



# Family-based training to improve cognitive outcomes for children from lower socioeconomic status backgrounds: emerging themes and challenges

Helen Neville<sup>1</sup>, Eric Pakulak<sup>1</sup> and Courtney Stevens<sup>2</sup>



In this brief review, we summarize key principles emerging from studies of family-based training to improve children's cognitive outcomes, especially for children from lower socioeconomic status backgrounds. Available evidence from both developed and developing countries supports the benefit of family-based training for promoting healthy child development, including long-term positive outcomes into adulthood. The biological mechanisms underlying program impact are beginning to be investigated, with current research emphasizing the potential for family-based programs to improve foundational brain systems underlying stress-regulation and self-regulation. As the field moves toward models of family-based interventions that can be adapted for use in different cultures and with diverse families, additional work will be needed to address challenges to large-scale implementation including scalability, assessment, and cultural adaptation.

## Addresses

<sup>1</sup> Brain Development Lab, Department of Psychology, University of Oregon, 1778 University of Oregon, Eugene, OR 97403, United States  
<sup>2</sup> Department of Psychology, Willamette University, 900 State Street, Salem, OR 97301, United States

Corresponding author: Neville, Helen ([neville@uoregon.edu](mailto:neville@uoregon.edu))

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## Introduction

A large literature documents the profound disparities in cognitive skills, brain function, and outcomes into adulthood associated with differences in socioeconomic status (SES) during development (for reviews, see [1,2]). Converging evidence from multiple fields of study also suggests that one of the most promising approaches to ameliorating these gaps is via evidence-based interventions targeting children from lower SES backgrounds early in development [2–6]. This review focuses on a subset of evidence-based interventions described broadly as family-based approaches because they involve training

programs for parents, either exclusively or in combination with training programs for children from the same family.

Several recent, longer reviews and meta-analyses provide an excellent and more extensive discussion of some issues raised in this review (e.g., [7,8–10,11<sup>••</sup>,12<sup>••</sup>]). We also note that, while the focus of this review is cognitive outcomes, extensive evidence exists supporting the efficacy of parenting programs for the prevention or amelioration of child behavioral problems (e.g., [13–15]). Here, we aim to highlight key issues emerging from this broader literature, including work from developing countries. The first section of the paper briefly reviews empirical support for family-based approaches, including the need for a long temporal horizon for assessment that considers outcomes into adulthood to understand program impact. The second section reviews a leading framework for understanding the biological mechanisms underlying the short-term and long-term effects of family-based programs for child development, which emphasizes the negative effects of chronic stress on development. Effective family-based programs may be successful, in part, through reducing levels of chronic stress in the home while also strengthening brain systems underlying both stress regulation and self-regulation more broadly. The final section of the paper explores a set of current challenges to adopting family-based approaches on a larger scale, addressing critical issues of scalability, assessment, and cultural adaptation.

## Support for family-based approaches

Decades of evidence support the value of family-based approaches for promoting successful long-term child outcomes, particularly among children growing up in lower SES backgrounds. Within the United States, example programs include the High/Scope Perry Preschool project (e.g., [5]), the Chicago Child-Parent Center Education Program (e.g., [16]), and the Carolina Approach to Responsive Education (e.g., [17]). These programs, initiated in the 1960s and 70s, combined interventions for infants or preschool children with programs for parents that usually involved instruction-based home visits and/or parent group trainings. There is some evidence that these and similar programs had short-term positive effects on child cognition. For example, following the program end, children randomly assigned to the Perry Preschool program scored higher on measures of IQ than children in the control group, although these gains were not maintained beyond second grade [18]. Studies conducted in

developing countries also support the benefit of family-based training for child development. For example, in a study in Jamaica, the children of mothers randomly assigned to receive weekly home visits by community health care workers including directed play sessions to improve mother–child interaction showed higher scores on standardized measures of nonverbal IQ and language at age 11–12 years [19], and these gains were maintained until age 17–18 [20]. A recent study with a similar design conducted in Colombia also reported positive benefits of family-based training, with children in families receiving weekly home visits that included instruction in developmentally appropriate play activities exhibiting better cognitive skills and receptive language early in development as compared to children randomly assigned to a non-intervention control condition [21\*\*]. These results are consistent with a meta-analysis of early childhood interventions internationally, which found that interventions involving educational components including family stimulation produced the largest effects on child cognition relative to interventions focused on cash transfer or nutrition [8].

