

Early childhood intervention and early adolescent social and emotional competence: second-generation evaluation evidence from the Chicago Longitudinal Study

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Background: To explore whether social or emotional outcomes for high-risk early adolescent youth that attended an established preventive intervention called the Chicago Child–Parent Center Preschool Program (CPC) are moderated by individual, family and program variations.

Purpose: Two questions are addressed: (1) Do the effects of CPC preschool participation on early adolescent social and emotional competency vary by sex of child, family risk status, parent education and family structure? (2) Do estimated effects on early adolescent social and emotional competency vary by program length in the preschool and school-age components of the program?

Programme description: Located in or close to elementary schools in the Chicago public school system, the CPC program provides educational and family-support services to children between the ages of 3 and 9 (preschool to 2nd or 3rd grade). Within a structure of comprehensive services similar to Head Start, the intervention emphasises the acquisition of basic skills in language arts and math through relatively structured but diverse learning experiences that include teacher-directed, whole-class instruction, small-group and individualised activities, and frequent field trips.

Sample: Data for this investigation were drawn from the Chicago Longitudinal Study (CLS). The CLS follows a cohort of 1539 disadvantaged, minority children (93% African-American, 7% Latino or Other) who were born in 1980 and attended kindergarten programs within the Chicago Public School System in 1985/86. Out of the full sample of 1539, a subset of 989 children (64% of the sample) received preschool services from one of Chicago's 20 Child–Parent Center (CPC) programs. An additional set of 550 children (36% of the sample) did not attend CPC preschool and serve as a non-CPC comparison group. The study sample are 1378 primarily African-American youth who participated in the CLS and had scores for two or more identifiable social and emotional competency indicators by age 15.

Design and methods: Follow-up of a non-randomised alternative intervention matched-group cohort at age 15 years. Differential effects were estimated using multiple regression. Program interaction terms (e.g., program \times sex or program \times parent high school graduate) were added to the basic regression model specification that already included the main effects of each variable included in the interaction.

Results: Some 12% (or 11 of 92) of the interaction terms for social and emotional outcomes by age 15 were significant at the 0.01 or 0.05 level. The most frequently detected differential effects were for family risk level (high or low) and sex of child.

Conclusions: Most children appear to benefit equally from participation in the CPC program. The prediction from ecological theory that children experiencing a large number of environmental risk factors (e.g., high family risk status and low

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parental education levels) are more likely to benefit from program participation was supported.

① **Keywords:** ????

Over the past three decades, research on the development of social and emotional competence for at-risk youth has become more systematic and sophisticated (see Devaney et al. 2006; Elias and Arnold 2006; Elias, O'Brien, and Weissberg 2006; Embry 2002; Fraser, Kirby, and Smokowski 2004; Greenberg et al. 2005; Greenberg, Domitrovich, and Bumbarger 2001; Kam, Greenberg, and Kusché 2004; Luthar, Cicchetti, and Becker 2000; Niles, Reynolds, and Nagasawa 2006; Reynolds 2000; Shaw et al. 2003). These studies have helped promote important progress in early childhood educational research. Moving from a primary focus on cognitive outcomes (such as IQ and literacy skills) to the development of children's social and emotional competence in pre-adolescence is one example (Farber and Egeland 1987; Luthar and Zigler 1991; Luthar, Cicchetti, and Becker 2000; Masten 1994; Masten and Coatsworth 1998; Rutter 1987; Smokowski et al. 2004).

Despite the knowledge that has been developed on early childhood programs and social and emotional competence beginning in the 1960s (see Beller 1983; Gray, Ramsey, and Klaus 1983; McKey et al. 1985), important questions remain unanswered. First, there is a lack of studies investigating social and emotional competency in adolescent minority youth (Luthar 1997; Niles et al. 2006; Reynolds 2000; Ramey and Ramey 2004; Schweinhart and Weikart 1997; Winfield 1995). It is unclear, for example, how social and emotional competence develops for African-American youth growing up in poor inner-city neighborhoods and if that development is different from children of other races. Second, findings on the role of moderating (or interacting) factors, such as gender of participant, level of family risk, program duration and curriculum type, on the development of social and emotional competence are almost non-existent in the early childhood education research literature (Guralnick 1989, 1993, 1997; Reynolds 2000). The purpose of this study is to expand this body of knowledge and explore whether social or emotional outcomes for high-risk early adolescent youth are moderated by individual, family and program variations. A comprehensive early childhood program located in Chicago, USA, called the Chicago Child-Parent Center (CPC) Preschool Program, is investigated. Two questions are addressed:

- (1) Do the effects of CPC preschool participation on early adolescent social and emotional competency vary by sex of child, family risk status, parent education and family structure?
- (2) Do estimated effects on early adolescent social and emotional competency vary by program length in the preschool and school-age components of the program?

