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Thresholds in the association between child care quality and child outcomes in rural preschool children

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ABSTRACT

This study examined whether a minimum level of preschool quality (threshold) is needed in order for a relationship to exist between preschool quality and children's academic, behavioral, and working memory in a sample of children from low-wealth rural communities where quality child care has been found to be lower than more urban communities. Participants included 849 children from two high-poverty, rural regions. Preschool quality was rated using the CLASS observational measure. Child outcomes included direct assessments of early language, mathematics, and working memory, as well as teacher ratings of attention, emotion regulation, problem behaviors, and peer relationships. Analyses included piecewise regression analyses that tested a priori specified cut-points and flexible b-spline analyses that tested for thresholds empirically. Results indicated some evidence for quality thresholds, suggesting that quality was related to children's behavioral outcomes above, but not below, a cut-point. Language, literacy, and working memory did not show evidence of threshold effects. Results are discussed in the context of prior mixed evidence for child care quality thresholds in other samples of predominantly low-income preschoolers in center-based child care in more urban areas.

The quality of child care settings is believed to play an important role in the early development of young children above and beyond the quality of the home and demographic characteristics (Pianta, Barnett, Burchinal, & Thornburg, 2009). Close examination of the associations between measures of child care quality and child outcomes indicates that observed quality is significantly related to child outcomes, but the magnitude of the linear association is quite modest (Burchinal, Kainz, & Cai, 2011; Crosnoe et al., 2010; NICHD Early Child Care Research Network, 2000). This has raised questions of whether the association between child care quality and child outcomes is linear or whether there might be thresholds below which quality is not related to outcomes. The purpose of this study is to test for thresholds in associations between a widely-used quality measure and preschool child outcomes in a longitudinal study of children born in two of the rural poverty belts in the United States, the Black South and Appalachia. Children in low-wealth rural communities may be particularly important to study because high-quality child care is less available in these communities, especially for low-income families and because the children are at increased risk for falling behind academically (Bratsch, 2011; Vernon-Feagans, Gallagher, & Kainz, 2010).

Early childhood policies have been predicated on the assumption that high-quality child care experiences promote young children's cognitive and social development. Experimental data collected in the past 50 years support this assumption. In two meta-analyses focusing on the evaluations of early childhood programs that involved experimental or quasi-experimental designs (Duncan & Magnuson, 2013; Karoly, Kilburn, & Cannon, 2005), there was evidence of significant effects of the programs. These meta-analyses also found larger effects that tended to be in the moderate to large range on cognitive outcomes for programs that were more intensive and that focused on improving school readiness.

Some recent work has examined how high-quality child care experiences might be more important for children who come from families with fewer educational and home resources. These

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recent studies have found that children from lower resourced home environments may be buffered against poorer cognitive, language, and social outcomes by the provision of high-quality child care (Burchinal, Peisner-Feinberg, Bryant, & Clifford, 2000; Dearing, McCartney, & Taylor, 2009; Magnuson, Meyers, Ruhm, & Waldfogel, 2004; McCartney, Dearing, Taylor, & Bub, 2007; NICHD ECCRN, 2000). McCartney and colleagues (Dearing et al., 2009; McCartney et al., 2007) examined whether overall observed child care quality might benefit low-income children more than other children in predicting a variety of language and academic outcomes. They found that high-quality child care buffered children from the negative effects of poverty in predicting school readiness and language skills. Higher-quality child care mattered more for children with income-to-needs ratios from zero to three, with the greatest effect sizes at or below the poverty threshold (McCartney et al., 2007).

A variety of other preschool and prekindergarten studies have also supported this finding. For instance, using a large dataset of three child care samples, Burchinal et al. (2000) found some evidence for the buffering effect of high-quality care, especially for low-income African American children's language development. In a later study, child care quality buffered African American children from the negative effects of social risk on later mathematics and problem behaviors in elementary school (Burchinal, Roberts, Zeisel, Hennon, & Hooper, 2006). In a nationally representative survey, center care was found to be related to better academic achievement for all children, but the effects were greater for children from poverty backgrounds and children with associated risk factors (e.g., low maternal education, single parent status and non-English speaking families; Magnuson et al., 2004). Other large child care studies, however, have failed to document larger impacts of quality for low-income children (Howes et al., 2008; NICHD & Duncan, 2003) so further work is needed to determine whether, and under what circumstances, child care experiences serve as a protective factor for low-income children.

