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Prevention of Problem Behavior Through Annual Family Check-Ups in Early Childhood: Intervention Effects From Home to Early Elementary School

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Abstract

Objective—This randomized intervention trial examined the effects of yearly Family Check-Ups (FCUs) and tailored parent management training on parent report of problem behavior from age 2 to 5 years and teacher report of oppositional behavior at age 7.5.

Method—A multiethnic risk sample of 731 families in 3 distinct geographical settings who were receiving assistance from the Women, Infants, and Children Nutritional Supplement (WIC) program were randomly assigned to a yearly FCU. Intention to treat (ITT) analyses were used to examine overall intervention effects, and complier average causal effect (CACE) modeling was used to examine the effects of annual intervention engagement in the FCU on parent reports of child problem behavior from age 2 to 5, and teacher reports of problem behavior at age 7.5.

Results—ITT intervention effects were found regarding parent report at ages 2 to 5 and teacher report at age 7.5, indicating less growth in problem behavior for children in the intervention group than for those in the control group. CACE modeling of intervention engagement revealed that the effect sizes on parent- and teacher-reported problem behavior increased as a function of the number of yearly FCUs caregivers participated in.

Conclusions—Findings suggest that embedding yearly FCU services within the context of social, health, and educational services in early childhood can potentially prevent early-onset trajectories of antisocial behavior. The increases in effect size with successive FCU engagement underscores the importance of a motivational approach to parenting support among high-risk families.

Keywords

antisocial behavior; oppositional behavior; early childhood; intervention engagement; family intervention; family management

Early and persistent antisocial behavior is perhaps the most troublesome of all childhood mental health problems with respect to undermining adult health, happiness, and satisfying work and family relationships (Dishion & Patterson, 2006; Robins, 1966). The presence of oppositional and aggressive behavior begins to predict long-term problem behavior at about age 3 years (Campbell, Pierce, Moore, Marakovitz, & Newby, 1996; Henry, Caspi, Moffitt, & Silva, 1996; Shaw & Gross, 2008) and becomes especially prognostic of adolescent and adult criminal behavior by ages 6 and 7 (Loeber& Dishion, 1983; Olweus, 1980). Youths who engage in antisocial behavior in childhood and continue through adolescence are more likely to become involved in serious delinquent acts and health-risking behaviors in young adulthood (Loeber, 1988; Robins, 1966).

In several evidence-based treatments for antisocial behavior, parenting practices have been identified as a key target for reducing children's problem behavior (see Forgatch & Patterson, 2010; Kazdin, 2010; Sanders & Turner, 2002; Webster-Stratton & Herman, 2010; Zisser & Eyberg, 2010). The effectiveness of parent training interventions for families seeking help with a problem child served as the stimulus for developing the coercion model for the development of antisocial behavior (Patterson, 1982). Longitudinal studies initiated in early childhood indeed suggest the importance of parenting, especially when children are temperamentally susceptible to noncompliance (Shaw, Gillom, Ingoldsby, & Nagin, 2003).

Prevention of early-onset antisocial behavior would entail intervention support for early caregiving practices. From a public health perspective, it would be ideal to embed family support in the context of services so that families most likely to benefit can be identified and assisted. The key principle of a public health model is to design an intervention that reaches as many children and families as possible, especially those who are most vulnerable (Biglan, 2003; Kellam, 1990).

Some investigators suggest that antisocial behavior in children is a better fit to a dental model than a disease model of pathology (e.g., Dishion & Patterson, 2006; Kazdin, 1987). The contrast between a dental and disease model is straightforward. Effective dental care follows a health maintenance focus in which it is assumed that periodic support prevents deteriorating dental hygiene and the preponderance of tooth decay. In contrast, a disease model presumes that effective treatment will eliminate the disease and future risk of the pathology. Given the stability of antisocial behavior over time and the developmental nature of risk and resilience, a health maintenance approach may be more helpful as a prevention paradigm.

The Family Check-Up (FCU) intervention was developed as a core component of a health maintenance approach to family intervention and treatment (Dishion & Stormshak, 2007). The FCU model has two phases. The first phase is the actual FCU, which is a brief, three-session intervention to guide and motivate support for specific family management practices. The FCU was modeled on the Drinker's Check-Up (Miller & Sovereign, 1989) and is grounded in motivational interviewing techniques (Miller & Rollnick, 2002). It is used as a selected intervention for families, and its three sessions consist of an initial interview, a family assessment, and a feedback session focused on the assessment results. The second phase of the FCU model is a structured curriculum with 12 unique and self-contained modules that address three domains of the caregiving environment: positive behavior support, limit setting and monitoring, and relationship quality (Dishion, Stormshak,& Kavanagh, 2011). The focus on family management practices is directly derived from parent management training approaches to the treatment of antisocial behavior in children (e.g., Forgatch & Patterson, 2010).

The goal of the FCU model is to reach out to families through community service settings and to motivate those most in need to engage in interventions that address their specific concerns during a developmental transition period. Unlike one-time treatment programs for families with children showing antisocial behavior, the FCU is offered yearly to address change and adaptation in a family over time. For example, in previous research, the FCU was offered in public middle schools to support families most in need during the early-adolescence transition. Randomized trials of the FCU in public middle schools have revealed intention to treat (ITT) and engagement effects on multiple indices of adolescent problem behavior and motional adjustment (e.g., Connell & Dishion, 2008; Dishion, Kavanagh, Schneiger, Nelson, & Kaufman, 2002; Stormshak, Fosco, & Dishion, 2010).

The FCU has also been developed and tested through Women, Infants, and Children Nutritional Supplement (WIC) programs. In many ways the WIC environment is ideal for the placement of a preventive intervention that addresses the parenting needs of young families in that nearly every county in the United States has a WIC office for indigent families (Shaw, Dishion, Supplee, Gardner, & Arnds, 2006). Following this pilot work, a multisite intervention trial was implemented that included families at high risk and their male and female children (N= 731) in urban, suburban, and rural settings. Initial findings were based on an ITT approach, and the impact of randomization of families to the FCU on children's problem behavior at age 2, 3, and 4 years was evaluated. In this ITT analysis, children in the intervention group showed reduced levels of problem behavior, and these reductions were mediated by increases in observed positive parenting practices between child age 2 and 3 (Dishion et al., 2008), as well as by decreases in maternal depression (Shaw, Dishion, Connell, Wilson & Gardner, 2009). The effects of the FCU were most pronounced for toddlers in the clinical range of the Eyberg inventory of problem behavior in early childhood.

