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Maltreatment prevention through early childhood intervention: A confirmatory evaluation of the Chicago Child-Parent Center preschool program

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Abstract

Increased recognition of the consequences associated with child maltreatment has led to greater emphasis on its prevention. Promising maltreatment prevention strategies have been identified, but research continues to suffer from methodological limitations and a narrow focus on select prevention models. This investigation uses data from the Chicago Longitudinal Study to examine mediating mechanisms that link the Chicago Child-Parent Center preschool program to a reduction in overall child maltreatment and, more specifically, child neglect. We use structural equation modeling to test child, family, and school measures hypothesized to mediate the effects of CPC participation on maltreatment and neglect. Results indicate that a substantial proportion of the program's impacts can be accounted for by family support processes, including increased parent involvement in school and maternal educational attainment as well as decreased family problems. The CPC program's association with reduced school mobility and increased attendance in higher-quality schools also significantly mediated its effects on maltreatment and neglect. Further, a decrease in troublemaking behavior contributed modestly to mediating the program's association with maltreatment but not neglect. We discuss the implications of these results for the field of maltreatment prevention.

Rates of child victimization in the United States, including officially reported child maltreatment, have been on the decline for many years. According to the National Child Abuse and Neglect Data System (U.S. Department of Health and Human Services, 2010), for example, approximately 763,000 children were abused or neglected in 2009, down more than 20% from peak levels in the early 1990s. The newly released Fourth National Incidence Study of Child Abuse and Neglect (NIS-4) revealed a similar pattern, as the number of children reported as having experienced maltreatment decreased substantially from the levels reported by the NIS-3 in 1993 (Sedlak et al., 2010).

This downward trend is welcomed news, though it is counterbalanced by several sobering realities. First, data from reported and recorded events likely underestimate the true

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²The CLS design and CPC program have been described in detail previously (See Reynolds, 2000; Reynolds & Robertson, 2003).

incidence of child maltreatment each year, and annual incidence rates undoubtedly fall short of lifetime prevalence rates. Therefore, despite the recent decrease in maltreatment, millions of American children each generation are at risk of being victimized before reaching majority age. Second, the rate reductions described above have varied by type of maltreatment; whereas verified physical and sexual abuse have declined, no significant change in child neglect has been observed (Finkelhor & Jones, 2006; Sedlak et al., 2010). Third, it is unclear why the incidence of maltreatment has decreased. The convergence of trends across data sources enhances confidence in the estimates, yet it is still uncertain whether the drop in maltreatment is authentic or artifactual. Unobserved sources of variance such as altered standards for screening and verifying abuse and neglect reports may affect official rates. Moreover, we do not know if programs and policies designed to prevent maltreatment have contributed to the apparent decrease.

While the accuracy of epidemiological data remains open to dispute, evidence compiled over the past two decades has left little doubt that exposure to abuse and neglect increases a child's risk of developmental and functional impairments. Findings from studies using various design, measurement and analytic strategies have shown that child maltreatment is associated with pervasive and persistent consequences. Maltreated children are at an elevated risk of poor physical health (e.g., Hussey, Chang, & Kotch, 2006; Lanier, Jonson-Reid, Stahlschmidt, Drake, & Constantino, 2010), mental health (e.g., Cohen, Brown, & Smailes, 2001; Springer, Sheridan, Kuo, & Karnes, 2007), and behavioral health (e.g., Moran, Vuchinich, & Hall, 2004; Topitzes, Mersky, & Reynolds, 2010) outcomes relative to their non-maltreated peers. Child maltreatment is also associated with decreased educational and economic attainments (McGloin & Widom, 2001; Mersky & Topitzes, 2010; Stone, 2007; Zielinski, 2009) as well as delinquency and crime (English, Widom, & Brandford, 2002; Ireland, Smith, & Thornberry, 2002; Mersky & Reynolds, 2007). Compounding its impacts on victims, child maltreatment results in substantial costs to society due to lost productivity and expenditures for public services (Wang & Holton, 2007).

Background

Increased awareness of the consequences outlined above has led to greater interest in programs and policies that have the potential to reduce maltreatment or associated risks. As summarized in several recent reviews (e.g., Geeraert, Van den Noortgate, Grietens, & Onghena, 2004; Klevens & Whitaker, 2007; MacLeod & Nelson, 2000; MacMillan, et al., 2009; Mikton & Butchart, 2009; Reynolds, Mathieson, & Topitzes, 2009; Sweet & Appelbaum, 2004), maltreatment prevention initiatives have often targeted expectant primiparous mothers and families with young children. Collectively, early childhood programs represent a preferred maltreatment prevention strategy because, among all victims, roughly one-third are younger than 3 and nearly one-half are below age 6 (Department of Health and Human Services, 2009).

Of the early childhood interventions that have been cited for their potential to prevent maltreatment, home visitation models have received the most attention. This is due in large part to the renown of Olds' Nurse-Family Partnership (NFP) program. An oft-cited randomized trial of the NFP discovered that children of young mothers who participated in

the program were significantly less likely to have been victims of substantiated maltreatment than control children (Olds et al., 1997). Subsequent investigations of the NFP and other home visitation interventions have yielded mixed results with respect to maltreatment and related outcomes, however (Chaffin, 2004). Divergence from the original findings of Olds and colleagues may be attributable to differences in salient features (e.g., intensity; fidelity; staff qualifications) of the programs that have been tested (Olds, Sadler, & Kitzman, 2007).

Despite receiving less public attention and scientific scrutiny, several other intervention models have been linked to reduced maltreatment or its associated risks, including parent education programs (Barth, 2009; Britner & Reppucci, 1997), health services programs (Brayden et al., 1993), and multi-component programs (DePanfilis & Dubowitz, 2005; Prinz, Sanders, Shapiro, Whitaker, & Lutzker, 2009; Stevens-Simon, Nelligan, & Kelly, 2001). Evaluations of center-based early childhood interventions have also produced encouraging results. For example, one randomized investigation found that parents whose children attended Head Start, the well-known school readiness program that serves low-income families, were less likely than control parents to report spanking their children (Puma et al., 2005). Other studies have produced similar findings, suggesting that participation in programs like Head Start and Early Head Start may reduce the incidence and frequency of parents' self-reported spanking (Love et al., 2005; Magnuson & Waldfogel, 2005). These results reinforce prior findings from Reynolds and Robertson (2003) who evaluated the impacts of participation in the Chicago Child-Parent Center preschool program, an early childhood intervention that shares many features with Head Start. The authors discovered that children who attended the program were less likely to have an indicated¹ maltreatment report by age 18 than a comparable group of children who did not attend preschool in a Child-Parent Center (Reynolds & Robertson, 2003).