While some evidence suggests higher child care quality might be more important for low-income/at-risk children than for other children, there is more evidence suggesting that child care quality is a modest predictor of academic and social skills regardless of social class (Burchinal, Kainz, et al., 2011; Vandell, 2007). Several recent meta-analyses (Burchinal et al., 2009; Burchinal, Kainz, et al., 2011; Dang et al., 2011) point to consistent but only modest associations between quality and child outcomes when studied using the assumption of a linear relationship (i.e., that as quality increases, child outcomes will improve). To examine this issue, Burchinal and colleagues conducted both a meta-analysis and coordinated secondary analyses with data from five large studies of early childhood care and education, and reported partial correlations between observed quality and child outcomes of .05 to .17. Similarly, Dang and colleagues (2011) conducted parallel analyses across five large child care study data sets and found only very modest associations between child care quality and child outcomes (i.e., $r_p = .04$). These discrepancies might reflect the greater control over the delivery of child care services and over decisions about who to include in the intervention studies than in the observational studies. The stark comparisons between these results with those from the experimental studies, however, raise important questions about our ability to measure child care quality and model associations between observed quality and child outcomes – especially since the intervention studies compared treated and control children without measuring quality whereas the observational studies ask directly about the association between measures of quality and child outcomes (Gordon, Kaestner, & Korenman, 2008).

One possible explanation for why associations between child care quality and child outcomes in early childhood are so modest is that quality must reach some threshold before it can impact children's development. That is, it may be that young children gain more in higher-quality programs only when they attend programs that are at or above a certain level of quality. Children in lower-quality programs would perform less well than children in higher-quality programs, but the level of quality within the lower-quality programs would not predict children's outcomes. Some, but not extensive, evidence suggests that thresholds in quality may exist.

Several studies have asked whether the association between child care quality and child outcomes was curvilinear. Burchinal and colleagues (Burchinal et al., 2009; Burchinal, Xue, Tien, Auger, & Mashburn, 2011) found some evidence of a curvilinear relationship in their follow-up analyses of four large child care data sets, including several data sets from Head Start, pre-kindergarten evaluations, and longitudinal child care studies. These findings suggested that child outcomes were higher when child care quality was higher only when quality reached a fairly high level on widely used quality measures. At least one other team of researchers has provided further support for the threshold hypothesis. Votruba-Drzal, Coley, and Chase-Lansdale (2004) reported a steep decline in both internalizing and externalizing behavior problems as current hours in care increased among low-income children who were in higher-quality care, but not in lower-quality care.

More recently, studies have used piecewise regressions to test the threshold hypothesis in which the linear associations between quality and outcomes were allowed to be different in lower- and higher-quality classrooms. Classrooms were categorized as having lower and higher quality based on whether they were at or below an *a priori* defined cut-point. The association between observed quality and child outcomes was estimated as separate slopes for classrooms falling in the lower quality range and in the higher quality range, and the difference between these slopes was tested. A significant difference between the slopes is interpreted as supporting a threshold, although it does not empirically estimate the cut-off point. Burchinal, Vandergrift, Pianta, and Mashburn (2010) used this approach in a recent study analyzing data from an 11-state pre-kindergarten study. They found some, but not consistent evidence, that academic outcomes were more strongly related to classroom observations of Instructional Support on the CLASS, when classrooms were in the moderate- to high-quality range than in the low-quality range, and that social outcomes were more strongly related to Emotional Support on the CLASS when classrooms were in the high-quality range than in the moderate- or low-quality range. Similarly, a meta-analysis of piecewise regressions in eight large child care studies found some, but not consistent evidence, that the CLASS Instructional Support appeared to have thresholds such that larger gains in academic skills related to quality were found in moderate- to high-quality classrooms than in lower-quality classrooms (Burchinal, Kainz, et al., 2011).

Following the model in the meta-analysis, Weiland and colleagues (2013) have asked whether there are linear or nonlinear relationships between quality and child outcomes for children participating in pre-kindergarten program in Boston public schools. They asked whether CLASS Emotional Support, Instructional Support and Classroom Organization scores was a stronger predictor of gains in receptive vocabulary, cognitive inhibitory control and working memory in higher than lower quality classrooms. Results indicated that all three CLASS domain scores were stronger predictors of cognitive inhibitory control, with stronger relationships at higher levels of quality. No evidence of associations between CLASS scores and the other outcomes emerged.

Recent analyses of two datasets that include infants, toddlers, and preschoolers in home-based and center care also provided some evidence suggesting thresholds in the association between observed child care quality and child outcomes (Torquati, Raikes, Welch, Ryoo, & Tu, 2011). They examined the pattern of association between observed quality in home-based child care and child