In our study we sought to extend the outcome analyses in the previous studies to address three questions. The families were offered the FCU and follow-up family management services at child age 2, 3, 4, and 5. The first question addressed was whether the FCU during early childhood was associated with reduced levels of child problem behavior in the home. For the second question, we sought to understand if reduction in child problem behavior in the home predicts teachers' reports of problem behavior at school in the second grade. Third, we asked to what extent does successful engagement in the FCU in early childhood predict increased effect sizes on reduced problem behavior. Increased effect sizes with successful engagement in yearly FCU services during early childhood would suggest the promise of a health maintenance approach to parenting support.

The analysis of intervention engagement (i.e., compliance) in a longitudinal prevention trial is not a simple problem. Simply comparing families in the randomized group within the intervention group that engaged with those in the control group is unacceptable because it undermines the validity of the design primarily with respect to selection bias. It is critical to identify equivalent members of the control group who would have engaged or not engaged if given the opportunity. In the past, the statistical development of appropriate comparison groups has relied on baseline covariates in the framework of propensity analyses, which is helpful only to the extent that there is very high baseline prediction of engagers and nonengagers. Fortunately, in the past 10 years, innovations in longitudinal data analysis relevant to randomized trials have enabled prevention researchers to make considerable progress in the study of engagement when assessing intervention effects (Jo, 2002a). In particular, complier average causal effect (CACE) modeling was developed as a quantitative strategy for the estimation of latent (i.e., unobserved) engagement and nonengagement in the control group. Thus the outcomes of latent engagers in the control group can be compared

with those of the intervention engager group to understand the impact of intervention engagement on children's adjustment.

In summary, we tested the following hypotheses: (a) random assignment of high-risk WIC families with a 2-year-old to the FCU model would result in reductions in parent-reported problem behavior from age 2 through 5 and in teacher report of oppositional behavior at age 7.5, (b) changes in parent-reported problem behavior would predict less teacher-reported problem behavior in school, and (c) engagement of families at high risk in the FCU during early childhood would result in reductions in children's problem behavior at ages 2 through 5 and teacher report of problem behavior at age 7.5, and that effect sizes would increase as a function of the number of FCUs the families participated in. These hypotheses were tested on a sample of 731 families of toddlers initially recruited through WIC offices in three distinct geographical regions.

Method

Participants

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 in and outside of Charlottesville, Virginia (Dishion et al., 2008). Families were invited to participate if they had a son or daughter between age2 years 0 months and 2 years 11 months, following a screen to ensure they met the study criteria by having socioeconomic, family, and/or child risk factors for future behavior problems.

Recruitment and Screening

The study was designed to evaluate the viability of the FCU for families most in need of caregiving support. The flow of participant recruitment in all phases of the study is summarized in Figure 1. Recruitment risk criteria were defined as one standard deviation above normative means or if established clinical cut points (i.e., for CES-D Eyberg)were met on screening measures in at least two of the following three domains: (a) child behavior problems (conduct problems—Eyberg Child Behavior Inventory; Robinson, Eyberg, & Ross, 1980; or high-conflict relationships with adults—Adult Child Relationship Scale; adapted from Pianta, 1995), (b) primary caregiver problems (maternal depression—Center for Epidemiological Studies on Depression Scale; Radloff, 1977; or daily parenting challenges—Parenting Daily Hassles; Crnic & Greenberg, 1990; or self-report of substance or mental health diagnosis, or adolescent parent at birth of first child), and (3) sociodemographic risk (low education achievement—less than or equal to a mean of 2 years of post–high school education between parents or low family income per WIC criterion; Trentacosta et al., 2008). In the case of children not qualifying on the criterion of child conduct problems, all participants were required to have at least above-normative average scores to increase parent motivation to reduce child problem behavior.

Of the 1,666 parents with 2-year-olds who were approached at WIC sites across the three study sites, 879 families met the eligibility requirements (52% in Pittsburgh, 57% in Eugene, 49% in Charlottesville) and 731 (83.2%) agreed to participate (88% in Pittsburgh, 84% in Eugene, 76% in Charlottesville). The children in the sample had a mean age of 29.9 months (*SD* = 3.2) at the time of the age 2 assessment.

Across sites, primary caregivers self-identified as belonging to the following ethnic groups: 50% European American, 28% African American, 13% biracial, and 9% other groups (e.g., American Indian, Native Hawaiian). Thirteen percent of the sample reported being Hispanic American. During the 2002 to 2003 screening period, more than two thirds of those families

enrolled in the project had an annual income of less than $20,000, and the average number of family members per household was 4.5 (*SD* = 1.63). Forty-one percent of the adult population had a high school diploma or GED equivalency, and an additional 32% had 1 to 2 years of post–high school training.

Retention—Of the 731 families who initially participated, 659 (90%) were available at the 1-year follow-up, 619 (85%) participated at the 2-year follow-up when children were between age 4 and 4 years 11 months, 621 (85%) participated at the 3-year follow-up when children were between age 5 and 5 years 11 months, and 566 (77%) participated in the 5.5-year follow-up when children were between 7 years 4 months and 8 years 5 months. At ages 3, 4, 5, and 7.5, selective attrition analyses revealed no significant differences relevant to project site; children's race, ethnicity, or gender; levels of maternal depression; or parent-reported children's disruptive problem behavior. Furthermore, minimal differences were found in the number of participants who were not retained in the control versus the intervention groups at age 3 (*n*= 40 and *n*= 32, respectively),age 4 (*n*= 58 and *n*= 53, respectively), age 5 (*n*= 48 and *n*= 62, respectively), and age 7.5(*n*= 74and *n* = 91, respectively). For teacher ratings of child oppositional problems at age 7, only 314 reports were available, primarily because of difficulties in obtaining cooperation at two of the largest school systems, which significantly reduced retention of school data in those sites (Chang et al., under review). Of the 578 families who were retained at age 7, 54% had teacher ratings available (Site 1 = 41%, Site 2 = 61%, Site 3 = 73%). With the exception of project site, analyses similar to those reported earlier in this article revealed no significant differences between families with teacher ratings versus those without, with respect to demographic characteristics or other study variables. Despite the missing data, teacher reports of children's oppositional behavior at school were included in the analysis to explore whether the intervention effects on oppositional-defiant behavior, if present, generalized across context and informant.

Measures

Every year since recruitment to the study (beginning at child age 2) a visit was made to the home, and each family was assessed using a variety of questionnaires, interviews, assessor impressions, and videotaped observations. All the measures used in this study were executed at the home visit. Responses to the measures described in the following subsections were assessed at the age 2 home visit and were used in the analyses to help predict class membership in the intervention or the control group.

