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Moderators of Outcome in a Brief Family-Centred Intervention for Preventing Early Problem Behavior

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Abstract

This study investigates moderators of change in an empirically supported family-centered intervention (the Family Check Up) for problem behavior in early childhood, among low-income families screened for risk family stress and early onset problem behavior. 731 2-3 year-olds were randomized to the Family Check Up intervention, or to a control group. Latent Growth Models examined socio-demographic and parent psychological risk factors as potential moderators of change in problem behavior between age 2, 3 and 4. Results revealed two moderators of intervention effectiveness. Caregivers with the lowest educational levels were more responsive to the family-centered intervention, and two-parent families were more responsive to the intervention. Other risk factors showed no predictive effects. Overall, findings suggest that this brief family-centered intervention can be equally effective in reaching the most distressed and disadvantaged families, compared to those who are more advantaged. However, these results suggest that more attention is needed to address the intervention needs of single parent families in reducing problem behavior in early childhood.

Keywords: child problem behavior, early prevention, moderators, parenting, conduct problems

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Numerous randomized trials show that parenting interventions are effective in preventing child problem behavior (Kazdin, 2002). These include 'efficacy' trials, conducted in relatively specialist settings, as well as more recent adaptations of these interventions into 'effectiveness' trials, which have the potential for widespread dissemination into real-world, community settings (Dishion & Stormshak, 2007; Gardner, Burton & Klimes, 2006; Hutchings et al., 2007a; Webster-Stratton, 1998a). To take such interventions 'to scale', investigators have developed modified interventions that are brief and low cost (Turner & Sanders, 2006), and are adapted to engage the most marginalized families (Dishion, Nelson, & Kavanagh, 2003; Shaw, Dishion, Supplee, Gardner & Arnds, 2006). It is generally accepted that such low cost interventions, even with quite modest effect sizes, could potentially be useful and translate into large public health benefits (Biglan & Taylor, 2000).

A key issue underlying the potential for public health impact is whether such brief interventions are effective for the most high risk families in society, or whether they confer greater benefit on more advantaged families, as reported in recent meta-analyses of predictors of outcome in parent training (Lundahl, Risser & Lovejoy, 2006; Reyno & McGrath, 2006). This is an important concern, given that high risk families are also those most likely to have children showing early onset and persistent behavior problems, which have a raised probability of escalating to more serious problem behaviors by adolescence (Farrington, 1994; Moffitt, 1993; Patterson & Yoerger, 1993). Accordingly, this paper investigates through moderator analyses whether some families and children benefit more or less from a brief intervention (Dishion et al., 2008; Shaw et al., 2006) for early prevention of problem behavior in high risk toddlers.

The Early Steps Multisite trial (Dishion et al., 2008) is a randomized trial of a brief family-centered intervention, the cornerstone of which is the Family Check Up (FCU), as well as linked parent management training (Dishion & Kavanagh, 2003; Dishion & Stormshak, 2007). The intervention takes an ecological approach to family intervention and treatment (EcoFIT) because it is designed for service setting implementation and is adapted and tailored to families' ecology and needs (Dishion & Stormshak, 2007). EcoFIT was applied to early prevention of conduct problems and risk of later drug use through enhancing parenting skills and addressing domains that compromise parental functioning (e.g., social support, parent well-being, neighborhood resources). It focuses on low-income families with toddlers, who are further screened for risk factors for early-starting problem behavior. Screening is based on developmental knowledge of risk factors for early-starter conduct problems, and their continuities with later risk behaviors (Moffit & Caspi, 2001; Shaw, Bell, & Gilliom, 2000; Shaw, Gilliom, Ingoldsby, & Nagin, 2003). Engaging high risk families in preventative interventions can in many cases pose challenges. These stem from the families' multiple problems and from the fact that, unlike most clinic samples, they have not necessarily requested help with family issues. From a stages of change perspective (Prochaska & DiClemente, 1986), it is often necessary in interventions for individuals not seeking help, to initially address the benefits of changing, say, parenting practices. Thus, an important feature of the FCU is the use of Motivational Interviewing (MI, Miller & Rollnick, 2002) techniques to enhance engagement and motivation for change in parenting. Central to the intervention is the use of individualized feedback from a detailed home-based assessment of the child and family needs, as well as videotaped observation tasks. The shared feedback process, using MI strategies, is a crucial part of engaging the family, which ensures that any subsequent intervention is closely tailored to their needs and goals, and that the parents are, as far as possible, motivated and ready for change. These factors also make it more likely that a brief

parenting intervention will be effective (Dishion & Stormshak, 2007). The FCU was originally developed and shown to be effective for high risk adolescents as a preventive intervention, embedded in the public school system (Dishion et al., 2003). More recent findings on the effect of this model as implemented in middle schools reveal reductions in problem behavior 5-7 years later (Connell, Dishion, Yasui, & Kavanagh, 2007). Analyses based on uptake of intervention sessions, moreover, reveal that the highest risk families were most likely to engage in the FCU, and to show reductions in adolescent problem behavior. Adaptations of the FCU to families with toddlers showed positive effects on parenting and problem behavior (Gardner, Shaw, Dishion, Burton & Supplee, 2007; Shaw et al., 2006).

For early childhood prevention, an accessible community service that reaches a high proportion of low-income toddlers throughout the USA is the Women, Infants, and Children program (WIC), a national program for family nutritional supplement and support. Findings from an earlier single site study (Shaw et al., 2006) and a large multi-site trial of FCU, involving 731 high risk toddlers recruited from urban, rural and suburban WIC sites (Dishion et al., 2008) show modest but significant intervention effects at age 3 and 4 on positive parenting skill and child problem behavior. In both trials, change in positive parenting appeared to predict change in the primary outcome, child problem behavior (Dishion et al., 2008; Gardner et al., 2007). Furthermore, in the multi-site trial, there were also significant intervention effects on maternal depression (Shaw, Connell, Dishion, Wilson, & Gardner, in press) and on children's school readiness (Lunkenheimer et al., in press), including language development and self-regulation. Main intervention effect sizes (Dishion et al., 2008; Shaw et al., in press) on parent-reported child problem behavior were d = .23 for CBCL externalizing, .23 for Eyberg Problem scale, .18 for maternal depression and .24 for positive parenting. Although these effects are modest, it is important to note that they might nevertheless have a substantial impact at a population level on

problem behavior, if implemented more widely. That is, many children in the sample do not have significant levels of problem behavior, and therefore, change is not expected. Analyses of two basic demographic factors, child sex and ethnicity (Dishion et al., 2008) revealed that there were no differences in intervention effects by sex or ethnicity.

