applies*, *sometimes applies*, or *doesn't apply*." The Competence Motivation scale assesses children's willingness to take on tasks and their determination to complete activities successfully. The Attention/Persistence dimension measures the degree to which children pay attention and are able to persist with difficult tasks. The Attitude Toward Learning dimension focuses on such concepts as children's willingness to be helped, desire to please the teacher, and ability to cope when frustrated. Convergent and divergent validity has been established for urban, low-income preschool children with di-

rect assessments of cognitive ability, receptive and expressive vocabulary skills, teacher-rated social skills, teacher- and parent-rated interactive peer play competencies, and direct observations of children's classroom self-regulation (Fantuzzo, Perry, & McDermott, 2004; McDermott et al., 2002). For the present study, PLBS *T* scores ($M = 50$, $SD = 10$) based on the national normative sample were used (McDermott et al., 2002).

Procedures

Sampling. A stratified, random sample of 257 children was drawn for the purposes of the study. Children in this sample consisted of 4-year-old children targeted to go on to kindergarten in the fall. Children within classrooms were stratified to be demographically and geographically representative of the school district's nine geographic regions. During that academic year, the prekindergarten Head Start program served a total 4,539 children across 73 centers and nine geographic regions.

Data collection. Data collection involved: (a) administrative data including child, family, and teacher demographic information routinely collected by the district's Head Start program; (b) Head Start teacher assessments of classroom situational behavior problems (ASPI) collected programmatically at the beginning of the preschool year; (c) Head Start teacher assessments of preschool learning behaviors (PLBS) at the end of the preschool year; and (d) individually administered direct assessments of children's language (TERA-3) and mathematics ability (TEMA-2) at the end of the preschool year. Consent for children's participation was obtained from parents as part of a larger collaborative university research partnership project with an urban public school district Head Start program in the Northeast.

Approval for the research activities was obtained from the Director of the Head Start program and from the Head Start Policy Council. Approval from the University Institutional Review Board was obtained prior to initiating data collection. Program administrative data were prepared in cooperation with the School District's Office of Research and Evaluation and the Head Start program. Before archival data were obtained, a confidentiality agreement was signed to ensure the confidentiality of all identifying information. Data were linked by school district personnel using students' unique district identification numbers. Once the files were integrated, any identifiers were stripped from the files to protect the confidentiality of participants before proceeding with data analyses. The ASPI is systematically collected twice a year (within the first 45 days in the fall and in mid-May at the end of the Head Start year) as part of a federal Head Start assessment requirement (Performance Standard, 1304.20; U.S. Department of Health and Human Services, 1996). The study's principal investigator obtained permission from the school district administration to use these administrative records and integrate them as described above.

In the spring of the Head Start year, teachers were contacted to elicit participation in the study. Prior to data collection, research team members met with teachers individually to explain the purpose of the study and to clarify issues of confidentiality, informed consent, and data collection procedures. Packets including the PLBS were distributed to teachers individually who completed the PLBS and a demographic questionnaire. Concurrently, a team of master's-level psychology or education graduate students were hired and trained to conduct individually administered direct assessments (TERA-3 and TEMA-2). Children who were randomly sampled to participate were assessed individually outside of the Head Start classroom in a quiet place following a brief "warm-up" period.

Results

Descriptive Statistics

To ensure that data were normally distributed, all variables of interest were examined for outliers, homoscedasticity, and kurtosis. Table 1 presents descriptive statistics and Table 2 presents the bivariate correlation matrix. Low to moderate associations were found

Table 1
Descriptive Statistics for Sample ($N = 257$)

Measure	*N*	Mean	*SD*
Fall			
Child age (in years)	257	4.65	0.30
Problems in Peer Interactions (ASPI)	220	50.36	10.05
Problems in Structured Learning Situations (ASPI)	220	46.88	9.41
Problems in Teacher Interactions (ASPI)	220	48.78	10.25
Spring			
Attitude (PLBS)	230	54.11	8.94
Motivation (PLBS)	230	52.53	9.15
Persistence (PLBS)	230	53.27	9.71
TEMA-2	253	90.26	13.35
TERA-3	252	87.94	12.94

Note. ASPI = Adjustment Scale for Preschool Intervention; PLBS = Preschool Learning Behavior Scale; TEMA-2 = Test of Early Mathematics Ability: 2nd Edition; TERA-3 = Test of Early Reading Ability: 3rd Edition. Scores for the ASPI and PLBS represent *T* scores ($M = 50$, $SD = 10$). Scores for the TEMA and TERA represent quotient scores ($M = 100$, $SD = 15$) based on their respective national standardization samples.

between the three ASPI situational problems and learning behaviors (ranging from $-.26$ to $-.48$) and between ASPI problems in structured learning and mathematics ability ($r = -.15$, $p < .05$).