Although promising approaches to preventing the maltreatment of young children have begun to emerge, lingering gaps in the literature remain. First, as aforementioned, researchers have principally focused on home visitation programs and, to a lesser degree, parent education programs and school-based sexual abuse prevention programs (Mikton & Butchart, 2009). Without minimizing the potential benefits of these prevention models, alternative approaches also warrant attention. Second, most evaluations of maltreatment prevention initiatives have suffered from significant methodological limitations. Few studies, for instance, have examined programmatic effects on actual abuse and neglect outcomes (Reynolds et al., 2009). Caution should be exercised when extrapolating from a program's effects on risks associated with maltreatment to actual impacts on maltreatment. Third, there is limited knowledge of how prevention programs impact different forms of maltreatment, and there is a particular dearth of interventions with demonstrated impacts on child neglect (DePanfilis & Dubowitz, 2005; Mersky, Berger, Reynolds, & Gromoske, 2009).

Last, even among well-designed studies of high-quality interventions, little is known about the mechanisms that link programs to their prevention effects. To our knowledge, only one exploratory study has examined mediating paths leading from participation in an early

¹In Illinois, "indicated" reports include substantiated allegations along with reports that have not been substantiated but where child protection agents have deemed that suspicion or risk of maltreatment is present.

childhood intervention to reduced maltreatment (Reynolds & Robertson, 2003). Fortunately, future studies in this area can draw from a more developed body of etiological research that has catalogued risks associated with child maltreatment. Numerous family-level indicators are known correlates of maltreatment, including poverty, early childbearing, low parent educational attainment, family conflict, poor parent-child relations, parent mental health and substance use problems, as well as low levels of parent involvement in school (e.g., Berger & Brooks-Gunn, 2005; Mersky, et al., 2009; Sidebotham & Heron, 2006; Stith et al., 2009). Broader structural and ecological factors, including neighborhood poverty and unemployment, have also been shown to contribute to maltreatment prediction models net of family-level sources of variance (See Coulton, Crampton, Irwin, Spilsbury, & Korbin, 2007 for review). Less is known about individual markers that elevate a child's risk of maltreatment, but a few studies have documented associations between child temperament characteristics or externalizing behaviors and maltreatment victimization (Harrington, Black, Starr, & Dubowitz, 1998; McBride, Schoppe, & Rane, 2002; Stith et al., 2009). Further research is needed to determine whether changes in the individual, family and extrafamilial processes listed above, along with other mechanisms of effect, explain why certain programs impact rates of maltreatment.

Study Aims

Using data from the Chicago Longitudinal Study (CLS), our investigation makes two significant contributions to the maltreatment prevention literature. First, we extend the work of Reynolds and Robertson (2003) who conducted hierarchical regression analyses to explore select mediators that may link the Chicago Child-Parent Center (CPC) preschool program to a reduction in child maltreatment. We use structural equation modeling (SEM) to test a more comprehensive set of child, family, and school measures hypothesized to mediate the CPC-maltreatment connection. Second, despite being the most prevalent form of maltreatment and a serious threat to child well-being (Cicchetti & Valentino, 2006; Tyler, Allison, & Winsler, 2006), there has been remarkably limited scholarly activity devoted to neglect and its prevention. Therefore, we build on evidence suggesting the CPCs generated a significant reduction in child neglect (Mersky et al., 2009) by examining mediators of the CPC-neglect connection.

Methods

Sample and Design

The CLS is a quasi-experimental panel study of 1,539 underprivileged minority individuals born in 1979 or 1980. The original sample included a cohort of 989 children who participated in the CPC preschool program (described below) in 1983 or 1984 and completed CPC kindergarten in 1986. Eligible families that enrolled their children in the program resided in high-poverty neighborhoods served by one of 20 different CPC preschool sites. A comparison group of 550 children from comparable family and neighborhood settings participated in full-day, public kindergarten programs but did not attend CPC preschools.²

The current study includes 1,411 participants (91.7% of original sample) for whom maltreatment status could be confirmed. Previous evidence suggests that the attrition sample does not differ significantly from the study sample on most background characteristics, including race, sex, parent education, parent employment, and family poverty (Mersky, et al., 2009). Participants retained in the effective sample were more likely to have been born into a single-parent family, however. Earlier CLS findings have also shown that children and families in the comparison group were similar to those in the CPC preschool group (Reynolds & Robertson, 2003).³ However, CPC children were more likely to live in a high-poverty neighborhood and to have an unemployed primary caregiver, while comparison children were more likely to have three or more siblings and a caregiver who did not complete high school.

Intervention

Launched in 1967 through Title I funding, the CPC program is the second oldest federally-funded preschool program in the United States behind Head Start (1965). By 1983, 20 CPC centers were established in low-income Chicago neighborhoods that were not served by Head Start or other school readiness programs. The CPCs were designed to provide educational and family support services to eligible children for up to six years, including one or two years of preschool, one year of kindergarten, and three years of school-age services (grades 1-3). Although there is some variation in curricula across sites (Graue, Clements, Reynolds, & Niles, 2004), the CPCs universally emphasize the development of language, literacy and numeracy through active learning. Participating children also receive health services, including initial medical screenings, along with free or reduced-price meals.

One of the distinguishing strengths of the CPC model, particularly in regard to its potential impacts on child maltreatment, is the program's emphasis on family involvement. When CLS participants attended the program in the early 1980s, parents were asked to visit their child's school at least one half-day per week, facilitating parent-child interactions, parent and child attachment to school, and mutual parental support. Parents were also eligible to engage in vocational and educational training opportunities regularly available at the CPCs. In addition, participants received some outreach services. Upon enrollment, all families received at least one visit from a school-community liaison, who continued to provide support as needed to help connect families with local resources (Reynolds, 2000).

Data Collection

Since its inception, the CLS has collected data to evaluate the CPC program and track participants' development. During initial stages of the project, data were collected from the Chicago Public Schools and other administrative sources. From kindergarten through the seventh grade, the CLS monitored study participants annually via child, parent, and/or teacher reports. Thereafter, the CLS collected additional survey and administrative data at multiple time points through early adulthood. After participants reached majority age, the

³Parents' motivation to enroll their children in preschool is a potential threat to group equivalence, though this concern is mitigated by two considerations. First, CPC school-community liaisons recruited families from CPC catchment areas, which may have reduced self-selection bias. Second, Reynolds and Temple (1995) found that residential proximity to CPC centers, and not parent motivation, distinguished CPC and comparison families.