Given these preventive intervention effects on child problem behavior, it is important to evaluate whether the FCU intervention has beneficial effects across the whole sample, or whether there are subgroups of the most distressed and disadvantaged families for whom the intervention is less effective: questions best investigated through moderator analyses. Before examining prior literature on predictors and moderators of parent training outcome to guide choice of variables for the present study, we first clarify the definition and relevance of these concepts. Moderator analyses are important for identifying those who are differentially responsive to intervention and thus may lead to better understanding of subgroups for whom there may be distinct causal patterns or prognoses (Hinshaw, 2002). Clinically, moderator analyses are helpful in identifying with greater precision types of clients for whom an intervention may be particularly suitable, or conversely, subgroups for whom there might be iatrogenic effects or the need for extra therapeutic effort. Findings may provide evidence to practitioners and prevention scientists that interventions can be effective for client groups traditionally thought to be hard-to-treat or, in the current sample, difficult to initially engage. Alternatively, results might suggest that specific interventions are less fruitful for families living in the context of high adversity.

In intervention trials, the relevant question is whether intervention effects are conditional ('moderated') on baseline characteristics of the sample. Crucially, moderation is defined as a statistical interaction between baseline characteristic and intervention effect (Hinshaw, 2002; Kraemer, Wilson, Fairburn, & Agras, 2002). Thus, moderators are distinct from 'predictors' of outcome, which may be associated with outcome equally across treatment and control groups

(Beauchaine, Webster-Stratton, & Reid, 2005; Hinshaw, 2002), or tested within the treatment group only (Dumas & Wahler, 1983).

In the field of parenting interventions for problem behavior, there are relatively few analyses of moderators, but many studies of predictors of outcome (Eyberg, Nelson & Boggs, 2008; Kazdin & Wassell, 1999, Dumas & Wahler, 1983). Two recent meta-analyses (Lundahl et al., 2006; Reyno & McGrath, 2006) attempted to combine findings on predictors of outcome across multiple trials (63 and 31 trials, respectively) of parenting interventions. These meta-analyses found reasonably clear cut results, despite synthesizing across a range of intervention and sample types, including clinic treatment, indicated prevention, and low-risk prevention studies. Both reviews concluded that children of parents with disadvantages, including those with low income, single parents, and with depression, show poorer intervention outcomes compared to those facing lower levels of adversity.

Large inclusive meta-analyses are useful in telling us broadly which characteristics predict intervention success across a wide range of programs; however, their weakness lies in not being able to identify whether specific programs may be differentially successful with more troubled families. Several recent studies, not included in these reviews, reached somewhat different conclusions. Thus, Werba, Eyberg, Boggs and Algina's (2006) study of a young clinic-referred group receiving parent-child interaction therapy (n= 81), although consistent with earlier studies in finding that maternal distress predicted poorer outcome, nevertheless found no effects of SES on child outcome. It may be that with some recent interventions, where explicit attention is paid to client accessibility and engagement (Webster-Stratton, 1998a, b), it is possible to achieve better results with high risk families, who traditionally have been seen as 'harder-to-reach', due to higher drop out rates and lower intervention success (Reyno & McGrath, 2006). For example, Beauchaine et al. (2005) pooled data from six treatment trials (total n=514) of the Incredible Years program

with 3-8 years olds. In predictor analyses, they found that younger parents, those with a history of drug abuse, and children with co-morbid problems did *better* in parent training than families without such risk factors. Furthermore, in moderator analyses, mothers with poor marriages or higher levels of depression, also fared better, compared to those who were less distressed. The same group found similar effects in a prevention study with low-income families. Thus, in two studies analyzing a large pooled sample in Head Start preschools, mothers who were depressed, or who had a history of abuse or substance use were just as likely to benefit from the Incredible Years program, as those without such risk factors (Baydar, Reid, & Webster-Stratton, 2003). Using multiple measures of outcome, engagement and attrition, Reid, Webster-Stratton and Beauchaine (2001) found that effectiveness and satisfaction were equally strong across four ethnic groups. In an independent replication of this intervention in low-income areas in the UK (Hutchings et al., 2007), moderator analyses found stronger effects on child outcomes where mothers were more depressed, whereas family disadvantage had no impact on responsiveness to the intervention or outcomes (Gardner, Hutchings, & Bywater, 2008).

In sum, the meta-analyses present a reasonably clear picture, albeit across somewhat disparate trials, suggesting parenting interventions in general are less successful at engaging the most distressed and disadvantaged families. In contrast, some large, more recent trials found no adverse effects of family disadvantage on outcome, in both community preventive and clinic-referred samples; it is noteworthy that most of these studies used intervention approaches that pay particular attention to parent engagement and accessibility of services (Hutchings, Bywater & Daley, 2007b; Webster-Stratton, 1998b).

The aim of the present paper was to test whether there were differential intervention effects on child problem behavior, by family and parent risk factors, in the multi-site Early Steps trial. 731 low-income toddlers were screened as high risk for problem behavior in WIC centers, and

randomly allocated to a brief parenting intervention, the FCU, or to no intervention (for main outcomes see Dishion et al., 2008; Shaw et al., in press). The prior literature guided our choice of potential moderator variables for the present study. Studies typically employ demographic and psychological distress variables that have been found repeatedly to predict poor behavioral outcomes in longitudinal studies (Ackerman, Brown, & Izard, 2004; Shaw, Winslow, Owens & Hood, 1998). There is evidence about mechanisms linking these predictors to problem behavior outcome, via fewer material and psychological resources, including lower social support, which in turn affect parenting skill and place stress on the parent-child relationship (Larzelere & Patterson, 1990; Trentacosta et al., in press). Meta-analyses show that the same factors traditionally appear to predict poor treatment outcome and high attrition from trials (Lundahl et al., 2006; Reyno & McGrath, 2006). Following this literature, we examined two sets of potential moderators of outcome, assessed at age 2. Family risk factors included: mother a single parent, a teen parent at the birth of her first child, low maternal educational level, maternal alcohol or drug problem. Parent risk factors, reflecting psychological problems at baseline, included depressive symptoms, perceived hassles, or partner relationship problems. Following work on cumulative family adversity and child problem behavior (Ackerman, Brown & Izard, 2004; Shaw et al., 1998), risk variables were also combined into a cumulative risk index. For all analyses, the dependent variable was the main trial outcome, growth in problem behavior between age 2, 3 and 4.