Parent report of child problem behavior(ages 2–5)—To develop a continuous measure of child problem behavior in early childhood, we selected items from the Child Behavior Checklist (CBCL; Achenbach & Rescorla, 2001) that describe defiance, opposition, and aggressive behavior. The CBCL asks parents to rate the validity of several statements regarding potential child behaviors on a 3-point Likert scale in which 0 = *not true;* 1 = *somewhat, sometimes true;* and 2 = *very true, often true*. A scale was then computed by averaging the values for problem behavior items at each assessment age. Because the CBCL changes items at age 5, there were only 8 oppositional-defiant and aggression items that were continuously present on the CBCL across ages 2 through 5 were used. Alpha reliabilities for the Problem Behavior scale were acceptable at all four ages (.71 at age 2, .75 at age 3, .78 at age 4, and .80 at age 5).

Teacher report of oppositional behavior at school(age 7.5)—To measure teacher-reported oppositional behavior in the classroom during school age, we used the DSM-oriented Oppositional Defiant Problems scale from the Teacher Report Form (TRF; Achenbach & Rescorla, 2001) version of the CBCL. The TRF is a well-validated measure of

child problem behavior and was administered to the primary teacher of study participants at age 7.5. Internal consistency for the 5-item scale was .90.

Demographics questionnaire—A demographics questionnaire was administered to the primary caregivers during the assessment procedure. This measure included questions concerning the demographic characteristics of the target child, primary caregiver, and other potential caregivers, as well as questions regarding the family structure, income, parental criminal history, and areas of familial stress.

Maternal depression—The Center for Epidemiological Studies on Depression Scale (CES-D; Radloff, 1977) was used to assess depression in the primary caregivers. The CES-D, which consists of 20 items, is a well-established and widely used measure of depressive symptoms. This measure uses a 0 (*less than 1 day*) to 3 (*5–7 days*) Likert scale to assess the frequency of experiencing depressive symptoms during the past week. An overall depressive symptoms score was created using the sum of the items. At the age 2 assessment, internal consistency in this sample was .76.

Substance use—The primary caregivers' current frequency of substance use was assessed using the short version of the Adult Substance Use questionnaire (Skinner & Allen, 1982). The primary caregiver was asked to estimate how often they drank any alcoholic beverage, smoked marijuana or hashish, or used hard drugs (including cocaine, methamphetamine, and pain killers) during the past 12 months, on a scale from 0 to 10 (0 = *never*, 4 = *2 or 3 times a month*, 7 = *nearly every day*, 10 = *3 or more times a day*). The mean of use was calculated across these items.

Positive relationship score—The positive relationship score was attained from the Adult–Child Relationship Scale, which was adapted for parents to report about their relationship with their child from the Student–Teacher Relationship Scale (Pianta & Nimetz, 1991). Caregivers were asked to rate, on a scale ranging from 0 (*definitely not*) to 5 (*definitely*), how well a variety of statements describe the relationship they had with their child. Parents were asked how well several statements, such as *this child likes telling me about him/herself* or *if upset* and *he seeks comfort from me*, describes the caregiver–child relationship. Alpha reliability for the items included in the positive relationship score was .60.

Chaotic home environment—The Confusion, Hubbub, and Order Scale (CHAOS; Dumas et al., 2005) is a 15-item measure of environmental confusion; it asks caregivers to designate whether specific descriptions about the organization of the home are typical of the family or not (true or false). Items are derived from a list of factors typically found in chaotic homes, with 8 of the 15 items comprising one factor for chaos in the home. The internal consistency for the chaotic home environment score was .74.

Neighborhood dangerousness score—Neighborhood dangerousness was assessed by means of primary caregiver report using the 19-item exposure to violence factor from the Me and My Neighborhood Questionnaire (MMNQ; Ingoldsby & Shaw, 2002). An example item is *a family member was robbed or mugged*. For each statement, the participant was asked to identify the frequency with which each behavior occurred in their neighborhood on a 4-point Likert scale (*never*, *once*, *a few times*, or *often*). The alpha reliability of the exposure to violence score was .88.

Positive behavior support—Videotaped family interactions were coded using the Relationship Process Code (RPC; Jabson, Dishion, Gardner, & Burton, 2004). Duration

scores were recorded to capture the amount of time a caregiver spent prompting and reinforcing the positive behavior of the target child by using the following RPC codes: prompts and suggestions of positive activities, positive reinforcement (both verbal and physical), and positive structure (e.g., providing choices in a request for behavior change). The average team percent agreement for the RPC coding system was .87, kappa = .86.

Intervention status—Participants were randomly assigned at recruitment to either an intervention (367 families) or a control (364 families) condition. Random assignment occurred after the first assessment at age 2. For these analyses, assignment was coded as 0 for the control condition and 1 for the intervention group.

FCU Intervention

The FCU has been extensively tested as a three-session intervention with follow-up services that emphasize specific family management practices (Dishion & Stormshak, 2007). To ensure that home visitors were blind to the intervention status of the family and to reduce bias in completion of the assessment, in this study we began with the assessment. In the second session, the parent consultant conducted an initial interview, during which adult caregivers' concerns and needs were explored. The third session of the FCU, family feedback, was typically scheduled at the family's home. Family strengths and challenges were determined by referring to the norms for the measures being collected about each domain. A colored feedback form identifying strengths (green) and areas that need attention (red) was used as a guide to give verbal and visual feedback to families One standard deviation above the mean on a risk factor was deemed as "needs attention." The goals of these sessions were to (a) share assessment findings with family members regarding areas of strengths and challenges, (b) engage in a motivation-enhancing discussion about promoting positive change, and (c) provide a menu of intervention and service resources to facilitate the family change process. The Everyday Parenting curriculum (Dishion et al., 2011) was used as a guide to follow up interventions every year for each family. This manualized intervention focuses on parent management training that includes 12 possible sessions. The 12sessions are partitioned into three domains of family management: positive behavior support, limit setting and monitoring, and relationship building. Follow-up sessions were selected and tailored based on the results of the ecological assessment and caregivers'motivation.

Engagement status—Engagement status was coded to reflect participation of the family in the FCU across the early childhood phase of development, including ages 2, 3,and 4, meaning that families were considered to have engaged at a given age if they participated in at least an initial interview and feedback session. Because this is a risk community sample involving families not requesting family intervention services, follow-up parenting interventions were neither advisable nor motivated by the caregivers. However, many of the families accepted the invitation to participate in the FCU, and of those who did, a majority also engaged in some form of follow-up interventions. Following are the percentage of participants who had an assessment at each age and(a) engaged in an FCU feedback session, (b) engaged in follow-up sessions, and (c) in parentheses, the average number of follow-up sessions, respectively: age 2: 76%, 72% (3.4); age 3: 69%, 70% (3.1); age 4: 70%, 74% (3.5).