CLS obtained official maltreatment records from two administrative sources maintained at the Chapin Hall Center for Children: petitions to the Cook County Juvenile Court and referrals to the Child Protection Division of the Illinois Department of Children and Family Services (DCFS).

Outcome Measures

Two primary dichotomous outcomes were constructed by aggregating juvenile court and DCFS records after the age of CPC preschool enrollment: (a) maltreatment ages 4-17 and (b) neglect ages 4-17. The former measure combines indicated reports (n=177) for all forms of maltreatment, including physical, sexual, and psychological abuse as well as neglect. The latter measure distinguishes participants with at least one indicated neglect report (n=122). Because our mediator variables (described below) were measured as early as age 6, we also created a parallel set of binary outcomes based on maltreatment histories from age 10-17. We conducted robustness tests with these secondary measures to assess whether estimates generated from primary analyses were affected by temporal overlap between the mediators and outcomes.⁴

Mediator Measures

We tested the following six child, family, and school measures as mediators in our analyses:

Troublemaking behavior was analyzed to test if CPC attendance impacted children's maladaptive behaviors and, in turn, decreased their risk of maltreatment. Troublemaking behavior from grades 3-6 was measured by student self-reports on 4 items ("I get in trouble at school", "I get in trouble at home", "I follow class rules", and "I fight at school"). Response options were presented on a three-point scale in grades 3 and 4 (1=not much, 2=some, 3=a lot) and a four-point scale in grades 5 and 6 (from 1=strongly agree to 4=strongly disagree). A total score for each year was calculated by summing ratings for all four items. Total scores were then transformed into Z-scores and averaged across years (Reynolds, Temple, & Ou, 2010).

Parent involvement (Grades 1-3) was measured using annual teacher ratings of "parent's participation in school activities" from poor/not at all (1) to excellent/much (5). A measure of mean parent involvement scores was constructed from grades 1-3.

Parent involvement (Grades 4-6) reflects mean annual teacher ratings of parent participation from grades 4-6.⁵

Mother completed high school at child's age 8 was measured from administrative and self-report data. Because our analyses controlled for each mother's educational status at her

⁴We constructed secondary measures in light of two competing demands. On one hand, restricting the age range to later maltreatment enhances temporal ordering between mediators and outcomes. However, it also limits the number of maltreatment cases to be analyzed and, consequently, reduces statistical power. We selected age 10-17, in part, to balance these demands and because participants were eligible to receive CPC services through age 9.

⁵We analyzed a later measure of parent involvement to determine whether changes associated with CPC preschool participation were sustained after the school-age program (grades 1-3) and, in turn, mediated program effects. Alpha reliability across all elementary grades is .73. Both measures have been analyzed in previous CLS studies (see Barnard, 2004) and demonstrate good properties of validity within the CLS dataset.

child's birth (see below), this dichotomous measure captures change in educational attainment during or after participation in the CPC program.

Family problems originated from responses to a CLS survey completed by participants once they reached early adulthood (ages 22-24). Respondents retrospectively reported whether they experienced the following during childhood (ages 6-10): frequent family conflict, family financial problems, substance abuse of a parent, and prolonged absence of a parent. Endorsement of any of the four items drawn from the Checklist of Stressful Life Events (Werner & Smith, 1982) resulted in a code of 1; all other cases received a code of 0.

School mobility is a dichotomous indicator denoting whether from grades 4-8 a participating child changed schools three or more times, a threshold for mobility that has been linked to poor individual and family outcomes (Astone & McLanahan, 1994; Mehana & Reynolds, 2004; Simpson & Fowler, 1994). Children received a code of 0 if they changed schools less than three times during this period.

School quality reflects whether public school records revealed that a CLS participant attended a magnet school from grades 4-8 or a school with 40% or more of its students reading above grade level in grades 4 or 5 according to standardized scores on the Iowa Test of Basic Skills (Arteaga, Chen, & Reynolds, 2010; Hieronymus, Lindquist, & Hoover, 1980). Families that send their children to magnet schools and other higher-performing schools are hypothesized to differ on latent criteria (e.g., parent investment in child) from families whose children attend lower-quality schools. This measure also may differentiate schools by the number and quality of protective supports (e.g., academic; social) offered to at-risk children and families.

Program Measures and Covariates

CPC preschool participation served as the explanatory variable in this study, and we covaried the effects of later participation in the CPC school-age program. We also controlled for child sex (1=female), race or ethnicity, (1=African American, 0=Hispanic), and indicated child maltreatment from ages 0-3. From Illinois Department of Public Health records we recorded low birth weight status (<2,500 grams), an additional factor we covaried given its potential relation to maltreatment risk (Sidebotham & Heron, 2006). Finally, we included a cumulative risk index as an exogenous study variable. This measure resulted from the sum of 8 dichotomous risk factors measured before or soon after the child's birth: (a) free lunch eligibility (b) mother a teen parent at first birth, (c) mother not employed, (d) mother did not complete high school, (e) four or more children in the household, (f) single-parent household, (g) household AFDC⁶ receipt, and (h) high census tract poverty (40% residents below poverty level, 1980 Census).⁷ The CLS collected these data from multiple sources

⁶This refers to Aid to Families with Dependent Children, the cash assistance program for parents with dependent children that was later changed to Temporary Assistance for Needy Families (TANF) in 1996.

⁷All demographic indicators incorporated in the cumulative risk index have known associations with individual and family well-being (Bendersky & Lewis, 1994). Comparable indicators of cumulative risk have been employed in prior studies of CLS data (see Reynolds, Ou, & Topitzes, 2004; Topitzes, Mersky, & Reynolds, 2010). We used an aggregate index rather than individual risk items to enhance parsimony and improve the model fit of our structural equation models in LISREL (Moustaki, Jöreskog, & Mavridis, 2004).

including the Illinois Longitudinal Public Assistance Research Database, Chicago Public Schools, and parent surveys.

Last, we controlled for kindergarten word analysis scores on a subtest of the Iowa Test of Basic Skills, a widely used indicator of pre-reading skills. In a previous exploratory test of mediation, Reynolds and Robertson (2003) found that this measure did not significantly contribute to mediating the CPC preschool-child maltreatment association. We, therefore, characterized this measure as an exogenous variable to account for early developed abilities.