However, over time, one issue that has become clear is that appreciating the impact of family-based programs often requires a long temporal horizon. For example, as noted above some studies found an initial fade-out of gains a few years after an intervention ended (e.g., [18]). Yet later, longer-term follow up studies showed that as these same children became adults, past program participation was associated with increased educational attainment and income, as well as decreased substance abuse, criminal activity, involvement in the justice system, and welfare receipt (e.g., [5,17,23]). When considering such longer-term benefits, which translate into increased tax revenues and lower criminal justice or welfare expenditures, careful benefit–cost analyses show rates of return on the initial investment approaching 13-to-1 [5], with even highly conservative analyses still showing rates of return between 7-to-1 and 10-to-1 [24]. Similar long-term effects have been found for interventions in developing countries. For example, a follow-up of the Jamaican Study found positive effects for children who received home visits on IQ, educational attainment, and general knowledge measures at age 22 [25]. Although it is hypothesized that returns on investment will be higher in developing countries, rigorous analyses of longer-term economic benefits are only now emerging. A recent evaluation of the economic impact of the Jamaican Study found that earnings in adulthood were 25% higher for children who received home visits, with estimated impacts substantially larger than the impacts reported for interventions in the US [26\*\*].

### Stress regulation and attentional control as biological mechanisms

Many family-based interventions feature the integration of parent education with other elements, such as nutritional

supplements and conditional-cash transfers, with benefits for measures of child cognition typically greater for approaches involving a parent educational component compared to nutritional or financial approaches independently [8]. Another integrated approach that is the subject of renewed interest is a two-generation approach, in which services focused on improving children’s school readiness and long-term outcomes are combined with services focused on improving adult well-being. Early interest in this approach was not sustained, thanks in large part to disappointing results from early programs simultaneously targeting children and parents. Following these early results, the limited available resources were shifted to focus on job search and placement programs for parents. Moreover, in subsequent years most anti-poverty policies directed at children developed in ‘separate silos’ from training programs for adults, reducing the coordination between services for parents and children (for review, see Ref. [12\*\*]).

However, there is now renewed interest in two-generation programs that dovetails with an increased understanding of the mechanisms underlying socioeconomic adversity, and the potential for two-generation programs to target these processes. For example, there is increasing understanding of the degree to which the disruptive effects of chronic exposure to stress during development can have enduring effects on multiple academic, economic, and health outcomes, likely via altered architecture for brain systems underlying both stress regulation and self-regulation more broadly (e.g., [27,28–30]). Therefore new interest in two-generation approaches focuses on the potential to ameliorate the effects of socioeconomic adversity via strategies that protect children from the consequences of adversity, and in particular chronic stress, by targeting self-regulation skills in both children and parents (e.g., [11\*\*,29]). In particular, many of the strategies provided to parents in family-based training may also serve to bring consistency and predictability to children’s home routines, leading to reductions in chronic stress associated with multiple physical and psychosocial stressors associated with poverty (e.g., unpredictable daily routines, chaotic and/or crowded home environments, family turmoil [31\*\*]). It has also been proposed that that, in addition to positive effects on cognition in children, interventions that improve the caregiving environment by targeting self-regulation skills in parents will also strengthen the economic and social stability of the family in numerous ways, for example by enhancing the employability of parents by improving these foundational skills [29].

This more recent research, which emphasizes the biological systems affected by family-based training, provides insight into the mechanisms whereby family-based training can translate into both short-term and longer-term gains. For example, positive changes in stress physiology, as measured by cortisol, have been reported in both

children and parents targeted in family-based interventions for foster parents [32–34]. Recently we also reported results from a two-generation intervention targeting selective attention, family stress, and self-regulation by simultaneously working with both parents and children. Compared to two comparison groups, children randomly assigned to this intervention showed improvements in electrophysiological measures of brain functions supporting selective attention, standardized measures of cognition, and parent-reported child behaviors, and parents participating in the program reported reduced parenting stress and displayed improvements in specific aspects of language interactions with their children [35\*\*]. We hypothesized that targeting child selective attention, a foundational and domain-general skill important for learning and academic success [36], while simultaneously targeting family stress and aspects of self-regulation in parents would lead to positive outcomes across multiple domains. The hypothesis that two-generation programs targeting foundational systems might protect children from the negative consequences of early adversity thus represents a promising avenue for future innovation and study [11\*\*,12\*\*].

### Future directions and challenges

Given the evidence supporting the short-term and long-term efficacy of family-based approaches, there are multiple future directions and challenges. Recent work has emphasized promising new programs [12\*\*] and the need for broader changes in conceptualization, intervention design, risk taking, and innovation [11\*\*]. Here we highlight several select future directions and challenges.