Given the mixed pattern of findings in the literature, we did not have specific hypotheses about whether higher levels of individual family or parent risk factors would be associated with greater improvements in child disruptive behavior. However, based on the findings of prior prevention studies that pay careful attention to parent engagement (Baydar et al., 2003), we postulated that the FCU would tend to show as good outcomes for families with higher versus lower levels of initial family and parent adversity. It is plausible that a brief intervention,

employing MI strategies intended to enhance engagement, might obtain good results with the most distressed families, compared to those who are less distressed, as found in the ES Pilot Study (Shaw et al., 2006). The present study extends existing literature by using a larger sample (n=731) than most other parent intervention trials and providing a more precise and reliable test of moderating mechanisms. It is noteworthy that of the 63 studies in Lundahl et al.'s (2006) review, seven had *N*s of over 100, but only one of over 200. Furthermore, it is important to examine moderators rather than merely predictors of change (Hinshaw, 2002) allowing us to distinguish predictors of general outcome from those that specifically predict intervention change.

Method

Participants

Ethical approval was granted by the Institutional Review Board at all authors' institutions. Parental written consent was obtained both for screening and trial stages of the study. Participants included 731 mother–child dyads recruited between 2002 and 2003 from WIC programs in the metropolitan areas of Pittsburgh, Pennsylvania, and Eugene, Oregon, and within and outside the town of Charlottesville, Virginia. Families were contacted at WIC sites and invited to participate if they had a son or daughter between age 2 years 0 months and 2 years 11 months, following a screen to ensure that they met the study criteria by having socioeconomic, family, and/or child risk factors for future behavior problems. Risk criteria for recruitment were based on earlier longitudinal work on toddlers, which examined early child and family characteristics as predictors of later problem behavior, in similar samples (Shaw et al., 1998, 2000; 2003). Risk criteria were defined as follows: at or above 1 SD above normative averages, derived from published standardization data, on one or more screening measures in the following three domains: (a) child behavior (conduct problems, high conflict relationships with adults), (b) family problems (maternal depression, daily parenting challenges, substance use problems, teen parent status), and

(c) socio-demographic risk (low educational achievement and low family income using WIC criteria). For inclusion in the sample, high risk status on at least two of the three risk domains was required. In cases where the high risk criterion was not met for child behavior, children were required to have above average scores on either the Eyberg Child Behavior Inventory Intensity or Problem scales (Robinson, Eyberg, & Ross, 1980) to increase the probability that parents would be motivated to change this behavior.

Recruitment. Initially, 1666 families with a 2-year old were screened at WIC sites across the three study sites, of which 879 met eligibility requirements and 731 (83%) agreed to take part. Children in the sample had a mean age of 30 months (*SD* 3.2) at the time of the age 2 assessment. Of the 731 families (49% girls), 37% each were recruited in Pittsburgh and Eugene, and 26% in Charlottesville. Across sites, primary caregivers' self-identified ethnicity was as follows: 28% African American (AA), 50% European American (EA), 13% biracial, and 9% other groups. Thirteen percent self-reported as Hispanic American. Over two-thirds of families had an annual income of less than $20,000 (in 2002-3)

Retention. Of the 731 families who initially participated, 659 (90%) participated at the one-year, and 619 (85%) at the two-year (age 4) follow-up. At ages 3 and 4, selective attrition analyses revealed no significant differences by site, race, ethnicity, or sex, levels of maternal depression, or children's externalizing behavior. Furthermore, no differences were found in the number of participants who were not retained in the control versus intervention groups at ages 3 (n = 40, 32) and 4 (n = 58, 53, respectively).

Measures

All measures were administered at the age 2, 3 and 4 home visits. However, we report on risk factors assessed at baseline (age 2), and problem behavior at ages 2, 3 and 4.

Early childhood problem behavior (dependent variable). The Eyberg Child Behavior Inventory (ECBI) was administered, a widely used 36-item measure of childhood problem behavior (Robinson, Eyberg & Ross, 1980). We used the Problem Scale, a primary outcome for the trial, which asks caregivers to report whether or not the behavior is a problem for the parent. The inventory has been shown to be highly correlated with independent observations of children's behavior, to differentiate clinic-referred and nonclinic populations, and shows high test–retest reliability (.86) and internal consistency (.98) (Robinson et al., 1980). In the current study, internal consistencies for the Problem factor were .84, .90, and .94 at ages 2, 3, and 4, respectively. We also used the 99-item Child Behavior Checklist 1.5-5 which has been found to have adequate test-retest reliability (range, 0.68 to 0.92) and good cross-informant agreement (parent-child care provider agreement = 0.65; Achenbach & Rescorla, 2000). We used the broad-band factor *Externalizing*; internal consistencies were .86, .89, and .86 at ages 2, 3, and 4.

Demographics questionnaire. A demographics questionnaire was administered to mothers, including items about family structure and risk factors, defined as follows: Single parenthood, as having no partner living in the household; teen parenthood as being <18 years old at the birth of the first child; low maternal educational level as having completed less than high school education.

Parent substance use. Mother's current drug or alcohol problem was defined, via questionnaire (Dishion & Kavanagh, 2003), to include one or more of the following: i) argumentative or irritable when drinking; ii) drink every day and 3-4+ drinks most days; iii) use marijuana or hard drugs more than once per month; iv) use more than one hard drug per month.