Engagement status was examined using increasingly strict criteria so that families randomly assigned to the intervention condition who engaged in the FCU at any point from child ages 2 through 4 were initially coded as 1 (n = 317, 86.4%), and those who did not choose to participate at all were coded as 0 (n = 50, 13.6%). *Engagement* was subsequently defined as participation in at least two feedbacks and all three feedbacks, with n = 249 (67.8%) and n =

163 (44.4%) participants coded as 1, respectively. Given the health maintenance hypothesis, it was expected that periodic, yearly FCUs would reduce parent reports of child disruptive behaviors over time. It is noteworthy that nearly three quarters of the intervention group participated in the FCU at child age 2, and engagement in the FCU decreased somewhat during the next 2 years. The effect of the intervention assignment for engagers/nonengagers (defined as completing one, two, or three FCU feedback opportunities or not) was estimated on the basis of CACE modeling, described in more detail later in this article.

Data analysis—Mplus 5.21 (Muthén & Muthén, 2009) was used for all analyses. For structural equation modeling results used in ITT analyses, multiple indices of model fit are provided. The use of multiple fit indices to assess structural equation model fit has become common in recent decades (Fan & Sivo, 2005). A good-fitting structural equation model should contain at least two of the following: a nonsignificant chi-square test, although this can be violated in large samples (Bentler & Bonnett, 1980); comparative fit index (CFI) close to 1.0 (Hu & Bentler, 1999); Tucker-Lewis index close to 1.0 (Bentler & Bonnet, 1980); and root mean square error approximation (RMSEA) less than .08 (MacCallum, Browne, & Sugawara,1996). FCU effects were determined by including the dummy-coded intervention status variable (1 = intervention) as a predictor of problem behavior. To assess whether increasingly strict definitions of engagement increased the preventative effect of the FCU on early-child disruptive behavior, CACE analysis with a growth mixture framework was used. CACE enables a distinction to be made between those participants who actually receive the intervention and those who do not (Stuart, Perry, Le, & Ialongo, 2008). Unlike ITT analyses, CACE analyses account for the existence of noncompliance in randomized experimental designs (Jo & Muthén, 2003). In the CACE framework, intervention engagement is treated as a moderator of the effect of random assignment to the intervention on child adjustment outcomes.

Although it is possible to conduct CACE-type analyses that rely on empirical model fitting and parametric assumptions (e.g., Muthén & Brown, 2009), we focused on a more widely practiced CACE approach in which empirical model fitting and parametric assumptions are not central to identification of causal treatment effects (see Jo, Stuart, Mackinnon, & Vinokur, under review). In this approach, to estimate the latent engagement status of the control group and to test for moderation effects on random assignment, several underlying assumptions are critical to the validity of the analytic framework (Angrist, Imbens, & Rubin, 1996; Jo, 2002a). These assumptions are that(a) possible outcomes for each individual are unrelated to the potential outcomes for other individuals; (b) intervention condition assignment is random; (c) there are no “defiers,” meaning there are no participants who do the opposite of the instructions given; (d) in the intervention group there are participants who comply, therefore the average causal effect of assignment to intervention on the actual receipt of services is not zero; and (e) for noncompliers, intervention assignment does not predict outcomes. This last assumption, called the *exclusion restriction*, is critical because comparing those with longitudinal trajectories similar to those of the interventions families who declined the FCU identifies the latent noncompliers in the control group. In our previous work, we found that parents who decline the FCU are more likely to be less at risk on a variety of factors than are those who engage. Thus, the exclusion restriction bias can be considerably reduced by including covariates in the model that adequately address engagement (Connell, 2009; Jo, 2002b).

Results

Before conducting the ITT and CACE analyses, unconditional latent growth models of child oppositional-defiant behavior from age 2 to age 5 demonstrated that a linear model provided a good fit to the data, in which $\chi^2(4) = 18.67$, $p < .001$, CFI = .985, TLI = .978, RMSEA = .

071. The mean of the slope was significant (estimate = −.083, $p < .001$),suggesting negative linear change over time, on average. The slope variance was also significant (estimate = .007, $p < .001$),suggesting individual differences in the rate of growth over time.

ITT analysis revealed a group effect favoring the intervention group in parent report of reduced child oppositional-defiant behaviors from ages 2 to 5 in the intervention group compared with the control group, $B = -.150$, $p < .05$, in which $\chi^2(7) = 20.14$, $p < .01$, CFI = .987, TLI = .981, RMSEA = .051. Cohen's *d* was used to calculate the effect size of the intervention group compared with that of the control group from ages 2 to 5 and revealed a modest effect size ($d = .30$). Similarly, intervention group assignment significantly predicted lower levels of teacher-reported oppositional behavior at age 7.5, with a small effect size, $B = -.129$, $p < .05$, model just identified; $d = .26$.

Next, as shown in Figure 2, a structural equation model including disruptive behaviors from ages 2 through 7.5revealed that the intervention effects on teacher-rated oppositional behaviors at school age operated indirectly through parent-reported change in oppositional-defiant problems from ages 2 to 5, indirect $B=-.086$, $p < .05$, with$\chi^2(9) = 29.33$,$p < .001$, CFI = .980, TLI = .967, RMSEA = .056; $d = .17$.

Of the 367 families assigned to the intervention group, 163 (44.4%) families completed an FCU at all three yearly opportunities. CACE analyses were then used to explore the effectiveness of the intervention on reducing oppositional-defiant behavior over time for those who engaged in the intervention at varying levels. Analyses did not reveal significant differences in the level of intervention engagement based on site (Pittsburgh, Eugene, or Charlottesville). In the intervention group, participants who completed three (age 2, 3, and 4) FCUs were compared on a number of variables collected during the initial assessment at age 2. Table 1 reports the means and standard deviations, or percentages, as well as the odds ratios and omnibus tests to compare the differences in baseline (age 2) characteristics between those in the intervention group who fully participated (engagers) in the intervention and those who did not (nonengagers). As shown in Table 1, participants who chose to engage in the intervention were more likely than nonengagers to endorse higher rates of depression when their children were age 2and to have a female target child. Nonengagers were more likely than those who engaged in the FCU to report having been a teen parent when they had their first child (not necessarily the study child), living below the poverty line, belonging to a minority racial group, and having been young when the target child was born.

CACE modeling is a mixture modeling that identifies longitudinal trajectories by using model constraints defined by the assumptions described previously. To improve the precision of the mixture, covariates can be used to predict engagement status. As with other mixture modeling techniques, CACE analyses do not provide typical estimates of model fit. The entropy index has been developed to assess the quality of growth mixture models (exploratory procedure). It evaluates the likelihood of membership in the classes for each individual on a scale from 0 to 1.0, with values close to 1.0 indicating better classification of the sample (Muthén & Muthén, 2006). For these data, entropy was acceptable, given the confirmatory nature of the CACE analyses, ranging between .58and .76, with entropy increasing as more lenient engagement criteria were used.