Missing Data

Each measure lacked valid data due to differential attrition across assessment time points. The proportion of missing cases for each mediator did not exceed 8% with the exception of a retrospective measure of family problems (24%). Using an expectation-maximization (EM) algorithm (Schafer, 1997), we estimated missing values with multiple imputation in LISREL. This strategy simulates values for missing observations by drawing on known associations between the measure of interest and other study variables (du Toit & du Toit, 2001). Likewise, roughly 10% of participants were missing data on one or more risk indicators used to construct the cumulative risk index; we also imputed these data using an EM algorithm in LISREL.

Data Analysis

Using hierarchical regression, Reynolds and Robertson (2003) identified parent involvement and school mobility as potential pathways through which CPC preschools impacted child maltreatment rates. We have extended their work by examining additional mediators, conducting confirmatory analyses using SEM, and investigating child neglect as an outcome.

Initially, we conducted bivariate tests of association to determine if potential mediators of the CPC-maltreatment association correlated significantly with the explanatory and outcome variables (i.e., double correlation). Next, we performed hierarchical probit regressions to assess whether hypothesized mediators: (a) were significantly associated with the explanatory and/or outcome measure net of study covariates and other mediators, and (b) reduced the original main-effect relation between CPC preschool and child maltreatment (Cohen, Cohen, West, & Aiken, 2002). When the former criterion is met, it signals the potential for indirect mediation (see MacKinnon, Krull, & Lockwood, 2000), which we tested in our two-block recursive models (i.e., two sets of temporally distinct mediators). We trimmed measures that met the bivariate double correlation criterion but failed to achieve the latter two criteria in multivariate analyses. This systematic process of variable pairing represents an “adaptive” approach to specifying mediator models and enhancing causal inferences (MacKinnon, 2008).

Last, to confirm our mediator model, we employed SEM with LISREL software (Jöreskog & Sorbom, 1996). A set of equations, one for each intervening variable, was estimated simultaneously by maximum likelihood (ML) based on a PRELIS-generated polychoric covariance matrix. Past updates to the LISREL program software facilitated use of ML with categorical data (Jöreskog, Sorbom, du Toit, & du Toit, 1999).

Completely standardized regression coefficients were generated to estimate the direct and indirect paths of effect. Measures within the same mediator block were allowed to covary, operations that were informed by theory and planned a priori. We represented latent variables with single indicators, incorporating estimates of measurement errors to increase the reliability of results. We relied on test statistics of 2.00 and 2.50 to convey statistical significance (α levels of approximately .05 and .01, respectively), and we tested the robustness of our primary results using the age 10-17 outcome measures. We report three indicators of overall model fit: root mean square error of approximation (RMSEA), standard root mean residual (SRMR), and adjusted goodness-of-fit index (AGFI). Conventionally, RMSEA and SRMR values below 0.05 and AGFI values above .90 indicate a model fits the data well (Byrne, 1998; Kelloway, 1998).

Results

Table 1 displays descriptive statistics for study measures and results from bivariate correlation analyses. Each mediator displayed was significantly associated ($p < .05$) with the preschool program measure and with both indicators of maltreatment. We tested other measures that fulfilled the double correlation criterion but failed to meet mediator criteria in the multivariate context. For instance, we found a significant bivariate correlation between troublemaking behavior and neglect, but the association was not significant in multivariate analyses. Troublemaking behavior was subsequently dropped from the analysis because it was modeled as a second-block mediator and was not directly associated with neglect.

We retained the following measures in the first temporal block of our mediator models: parent involvement (grades 1-3), mother completed high school (child age 8), and family problems (child ages 6-10). Our second block of mediators included parent involvement (grades 4-6), school mobility (grades 4-8), and school quality (grades 4-8). Troublemaking behavior (grades 3-6) was included as a second-block mediator, but only in overall maltreatment models.

Confirmatory SEM analyses examining the CPC-maltreatment connection are shown in Figure 1. As hypothesized, early parent involvement fulfilled both a direct and indirect mediating role. CPC preschool participation predicted early parent involvement, which linked directly to the outcome as well as to troublemaking behavior, later parent involvement, and school mobility. In turn, troublemaking behavior, later parent involvement, and school mobility forged significant paths to the outcome. Mother completed high school acted as an indirect mediator in this model, connecting CPC participation to the outcome through later parent involvement and school mobility. The modest association between CPC involvement and family problems helps to explain the preschool program's prevention effect through a direct path to child maltreatment along with indirect path through later parent involvement and school mobility. Results indicated that school mobility acted as direct mediator of the CPC-maltreatment connection, while school quality contributed to this model through a direct mediating pathway as well. Last, school quality contributed to this model through a direct mediating pathway.

For the neglect mediator model, shown in Figure 2, results were largely similar to the overall maltreatment model. Parent involvement, family problems, maternal educational attainment, school mobility and school quality contributed substantial mediating effects in both models.⁸ Two notable differences between the neglect and overall maltreatment models were evident. First, whereas troublemaking behavior contributed a modest mediating effect in the full maltreatment model, it did not help explain the CPC-neglect association. Second, a direct path from CPC preschool to the neglect outcome remained after accounting for the mediators (i.e. partial mediation). These findings suggest that the magnitude of the mediation effects of the model explaining the CPC preschool-neglect link were not as strong as the effects of the model explaining the program's association with global maltreatment.

As shown in Figures 1 and 2, our final models fit the data well. Our full maltreatment model resulted in a RMSEA of 0.030 (90% confidence interval of 0.017-0.044), an SRMR of .012, and an AGFI of 0.97, which were comparable to the RMSEA (0.029), SRMR (.011), and AGFI (0.98) fit statistics for our neglect models. Whereas the maltreatment model reduced the association between preschool program participation and overall maltreatment by 91.9%, the neglect model reduced the original main-effect relation by 55.5%. The full structural models explained 67.8% and 76.5% of the maltreatment and neglect outcomes, respectively.

We performed secondary analyses because temporal overlap between certain mediators and primary outcomes limit confidence in the causal order of effects. Results from robustness tests with age 10-17 outcomes largely resembled those from primary analyses. All mediators retained their significant associations with secondary measures of maltreatment and neglect.