Maternal depression. We used the Center for Epidemiological Studies on Depression Scale (CES-D; Radloff, 1977), a well validated, widely-used 20-item measure of depressive symptoms. Participants report frequency of experiencing listed depressive symptoms during the past week on a scale ranging from 0 (*0-1 day*) to 3 (*5–7 days*). Items are summed to create an overall depressive

symptoms score. In terms of convergent validity, clinically depressed individuals have been found to score higher on the CES-D than non-depressed individuals (Weissman et al., 1996). Internal consistencies have been found to range from 0.80 to 0.90 and test-retest reliabilities have ranged from 0.40 to 0.70 among community samples (Devins et al., 1988; Radloff, 1977). For the current sample, internal consistencies were .76 and .75 at age 2 and 3.

Parenting Daily Hassles (PDH). The PDH is a measure of typical daily stressors perceived by parents, found to be associated with child behavior outcome to a greater degree than life stresses that are more global in nature (Crnic & Greenberg, 1990). The 20-item frequency subscale of the PDH has good internal consistency (alpha = 0.81) and was highly correlated with perceived intensity of daily hassles, indicating good convergent validity (r =0.78; Crnic & Greenberg, 1990). In the present study, the 20-item PDH was administered to mothers, and the scale of perceived frequency of daily stressors was used; internal consistency was .81.

Partner relationship quality. Maternal perception of the level of satisfaction in her partner relationship was assessed using the 16-item short form of the Marital Adjustment Test (Locke & Wallace, 1959), where high scores represent higher satisfaction. Prior research shows that this measure differentiates between harmonious and disturbed marriages (Locke & Wallace, 1959; Rosenbaum & O'Leary, 1981) and also predicts child behavior problems (Emery & O'Leary, 1984). Split-half reliability of the short Marital Adjustment Test was found to be 0.90. Where mothers were recently separated, they were asked to report on the period of the past year when they were still living with their partner. Where mothers were not married, they were asked to complete the scale on their most intimate adult relationship, including live-in or dating partner. The word 'close relationship' was substituted for 'marriage'. This strategy is sensitive to the fact that 40% of mothers in the study were single, yet allowed for inclusion of important information on their close relationships. In the current study, internal consistency was .57 at age 2.

Cumulative risk index. This was generated from the seven indicators of socio-demographic risk that were examined as moderators. These indicators were: (1) single parenthood, (2) teen parent status, (3) low maternal education, (4) substance use problem, (5) maternal depression, (6) parenting daily hassles (7) partner relationship quality. Because maternal depression, daily hassles, and relationship quality were used as continuous variables in the primary moderator analyses, they required dichotomization for computation of the cumulative risk index. Maternal depression was dichotomized based on the standard clinical cut-off score of 16 on the CES-D (Radloff, 1977). Daily hassles and relationship quality were dichotomized based on scores greater than one standard deviation above the sample mean and less than one *SD* below the sample mean on these scales, respectively. Families received a score of '1' for each risk indicator if present, or '0' if absent. The cumulative risk index was the proportion of risk indicators present for each family. Possible scores on the risk index range from 0 (no risk factors) to 1 (all risk factors present).

Procedures

Assessment protocol. Parents and children who agreed to participate in the study were scheduled for a 2.5-hour home visit. Each assessment began with a series of observational tasks including free play, clean-up, teaching tasks, meal preparation and lunch; these parent-child interaction data were used for investigating outcomes and mediators, and for parent feedback, and are not further reported here. Parents also completed questionnaires during the home visit. The home visit and observation protocol was repeated at age 3 and 4 for control and intervention groups. Families received $100 for age 2, and $140 for participating in the age 4 assessment.

The randomization sequence was computer-generated by a staff member who was not involved with recruitment, and was stratified by sex. To ensure allocation concealment, the examiner opened a sealed envelope, revealing the family's group assignment only after the

assessment was completed, and shared this information with the family. Examiners for follow-up assessments were not informed of families' allocation.

Intervention protocol: The FCU. Families randomly assigned to the intervention condition were scheduled to meet with a parent consultant for the FCU. The FCU (Dishion & Kavanagh, 2003; Dishion & Stormshak, 2007) is a brief, three-session intervention inspired by innovations in Motivational Interviewing (Miller & Rollnick, 2002). The general concept is to integrate clinical skill with systematic assessments to support parents' motivation to change parenting practices that may be problematic, and importantly, to maintain those that are healthy. Although the typical sequence of sessions in the FCU is an initial interview, an assessment session and a feedback session, the sequence was altered to enhance the internal validity of the current research (Dishion & Stormshak, 2007). For the first assessment, we designed the study so that families were unaware of their randomly assigned intervention status until after the initial assessment. Thus, families at age 2 first completed the assessment, were then randomized, and if they were assigned to the intervention group, were then interviewed by a parent consultant and provided with feedback based on the assessment. Families were given a $25 gift certificate for completing the FCU at the end of the feedback session. The rationale for providing an inexpensive incentive for engaging with the FCU was based on the community reinforcement approach, where it has been found that engaging the highest risk clients in empirically supported interventions in community services benefits from the use of incentives (Sorensen, Rawson, Guydish & Zweben, 2003).

Thus, the initial meeting was an assessment conducted with research staff, as described earlier, during which the family engaged in a variety of in-home videotaped tasks of parent–child interaction, and caregivers completed several questionnaires about their own, and their child's, and family's functioning. During the assessment, staff completed ratings of parent involvement with and supervision of their child. The second session was an initial interview with the parent

consultant, during which the consultant explored parent concerns, focusing on family issues that were currently most critical to the child's well being. The third meeting was a detailed feedback session, during which the parent consultant summarized the results of the assessment using MI strategies. An essential objective of the feedback session is to explore the parents' willingness to change problematic parenting practices, to support existing parenting strengths, and to identify services appropriate to the family needs. For example, it was not uncommon for caregivers to not realize that they were suffering from depression, and thus feedback could potentially motivate a parent to seek mental health services. The parent was also offered follow-up sessions that focused on parenting practices, other family management concerns (e.g., co-parenting), and contextual issues (e.g., daycare, partner relationship, housing). The MI approach is especially prominent in the initial interview and feedback sessions, and pervades later sessions as needed, depending on parent motivation and engagement (Gill et al., in press).