Few other studies have investigated such interaction effects, yet they would be predicted by resilience theory and ecological systems theory, both of which are commonly used to inform the conceptual models of early childhood intervention for high-risk children, including the CPC Program (see Reynolds 1995, 1998, 2000).

Characterising social and emotional competence

In general, social and emotional competence has been described as a wide range of developmental indicators that children need for successful social adaptation (see Embry

2002; Greenberg, Domitrovich, and Bumbarger 2001; Kam, Greenberg, and Kusché 2004; Shaw et al. 2003). This broad description is consistent with the specific outcomes used for this study (in parentheses). As described in recent research (see Devaney et al. 2006; Elias and Arnold 2006; Elias, O'Brien, and Weissberg, 2006; Greenberg et al. 2005), these indicators consist of positive interactions with teachers and peers (peer relationships), emotion knowledge (acting-out behaviors and shyness), emotion regulatory abilities (frustration tolerance and task orientation), relationship skills (assertive social skills) and participation in special education programs for behavior problems (see Carlton 2000; Howes and Smith 1995; Izard et al. 2001; Jacobsen and Hofmann 1997; O'Neil et al. 1997).

Second-generation research of early childhood intervention: what we know

Evaluations of early childhood intervention programs have entered a second-generation of evaluation efforts. These efforts have advanced beyond a sole reliance on average program effects to increased attention to the heterogeneity of impact estimates through moderation analyses (Guralnick 1991, 1993, 1997; Reynolds 2000). Second-generation research hypothesises that specific attributes of early intervention programs should promote gains within a number of subgroups including the child, the family and the educational environment (Guralnick 1991, 1993, 1997; Reynolds 2000). It has also inspired a renewed interest in early childhood intervention and the development of social and emotional competence (Guralnick 1989, 1993, 1997; Hart, Atkins, and Fegley 2003; Nelson, Westhues, and MacLeod 2003; Reynolds 2000). This emerging area of research is based on a wide collection of studies, including randomised trials and longitudinal studies that span from birth through adolescence or adulthood (see Bar-On, Maree, and Elias, 2007; Greenberg et al. 2005).

Although limited in number, previous moderation studies of small-scale model programs report that girls who participated in an early childhood intervention demonstrated higher achievement test scores than program boys but not by large amounts (Barnett 1995, 1998). Olds's (1988) evaluation of a home-visiting program indicated that high-risk children (those with lower cognitive skills and from families that demonstrated poor parenting skills) benefited from the program more than participants at lower risk did (Sweet and Appelbaum 2004). In the Brookline Early Childhood Program, Pierson (1988) found that children of college graduates benefited more than children of non-college graduates. More recently, Burchinal et al. (2000) found that children who have traditionally been at risk of not doing well in school (e.g., those who live in poverty or are of minority ethnic background) are affected more by the quality of childcare experiences than other children. Consistent with this finding, Reynolds (2000) reported that children who attended comprehensive early childhood programs in relatively high-poverty neighborhoods (more than 60% low income) benefited more on scholastic outcomes and the need for remedial services (e.g., reading and math achievement and less grade retention) than children who attended programs in neighborhoods with lower rates of poverty at age 15. Although many studies have investigated the differential effects of early childhood program curricula on child and family outcomes, findings have been generally mixed, and the evidence has been mostly limited to children in poverty (see Graue et al. 2004; Marcon 1999; Schweinhart and Weikart 1997; Stipek et al. 1992). Others have failed to detect differential effects of program curricula (Lazar et al. 1982) and have argued that many instructional methodologies can be helpful for children provided the approaches are well implemented (Graue et al. 2004).

As indicated above, those early childhood education research studies that have explored moderating program effects almost always consider indicators of scholastic achievement or the need for remedial services, such as grade retention or special education as outcome measures. Because of this, the presented study is important in two ways. First, it helps to fill the gap of knowledge about whether or not early childhood programs affect the social and emotional development (as opposed to cognitive-based outcomes) of adolescent minority youth, and second, it incorporates second-generation research (moderation) analyses that addresses the question of which children and families benefit the most – and least – from a high-quality early childhood intervention program. Taken together, these two contributions provide both educational researchers and practitioners more knowledge of the importance of social and emotional development and information about using limited resources more efficiently while improving the effectiveness of program services for participants.