Discussion

This investigation reinforces previous CLS findings indicating that sample children who attended CPC preschools were significantly less likely to be maltreated than a comparable group of children who attended other public school programs. Consistent with a confirmatory program evaluation approach (Reynolds, 1998), we systematically investigated hypothesized mediators of the program's main effects. We discovered that family and school indicators contributed significantly to explaining the CPC program's impacts on overall child maltreatment and, more specifically, child neglect. Results suggested that our mediation models were a good fit for the data. Findings were robust to alternative model specifications supplanting our primary dependent variables (ages 4-17) with comparable outcomes measured from ages 10 to 17; all paths depicted in Figures 1 and 2 remained statistically significant in secondary analyses. These results mitigate the threat of bidirectionality to some degree.

Consistent with results reported by Reynolds and Robertson (2003), we found that the CPC preschool effects on maltreatment and neglect were partly accounted for by parents'

⁸We calculated the approximate contribution of each mediator to the total effects of the mediating model. To do so, we identified the total indirect effect of the mediator model in LISREL and calculated the proportion of this effect accounted for by each path. Based on these estimates, we found in our full maltreatment model (ages 4-17) that family processes explained the greatest proportion of mediating effects, as follows: family problems (32%), parent involvement (21%), and mother completed high school (11%). School mobility and school quality explained 20.6% and 14.5% of the modeled effects, respectively. Troublemaking behavior accounted for a mere 1% of the mediated effects.

increased involvement in their children's school. By disaggregating parent involvement between grades 1-3 and grades 4-6 we were able to assess whether CPC parents, compared to parents whose children did not attend CPC preschools, continued to participate more frequently in their children's school beyond any involvement in the program. Results confirmed that increased parent involvement from grades 1-3 helped to directly mediate the CPC program's impacts on maltreatment and neglect. Additionally, earlier parent involvement (grades 1-3) contributed indirect mediating effects through an association with later parent involvement (grades 4-6). Increased parent involvement in the CPCs may have led to reduced maltreatment in multiple ways. For example, parent attitudes and behaviors may be modified by virtue of parent participation. Specifically, interactions between parents and children in school may have enhanced parent-child relations and increased parent and child investments in education. Parents also may have benefited from decreased social isolation resulting from supportive relationships with teachers and other parents (Reynolds, 2000).

CPC program impacts also appear to have extended beyond the classroom by increasing maternal educational attainment. Results showed that CPC caregivers were more likely than mothers in the comparison group to complete high school by the participating child's 8th birthday, net of pre-program differences in education. This suggests that mothers who participated in the program may have taken advantage of classes offered at the CPCs to earn their GED. Caregivers who completed high school were more likely to participate in their children's schools from grades 4-6, which led to a reduced likelihood of maltreatment. Thus, CPC participation appeared to translate into increased parent involvement in school, in part, by promoting parents' investments in their own education. It is also possible that increased maternal educational attainment may have contributed to the estimated effects on maltreatment in other ways that were not measured, such as increasing family financial stability and/or parents' self-esteem.

Our models also showed that CPC preschool participation resulted in fewer family problems (e.g., conflict; financial problems), which contributed to later increments in parent involvement and decrements in child maltreatment. This finding should be viewed with caution due to the heterogeneous and retrospective nature of the family problems variable. However, a speculative implication is that strengthening mesosystemic connections between families and schools may have promoted beneficial and possibly synergistic changes in family conditions, parent involvement in school, and parent behavior at home.

Another way that the CPCs appeared to indirectly impact maltreatment and neglect is by reducing school mobility. It is possible that participating in an enriched early childhood program increased the probability that children would enter stable learning environments in the future (Reynolds & Robertson, 2003). Maintaining ties to school may have reinforced child and family gains established earlier through CPC involvement. It should be noted, though, that school mobility is a complex construct. School transitions can be precipitated by factors other than school preference, including variables that contribute to residential mobility (e.g., economic instability). To wit, all family indicators in our first block of mediators connected the program to school mobility. Thus, CPC participation may have altered family processes that influenced the number of times children changed schools. In

sum, we cannot disentangle whether the mediating effect of school mobility reveals family and/or school support mechanisms.

Unlike the school mobility findings, attending higher-quality schools directly mediated the associations between CPC participation and both child maltreatment and child neglect independent of the program's effects on family problems, parent involvement or educational attainment. Attending better elementary and middle schools may have offered promotive or compensatory effects to children and families similar to those observed for the CPCs. For instance, attending higher-quality schools may have enhanced or reinforced parent investments in their children and reduced their likelihood of being maltreated. It is also possible that school quality is a proxy for other unobserved between-group differences. In this event, a child's likelihood of being maltreated would not be attributable to the school he or she attended, but to other individual, family, or ecological factors associated with school quality.

Finally, we discovered that parents' increased involvement in their child's school following CPC preschool participation led to reduced child troublemaking behavior from grades 3-6, thereby decreasing a child's likelihood of being maltreated. Troublemaking behavior did not significantly mediate the CPC-neglect association, however. The discrepancy between models actually enhances the face validity of our conclusions because, to the extent that behavior problems increase a child's risk of being maltreated, it is more plausible that they do so by increasing their risk of physical abuse than their risk of neglect. Due to the low base rate of physical abuse (3.3%) in this sample, however, we were unable to directly test this hypothesis. Future research of this kind should consider whether the direct and indirect effects of maltreatment prevention programs differ among various forms of abuse and neglect.

Limitations

The above findings should be interpreted in light of four study limitations. First, we relied on official maltreatment data from administrative records. These data may discount the prevalence of maltreatment in the sample and reflect factors other than abuse and neglect (e.g. reporting biases) that affect the probability a child or family will be reported to and investigated by child protection agencies (Mersky et al., 2009; Miller-Perrin & Perrin, 2007). Two additional limitations derive from the serendipity of the findings linking CPC participation to reduced maltreatment (Reynolds & Robertson, 2003). For one, because the CPCs were conceptualized as a school readiness program, much of the CLS data collected on participating children reflected this intent. Therefore, some of our mediators are gross indicators that may be proxies for other mechanisms of effect or that may signify multiple underlying micro-processes. Omitted variable bias is another concern. We were unable to test several processes (e.g., parenting style; family isolation) that may have mediated the program's effects on maltreatment.

Finally, despite our longitudinal data, we could not completely eliminate some temporal overlap between the mediators and outcomes. Because officially recorded maltreatment is a low-base-rate phenomenon, even in this impoverished, urban sample, we elected to incorporate the full range of indicated maltreatment reports in our primary outcomes (ages

4-17). Although secondary analyses examining the CPC program's effects on later maltreatment (ages 10-17) largely replicated our primary findings, the threat of bi-directionality between mediators and outcomes could not be fully mitigated.

