



CHILD PARENT CENTER INTERVENTION IMPACT ON EXECUTIVE FUNCTIONING

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Introduction

The Child Parent Center (CPC) intervention targets school readiness and sustaining academic gains for preschool students from low socioeconomic backgrounds.

- The development of executive function (EF) is associated with several important life outcomes, including academic achievement (Diamond & Lee, 2011).
- Research on the development of EF skills points to the preschool years as a sensitive period of development.
- The unique impact of the CPC model on developing executive function skills has not previously been assessed.
- This program of high-quality preschool with small class sizes, strong parental involvement, and early childhood professional development may positively influence EF development in an otherwise vulnerable population.

Hypotheses

We hypothesized that the high exposure group (i.e., greater number of days in CPC instruction) would demonstrate stronger EF in comparison to the low exposure group (i.e., fewer days of instruction).

Participants

Participants volunteered into the program, and were included in the study based on similar poverty and low parent education levels.

For the low exposure group, the MEFS was administered to a cohort of preschool students (n = 52) enrolled in the CPC Midwest Expansion Project at two locations in Rochester, MN after receiving services for 2 months. Both Rochester sites were combined into a single low exposure cohort after an independent samples t-test revealed no significant differences between them, $t(59) = -0.582, p = 0.562$. The high exposure group comprised of a CPC cohort of (n=37) preschool students at a site in Madison, WI, after 7 months of services. Across all sites, there were no significant differences in performance on the MEFS task between males and females, $t(96) = 0.482, p = 0.631$.

Methods

Executive function was measured using the Minnesota Executive Function Scale (MEFS; Carlson & Zelazo, 2014), an iPad application of the Dimensional Change Card Sort (Zelazo, 2006) normed on 7,410 typically developing children ages 2-13 years. Students sort cards based on the given rule (or rules) and receive a score from 0-100 based on the accuracy and speed of their performance. A higher MEFS score indicates a higher level of executive functioning.

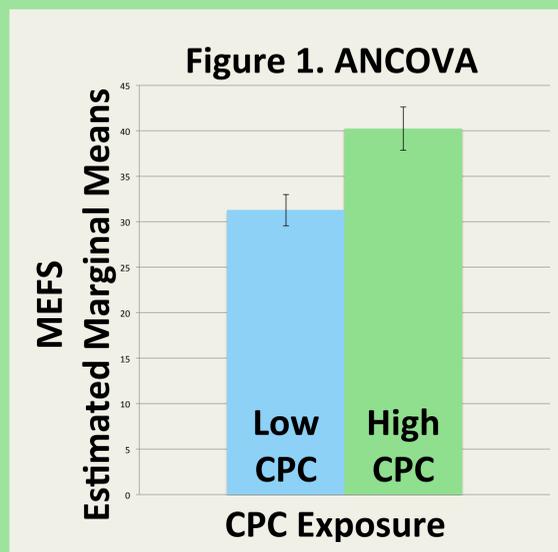
Table 1.

Site	Rochester 1 n= 45			Rochester 2 n= 16			Madison n= 37			Statistic		
	Mean	SD	SE	Mean	SD	SE	Mean	SD	SE	t(df)	F(dfw, dfb)	p-value
Sex (M:F)	21 : 24			5 : 11			19 : 18			0.482(96)		p=0.631
Age (months)	50.490	6.741	1.005	48.560	7.589	1.897	59.950	3.350	0.551		33.869(2, 95)	p<.001
Days in CPC	22.311	1.104	0.165	23.000	0.000	0.000	126.865	0.787	0.129		156873.847(2, 95)	p<.001
MEFS Score (0-100)	28.110	13.678	2.039	25.810	13.197	3.299	46.430	13.11	2.155		23.176(2, 95)	p<.001

Results

A Pearson's product-moment correlation was run to assess the relation between Age (in months), MEFS performance, and CPC classroom exposure (days in CPC) (Table 2).

- The significant correlation between age and the MEFS is expected, as the MEFS score is highly sensitive to age-related development in executive functioning.
- The correlation magnitude for amount of days in the CPC intervention and the MEFS score indicates a medium to high association.
- The medium to high correlation between and age and days in CPC reflects the increasing age students from being in CPC for a longer length of time.



Note. Adjusted for Age;
Error bars denote standard error.

Results

An ANCOVA revealed a statistically significant difference in MEFS performance between the low and high exposure groups after controlling for age, (Figure 1), $F(1, 96) = 7.528, p = 0.007, \text{partial } \eta^2 = 0.07$. Thus, length of time in CPC has a significant impact on executive functioning performance, such that the more exposure to the intervention, the higher the performance on MEFS (Figure 1). The high-exposure CPC children scored 10 points higher than the low-exposure children, even when controlling for age.

Table 2. Pearson's Correlations	MEFS Score	Days in CPC
Age (months)	$r=0.643^{**}$	$r=0.635^{**}$
MEFS Score (0-100)		$r=0.568^{**}$

Note. ******= statistically significant at $p < .01$ level.

Discussion

Several life outcomes are connected to EF development, particularly academic achievement and future career paths (Diamond & Lee, 2011). The pervasive influence of EF is especially apparent in children from a background of low socioeconomic status (Fitzpatrick et al., 2013; Nesbitt, Baker-Ward, & Willoughby, 2013). The CPC provides a promising intervention for the development of EF in an at-risk population.

Limitations

Our study samples came from 3 schools in 2 cities. Due to adherence to the CPC model, however, fidelity of implementation was likely similar between sites. Given that the brief and longer exposure groups came from different cities, there may be additional differences between them that have not been accounted for. With further data, the comparability between the sites will be assessed.

References

Diamond, A., & Lee, K. (2011). Interventions shown to aid executive function development in children 4 to 12 years old. *Science*, 333(6045), 959-964.
 Fitzpatrick, C., McKinnon, R. D., Blair, C. B., & Willoughby, M. T. (2014). Do preschool executive function skills explain the school readiness gap between advantaged and disadvantaged children? *Learning and Instruction*, 30, 25-31.
 Nesbitt, K. T., Baker-Ward, L., & Willoughby, M. T. (2013). Executive function mediates socio-economic and racial differences in early academic achievement. *Early Childhood Research Quarterly*, 28, 774-783.
 Reynolds, A. J., Temple, J. A., Robertson, D. L., & Mann, E. A. (2001). Long-term effects of an early childhood intervention on educational achievement and juvenile arrest: A 15-year follow-up of low-income children in public schools. *Journal of the American Medical Association*, 285, 2339-2346.