The covariates that predicted engagement in the FCU at all three, at two, and at least one time point were assessed using a logistic regression framework in the respective CACE analysis. All analyses used full information maximum likelihood to account for missing data, assuming that data are missing at random conditional on observed information, including baseline covariates and observed engagement status within the intervention

condition (Jo, 2008). These analyses predicting the engagement classes included the full sample of participants. The results of the comparison of the most stringently defined engagement group (i.e., engagement in all three FCUs) and nonengagers (see Table 2) suggest that higher levels of caregiver depression, having a female target child, being above the poverty line, and the primary caregiver's age at the target child's birth predicted engagement.

Dosage Effects

CACE models were performed using increasingly stringent engagement criteria, such as engagement in one, two, or three FCUs. The number of FCUs in which the caregiver participated was then used as an estimate of the dosage effect for these participants at this period of transition to preschool. The effects of dosage on the slope for parent-reported problem behavior and teacher-reported ODD are summarized in Table 3.

Children in families in the control group and the intervention nonengager group showed relatively low levels of problem behavior over time. In contrast, for one-FCU engagers, those children in the intervention group showed considerably less growth in oppositional behavior than did those defined as potential engagers in the control group ($B = -.22$, $p < .01$). The effect size comparing the intervention group with the control group from ages 2 to 5 was small to medium ($d = .44$). Moreover, the indirect effect of the FCU on age 7.5 teacher-reported oppositional behavior through growth of parent-reported disruptive behaviors was also significant (indirect $B = -.116$, $p < .05$), with an effect size of $d = .23$.

Also, shown in Table 3, two-FCU engagers showed significant reductions in growth in child problem behavior from ages 2 to 5 ($B = -.28$, $p < .05$), and FCU assignment indirectly predicted lower levels of teacher-reported oppositional behavior at age 7.5 (indirect $B = -.146$, $p < .05$). The effect size of the intervention group compared with that of the control group was $d = .55$on growth from ages 2 to 5 and $d = .29$ for the indirect effect on teacher-reported oppositional problems at age 7.5.

Consistent with the findings for one and two feedbacks, three-FCU engagers showed significant reductions in child problem behavior from age 2 to age 5 ($B = -.46$, $p < .05$); however, the indirect effect of the intervention on age 7.5 oppositional behavior was reduced to a trend (indirect $B = -.23$, $p < .10$). The significant intervention effect on problem behavior growth from ages 2 to 5 is shown in Figure 3. The effect size of the intervention compared with that of the control group from age 2 to 5 was large ($d = .93$) and small to medium for age 7.5 oppositional defiant problems ($d = .47$).

In summary, when moving from an ITT analysis to the CACE strategy that incorporates successive years of engagement, the effect size of intervention on growth in children's problem behavior from age 2 to age 5 increased from small to large (e.g., ITT $d = .30$, 1 FCU $d = .44$, 2 FCUs $d = .55$, 3 FCUs $d = .93$), and from small to moderate on teacher-rated problem behavior at age 7.5 (e.g., ITT $d = .17$, 1 FCU $d = .23$, 2 FCUs$d = .29$, 3 FCUs $d = .47$). These results suggest intervention dosage may be an important factor for preventing problem behaviors for high-risk populations.

Discussion

This intervention trial describes an effort to proactively identify and engage young families potentially at risk for early development of child problem behavior. One of the major barriers to the use of family-centered intervention strategies is surmounting the reluctance of parents to seek parenting support (Spoth, Kavanagh,& Dishion, 2002), and therefore their inability to benefit from the parenting services offered (Patterson, 1985). The health

maintenance framework provides an alternative approach to family engagement by virtue of being brief, motivation focused, collaborative, and strengths based. Most important, the FCU was offered every year during the early childhood period. The relatively high levels of engagement in the FCU (greater than 70%) and the follow-up parent management training interventions suggest the approach has promise.

These analyses suggest the efficacy of a health maintenance framework in general and the FCU in particular for the prevention of early emergence of conduct problems. The typical developmental trend is for disruptive and defiant behaviors in young children to decrease from age 2 through 5 (Shaw et al., 2003; Tremblay, 2000), as we found in this sample of 731 toddlers and their families. When we examined the effects of the FCU from age 2 to 5 on parent report of oppositional-defiant behavior, we found a small but statistically reliable intervention effect when using an ITT framework. This result suggests that the normative decreases in disruptive behavior seen in the control group are enhanced if parents are provided some support with parenting practices. More important, perhaps, is the significant decrease in teacher reports of oppositional problems by Grade 2 (7.5 years) in the school context. Teachers were unaware of the intervention condition of each study child, thus this effect is suggestive of long-term benefits of parenting support in early childhood.

Examination of results of engagement in the FCU also revealed a dosage effect associated with the number of FCU feedbacks the caregivers received. We found intervention effects increasing from the moderate range to the large range associated with increasing levels of engagement. Families who engaged in the FCU at child ages 2, 3, and 4 (47.4%) showed the greatest reductions in problem behaviors from ages 2 through 5, compared with results for a latent class of engagers randomly assigned to the control condition. In contrast to results from previous outcome studies of this intervention model, parents who were somewhat less at risk with respect to teenage parenthood and observed positive behavior support were more likely to engage in all three of the offered FCUs. However, maternal depression was associated with a higher level of engagement in the FCU. Given that the FCU is voluntary and involves consistent participation over time, the profile of parents who engaged makes sense. However, the longitudinal pattern of nonengagers is similar to that found in previous studies (e.g., Connell, Dishion, Yasui, & Kavanagh, 2007; Stormshak et al., 2010); that is, children of caregivers who chose not to engage in the FCU tended to show less growth in problem behavior over time. These findings suggest some accuracy in the parents' sense of parenting efficacy and need for services. Further research on engagement in intervention service could clarify the dynamics of self-selection.

Longitudinal analysis of change in children's problem behavior as a function of consistent family support is significant socially and theoretically. It has been known for quite some time that early starters represent approximately 6%–7% of the population, yet are responsible for nearly half of adolescent crime and three fourths of violent crimes (Offord, Boyle, & Racine, 1991). These youth typically initiate problem behavior very early in development and are engaging in antisocial behavior by age 6 or 7.From the coercion model perspective, it is more accurate to say that their coercive behaviors, unfortunately, were not reduced as is typical during this phase of development. Youths who are consistently high in coercive behaviors are more likely to be seen as problematic by age 8 (Shaw et al., 2003). Children rated by teachers as problematic as early as age 6 and 7 are much more likely to engage in serious problem behavior in adolescence (Loeber & Dishion, 1983). Thus, these initial findings suggest that randomization to a relatively brief, annual parent support check-up can potentially prevent the emergence of a behavior pattern that portends future and more serious antisocial and emotional difficulties for these youth.