Multilevel Modeling Results

To examine the unique relationship between the three ASPI situational problems assessed by the teacher at the beginning of the preschool year and the three school readiness outcomes, a series of multilevel models were tested to account for the hierarchical structure of the data (children nested within classrooms). A series of two-level models were analyzed using hierarchical linear HLM modeling (Version 6.01a; Raudenbush, Bryk, Cheong, & Congdon, 2004). Separate models were constructed for early reading ability (TERA-3), for early mathematics ability (TEMA-2), and for each of the three approaches to learning dimensions (PLBS).

The first set of models specified were fully unconditional models in order to determine the distribution of variance in each of the outcomes attributable to Level 1 (variability from differences between children within classrooms) and Level 2 (variability from differences between classrooms). Once it was established that there was substantial variability to be explained at each level, variables were entered in a series of steps. First, child demographic covariates (age, sex, and ethnicity) were entered at Level 1 to determine the proportion of child-level variance explained in outcomes. Child age was entered as a demographic covariate in approaches to learning outcome models; however, because the TEMA and TERA overall mathematics and reading quotients were age-normed, child age was not entered as a covariate in these models. Second, the three ASPI situational problem dimensions (behavior problems in structured learning, teacher and peer interactions) were entered at Level 1 to examine the additional proportion of variance explained in children's outcomes by the ASPI above and beyond demographic covariates. All variables, including dummy-coded demographic variables, were centered at the group mean (Enders & Tofighi, 2007). To determine the relative contribution of each set of variables to children's readiness outcomes, the percent of incremental variance explained by child demographic variables and ASPI situational problem behavior was examined. To determine the direction and strength of the effects of each predictor, the fixed effects (unstandardized regression coefficients) from the multilevel models were examined.

Situational problem behavior and early reading ability. To determine the unique contribution of ASPI situational problems assessed at the beginning of the preschool year to children's reading ability, a multilevel model tested the relationship between the three ASPI situational dimensions and the TERA-3 reading quotient assessed at the end of the year. The final multilevel model consisted of two levels (the child level and the

Table 2
Bivariate Correlations Among Child-Level Measures

Measure	1	2	3	4	5	6	7	8
1. Fall Problems in Peer Interaction	—	.58**	.50**	−.48**	−.26**	−.43**	−.04	.03
2. Fall Problems in Structured Learning		—	.62**	−.42**	−.37**	−.48**	−.15*	−.11
3. Fall Problems in Teacher Interaction			—	−.39**	−.39**	−.39**	−.06	−.06
4. Attitude				—	.57**	.73**	.18**	.07
5. Motivation					—	.73**	.23**	.20**
6. Persistence						—	.23**	.18**
7. Early Math							—	.60**
8. Early Reading								—

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

classroom level). In the Level 1 equation (Equation 1), the reading ability score (Y) for a child (i) who is in a classroom (j) is a function of the intercept (β_{0j}; the estimated classroom mean score) after adjusting for demographic covariates (β_{1j}, β_{2j}, β_{3j}, and β_{4j}), problem behavior scores (β_{5j}, β_{6j}, and β_{7j}), and the error term associated with this estimated mean (r_{ij}).

$$\begin{aligned} Level\ 1\text{: } Y_{ij} = {} & \beta_{0j} + \beta_{1j}\,(\text{Sex}) + \beta_{2j}\,(\text{Black}) \\ & + \beta_{3j}\,(\text{Hispanic}) + \beta_{4j}\,(\text{Other}) \\ & + \beta_{5j}\,(\text{Problems in Peer Interaction}) \\ & + \beta_{6j}\,(\text{Problems in Structured Learning}) \\ & + \beta_{7j}\,(\text{Problems in Teacher Interaction}) + r_{ij} \end{aligned} \quad (1)$$

In the Level 2 equation (Equation 2), the adjusted outcome mean score for children in each classroom (β_{0j}) is a function of the grand mean score (γ_{00}) and the error term associated with this estimated mean (u_{0j}).