First, as research on family-based interventions advances, a better understanding of the mechanisms by which successful approaches are effective is crucial. Advances in assessment now permit the evaluation of the effects of intervention on biological (e.g., [32,33]) and neurobiological (e.g., [35\*\*]) systems. Future work incorporating such assessment methods will strengthen our understanding of the mechanisms by which family-based interventions can improve outcomes for both children and parents, which in turn will inform the refinement of existing interventions and the development of novel approaches. Another approach to understanding mechanisms involves the need to deconstruct interventions with multiple dimensions in order to determine, if possible, the independent contributions of different elements. A good recent example is provided by Attanasio and colleagues [21\*\*], who systematically examined the contributions of home visits, micronutrient supplementation, and a combination and found clear support for the importance of home visitation in improving child cognition.

Another consistent and enduring issue of particular relevance to family-based intervention is broader implementation. Promising results from smaller-scale efficacy

studies may not translate when scaled-up more broadly in community settings and/or with different cultural groups. Because a demonstration of larger-scale efficacy can better inform public policy, a consideration of issues surrounding broader implementation is crucial. Below, we consider several challenges related to broader implementation.

Typically, initial program evaluations are conducted, by necessity, on relatively homogenous groups, for example, families with monolingual, typically developing preschool children. While many of the principles of family-based programs are expected to have cross-cultural currency (e.g., foundational systems supporting stress regulation, attention, and self-regulation), the delivery of a program must be sensitive to cultural differences and norms. For example, Hurwicz-Reiss and colleagues [22] describe the careful cultural adaptation of a parenting program for use by Latino families in the United States. This is not a simple linguistic translation of materials from one language to another, but rather a multi-step process. Among other things, this process involves careful assessment of community needs and the initiation of a collaboration with community stakeholders and leaders, translation of materials followed by a review in focus groups with members of the target population, and a continuing review and refinement process with members of the target population. This process should focus on cultural considerations in the adaptation to ensure that interventions developed in one cultural context are appropriate in another and that there are not unintended harmful effects as the result of cultural differences, an especially important consideration with parenting interventions given the degree to which cultural values influence parenting practices and attitudes (e.g., [37–39]). In our own research, we are currently adapting a two-generation program for families with preschool children for Latino families in Head Start. In addition to adapting programs cross-culturally, there is also a need to track whether programs, once designed, can be implemented by non-project staff in ways that maintain the fidelity of the original program.

As programs are implemented more broadly, they must also be *accessible* to families and address potential structural barriers to participation. Interventions that operate only on the child level can be implemented through preschool or school systems. However, two-generation programs face the added challenge of engaging parents. Some estimates indicate that roughly two-thirds of families decline participation in typical parenting interventions [40,41]. For many families, and particularly lower-income families, challenges to participation include welfare work requirements [42], family schedules [41,43], and single parenthood [44]. Importantly, the challenge of participation arises not only during program implementation, but also during program development

and evaluation where some families may be less likely to participate due to privacy concerns with videotaping and home visits that are common parts of program assessment [43]. A related concern is the potential 'selection bias' of families who voluntarily enroll in small-scale studies. Even when these small-scale studies include random assignment, the parents who elect to participate in the study may differ in systematic ways from those who would be targeted in a larger scale implementation. For example, parents who participate in small-scale, voluntary studies may be ready to consider changing their family functioning, whereas this may not be true of all families who would be targeted through program implemented more broadly.

Some insight into larger scale program implementation can be found from work in developing countries, which has capitalized on local infrastructure or cultural norms to facilitate broad implementation of family-based programs. For example, to broadly implement a home-visit approach, Attanasio and colleagues [22\*\*] employed infrastructure in Colombia for the delivery of conditional cash transfers which involves a community representative known as a *madre líder* ('mother leader'). They were able to effectively implement a family-based intervention broadly by utilizing these mother leaders, who were respected and well-connected community leaders, either to deliver the intervention themselves during home visits or to identify other community members as replacements. Working with respected community leaders may also be critical to creating stronger buy-in from families who might otherwise be uninterested in an intervention that may involve changes to family practices. As noted above, small-scale studies may suffer from a selection bias, and broader program implementation will need to be able to engage all eligible families.

## Conclusion

There is clear evidence to support the value of family-based training as a highly effective means for improving cognitive outcomes for children from lower SES backgrounds. As the biological mechanisms underlying these benefits become more clearly understood, we can assess programs in new ways and also develop and refine family-based training programs to be more effective. Addressing the barriers to large-scale implementation will be a key component of adopting a stronger public-health model of proactive, preventive support for families [45]. Future research that incorporates recent insights into biological mechanisms and issues of broader implementation thus has great promise to inform the development of family-based approaches with great potential to benefit vulnerable children.

## Conflict of interest

Nothing declared.

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