Data from our study suggest early emerging problem behavior in children is malleable in the context of a family intervention. Our study, in combination with previous treatment studies that have involved young children and that have revealed similar findings (Webster-Stratton & Reid, 2010; Zisser & Eyberg, 2010), motivates a deeper level of understanding of the social and biological mechanisms underlying early mental health problems in general and the emergence of early conduct problems in particular. In other words, problem behavior is a preventable phenomenon.

It is noteworthy that WIC agencies offer assistance in nearly every county in the United States. As such, offering the FCU as an integral feature of the WIC program could potentially have a large public health effect in the entire country. Given that indigent families are the most likely to engage in WIC, comprehensive insertion of empirically supported family intervention services in WIC and other settings serving this population (e.g., Early Head Start, Head Start) could provide substantial public health benefits for the larger community. In previous reports, we documented similar outcomes after having inserted the FCU into public school environments, which resulted in preventive effects on adolescent problem behavior that endured from age 11 through 18 (Connell et al., 2007). Thus, it is becoming increasingly clear that families can be effectively supported throughout development, with lasting benefits in terms of reducing substance use and mental health problems in children and adolescents, and in turn reducing persistent and severe problematic behaviors in emerging adulthood and beyond.

The FCU is complementary to existing family intervention programs in its focus on supporting specific parenting skills. Yet in other ways, it is radically different. For example, for families showing some risk, various intervention options are available, and relatively brief and focused interventions are provided that specifically target family needs, such as limit setting or positive behavior support. Although the interventions' curricula are similar in content to those of well-established family intervention programs (e.g., Forgatch & Patterson, 2010), most families engage in only one to three sessions of parent training, as indicated by the assessment. If effective, this adaptive and tailored strategy is clearly cost efficient, especially when it is implemented at a community level. It is worth noting that in our study, only a small percentage of the families received intensive support, that is, engaged in more than 10 sessions following the FCU (14.5% at age 2, 13.8% at age 3, 12.7% at age 4, and 25.5% at age 5). Because of the low number of families that engaged in follow-up parenting services, it is difficult to analyze this aspect of engagement. Research on the use of the FCU for caregivers seeking help with an oppositional child would likely be the better context for evaluating the extent and nature of the follow-up sessions relevant to outcome.

This research and intervention strategy has some limitations. Notably, there was considerable loss of teacher report data in two of the three sites. The problem with retention in this study was not a function of individual teacher refusal, but rather the process of obtaining school permission. In this phase of the study, we had coupled teacher report with direct observations of student behavior in the public school setting. Understandably, school districts were more cautious with this form of data collection, and therefore were more likely to decline participation. However, an analysis of the participants with missing data on teacher ratings does not suggest severe differences with those retained in this assessment. Moreover, we ran the models for the one site with 75% retention in the teacher ratings and found the same pattern of intervention effects as those reported on the full sample.

The second limitation is that minority families were less likely to engage in the FCU at all three ages. We are concerned about and interested in this problem, and future research will seek to improve minority family engagement. However, it is worth noting that despite this

statistical trend, in general engagement in the FCU was quite high across all demographic groups in this study. In another project, when we were able to match the ethnicity of the parents with that of our parent consultants, we increased engagement from 25% observed in a previous project to 50% (Stormshak et al., 2010).

In summary, our study results suggest that there is promise in proactively offering parenting services that enhance motivation and engage parents in empirically supported intervention services. As suggested by Kazdin (1987), a “dental model” is perhaps more appropriate for the prevention and treatment of antisocial behavior. The health maintenance model and the dental model are closely aligned. In both models, prevention and treatment services are integrated into periodic visits. As one would hope, following a dental check-up, follow-up services are driven by results of well-established assessment protocols. Finally, the most vulnerable patients are motivated to engage in more frequent and intensive services. From this perspective, offering the FCU in a variety of service contexts that include periodic contact increases engagement of community samples of children and families (Hoagwood &Koretz, 1996). Examples of such service settings include WIC, Head Start, public school systems, and general pediatric care. Results of this study suggest that interventions such as the FCU are appealing to caregivers when the focus is collaborative, respectful, and strengths based. This approach has the potential to prevent children arriving to the public school environment from quickly acquiring the “problem child” label, thus preventing the cascade of developmental experiences that can arise from this difficult start.

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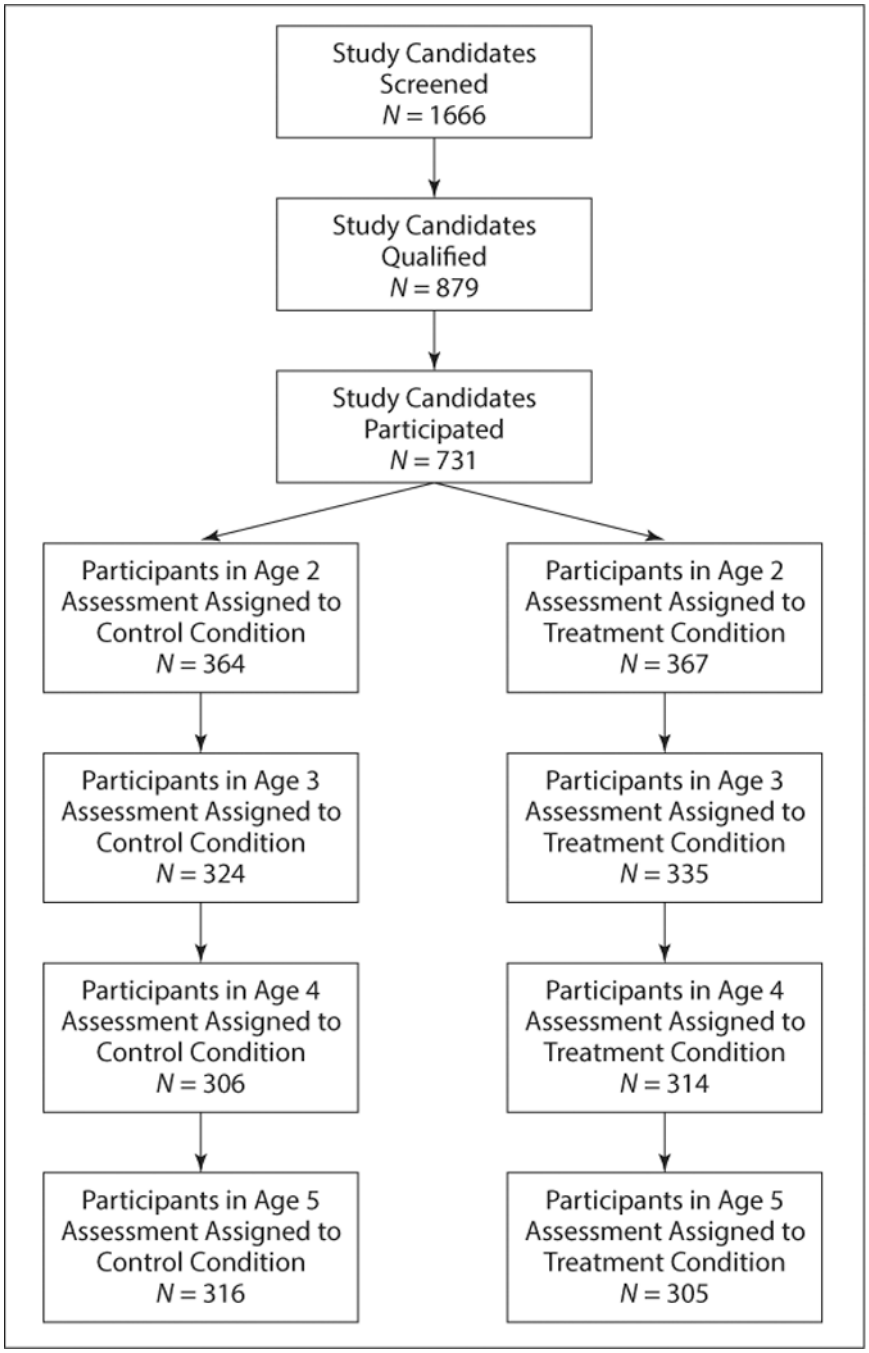