The Chicago Child–Parent Center (CPC) Program

Program description

Located in or close to elementary schools in the Chicago public school system, the Chicago Child–Parent Center (CPC) program provides educational and family-support services to children between the ages of 3 and 9 (preschool to 2nd or 3rd grade) (Reynolds 2000). Within a structure of comprehensive services similar to Head Start, the intervention emphasises the acquisition of basic skills in language and math through relatively structured but diverse learning experiences that include teacher-directed, whole-class instruction, small-group and individualised activities, and frequent field trips (Reynolds 2000).

Each center is directed by a head teacher and two coordinators. The parent–resource teacher coordinates the family-support component (Reynolds 2000). The school–community representative provides outreach to families (Reynolds 2000). Major elements of the intervention include: low child-to-staff ratios in preschool (17:2), kindergarten (25:2) and the primary grades (25:2); an intensive parent program that includes receiving parenting education, volunteering in the classroom, attending school events and field trips, furthering educational attainment and receiving home visitation; and health and nutrition services, including screening and diagnostic services, speech therapy, meal services and referrals by program nurses (Reynolds 2000).

After full-day or part-day kindergarten, school-age ‘follow-on’ services are provided under the direction of the curriculum parent–resource teacher (Reynolds 2000). The school-age intervention is open to any child in the school, either in the 1st or 2nd grade in 14 sites or 1st through 3rd grade in six sites (Reynolds 2000). The eligibility criteria for the intervention are: (1) residence in a high-poverty (Title I) school area, (2) demonstration of educational need as assessed by a screening interview and staff outreach and (3) agreement of parent(s) to participate. Rates of participation of eligible children were high as the program was located in areas not served by other preschools (Reynolds 2000). The high level of community participation helps ensure that findings are representative of eligible children rather than sample selection (Reynolds 2000). Figure 1 illustrates the organisational structure of the Child–Parent Center Program.

Methods of presented study

Sample description

Data for this investigation was drawn from the Chicago Longitudinal Study (CLS: Reynolds, 1998; Reynolds et al. 2001; Smokowski, Reynolds, and Bezruczko 1999).

The CLS follows a cohort of 1539 disadvantaged, minority children (93% African-American, 7% Latino or Other) who were born in 1980 and attended kindergarten programs within the Chicago public school system in 1985/86. Out of the full sample of 1539, a subset of 989 children (64% of the sample) received preschool services from one of Chicago's 20 Child-Parent Center (CPC) programs. An additional set of 550 children (36% of the sample) did not attend CPC preschool and serve as a non-CPC comparison group. The study sample were 1378 primarily African-American youth who participated in the CLS and had scores for two or more identifiable social and emotional competency indicators by age 15 (Niles 2004). Some 89% of the original sample met this score criterion. Table 1 presents the equivalence of program and comparison groups.

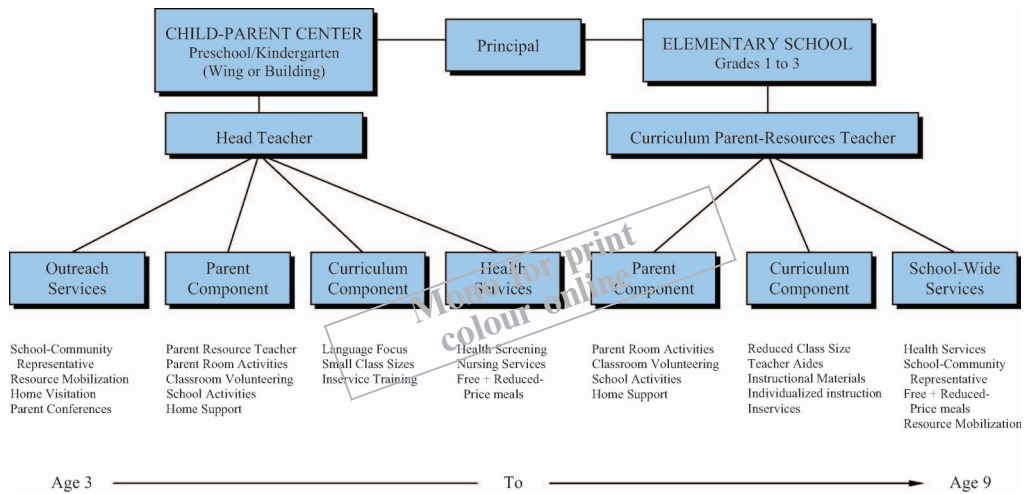


Figure 1. Child-Parent Center Program.