$$Level\ 2\text{: } \beta_{0j} = \gamma_{00} + u_{0j} \quad (2)$$

Results from the unconditional model indicated that a significant proportion of variance in the TERA Reading Quotient was attributable to differences between classrooms (8%) with the remaining 92% attributable to child-level differences. Child demographic covariates (gender and ethnicity), as a set, accounted for 1% of the child level variance in early reading ability. The situational dimensions, as a set, accounted for an additional 4% of the child level variance in early reading ability. Table 3 presents the results for the final models. Unstandardized regression coefficients (B), degrees of freedom (df), t ratio, and p values indicate the direction and magnitude of the associations between child-level demographic variables, situational problem behavior, and children's reading ability. The direction and strength of the regression coefficients indicated that early problem behavior in structured learning situations predicted lower reading ability scores at the end of the year.

Situational problem behavior and early mathematics ability. To determine the unique contribution of ASPI situational problems assessed at the beginning of the preschool year to children's mathematics ability, a multilevel model tested the relationship between the three ASPI situational dimensions and the TEMA-2 mathematics quotient assessed at the end of the year. The final model was identical to the one estimated for early reading ability, so the equation is not repeated here. Results from the unconditional model

Table 3
Relationship Between Preschool Situational Problem Behavior Dimensions and Early Mathematics and Reading Ability

	Early Mathematics Ability			Early Reading Ability		
Fixed Effects	Coefficient	*df*	*t* Ratio	Coefficient	*df*	*t* Ratio
Intercept (β_{0j})	91.30**	74	104.44	88.69**	74	95.11
Sex (β_{1j})	2.90	208	1.56	−0.75	207	−0.40
Black (β_{2j})	−2.57	208	−0.41	−2.36	207	−0.38
Hispanic (β_{3j})	−5.95	208	−0.78	−9.67	207	−1.28
Other (β_{4j})	−1.20	208	0.14	−3.60	207	−0.42
Fall Problems in Peer Interaction (β_{5j})	0.20	74	1.25	0.24	207	1.83
Fall Problems in Structured Learning (β_{6j})	−0.45*	74	−2.51	−0.36*	207	−2.17
Fall Problems in Teacher Interaction (β_{7j})	0.10	74	0.58	−0.14	207	−0.84
Random Effects	Variance Component	*df*	χ^2	Variance Component	*df*	χ^2
Intercept (γ_{0o})	10.96	13	18.16	12.85	74	90.88
Fall Problems in Peer Interaction (u_{1j})	0.32**	13	30.69	n/a	n/a	n/a
Fall Problems in Structured Learning (u_{2j})	0.17**	13	37.57	n/a	n/a	n/a
Fall Problems in Teacher Interaction (u_{3j})	0.04*	13	26.16	n/a	n/a	n/a
Level-1 Effects (r_{ij})	130.73	—	—	146.74	—	—

Note. n/a = not applicable because these variance components were fixed and not allowed to vary randomly in this model.
*$p < .05$.
**$p < .01$.

indicated that a small proportion of the variance in the TEMA Mathematics Quotient was attributable to differences between classrooms (4.4%) and 96% was attributable to child-level differences. Multilevel modeling was still considered the most appropriate analytic approach because the percent of variance attributable to between classroom differences was close to 5% (Raudenbush & Bryk, 2002). Child demographic covariates (gender and ethnicity) accounted for 1% of the child-level variance in early mathematics ability. The situational dimensions, as a set, accounted for an additional 24% of the child-level variance in early mathematics ability. Table 3 presents the results for the final models. Unstandardized regression coefficients (*B*), degrees of freedom (*df*), *t* ratio, and *p* values indicate the direction and magnitude of the associations between child-level demographic variables, situational problem behavior, and children's mathematics outcomes. The regression coefficients (Table 3) indicated that early problem behavior in structured learning activities was associated with lower mathematics ability scores at the end of the year.

Situational problem behavior and approaches to learning. To determine the unique contribution of ASPI situational problems to children's approaches to learning, a set of multilevel models tested the relationship between the three ASPI situational dimensions and the three PLBS dimensions (competence motivation, attention/persistence, and attitude toward learning). A separate model was estimated for each of the three PLBS outcomes. Final models were identical to the one estimated for early reading and mathematics ability, except that age was also included as a

Table 4
Relationship Between Preschool Situational Problem Behavior Dimensions and Approaches to Learning