Figure 1.
An overview of recruitment, assessment, randomization, and participation.

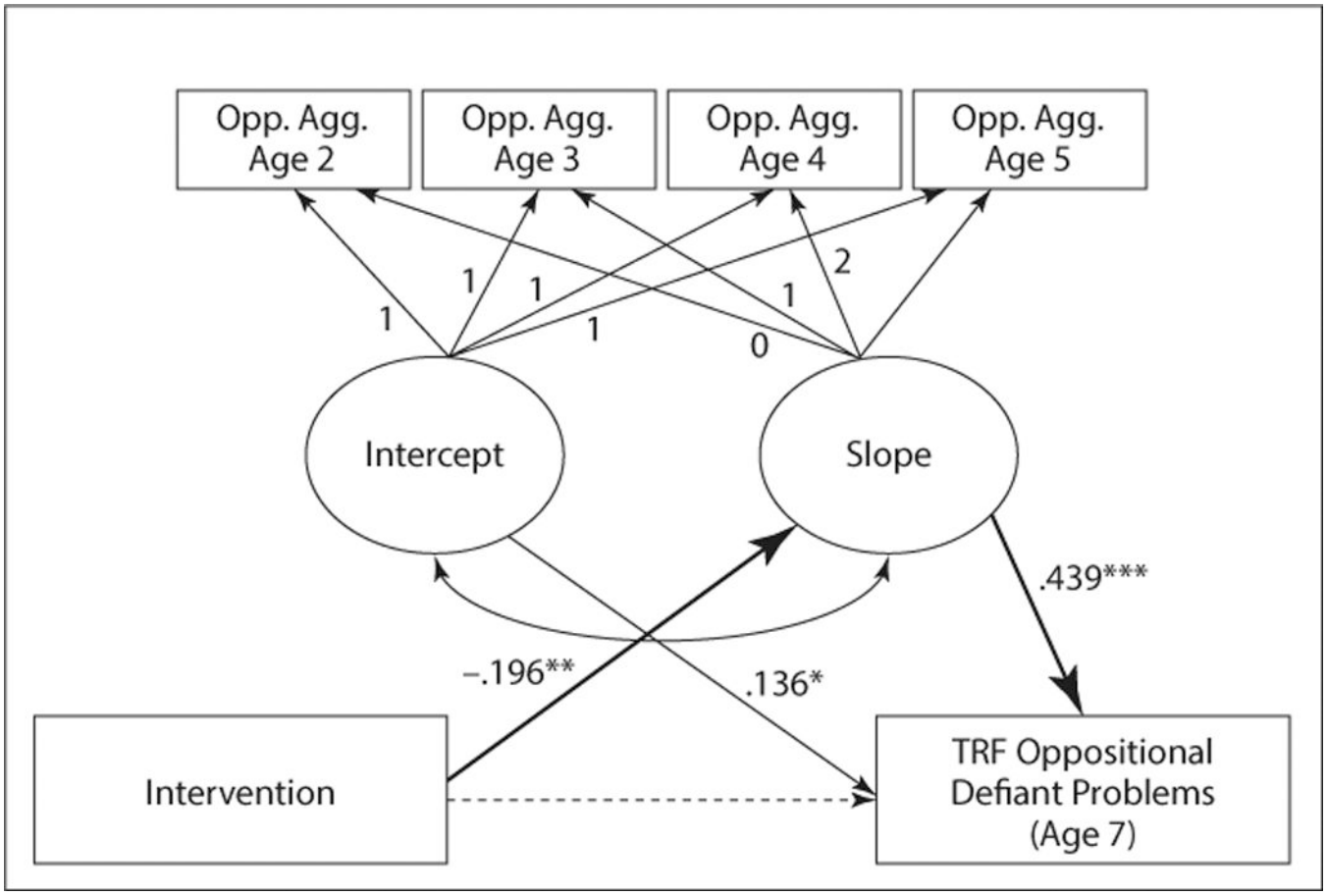

Figure 2.
Latent growth model of intervention effects on early-childhood problem behavior and teacher ratings of oppositional behavior.