All parent consultants had at least master's-level qualifications and experience in family interventions, but, at the study's outset, no experience in using the FCU. They were initially trained for 2.5–3 months using a combination of strategies, including didactic instruction and role playing, followed by ongoing videotaped supervision of intervention activity. Before working with families, parent consultants were certified by lead consultants at each site who had been certified by the FCU intervention developer, Thomas Dishion, and re-certified annually. Certification was established by reviewing videotapes of feedback and follow-up intervention sessions to evaluate whether parent consultants were competent in all critical components of the intervention. Weekly supervision plus weekly cross-site video-conferences also helped to enhance fidelity and prevent drift. Finally, annual parent consultant meetings were held to update training, and address issues related to the needs of families across sites.

Of families assigned to the treatment condition, 80% participated in the initial interview and feedback sessions at age 2 and 65% at age 3. Of those families who met with a parent consultant, the average number of sessions per family was 3.3 (*SD* = 2.8) at age 2, and 2.8 (*SD* = 2.7) at age 3 (range 1-19), including the initial interview and feedback as two of those sessions. 35% of families at age 2 and 26% at age 3 opted to have further sessions after the feedback. Over two-thirds of families chose goals related to parenting, child development and behavior, thus these issues were the main focus of follow-up intervention sessions. There was a modest positive correlation between level of child problem behavior and number of sessions (Shaw et al., in press), implying that parents of more difficult children were slightly more likely to engage. However, there were no correlations between family and parent risk factors (listed on page 9) and number of sessions at age 2. We used an intention-to-treat design, including in all analyses the 22% of families assigned to intervention who did not participate in the FCU.

Results

Table 1 shows descriptive statistics for main trial outcome variables at ages 2, 3 and 4 (as reported in Dishion et al., 2008); Table 2 shows moderator variables at time 1. Families showed high levels of disadvantage, with nearly 80% below the poverty line (29% below $10k), and 40% single parents. Furthermore, 42% of mothers were above the clinical cut-off for depression (16 on the CES-D), and 44% of children at age 2 were above the clinical cut-off on the ECBI Intensity scale (132 in the re-standardization sample; Colvin, Eyberg, & Adams, 1999). Consistent with random assignment, there were no differences between the groups on baseline demographic or behavioral characteristics.

Descriptive data on predictor effects. For illustrative purposes, we present descriptive data on predictors of change in the intervention group for two variables. Table 3 shows intervention

change from age 2-4 on ECBI by 'risk' group, and for comparison also shows predictors of change over the same time period in the control group.

Moderation analysis plan. Moderation hypotheses were examined using Latent Growth Model (LGM) analyses. Because only three time points of data were available, LGMs could only include intercept and linear slope growth parameters, reflecting the initial level of problem behaviors and the linear rate of change in problem behaviors from age 2 to age 4. Separate LGMs examined changes in the Eyberg and CBCL Externalizing scores over time. Moderation of the effect of treatment on the rate of change in problem behaviors was captured by a series of interaction effects between intervention status and the covariates. In these models, the effect of intervention and all intervention covariates (effects on the intercept) were fixed at zero, as the intercept was a baseline measurement, prior to the introduction of treatment. However, all covariate and intervention covariate interactions were allowed to predict the slope parameter.

All of the hypothesis-testing analyses were conducted in Mplus, using Full Information Maximum Likelihood estimation (FIML; Muthen & Muthen, 2007), which provides a method for accommodating missing data by estimating each parameter using all available data for that specific parameter. Overall model-fit indices reflect the broad correspondence between the measurement and structural paths included in the hypothesized model and the covariance structure in the observed data. In the face of acceptable overall model-fit, core hypothesis tests are reflected in the statistical significance of the individual parameters of the model, such as the paths from covariates to the growth parameters.

Eyberg Problem Behavior findings.

Interaction term model. LGM results for moderators of the effect of intervention on the rate of change in Eyberg Problem behavior scores are shown in Table 4. This model appeared to provide reasonable fit to the data (χ^2 [df = 24] = 55.40, $p < .05$; CFI = .95; RMSEA = .04; SRMR

= .02), although the significant chi-square value is likely a reflection of the large sample size. The initial level of problem behaviors at age 2 was negatively related to maternal-reported marital quality, and positively related to mother-rated daily hassles. Overall, significant growth was seen in Eyberg Problem behavior scores over time. Intervention was significantly related to decreased growth over time. Marital quality and daily hassles were both negatively related to the rate of change, while low education predicted greater growth in problem behaviors. Two significant interaction effects were found. First, low maternal education interacted with intervention status to predict the rate of change in problem behaviors. The interaction effect (for an example, see Figure 1) indicates that a greater effect of intervention was seen in families with less educated mothers, while higher maternal education was associated with a smaller intervention effect. Follow-up analyses using methods by Preacher, Curran, and Bauer (2006) indicated that significant growth in problem behaviors was seen in both high and low educated control groups (simple slope high education control group =1.21, *SE* =.40; simple slope low education control group =2.07, *SE* =.62). In the intervention groups, simple slopes were non-significantly negative, but more negative in the low-education group (simple slope low education intervention group = -1.02, *SE* =1.04), relative to the high education intervention group (simple slope high education intervention group =-.41, *SE* =.41).

Second, single mother status interacted with intervention status to predict rate of change in problem behavior. This interaction effect indicates that stronger intervention effects were seen in two-parent families, with a smaller effect in families of single mothers. Follow-up analyses using methods by Preacher et al. (2006) indicated that significant growth in problem behaviors was seen in both the partnered and single-mother control groups (simple slope partnered control group = 1.21, *SE* = .40; simple slope single mother control group = 1.36, *SE* = .56). In the intervention groups, simple slopes were both non-significant, but negative (i.e. behavior improved) in the

partnered group (simple slope partnered intervention group = -.41, *SE* = .41), and slightly positive in the single-mother intervention group (simple slope single intervention group = .12, *SE* =.93).

Effect sizes for each significant moderator were calculated using Cohen's *d*, based on comparing the effect of control versus intervention allocation on outcome, with families grouped by presence/ absence of each moderator variable. For the Eyberg outcome, control versus intervention group: *d* = .04 for single parents; *d* = .53 for partnered parents, respectively. Examining parental education as the moderator (Fig 1), control versus intervention group: *d* = .18 for more educated parents; *d* = .68 for lower educated parents, respectively.