	Competence Motivation			Attention/Persistence			Attitude Toward Learning		
Fixed Effects	Coefficient	*df*	*t* Ratio	Coefficient	*df*	*t* Ratio	Coefficient	*df*	*t* Ratio
Intercept (β_{0j})	52.71**	67	67.68	53.60**	67	72.95	54.27**	67	68.11
Age (β_{1j})	2.65	187	1.14	1.17	187	0.50	0.10	187	0.05
Sex (β_{2j})	−1.97	187	−1.67	−1.92	187	−1.62	−0.99	187	−0.97
Black (β_{3j})	7.16	187	1.67	4.03	187	0.91	5.02	187	1.31
Hispanic (β_{4j})	6.85	187	1.35	4.01	187	0.77	3.39	187	0.76
Other (β_{5j})	12.46*	187	2.06	10.32	187	1.69	10.82*	187	2.04
Fall Problems in Peer Interaction (β_{6j})	0.07	187	0.86	−0.16	67	−1.74	−0.29**	67	−3.26
Fall Problems in Structured Learning (β_{7j})	−0.22*	187	−2.08	−0.38**	187	−3.60	−0.13	187	−1.46
Fall Problems in Teacher Interaction (β_{8j})	−0.17	187	−1.53	−0.02	187	−0.19	−0.03	67	−0.26
Random Effects	Variance Component	*df*	χ^2	Variance Component	*df*	χ^2	Variance Component	*df*	χ^2
Intercept (γ_{0o})	21.72**	67	145.04	18.69**	51	114.27	30.21**	32	150.23
Fall Problems in Peer Interaction (u_{1j})	n/a	n/a	n/a	0.08*	51	72.86	0.15**	32	67.45
Fall Problems in Structured Learning (u_{2j})	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Fall Problems in Teacher Interaction (u_{3j})	n/a	n/a	n/a	n/a	n/a	n/a	0.02	32	46.06
Level-1 Effects (r_{ij})	52.79	—	—	48.82	—	—	34.11	—	—

Note. n/a = not available.
*$p < .05$.
**$p < .01$.

covariate at the child level. Results from the unconditional models indicated that a substantial proportion of the variance in the PLBS dimensions was attributable to differences between classrooms, thus confirming that multilevel modeling was the most appropriate analytic approach (Raudenbush & Bryk, 2002). For competence motivation, attention/persistence, and attitude toward learning outcomes, 22%, 14%, and 26% of the variance, respectively, was attributable to classroom-level differences; the remaining 78%, 86%, and 74% was attributable to child-level differences.

Child demographic covariates (age, gender, and ethnicity), as a set, accounted for 6%, 9%, and 5% of the child-level variance in competence motivation, attention/persistence, and attitude toward learning, respectively. The situational dimensions, as a set, accounted for an additional 13%, 31%, and 37% of the child level variance in competence motivation, attention/persistence, and attitude toward learning, respectively. Table 4 presents the results for the final models. Regression coefficients indicated that the ASPI situational problem dimensions differentially related to the three

approaches to learning outcomes. Problems in structured learning situations were negatively associated with children's competence motivation, attention, and persistence. Problems in peer interactions at the beginning of the preschool year were negatively associated with children's attitude toward learning at the end of the year.

Discussion

The present study advances the knowledge base by examining the distinct contribution of problem behavior within routine preschool learning and social contexts to a comprehensive set of academic and learning-related readiness skills. Guided by a developmental-ecological model, the study examined these relations for a representative sample of children living in urban poverty. Findings extend prior research and suggest that where children exhibit early problem behavior within the early childhood classroom matters for their mastery of important academic readiness skills as well as learning-related skills such as attention, persistence, and motivation to learn.

Situational Problem Behavior, Early Reading, and Mathematics Ability

Study findings confirmed initial hypotheses, providing consistent evidence for the negative influence of early problem behavior within structured learning activities on children's reading and mathematics outcomes. Controlling for child demographics, early problem behavior in structured learning situations predicted lower scores on both measures of reading and mathematics ability at the end of the year. This finding is consistent with initial research that identified the differential effects of early problems within organized classroom learning activities on more global teacher measures of cognitive skills (Bulotsky-Shearer et al., 2008). The present study replicates these findings employing nationally norm-referenced direct assessments.

Findings are supported by early childhood research and ecological theory underscoring the positive benefits of children's active engagement within classroom activities intentionally designed by educators to foster learning (Bowman et al., 2001; National Association for the Education of Young Children, 2009). Our study provides empirical support for the notion that multiple social and emotional skills are required to navigate structured learning situations where reading or mathematics skills are taught (Kontos & Keyes, 1999). Children with difficulty attending, regulating their behavior, or engaging appropriately during structured activity times (such as circle time or small group time) demonstrated lower early reading and mathematics skills. In our study, direct assessments of these academic skills tested children's alphabet knowledge, phonemic awareness, early number operations, and counting skills—academic skills likely intentionally taught during structured learning activities within the Head Start classroom (Rimm-Kaufman, Pianta & Cox, 2000).