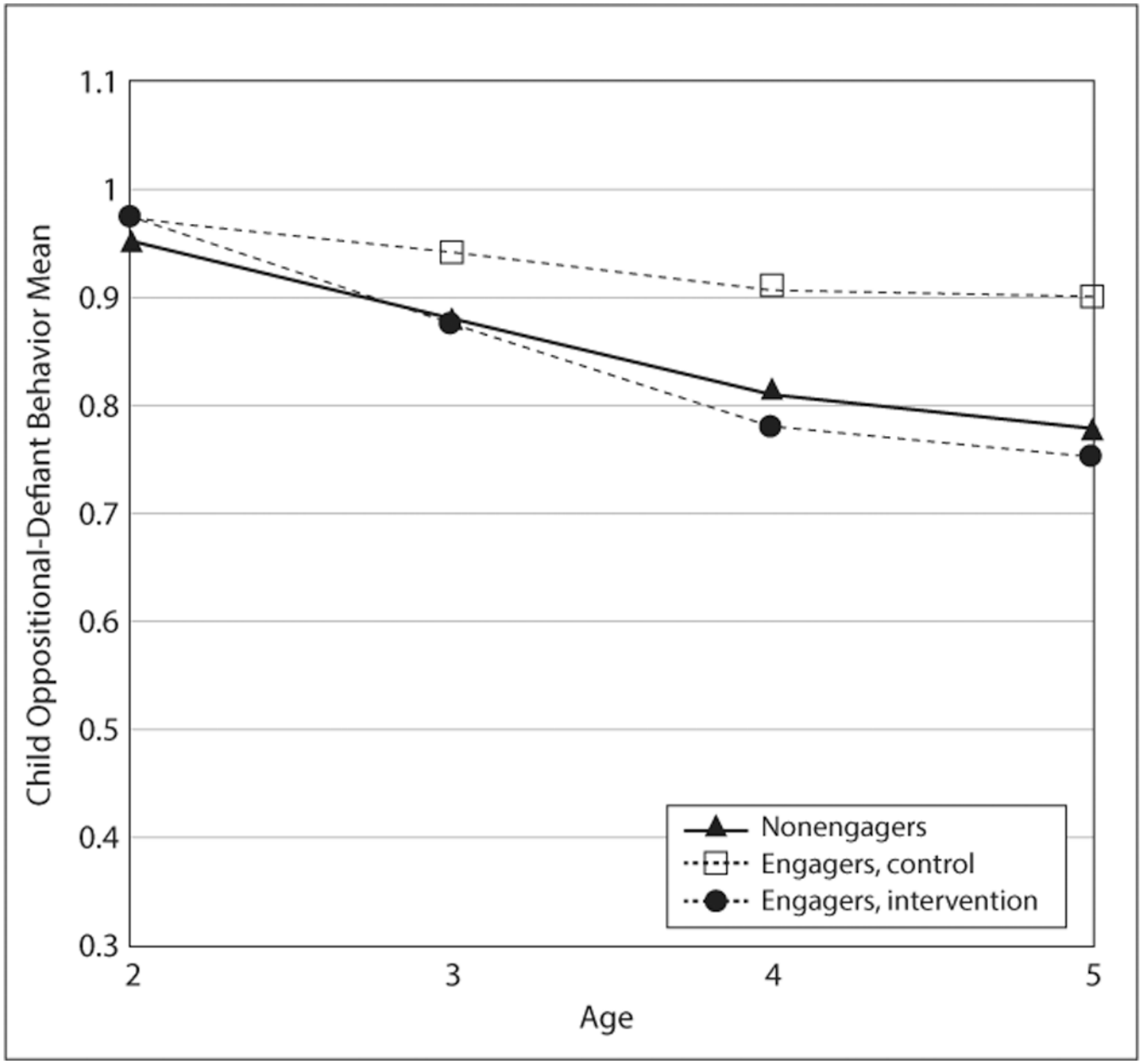

Figure 3.
CACE results for the effect of the intervention on changes in child oppositional-defiant behavior for 3 FCU engagers and nonengagers.

Table 1

Baseline (at Age 2) Characteristics of Nonengagers and Engagers Randomized to FCU Intervention

Covariate	Nonengager	Engager	Omnibus test	Odds ratio
Child gender female	45.10%	55.20%	$\chi^2(df = 1) = 3.71, p < .05$	1.50
Caregiver depression	15.99 (9.99)	18.12 (10.58)	$F(1, 364) = 3.88, p < .05$	1.02
Caregiver's age at child's birth	23.64 (5.57)	26.52 (7.59)	$F(1, 362) = 17.42, p < .001$	1.07
Caregiver minority status	59.30%	45.40%	$\chi^2(df = 1) = 6.13, p < .01$	0.59
Caregiver substance use	2.05 (2.18)	1.63 (1.89)	$F(1, 317) = 3.33$, *ns*	0.90
Teen parent	25.50%	17.80%	$\chi^2(df = 1) = 3.12, p = .05$	0.63
Live-in partners since child's birth	0.88 (0.70)	0.89 (0.49)	$F(1, 354) = 0.01$, *ns*	1.02
Caregiver–child positive relations	8.18 (2.97)	8.42 (3.05)	$F(1, 364) = .595$, *ns*	1.03
Chaotic home rating	12.71 (2.25)	12.60 (2.27)	$F(1, 363) = 0.32$, *ns*	0.97
Family poverty	79.40%	65.00%	$\chi^2(df = 1) = 11.85, p < .001$	0.44
Neighborhood danger	19.00%	15.40%	$\chi^2(df = 1) = 0.83$, *ns*	0.99
Positive behavior support	−0.08 (0.72)	0.03 (.70)	$F(1, 365) = 2.04$, *ns*	1.24

Note. Means are presented first, standard deviations are in parentheses.

Table 2

CACE Model Prediction of Compliance Class Membership

Variables predicting intervention engagement	Class membership engager vs. nonengager Logit (*SE*) Fixed at 0 –
Child gender is female	0.51 (0.26)*
Age 2 caregiver depression	0.03 (0.01)*
Caregiver's estimated age at target child's birth	0.08 (0.02)***
Caregiver race is of minority status	−0.30 (0.26)
Age 2 caregiver substance use	−0.02 (0.02)
Caregiver has been a teen parent	0.30 (0.31)
Age 2 number of live-in partners since TC's birth	0.03 (0.20)
Age 2 caregiver–child positive relationship score	0.03 (0.05)
Age 2 chaotic home rating	0.01 (0.06)
Age 2 family below the poverty line	−0.55 (0.28)*
Age 2 neighborhood danger rating	−0.00 (0.02)
Age 2 positive behavior support construct	0.12 (0.18)
Parameter intercept	−2.97 (1.23)*

* $p < .05$,

** $p < .01$,

*** $p < .001$.

Table 3

CACE Model Results on Dependent Variables for Three Definitions of Engagement

	Within-class variation on parent-reported problem behavior				
	Nonengager class		Engager class		
Randomly assigned and engaged in:	**Intercept (*SE*)**	**Slope (*SE*)**	**Intercept (*SE*)**	**Slope (*SE*)**	**Teacher-reported ODD (*SE*)**
1 Family Check-Up	0[a](0)	0[a](0)	0[a](0)	−0.22 (.08)**	0.01 (0.08)
2 Family Check-Ups	0[a](0)	0[a](0)	0[a](0)	−0.28 (.10)*	0.05 (0.14)
3 Family Check-Ups	0[a](0)	0[a](0)	0[a](0)	−0.46 (.20)*	−0.00 (0.21)

Note

[a] fixed at zero in CACE mixture models; ODD = oppositional defiant disorder;

* $p < .05$,

** $p < .01$.