Cumulative risk model. The cumulative risk model provided excellent fit to the data (χ^2 [*df* = 6] = 8.19, *p* = .24; *CFI* = 1.00; *RMSEA* = .02; *SRMR* = .02). The cumulative risk index was significantly related to the intercept parameter (*est* = 2.08, *SE* = .70) and to the slope parameter (*est* = 3.30; *SE* = 1.24). The intervention effect on the slope dropped to non-significance in this model (*est* = -.79; *SE* = .53), a change which is likely due to high collinearity with the interaction term included in this model. The interaction between intervention and cumulative risk was not significantly related to the slope of problem behaviors (*est* = -.41, *SE* = 1.68).

To verify that collinearity was the reason for the lack of main effect of intervention on the problem behavior slope in the interaction model, we also ran a model that only included main effects of intervention and cumulative risk as predictors of the rate of change in problem behaviors. As expected, a significant main effect of intervention on rate of change in problem behaviors was seen (*est* =-.24, *SE* =.08), indicating that the non-significant effect of intervention in the interaction model was likely due to high collinearity between the main and interaction effects.

Externalizing Behavior Problem Findings

Interaction term model. LGM results for moderators of the effect of intervention on rate of change in behavior problems on the CBCL Externalizing scale are shown in Table 5. This model

provided excellent fit to the data (χ^2 [*df* = 24] = 32.19, *p* = .12; *CFI* = .99; *RMSEA* = .02; *SRMR* = .01). The initial level of problem behaviors at age 2 was negatively related to marital quality and positively related to daily hassles. Overall, significant declines were seen in externalizing scores over time. Intervention was significantly related to steeper declines in externalizing scores over time. One significant interaction effect was found. Low maternal education interacted with intervention status to predict rate of change in problem behaviors. The interaction effect (figure 1) shows that a greater effect of intervention was seen in families with less educated mothers, while higher maternal education was associated with a smaller intervention effect. Follow-up analyses (Preacher et al., 2006) indicated that slopes were significant across all four groups (treatment x education), but that the magnitude of the differences between the intervention and control groups was larger for the low-education groups (simple slope in control group = -1.19, *SE* = .58; simple slope in intervention group = -5.14, *SE* = .98), relative to the difference in slopes across the high education groups (simple slope in control group = -1.64, *SE* = .27; simple slope in intervention group = -3.43, *SE* = .37). Effect sizes for this moderator on CBCL growth were as follows: control versus intervention group: *d* = .15 for more educated parents; *d* = 1.17 for lower educated parents.

Cumulative risk model. The cumulative risk model provided reasonable fit to the data (χ^2 [*df* = 6] = 16.64, *p* < .05; *CFI* = .99; *RMSEA* = .05; *SRMR* = .03), although the non-significant chi-square value likely reflects the large sample size. The cumulative risk index was significantly related to the intercept parameter (*est* = 3.45, *SE* = .78), and to the slope parameter (*est* = 3.68; *SE* = 1.15). The intervention effect on the slope was not significant in this model (*est* = -.15; *SE* = .49), a change which is likely due to high collinearity with the interaction term included in this model. The interaction between intervention and cumulative risk did not significantly predict the rate of change in problem behaviors (*est* = -2.77, *SE* = 1.57).

As above, to verify that collinearity was the reason for non-significance of the main effect of intervention in the interaction model, we also ran a model that only included the main effects of intervention and cumulative risk as predictors of the rate of change in problem behaviors. Consistent with a multicollinearity hypothesis, a significant main effect of intervention on growth in problem behavior was seen in this model (*est* =-.85, *SE* =.29).

Discussion

Our moderator analyses found that one family risk factor, low parent educational level, predicted greater improvement in child problem behavior from age 2 to 4 in response to a brief parenting intervention. This effect on growth in problem behavior was robust across Eyberg and CBCL outcomes. Another risk factor, single parent status, on the other hand, predicted lesser improvement following intervention, for the Eyberg outcome only. Importantly, for both outcomes there was a consistent picture of no moderator effects for other risk variables; parents who were very depressed or hassled, who had marital or drug problems, or who had been a teenaged mother, were equally likely to see improvements in child problem behavior following intervention, compared to those with lower levels of risk on these variables. When we combined predictors into a cumulative risk index there was similarly no evidence of differential outcome by level of risk.

The present paper complements the findings of Dishion et al. (2008) and Shaw et al. (in press), which demonstrate effectiveness of the FCU for preventing problem behavior in a high risk, non-referred sample, and for addressing key risk factors, including parenting skill and maternal depression. Effect sizes, although modest, were reasonable for a brief intervention in a preventive setting. The trial also shows that the FCU is equally likely to reduce problem behavior for boys and girls, and for families of different ethnic groups (Dishion et al., 2008). The present paper extends these findings considerably, by showing that the intervention effects were generally

very similar in size for families with very high levels of distress and disadvantage, compared to those who are more advantaged, albeit with a sample of predominantly low-income families.

It is noteworthy that this prevention trial fails to replicate a more common pattern of findings, whereby family risk factors predict poor outcome, as found in both treatment and prevention studies in two meta-analyses (Dumas & Wahler, 1983; Reyno & McGrath, 2006). The more optimistic findings of the Early Steps trial are consistent with some other recent preschool parenting intervention trials, including those analyzing data from a rather different intervention, the Incredible Years program (Baydar et al., 2003; Beauchaine et al., 2005; Gardner et al., 2008) which also found as good or sometimes better results with more distressed and disadvantaged families, in both treatment and prevention settings.