Implications

This study sheds new light on the CPC preschool program and the mechanisms by which it appears to have reduced maltreatment. Our findings have overarching implications for preventing maltreatment that can be elucidated by scrutinizing the CPC program and its alignment with common precepts of prevention. Nation and colleagues (2003) registered nine unifying principles that characterize effective prevention programs. Below we offer a brief assessment of the CPC program's adherence to each of these nine principles.

Based on their synthesis of the literature, Nation et al. (2003) concluded that *comprehensive* interventions tend to be more effective than narrowly focused programs. On this count, the CPCs stand out along with other multi-faceted interventions, such as Sanders' Triple P model (Sanders, Cann, & Markie-Dadds, 2003; Prinz et al., 2009) and Bavolet's Nurturing Parenting Program (Cowen, 2001; Palusci, Crum, Bliss, & Bavolet, 2008). The CPCs provide an array of services in multiple settings, including school-based programming for children and families, community learning activities for children, and outreach services to families. Correspondingly, our results suggest that the program's impacts on child abuse and neglect were effectuated through complex transactions across individual, family, and extrafamilial domains. These findings are consistent with contemporary ecological-transactional theories which suggest that diverse processes across contexts contribute independently and/or interdependently to abuse and neglect (Belsky, 1993; Cicchetti & Toth, 1995).

A related principle, *varied teaching methods*, implies that prevention programs are more effective if they emphasize a range of learning opportunities, particularly those that foster skills by way of active learning (Nation et al., 2003). The CPCs offer experiential and interactive exercises for children and various opportunities (e.g., GED classes; consumer education training) for parents to promote their own development. Having *well-trained staff* is critical to effectively delivering these services. Each CPC preschool site is administered under the supervision of a teacher with at least a bachelor's degree and certification in early childhood education (Reynolds, Temple, & Ou, 2007). Plus, like most school-based programs, the CPCs have lower rates of staff turnover than most child care programs for young children.

Furthermore, effective programs tend to be *theory driven*, meaning that their purported effects are generated through hypothesized mechanisms of change. Reynolds (2000) has articulated five pathways through which the CPCs are likely to impact participants. Prior confirmatory evaluations have demonstrated support for the 5-hypothesis model in explaining the CPC program's impacts on diverse outcomes, including educational attainment and juvenile delinquency (Reynolds, Ou, & Topitzes, 2004). Although the CPC program was not designed to prevent maltreatment, we tested and found support for three of the five hypothesized paths of effect: (a) child *social adjustment* (troublemaking behavior),

(b) *school support* (school mobility; school quality), and (c) *family support* (parent involvement; maternal education; family problems).

As expected, we found that family support processes made the most substantial contribution to our mediation models, underscoring that prevention programs are typically more effective when they promote *positive relationships*. In the case of the CPCs, family involvement may have enhanced parent-child bonding. In addition, children and parents may have benefited from interacting with other positive adult models, including teachers, staff and other parents involved in the program. In this way, child and adult behavior could be modified via social learning. Families also may have developed an auxiliary social support system that served as a protective factor against risks associated with maltreatment, such as social isolation (DePanfilis, 1996; Fantuzzo, Stevenson, Kabir, & Perry, 2007) or parent stress (Bonds, Gondoli, Sturge-Apple, & Salem, 2002; Hashima & Amato, 1994).

Another key principle is the amount of *dosage* needed for an intervention to generate effects. The level of service intensity required to prevent maltreatment in a center-based intervention like the CPCs is uncertain, but we conjecture that the average duration of participation in the program likely contributed to its estimated effects.⁹ In support of this hypothesis, Reynolds and Robertson (2003) found that the rate of child maltreatment was lower among families who participated in the CPCs for two years than it was among families who participated for only one year.

In addition to dosage, *timing* matters. The field of maltreatment prevention has primarily focused on interventions delivered during early childhood, especially home visitation programs and other approaches that target pregnant women and families with infants and toddlers. Our investigation adds to emerging evidence indicating that center-based interventions with preschool-aged children also have the potential to prevent maltreatment and associated risks among lower-income families (Love et al., 2005; Magnuson & Waldfogel, 2005).

Nation and colleagues (2003) also surmised that the success of a prevention program partly hinges on its *sociocultural relevance*, or the extent to which the program reflects community norms and practices. In this respect, the CPC program's impacts may have been enhanced by virtue of being embedded within, and by responding to the needs of, the communities it serves. Because of the comprehensiveness of its services, the CPC program may be better equipped to meet the unique needs of children and families than more narrowly focused approaches. Moreover, families may be receptive to school-based programs like the CPCs because they do not suffer from the stigma often associated with mandated programs (Guterman, 1999; Klevens & Whitaker, 2007).

A final principle of prevention pertains not to a program itself, but to the quality of a program's *outcome evaluation*. Notwithstanding its limitations, this study advances the field of maltreatment prevention by virtue of its methodological strengths. To begin, we analyze

⁹As noted previously, eligible children attended CPC preschools for one or two years, during which time parents were asked to attend the program one half-day per week. It should be acknowledged, however, that in practice this requirement represented a "soft mandate," as parents were rarely sanctioned if they failed to participate (Reynolds, 2000).

the impacts of an intervention on actual maltreatment outcomes. Research has identified many interventions that reduce risks associated with child abuse and neglect, but few studies have uncovered direct program impacts on actual measures of abuse and neglect (Reynolds, et al., 2009). In addition, using prospective, longitudinal data to investigate a large sample affords multiple advantages. Because a small proportion of the population experiences officially verified maltreatment, larger samples afford the requisite statistical power to generate valid estimates. Long-term data collection enhances this possibility by aggregating the cumulative incidence of maltreatment over time,¹⁰ and it enhances causal inferences by facilitating efforts to validate the temporal ordering of program involvement, the program's mechanisms of effect, and the program's ultimate impacts on child maltreatment.

In summation, this study marshals further evidence indicating that center-based early childhood interventions have the potential to reduce maltreatment and attendant risks. Tests of mediation articulating direct and indirect paths of effect strengthen the validity of our results. Confidence in the estimated effects of the CPCs on child abuse and neglect is also enhanced by indications that the CPC program is well-aligned with universal principles of prevention.