Situational Problem Behavior and Approaches to Learning

Confirming hypotheses, early problem behavior in structured learning activities predicted lower competence motivation, attention, and persistence in learning tasks at the end of the year. Behavior problems in peer interactions predicted lower attitude toward learning. Although research conducted within Head Start supports the finding that early problem behavior in structured learning and teacher interactions negatively affects children's approaches to learning as a global construct (Domínguez et al., 2011), this is the first study to examine the differential relations between situational problem behavior and *multiple dimensions* of preschool learning behaviors.

Study findings are supported by early childhood research documenting the importance of learning-related skills to academic readiness outcomes. Competence motivation, attention, and persistence have been identified as the key dimensions that link children to learning and engagement in academically focused activities (Fantuzzo et al., 2005; Rouse

& Fantuzzo, 2008). In our study, children exhibiting early problem behavior within structured learning situations demonstrated lower motivation to learn, attention, and persistence with learning tasks at the end of the year. Early childhood research supports this finding, documenting a negative association between early internalizing problem behavior, competence motivation, and autonomous classroom behavior (Fantuzzo et al., 2004). Research also provides evidence for a negative relationship between early externalizing problem behavior, attention, and persistence at the end of the year (Fantuzzo et al., 2005). In our study, problem behavior in structured learning activities included both internalizing and externalizing behavior. Both types of problem behavior within structured learning contexts related differentially to children's competence motivation and attention and persistence, which were the two approaches to learning dimensions found most strongly associated with early academic success (Rouse & Fantuzzo, 2008).

Our study also extends previous research by documenting the negative association between early problem behavior in peer interactions and children's attitude toward learning. In our study, attitude toward learning consisted of learning-related behaviors within the context of socially mediated learning interactions with peers and teachers (e.g., children's willingness to be helped, desire to please the teacher, propensity to express hostility when frustrated; Fantuzzo et al., 2004). Children demonstrating problem behavior in peer interactions exhibited difficulties regulating their emotions, tolerating frustration, and accepting help in learning activities involving peers and teachers. Although this is the first study to examine the relations between situational problem behavior and children's attitude toward learning, initial research employing the ASPI situational dimensions provides some support for these findings. This research identified a link between problem behavior in peer interactions and higher disruptive peer play skills in the classroom (Bulotsky-Shearer et al., 2008). In addition, findings from two recent studies suggest that early socially disruptive or emotionally disregulated behavior, such as aggressive behavior, is associated with lower attitude toward learning in Head Start (Fantuzzo et al., 2005, 2007). Although further research is needed to confirm this differential relation, our findings suggest that children who demonstrate early behavioral difficulties within the peer context are less likely to acquire important adaptive learning-related skills within socially mediated learning activities throughout the course of the preschool year.

Limitations and Directions for Future Research

Although the study employed a complex multilevel analytic approach to examine children's behavior within routing classroom social and learning contexts, several qualifications must be acknowledged. The study sample was intentionally representative of 4-year-old children enrolled in a large, urban school district Head Start program serving predominantly African American families in the Northeast; thus, findings are limited to this population. Future studies should examine the generalizability of our findings to other more geographically, culturally, and ethnically diverse populations of preschool children (e.g., children served in rural programs, or children from other cultural or linguistic backgrounds).

In addition, our study did not include contextual variables, at the family or classroom level that might explain variance in reading, mathematics, and approaches to learning outcomes. Future studies could extend this line of research by examining the additive or interactive influence of contextual variables documented in the literature to affect school readiness. These could include family risk variables such as poverty, maternal unemployment, or depression (Garbarino, 1995; McLoyd, 1998), or protective factors such as classroom quality (e.g., teacher–child interactions or teacher instructional support; Pianta, 2006). For example, a growing body of early childhood research suggests that classroom process quality (teacher sensitivity; instructional and emotional support) may moderate

the effect of classroom activity setting on problem behavior (Rimm-Kaufman, LaParo, Downer, & Pianta, 2005). A recent study in Head Start documented that observed classroom emotional support buffered the negative effects of problem behavior in teacher interactions on a global assessment of approaches to learning (Domínguez et al., 2011).