It is worth considering whether there might be common factors contributing to some interventions being more effective with very troubled or impoverished families, compared to less troubled families. The large meta-analyses of parenting trials included families referred for treatment and with high conduct problem symptom counts (Reyno & McGrath, 2006), as well as in (Lundahl et al., 2006) prevention trials. More recent studies showing no moderator effects, or some effects, but in the direction of more troubled parents doing better, are noteworthy in having much larger samples than studies in the meta-analysis, and in paying strong and explicit attention to client engagement. In other ways they are not particularly similar; the Incredible Years program is group-based and much more intensive; one of their studies is a clinic treatment sample, the other is, like Early Steps, a low-income early prevention trial, but is located in Head Start preschools. Despite these considerable differences in program type, common factors likely to contribute to successful intervention with very disadvantaged families include accessibility and careful attention to client engagement and motivation (Hutchings et al., 2007b). These factors are central to the FCU, with its use of shared assessment results to design an intervention led by client-needs, and its

use of MI strategies. This explicit focus on collaborative engagement with parents is also prominent in the Webster-Stratton (1998a,b) program, where it is achieved through use of a group-based program with an emphasis on non-didactic parent discussion and shared problem-solving. Accessibility is addressed in the FCU by having individual meetings with families in their homes, for both assessment and intervention, and in the Webster-Stratton program by providing food, childcare and often transport. The latter program has an impressively strong evidence base, but is less brief (12 group sessions). Furthermore, a group-based format may not suit all families.

Potentially, we can speculate that the FCU, although its effect sizes may be smaller in magnitude because of the relatively small amount of contact with families, is also a briefer route to engaging marginal families. Two considerations are relevant to the issue of effect sizes with a community intervention trial. First, the majority of children and families even in an at risk community sample do not display clinically significant levels of problem behavior or dysfunctional parenting. Thus, some families simply do not need to change, and a larger set need to change very little. We see the most pronounced change, indeed, in the families with offspring with the highest levels of problem behavior who engage in the FCU (Dishion et al., 2008; Connell et al., in press). The second consideration is that we are studying a developmental range where early behavior problems maybe more temperamentally driven than over-learned patterns of family interaction. As some children grow in overt and covert forms of problem behavior, we may anticipate larger effect sizes over time, given the preventive nature of this effort. Findings such as those reported by DeGarmo, Patterson and Forgatch (2004) suggest that changes in family dynamics such as reduced depression and improved parenting may actually produce increases in effect sizes over time. However, to resolve questions of real-world prevention effectiveness, such programs will need to be taken to scale, for example, within a national service such as WIC, and

further tested for cost-effectiveness, as some community trials have begun to do (Tudor-Edwards, Ceilleachair, Bywater, Hughes, & Hutchings, 2007).

Although it should be noted that moderator effects are relatively modest in terms of the amount of variance accounted for, another way of looking at their magnitude is to examine effect size differences by moderator group, which are quite marked. Thus, taking the CBCL outcome as an example, effect size in the intervention group is large (1.17) for low educated parents and small (.15) for those who are higher educated. It is also important to consider why parents with very low educational attainment responded better to the intervention. It might be this risk factor is linked to more limited awareness of child development and parenting issues, and the structured feedback provided by FCU is particularly accessible and easy to understand, and therefore more useful for these parents. On the other hand, in common with findings from the meta-analyses, single parents in our study appeared to find it harder to make use of the intervention, without the support of a partner. One explanation for this might be that lack of a partner to actively support change in parenting is critical. Alternatively, as found by Tolson et al. (1995), it might be that mothers perceived emotional support is positively affected when another adult resides with the family, regardless of the other adult's involvement with the parenting role. The findings suggest the need to pay more attention to strategies for engaging single mothers in the FCU, and addressing their goals and social support needs.

In addition to modest effect sizes, limitations of the study include that the findings may not be generalizable to higher income or lower risk families, nor to those who are referred for child behavior problems. Also, while the sample included reasonably high percentages of AA and EA families, we had proportionately fewer Hispanic families, and AA families were primarily concentrated in urban rather than rural or suburban neighborhoods. It is also worth noting that in the case of some risk variables, mothers were the informants for both the predictor and outcome

variables; mothers may also have been reluctant to disclose substance use. However, many of the risk variables were relatively objective demographic data, such as maternal age or education attainment, or tended to have little method overlap with the outcome variable, child problem behavior. Given that 40% of mothers had no live-in partner, we adapted slightly the wording of the marital questionnaire, so that it was applicable to a wider range of intimate relationships. We acknowledge this may have affected its validity. Even though we have randomization and an experimental design, measurement would ideally have included use of multiple methods and informants. As the children transition to school, it will be possible in future waves to gather multiple informant data.

Strengths of the present study include its large and diverse sample; to our knowledge, this is the largest study to date of moderating mechanisms in a family or parenting intervention. By using three assessment points, we were able to use more powerful growth modeling techniques. The intervention is noteworthy for being assessment-driven, with careful attention to selection of participants likely to be at higher risk, within a low-income sample, based on data from longitudinal studies of early-starting problem behavior (Shaw et al., 2000; 2003). By using techniques based on MI, effectiveness of a brief intervention is likely to be enhanced.

In conclusion, the FCU intervention holds much promise. When an intervention aims to be effective for at-risk families, then it is critical to test whether this is indeed the case, using moderator analyses. These findings suggest that the FCU is as likely to be effective, with the most distressed and disadvantaged families within an already low income sample, selected for having multiple risk factors for later problem behavior and drug use. Furthermore, although effect sizes are relatively modest, the brevity of the FCU intervention means there are possibilities for embedding it within a widespread and accessible service system such as WIC. This means that, taken to scale, the FCU could potentially have considerable public health impact.

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Table 1.

Descriptives for primary trial outcome measures

	Control				Intervention			
	N	Mean	*SD*	*N* (%) in clinical range	*N*	Mean	*SD*	*N* (%) in clinical range
Maternal depression, Age 2	363	16.56	11.02	148 (40.8)	366	16.94	10.30	155 (42.3)
Maternal depression, Age 3	320	16.26	10.84	134 (41.9)	331	14.62	11.06	123 (37.2)
Eyberg Problem (T-score), Age 2	364	59.22	8.49	169 (46.4)	365	59.14	8.45	154 (42.2)
Eyberg Problem (T-score), Age 3	315	60.06	10.51	163 (51.7)	327	59.18	10.22	158 (48.3)
Eyberg Problem (T-score), Age 4	305	60.63	10.80	163 (53.4)	311	58.64	11.15	139 (44.7)
Externalizing (T-score), Age 2	363	59.32	7.83	179 (49.3)	367	59.65	8.57	176 (48.0)
Externalizing (T-score), Age 3	320	56.11	9.56	117 (32.1)	331	55.83	9.23	107 (29.7)
Externalizing (T-score), Age 4	306	54.67	9.97	93 (30.4)	313	52.68	10.87	82 (26.2)

Table 2

Descriptives for predictor variables at Age 2

	Intervention		Control	
Parent psychological factors				
(continuous measures)	Mean	*SD*	Mean	*SD*
Maternal depression	16.9	10.3	16.6	11.0
Partner satisfaction (Locke)	56.3	10.3	58.2	9.7
Daily Hassles frequency	46.8	8.8	46.5	8.5
Family factors				
(categorical measures)	%		%	
Teen parent	22		23	
Single parent	38		42	
Low educational level	22		25	
Drug use	14		12	

Table 3.