Table 1. Equivalence of program and comparison groups.

Indicator	CPC group n = 95	Non-CPC group n = 483	Significance
Percent of sample with two or more competency indicators	90.5	87.8	0.100
Percent girls	53.0	47.1	0.037
Percent black	93.0	93.0	0.949
Percent high school completion for parent through child (8)	66.5	59.3	0.016
Percent single parent by child age 8	70.2	66.9	0.276
Percent parent were teen at child's birth	23.2	19.2	0.158
Percent parent unemployment by age 8	64.9	60.8	0.202
Percent ever reported receiving free lunch by age 8	92.3	92.8	0.768
Percent child/neglect report by age 4	0.016	0.028	0.135
Percent income level is 60% + poverty for school area	0.777	0.729	0.048
Percent missing data from parent education or free lunch report	22.5	25.4	0.241
Family risk index (0-6)	2.95	2.83	0.176

Analytic technique

Consistent with the method of Reynolds (2000), moderating effects were estimated using multiple regression. Program interaction terms (e.g., program \times sex or program \times parent high school graduate) were added to the basic regression model specification that already included the main effects of each variable included in the interaction (Reynolds 2000; Niles 2004). These terms were included sequentially for each program indicator (Reynolds 2000; Niles 2004). Only two subgroup characteristics were included in any one model specification (Reynolds 2000; Niles 2004). To determine if girls benefited more than boys, for example, program \times sex status was entered in the model after the main effects (Reynolds 2000; Niles 2004). Other interactions (e.g. involving program \times parent education) were estimated separately and included sex of child and the sex by program interaction (Reynolds 2000; Niles 2004). Any covariate that was tested as a moderator was excluded as a covariate in the interaction model in order not to confound the results (Niles 2004). Effects for preschool participation and follow-on participation, however, were estimated simultaneously (Reynolds 2000; Niles 2004).

Effect sizes (ES) were estimated. This study used the following formula to calculate ES: mean of control group – mean of treatment group/total sample standard deviation (Cohen 1988). Modest, but practically meaningful effect sizes have been defined as $d = 0.20$ (see Cohen 1988; Kirk 1996), while a medium effect is $d = 0.50$ and a large effect is $d = 0.80$ (Cohen 1988). According to Cohen (1988), an ES of 0.20 is equivalent to a correlation of 0.10 between program participation and outcome (Reynolds 2000; Rosenthal 1991). Values of 0.20 or above were interpreted as being practically significant (i.e., whether the ES is large enough to be observed in the ‘real world’). Data were analysed in STATA and a total of 92 interaction terms were tested.

Independent variables*CPC program participation*

Early childhood intervention was measured by participation in one of Chicago’s Child–Parent Center programs ($n = 895$). Program participation was scored as a dichotomous variable – whether or not the child attended a CPC preschool (coded 1). Non-CPC preschool participants ($n = 483$) enrolled in alternative, but similar, all-day kindergarten programs at age 5 were coded 0. All children who participated in CPC preschool also enrolled in CPC kindergarten. Non-CPC preschool participants enrolled in all-day kindergarten programs at age 5 (either a Chicago Effective Schools Project (CESP) program or the kindergarten program in the centers).

Family-level moderator variables*Sex of child*

Girls were coded 1 and boys were coded 0 as obtained from school records.

Family risk index (FRI)

Because the accumulation of risk factors may pose a stronger threat to functioning than any particular risk factor on its own (Garmezy 1993; Rutter 2001; Seifer et al. 1992), a

Family risk index (FRI) was used in the analysis. The FRI was the sum of the five dichotomously defined risk indicators collected when the child was age 8, 10, 12 and 17. They are: (1) parent did not graduate from high school; (2) child was eligible for a free lunch subsidy (during school-age data collection); (3) there were four or more children in the family; (4) parent was not working full or part time; and (5) child lived in single parent or non-married family. The five main indicators in this index have been similarly used in prior studies (Bendersky and Lewis 1994; Rutter 1987; Reynolds 1998, 2000). For this study, the age 8 FRI is used because it represents the most proximal measures of risk relative to program participation. Those with three or more identified risks were considered to be high risk and coded 1, all others 0. This definition is consistent with other early childhood studies exploring family risk levels (see Olds 1988; Reynolds 2000).