Future Directions

This investigation contributes to the field of maltreatment prevention while exposing gaps in the knowledge base that should be addressed by future evaluation research. For example, as aforementioned, most studies of maltreatment prevention programs have not examined impacts on actual maltreatment outcomes. Ideally, it should be routine practice for evaluators of maltreatment prevention programs to collect official abuse and neglect histories, child welfare service records, along with maltreatment data gathered from surveys of parents and other collateral reporters (Reynolds et al., 2009). The science of prevention will also be advanced by research into the processes by which interventions impact maltreatment. In addition to mediation analyses, tests of moderation may help to identify risk and protective factors that influence maltreatment along with population subgroups that may benefit most from intervention. Likewise, future studies of the CPCs and other interventions that are delivered at multiple ecological levels should apply multilevel procedures to model nested effects.¹¹

At a broader level, the field continues to suffer from a lack of investment in developing and evaluating innovative prevention strategies. Paradoxically, over the past decade there has

¹⁰Reynolds and Robertson (2003) discovered that CPC effects were not evinced until later maltreatment (ages 10-17) was taken into account. Olds et al. (1997) reported similar findings for the NFP program. There are at least three possible explanations for this pattern of results, the most plausible of which is that statistical power increases as maltreatment reports accrete over time, thereby increasing the probability of detecting significant effects. A second potential explanation is that prevention effects could be suppressed by surveillance bias, whereby program involvement results in greater exposure to mandated reporters of child maltreatment and an increased likelihood of being reported to child protective services. Surveillance bias would presumably dissipate post-program, allowing the program's impacts on maltreatment to surface. Empirical evidence of surveillance bias is scant, however, and what research does exist indicates that its effects are small (Chaffin & Bard, 2006). A third hypothesis is that the effects of the CPC and NFP programs did not emerge until years after program participation. Although these so-called "sleeping effects" have been documented empirically in other fields (e.g., Kumkale & Albarraçin, 2004; Maurer, Mondloch, & Lewis, 2007), it is far more common to uncover intervention effects proximal to an intervention and for effects to fade over time.

¹¹Given that CLS data are nested (e.g., individuals within schools; schools within neighborhoods), multilevel modeling procedures could generate slightly different estimates than those reported herein. For instance, effects associated with school quality may be attenuated somewhat (due to smaller standard errors) in a hierarchical linear modeling context.

been an outpouring of reviews and meta-analyses summarizing the literature—so many, in fact, that a recent *review of reviews* was published (Mikton & Butchart, 2009). However, the majority of empirical work has focused on a few prevention models, namely home visitation programs, parent education programs, and school-based programs to prevent sexual abuse. Other promising maltreatment prevention strategies, such as health services programs and media-based interventions, warrant added scrutiny. Greater attention should also be paid to largely untested policies and programs that may impact maltreatment, such as income transfer programs, drug and alcohol treatment services, and teen pregnancy prevention initiatives.

Paired with prior research (Magnuson & Waldfogel, 2005; Puma et al., 2005), findings from the CLS suggest that center-based preschool programs are also worthy of increased attention vis-à-vis their impacts on maltreatment. Consistent with prevailing ecological perspectives on maltreatment (Belsky, 1993; Cicchetti & Toth, 1995), comprehensive early childhood interventions like the CPCs may impact abuse and neglect through a range of micro-, meso-, and exosystemic processes. These programs hold the added advantage of promoting other positive outcomes for children, parents, and families (e.g., Karoly, Kilburn, & Cannon, 2005; Nelson, Westhues, & MacLeod, 2003; Reynolds, et al., 2007). Provided future studies replicate our findings, public preschool programs delivered to economically disadvantaged families may represent sound maltreatment prevention policy, particularly as a cost containment strategy. Programs like the CPCs are likely to be less expensive to deliver per participant than targeted or mandated interventions delivered by individuals or small agencies and they also may be better equipped with resources needed to reach and maintain contact with higher-risk populations (Gershater-Molko, Lutzker, & Wesch, 2003; Klevens & Whitaker, 2007).

Having said this, one final word of caution is in order. It is uncertain whether the estimated effects of the CPC preschool program on children and families who attended in 1983 or 1984 could be replicated today. Since that time the CPCs have endured cuts in services due to budgetary constraints in the Chicago Public School system (Reynolds, Magnuson, & Ou, 2010). There also have been significant cultural and policy changes over the past generation that may limit the generalizability of our findings. For instance, it is unclear whether the same levels of parent involvement could be achieved in a post-TANF era. Caregivers from low-income families simply may have less time available to participate in their children's school due to TANF work requirements. Federal policy mandates that 50% of all families receiving TANF engage in at least 30 hours of work-related activity per week, or 20 hours per week for single parents (Mahoney & Wiggers, 2007; Schott, 2009). This is a serious concern given that family support processes such as parent involvement appeared to be critical mechanisms linking CPC participation to reduced maltreatment and neglect.

Therefore, programs like the CPCs may need to be supplemented with additional services or tailored to fit the current sociocultural context to achieve similar results. One way forward is to implement validated maltreatment prevention curricula within center-based programs, services that could be offered universally or to higher-risk subgroups. For example, Baydar, Reid, and Webster-Stratton (2003) found that Head Start parents who were randomly assigned to receive the Incredible Years curriculum, a well-known parent training program,

were more likely to engage in supportive parenting and less likely engage in negative or inconsistent parenting than other Head Start parents who did not receive parent training. Another possibility is to increase the level of outreach and home visitation services offered to families. Although all CPC families received at least one home visit, many families received no additional outreach. In order to compensate for less frequent parent involvement in schools, it may be possible to achieve similar levels of parent investment and school-family synchrony by bringing home visitors and other school liaisons into home and community settings.