Illustrative descriptive data for significant moderator effects on Eyberg Problem outcome.

	Change in Eyberg Problem score from age 2-4 by family risk factor.	
Risk variable	Intervention (n = 310)	Control (n = 304)
Single Parent	-1.0	-1.4
Living with partner	1.6	-1.1
t-test, single vs not	t = 2.6, p =.009	t = -.29, NS
Parent less than high school	.59	-4.2
high school or more	.67	-.30
t-test, less vs more than high school	t = -.07, NS	t = -3.3, p = .001

Table 4: LGM Interaction model for Eyberg Problem Scale

	Intercept Est (SE)	Slope Est (SE)
Intervention status	Fixed at 0	-1.61 (.56) *
Locke-Wallace	-.09(.03) *	-.05 (.02) *
Hassles	.31 (.03) *	-.08 (.02) *
Mother depression	.00 (.02)	.02 (.02)
Drug/Alcohol problems	-.39 (.66)	.20 (.51)
Teen mother	.05 (.51)	-.10 (.41)
Low education	.53 (.51)	.86 (.40) *
Single parent	-.38 (.45)	.52 (.36)
Interactions: Treatment x		
Locke-Wallace	Fixed at 0	-.02 (.04)
Hassles	Fixed at 0	-.02 (.04)
Mother depression	Fixed at 0	.01 (.04)
Drug/Alcohol problems	Fixed at 0	-.13 (.95)
Teen mother	Fixed at 0	-1.25 (.75) †
Low education	Fixed at 0	-1.47 (.75) *
Single parent	Fixed at 0	1.35 (.67) *
Parameter Intercept	14.13 (.38) *	1.21 (.40) *
Parameter Residual Variance	16.30 (2.96) *	11.15 (1.79) *

* $p < .05$ † $p < .10$ (trend)

Table 5: LGM Interaction model for CBCL Externalizing

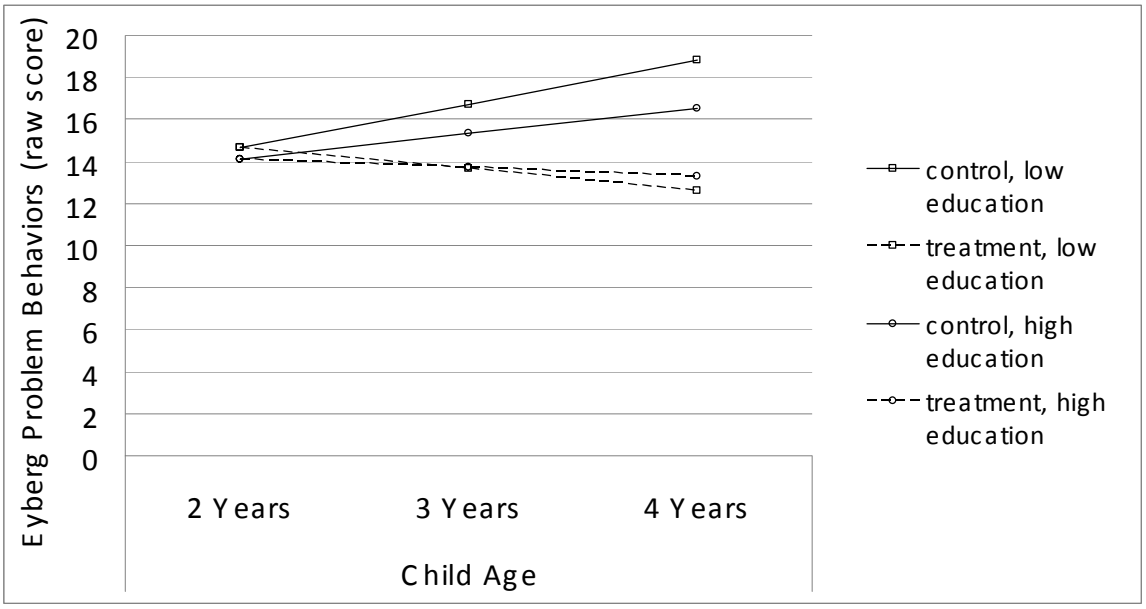
	Intercept Est (SE)	Slope Est (SE)
Intervention status	Fixed at 0	-1.72 (.52) *
Locke-Wallace	-.11(.03) *	-.04 (.02)
Hassles	.26 (.03) *	-.03 (.02)
Mother depression	.03 (.03)	.02 (.02)
Drug/Alcohol problems	.39 (.77)	-.19 (.48)
Teen mother	.36 (.60)	-.37 (.38)
Low education	1.39 (.60)	.45 (.38)
Single parent	-.36 (.53)	.32 (.33)
Interactions: Treatment x		
Locke-Wallace	Fixed at 0	-.06 (.04)
Hassles	Fixed at 0	-01 (.04)
Mother depression	Fixed at 0	-.04 (.03)
Drug/Alc problems	Fixed at 0	-.04 (.88)
Teen mother	Fixed at 0	-.52 (.69)
Low education	Fixed at 0	-2.16 (.69) *
Single parent	Fixed at 0	.19 (.62)
Parameter Intercept	21.08 (.44) *	-1.64 (.38) *
Parameter Residual Variance	32.08 (3.38) *	8.86 (1.68) *

* $p < .05$ † $p < .10$ (trend)

Figure captions

Figure 1. Intervention effects on child problem behavior (Eyberg Problem scale) by parent educational level

Figure 1


Eyberg Problem Behaviors (raw score)
20
18
16
14
12
10
8
6
4
2
0
2 Years
3 Years
4 Years
Child Age
control, low education
treatment, low education
control, high education
treatment, high education