Parent education level

This measure designates whether or not the youth's parent completed high school or higher levels of education (coded 0 if parent's education was less than completing high school and 1 if completed high school or higher levels of education) at age 8 of the child.

Family structure

This variable indicates whether or not the youth grew up in a single parent family (1 = yes; 0 = no) at age 8.

Four or more children in household

If the household had four or more children under the age of 18 residing in the home, they were coded 1, all others 0.

Program-level moderator variables

Two years versus one year of preschool

This measure was coded 1 for children who participated in the CPC program for 2 years. Children with 1 year of participation in the CPC program were coded 0.

Extended versus less extended

This measure was coded 1 for children who participated in each component of the CPC program from preschool to 2nd or 3rd grade (4–6 years). Children with less extensive participation in the CPC program (four or fewer years) were coded 0. Those having 4 years of participation but only 1 year of follow-on intervention (i.e., program entry at age 3) were not considered extended program participants (coded 0). In previous studies (Reynolds and Bezruczko 1993; Reynolds 1994; Reynolds and Temple 1995), this indicator of program participation has shown the strongest associations with social competence outcomes.

Dependent variables

This study only tested indicators of social and emotional competency in early adolescence (ages 12–15) rather than the usual focus on early cognitive and scholastic outcomes (i.e.,

reading and writing scores at age 9). Following the approach in previous studies (Niles 2004; Reynolds 2000), teacher-rated classroom behaviors were taken from the *Teacher-child rating scale* (T-CRS; High-tower et al. 1986). Outcomes are measured when youth are ages 12–15.

Acting-out behaviors

Acting-out behaviors refer to being disruptive or fidgety in class, having difficulty sitting still, disturbing others while they are working, constantly seeking attention and being overly aggressive to peers, and being deviant, obstinate or stubborn. On this measure, a higher value reflects a less favorable outcome and values can range from 6 to 30.

Assertive social skills

Assertive social skills refer to defending one's views under group pressure, being comfortable as leader, participating in class discussions, expressing ideas willingly and questioning rules that seem unfair or unclear. The scale can range from 5 to 25, where higher values represent greater social skills.

Emotional or behavior disorder (EBD): special education services

A dichotomous measure of the presence of any special education service for emotional behavior disorders (EBD) among children from age 12 through 15 was used. This measure comes from administrative records of the Chicago public schools.

Frustration tolerance

Frustration tolerance refers to the child's ability to accept things not going his/her way, to ignore teasing, to accept limits and to cope well with failure, for example. The *Frustration tolerance scale* can range from 5 to 25, with higher values reflecting more favorable outcomes. The frustration tolerance indicator was reverse scored.

Peer social skills

Peer social skills refer to having many friends, being friendly toward peers, making friends easily and being well liked by classmates, for example. The scale can range from 5 to 25.

Shyness/anxiety

The *Shyness/anxiety scale* refers to the extent to which the child is withdrawn, shy, anxious, nervous, frightened or tense; expresses feelings; and is unhappy. The scale can range from 6 to 30, with higher values reflecting greater levels of shyness and anxiety.

Task orientation

The *Task orientation scale* has five items regarding completing work, being well-organised, functioning well even with distractions, working well without supervision and being a self-starter. The scale ranges from 5 to 25.

Total competency index

Along with an additional five competency indicators, the 15 items from the assertive social skills, task orientation and peer social skills scales are summed to create the *Total competency scale*. The resulting scale's range is from 20 to 100, with higher scores reflecting more overall competence.

Total problems index

The *Total problems scale* combines 18 items regarding acting-out, frustration tolerance and shyness/anxiety. While others' use of this indicator includes a 'learning problem' component, we exclude this element because it is more closely related to academic achievement than measures of social and emotional development.

Table 2 presents the age when measure was taken, the number of items, the descriptive statistics and reliability coefficients for each dependent variable. There are no 'ceiling' or 'floor' effects, with the mean values being in the middle of the possible range for all measures. Therefore, it is assumed that these measures can reliably detect between-group differences, if they exist. Additionally, the correlation coefficients (not shown) between the measures are generally low or moderate, suggesting that the indicators used in our analysis measure distinct concepts.

Covariates

Several socio-demographic indicators were collected from school entry to the 10th grade and served as covariates in this study. These covariates were chosen because they have been used for multivariate adjustment in prior research on the CPC program (see Reynolds 2000; Niles 2004) and because they were hypothesised to have the greatest potential for confounding social and emotional outcomes (Reynolds 1994, 1995, 2000; Reynolds et al. 2001).