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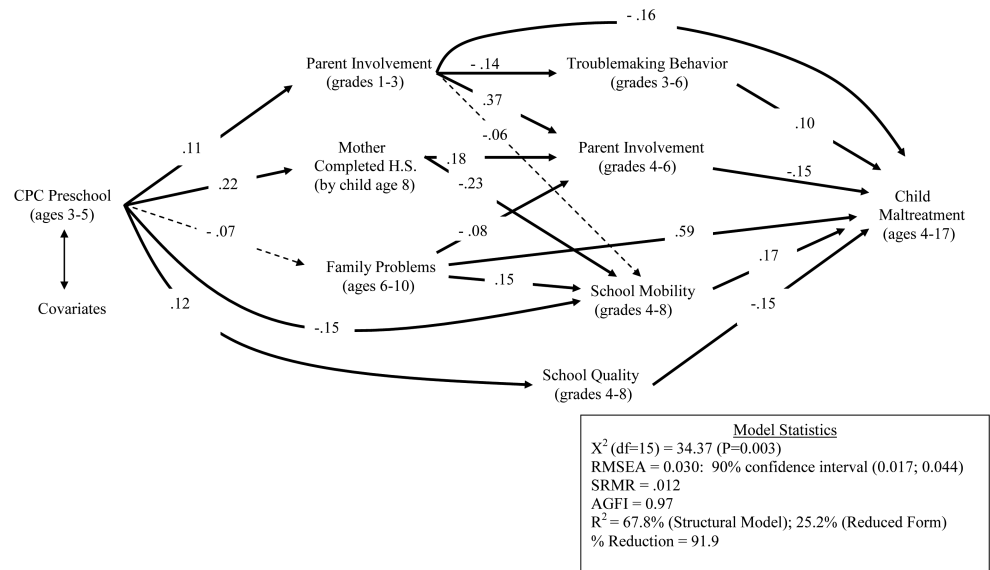


Figure 1. Structural equation model depicting a 2-block solution linking CPC preschool to child maltreatment, ages 4-17 (n=1,411)*
 *Numbers shown with paths are fully standardized coefficients. Unbroken lines in structural model represent paths significant at $p < .01$. Dashed lines represent paths significant at $p < .05$.

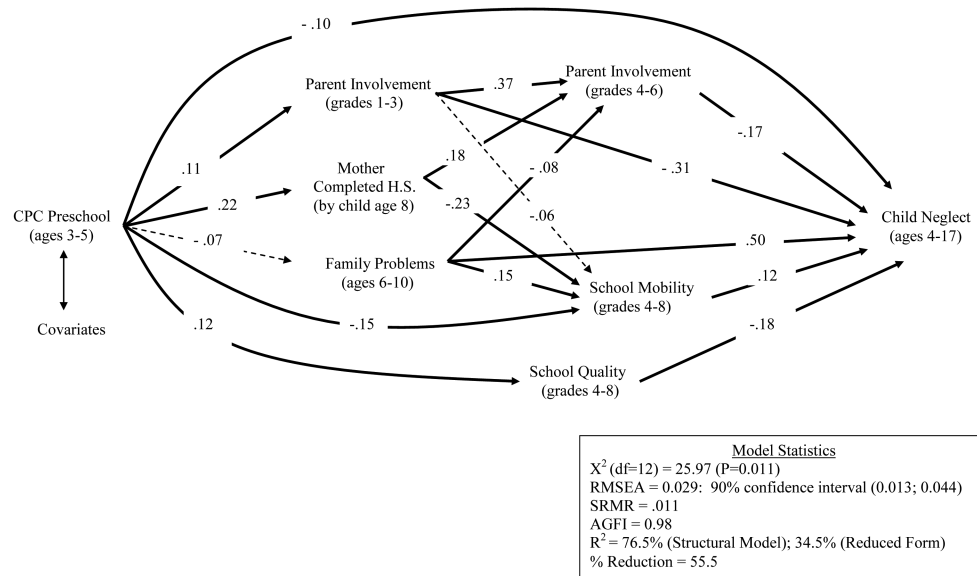


Figure 2. Structural equation model depicting a 2-block solution linking CPC preschool to child neglect, ages 4-17 (n=1,411)*
 *Numbers shown with paths are fully standardized coefficients. Unbroken lines in structural model represent paths significant at p<.01. Dashed lines represent paths significant at p<.05.

Table 1

Correlation Matrix and Descriptive Statistics of Study Measures

Variable	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.
1. Gender	1.00																
2. Race	.027	1.00															
3. Child maltreatment, ages 0-3	-.006	.015	1.00														
4. Low birth weight	.060*	.081*	.052	1.00													
5. Risk index	.010	.132*	.000	.000	1.00												
6. CPC preschool participation	.059*	.000	-.036	-.043	.017	1.00											
7. CPC school-age participation	.009	.022	-.026	-.003	.010	.390*	1.00										
8. Kindergarten word analysis	.077*	.049	.014	-.053*	-.089*	.184*	.170*	1.00									
9. Troublemaking, grades 3-6	-.181*	.024	.042	-.002	.093*	-.065*	-.047	-.151*	1.00								
10. Parent involvement, grades 1-3	.108*	-.011	-.021	-.024	-.164*	.161*	.173*	.306*	-.218*	1.00							
11. Parent involvement, grades 4-6	.133*	-.027	.018	-.061*	-.142*	.099*	.104*	.224*	-.196*	.422*	1.00						
12. Mother completed h.s., age 8	-.003	.112*	-.081*	-.043	-.352	.111*	.063*	.148*	-.084*	.191*	.164*	1.00					
13. Family problems, ages 6-10	.030	.038	.115*	-.025	.029	-.044*	-.010	.037	.029	-.004	-.022	-.077*	1.00				
14. School mobility, grades 4-8	-.054*	.016	.015	.027	.093*	-.130*	-.086*	-.106*	.071*	-.095*	-.120*	-.134*	.071*	1.00			
15. School quality, grades 4-8	.074*	.024	-.033	-.019	-.150*	.147*	.151*	.172*	-.089*	.135*	.057*	.148*	-.043	-.078*	1.00		
16. Child maltreatment, ages 4-17	.034	.035	.128*	.056*	.114*	-.097*	-.057*	-.050*	.092*	-.150*	-.130*	-.125*	.365*	.161*	-.088*	1.00	
17. Child neglect, ages 4-17	.029	.034	.169*	.062*	.103*	-.116*	-.043	-.046*	.086*	-.184*	-.126*	-.102*	.317*	.135*	.083*	.812*	1.00
Range	0-1	0-1	0-1	0-1	0-8	0-1	0-1	0-1	19-99	-1.72-2.95	1-5	0-1	0-1	0-1	0-1	0-1	0-1
Mean/Rate	0.50	0.93	0.02	0.12	4.44	0.65	0.58	63.71	0.03	2.57	2.50	0.61	0.21	0.09	0.12	0.13	0.09
Standard Deviation	0.50	0.25	0.13	0.32	1.83	0.48	0.49	13.30	0.77	1.01	0.99	0.49	0.41	0.28	0.33	0.33	0.28

* p .05