Our study is also qualified by the fact that the Head Start teachers completed both the ASPI and the PLBS. Although direct assessments (TERA and TEMA) were used to measure children's academic readiness, teacher report was used to assess both situational problem behavior (ASPI) and approaches to learning (PLBS). We intentionally chose the PLBS as a measure of approaches to learning because it is a multidimensional instrument validated for use with low-income preschool populations (Rogers, 1998; U.S. Department of Health and Human Services, 2001). In addition, we chose this measure because research suggests that teachers are one of the most knowledgeable and reliable sources for accurate, summative observations of children's classroom behavior (McDermott, 1986). Nevertheless, it is important to acknowledge that the relations observed between situational problem behavior and learning behavior may in part from shared method variance. Future studies can extend this research by incorporating additional assessments of children's approaches to learning across additional sources and methods (e.g., parents or direct observation by independent observers).

Finally, our models theoretically assumed directional relations between early situational problem behavior and children's readiness outcomes. Further research is needed to confirm or disconfirm this assumption as researchers are increasingly highlighting the overlapping and bidirectional nature of school readiness domains (McWayne & Cheung, 2009; Snow, 2007). The temporal structure of our data did not permit the examination of an alternate hypothesis (testing the influence of early reading, mathematics, and learning behaviors on problem behavior) or possible mediating mechanisms among these variables. However, future studies could test a cross-lagged structural equation model to determine which statistical model best fit these data: whether children's academic skills and learning-related behaviors predicted situational problem behavior or vice versa (Muthén & Muthén, 1998–2010).

A longitudinal model that examines the influence of situational problem behavior on academic and learning-related outcomes across the transition to elementary school would also strengthen our findings. For example, a recent longitudinal study examined the relations between preschool situational problem behavior and literacy and language outcomes in kindergarten and first grade (Bulotsky-Shearer & Fantuzzo, 2011). Children with behavioral difficulties in preschool classroom learning situations demonstrated significantly lower early reading fluency, language, and reading achievement across these critical transition points in elementary school.

Implications for Policy and Practice

There are a number of implications of this research. First, our study highlights the importance of early identification of problem behavior within the classroom context for preschool children living in urban poverty. Our findings underscore the need to attend to behavioral problems within the context of early childhood classroom learning and social experiences where fundamental mathematics, reading, and approaches to learning skills are intentionally taught. Our study suggests that if problem behavior occurred in structured learning situations, these mattered for children's early reading and mathematics skills. In addition, if problems occurred in classroom structured learning or peer interactions, these influenced children's ability to acquire important learning-related behaviors across the preschool year. To inform targeted interventions, it is critical that developmentally and contextually relevant tools like the ASPI are used to identify problems where learning occurs in early childhood classrooms.

Our study is responsive to national priorities that call for the expansion of developmentally and contextually appropriate assess-

ments to inform early identification and intervention efforts for low-income populations (U.S. Department of Health and Human Services, 2001). Key to programmatic early intervention is the use of high-quality assessment tools that can identify a comprehensive set of problem behaviors within routine, developmentally appropriate classroom learning contexts. Use of such tools is particularly important for diverse low-income populations whose mental health needs are traditionally underidentified within community-based early childhood educational programs (U.S. Department of Health and Human Services, 2001). In our study, we provide additional validity for an assessment of early situational problem behavior based on observations within the naturalistic classroom context, by early childhood teaching staff—key natural resources and contributors to children's development (Fantuzzo, McWayne, & Bulotsky, 2003).

Early childhood programs can benefit directly from using information about the ASPI situational dimensions to inform both universal and targeted classroom-based intervention efforts. Rather than identifying "types" of behavior problem (e.g., internalizing or externalizing), this study identified those situations "where" problem behavior in the preschool classroom most affected children's learning. Data collected program-wide regarding the most challenging classroom situations for both children and teachers can help direct programmatic resources toward classrooms in greatest need, as well as guide staff professional development efforts that complement universal and targeted classroom strategies such as the Pyramid Model (Powell, Dunlap, & Fox, 2006). In the classroom, teachers can use ASPI data to identify "where" children's behavior problems are most likely to influence learning and to take steps to support more adaptive behavior. This ecological approach to intervention shifts the focus of intervention from a more traditional focus on "fixing" the individual child to "making the larger system work" (e.g., changing the classroom situation to better fit the capacities of the child; Evans & Evans, 1990; Swartz & Martin, 1997).

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