Table 2. Descriptive statistics of outcome measures.

	Age measured	Number of items	Mean	Minimum	Maximum	Standard dev.	Reliability
Acting-out behaviours	12–13	5	12.4	6.0	30.0	6.7	0.94
Any emotional or behavior disorder	15	1	0.1	0.0	1.0	0.2	0.96
Assertive social skills	12–13	5	15.6	5.0	25.0	4.4	0.87
Frustration tolerance	12–13	5	14.4	5.0	25.0	4.9	0.92
Peer social skills	12–13	5	16.7	5.0	25.0	4.1	0.93
Shyness/anxiety	12–13	6	10.0	6.0	28.0	4.4	0.84
Task orientation	12–13	5	14.5	5.0	25.0	5.2	0.93
Total competence index	12–13	20	61.2	20.0	100.0	16.8	0.85
Total problems index	12–13	18	37.2	18.0	84.0	15.3	0.88

Note: Sample size ranges from 1006 to 1,52, depending on the measure.

Any follow-on participation

This measure was coded 1 for children who participated in the CPC primary grade intervention component during the 1st to 3rd grades (in 1986–89) and 0 for children who did not participate but were enrolled in a regular school program.

Race/ethnicity of child

African-American children were coded 1 and Hispanic and Caucasian children were coded 0.

Child abuse/neglect

Children who had an administrative record of any child abuse or neglect (0–4) by age 8 were coded 1, otherwise 0.

CPC program sites

Twenty dichotomous indicators of CPC site participation were used.

Missing on FRI

Missing on any of the FRI variables was coded 1 if no answer on parent education, marital status, or a question about the number of children in the household was provided. Families who did not answer these questions were assumed to have resided in a high-poverty neighborhood, have less than a high school degree, to be a single parent or unmarried. A parent who answered all background questions received 0. Some 12% of parents did not answer questions in one of the above listed categories, and were coded 1 for missing data.

Additional covariates

The sex of child and family risk were also used as covariates but excluded in the regression model when tested for moderation effects.

Given the large number of interaction terms, for overall effects the p-value was set at 0.01 to reduce the likelihood of a Type I error. However, to provide a more robust set of results, program effects were interpreted at the 0.05 probability level. This is consistent with previous research (Reynolds et al. 2006).

Results

Results have been organised by outcome and program indicator for significant (at either the 0.01 or 0.05 level) interaction effects only: girls versus boys, risk status and duration of participation. Some 11% (or 10 of 92) of the interaction terms for social and emotional outcomes by age 15 were significant at the 0.01 or 0.05 level. The most frequently detected differential effects were for family risk level (high or low) and sex of child. Table 3 presents the results in alphabetical order.

Table 3. Significant effect sizes.

Outcome	Boys		Girls		Low-risk		High-risk		Duration	
	ES	P-value	ES	P-value	ES	P-value	ES	P-value	ES	P-value
Acting out behaviors	0.38	0.008**	0.16	0.008**	0.18	0.004**	0.33	0.004**	0.28	0.084
Any EBD placement by age 15	0.17	0.158	0.14	0.158	0.22	0.089	0.22	0.089	0.20	0.099
Assertive social skills	0.20	0.224	0.19	0.224	0.17	0.009**	0.24	0.009**	0.19	0.521
Frustration tolerance	0.16	0.108	0.14	0.108	0.19	0.447	0.24	0.447	0.24	0.781
Peer social skills	0.19	0.187	0.16	0.187	0.17	0.010**	0.25	0.010**	0.23	0.007**
Shyness/anxiety	0.18	0.110	0.17	0.110	0.19	0.697	0.28	0.697	0.12	0.964
Task orientation	0.16	0.333	0.15	0.333	0.19	0.058	0.051	0.058	0.28	0.020*
Total competence index	0.33	0.009**	0.17	0.009**	0.21	0.220	0.21	0.220	0.22	0.851
Total problems index	0.29	0.005**	0.18	0.005**	0.16	0.047*	0.22	0.047*	0.17	0.154

Note: **Statistically significant, $p < 0.01$; *Statistically significant, $p < 0.05$.

495-
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Acting-out behaviors at ages 12–13

Gender was a significant moderator of the effects of program participation. Relative to comparison group boys, preschool boys experienced a significantly lower rate of acting-out behaviors at ages 12–13 ($p = 0.008$; $d = 0.38$). Families that were considered high risk also benefited more on the acting-out behaviors at ages 12–13 measure ($p = 0.004$; $d = 0.33$).

Assertive social skills ages 12–13

Family risk level moderated the link between CPC participation and assertive social skills at ages 12–13. Compared to families with lower risk, high-risk families had greater assertive social skills at ages 12–13 ($p = 0.009$, $d = 0.24$). In contrast to the youth outcomes, parent education was more likely to moderate the effects of program participation on assertive social skills outcomes, although the estimates did not reach significance.

Peer social skills ages 12–13

Relative to children who resided in lower-risk families, children of high-risk families benefited more on peer social skills ($p = 0.010$; $d = 0.25$). Children who attended the program for more than 1 year also had greater peer social skills at age 12–13 ($p = 0.007$; $d = 0.23$).

Task orientation ages 12–13

Children who experienced longer duration of program participation were more likely to benefit on task orientation at ages 12–13 than those with less intervention ($p = 0.020$; $d = 0.28$). Risk status moderated this outcome as well, although it only reached marginal significance levels ($p = 0.051$; $d = 0.19$).

Total competence ages 12–13

Relative to CPC girls, CPC boys benefited more on the total competence outcome at age 12–13 ($p = 0.009$; $d = 0.33$).

Total problems at ages 12–13

Gender moderated the estimated effect of CPC participation on total problems at ages 12–13. Boys had a larger effect size ($p = 0.005$; $d = 0.29$) than girls ($d = 0.18$). Those children that resided in a high-risk household also benefited more (had less total problems) than those that did not ($p = 0.047$; $d = 0.22$).

No moderator effects were found for frustration tolerance at ages 12–13, shyness/anxiety at ages 12–13 or any EBD placement through age 15, although the CPC program group had higher positive effects sizes.

Discussion

With regard to differential program effects within the study sample, findings were limited and led to the tentative conclusion that most children appeared to benefit equally from

participation in the CPC program. The prediction from ecological theory that children experiencing a large number of environmental risk factors (e.g., high family risk status and low parental education levels) are more likely to benefit from program participation was supported, albeit modestly. The most frequently detected differential effects were for sex of child, with boys benefiting more than girls. Statistically significant effect sizes ranged from 0.38 (boys benefiting more than girls on acting-out behaviors) to 0.22 (total problems – CPC group), and although modest in size, most were at or above the level of practical significance (0.20). The results of this study are consistent with previous moderation analyses using these data (see Reynolds 2000). While the results from this study were modest (10 of 92 interaction were significant at the 0.01 or 0.05 level), the findings are worth noting since there remains much work to do in understanding how best to design studies that include samples of sufficient size and variation in key attributes, program characteristics (for example, curriculum approaches or parents' involvement) and neighborhood conditions (Reynolds 2002).

These findings supplement the existing literature on early intervention and children's social and emotional development in several ways. First, while Head Start, the largest federally funded comprehensive early intervention program for economically disadvantaged children, encourages 'positive social development', few studies have evaluated whether program participation ultimately increases longer-term social and emotional development (McKey et al. 1985; Olmsted 1991; Slaughter et al. 1989; Rubin and Coplan 1993; Taylor and Machida 1994). Secondly, this study adds to the existing evidence on testing moderation effects for large-scale public early intervention programs, although results suggest only modest support for differential program effects. However, many of the factors examined are alterable (e.g., duration of program participation and parental education levels) which may help program administrators target scarce resources more efficiently and improve the effectiveness of services for participants. Finally, this study is the first, to our knowledge, to highlight program and family moderation effects on early adolescent social and emotional outcomes from age 12 through 15 using such a large public school sample.

Why would the CPC intervention promote differential effects for low-income children?

The finding that boys derived a greater benefit from the CPC program is not surprising. Boys residing in the CPC program neighborhoods are more likely to be at higher risk for negative social and emotional outcomes, such as juvenile delinquency (Reynolds et. al. 2001). Further, for those families in high-poverty areas, socially approved male role models may be more aggressive (Cauce 1995; Cauce, Ryan, and Grove 1998; Carlton 2000). This suggests that social learning plays a role in increasing risk factors for boys. Consistent with this finding, families that were considered high risk also benefited more on many of the outcomes. Length of program participation also demonstrated moderation effects. Relative to those who had less duration of participation, children who experienced longer duration of program participation benefited more from the CPC program. This supports the early childhood hypothesis that duration of participation is important. Schorr and Schorr (1988) summarise this view of early childhood intervention by noting, 'the programs that work best for children and families in high-risk environments typically offer comprehensive, longer duration and intensive services' (1988, xxi–xxii). This finding is also theoretically supported. By being exposed to increasingly complex interactions, over time, a child might be more motivated to stay on task, manipulate, elaborate and imagine (Bronfenbrenner 1985; Bronfenbrenner and Neville 1994).

For education practitioners and researchers alike, several additional explanations for the CPC program affecting participants differentially are worth noting. First, a system of intervention is in place beginning at age 3 that continues to the early grades. This school-based system promotes stability in the children's learning environment, which can provide smooth transitions to formal schooling. A second key feature is that, as a public school program, all CPC teachers have relevant credentials (e.g., at least a bachelor's degree) and also receive ongoing training (promoting lifelong learning). The professional development of teachers has been shown to be related to quality of early childhood programs, and program quality predicts developmental outcomes for children. Third, instructional activities are responsive to all of children's learning needs, but special emphasis is given to literacy and school readiness through a diverse set of learning activities. Fourth, there is a clear focus on comprehensive results. Clear results and expectations are specified and used to guide individual planning for all CPC children and based on all domains of development (social-emotional, physical, motor, cognitive, language and approaches to learning). Fifth, parental and family involvement is high. CPC parents or family members are required to participate in the program for a minimum amount of time, such as at least one half-day per week. Parent involvement is further emphasised through home visits from project staff, involvement in family activities that extend the classroom curriculum, volunteering in the classroom, going on field trips, participating in the parent resource materials, providing home support for learning and receiving parenting education. Given the growing evidence of long-term positive effects of early intervention, the processes through which intervention leads to greater well-being are better understood. These and related factors need to be investigated across a wider range of outcomes and interventions.

Limitations

We note three significant limitations. First, because of the quasi-experimental design of this study, self-selection into the program cannot be ruled out as threats to the validity of findings. Confounding variables affecting both preschool participation and social and emotional competence may have been omitted or not fully considered in the regression models. Thus, the major results of this study – the significant program effects on some of the outcomes and the absence of program effects on others – should be interpreted cautiously as well as verified with additional samples.

A second limitation of this study was the use of a limited measure of social and emotional competence. Some of the early adolescent scales (i.e., total competency and total problems) have not been standardised and explored a restricted range of early adolescent social and emotional development. These attributes may have resulted in conservative rather than liberal estimates of intervention effectiveness. It is unlikely, however, that the measurement of social and competence sufficiently explains the lack of program effects across regression models.

Third, children had the opportunity to participate in up to three years of follow-on intervention. Although their participation in the follow-on program was statistically controlled in the analysis, the implementation of the total intervention represents a level of commitment that is unique among intervention programs and school contexts. Thus, evidence from other programs and contexts is necessary before greater generalisability of findings is warranted.

However, several design features and results reduce the magnitude of these limitations. First, the groups were well matched on several family factors. These included parent education, family income (i.e., eligibility for free lunch), single-parent family status and the

numbers of cumulative risk factors. All children in the CLS were eligible for and participated in government-funded services in preschool or kindergarten. Group differences that did exist were taken into account in the analysis. The provision of comprehensive services, a strong emphasis on parent involvement in school and in children's education, and a child-centered focus on language development are also strengths of the program (Chafel 1992; Schweinhart and Weikart 1997). In addition, the CPC program has been successfully implemented for nearly four decades; thus, it is an established program that has continued to strive to meet the changing needs of families.

Qualifications and conclusion

This study supports contemporary literature that suggests early childhood intervention affects social and emotional development in early adolescence. This conclusion is qualified, however, because of the modest effect sizes. In addition, further research would add to the limited evidence that attempts to clarify whether different effects are produced by various program designs to determine, for example, whether location of early childhood centers (i.e., in an attached classroom or separate facility from the elementary school), or families experiencing high levels of segregation benefit more on social and emotional outcomes. It would also be helpful to determine whether different populations of students respond differently to early childhood education in general or to particular program models.

Finally, second-generation research, while interested in who benefits the most from programs and services, is also focused on the mechanisms that promote success. Subsequent research should not only answer who benefits most from the early childhood intervention programs, but also why and how the benefits are generated. Although the contextualisation of development is highly emphasised in the research literature, there is still a scarcity of studies analysing the mediation of the external sources on children's development of social and emotional competence.

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