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An Ecological Approach to Promoting Early Adolescent Mental Health and Social Adaptation: Family-Centered Intervention in Public Middle Schools

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Abstract

This study examined the impact of the Family Check-Up (FCU) and linked intervention services on reducing health-risk behaviors and promoting social adaptation among middle school youth. A total of 593 students and their families were randomly assigned to receive either the intervention or middle school services as usual. Forty-two percent of intervention families engaged in the service and received the FCU. Using complier average causal effect analyses, engagement in the intervention moderated intervention outcomes. Families who engaged in the intervention had youth who reported lower rates of antisocial behavior and substance use over time than did a matched control sample. Results extend previous research indicating that a family-centered approach to supporting youth in the public school setting reduced growth of antisocial behavior, alcohol use, tobacco use, and marijuana use throughout the middle school years.

Early adolescence (age 11–13) is a time of rapid and extreme biological (i.e., puberty) and social (i.e., peer groups, schools) transition during which new behaviors are learned that can either benefit the health and social adaptation of youth, or alternatively, seriously undermine adjustment in later adolescence and adulthood. Problem behavior in childhood can amplify as children move into the middle school years (Caspi, Moffitt, Newman, & Silva, 1998; Dishion & Patterson, 2006; Patterson, Capaldi, & Bank, 1991). The change to the middle school structure contributes to this problem, with decreased parent–teacher communication, increased exposure to a wider array of peer influences, and more unsupervised time (Larson & Richards, 1991; Larson, Richards, Moneta, Holmbeck, & Duckett, 1996; Mayseless, Wiseman, & Hai, 1998). Decreased parental monitoring and involvement also make the middle school years a risk period for the development and maintenance of problem behaviors such as substance use, aggression, and violence (Dishion, Patterson, Stoolmiller, & Skinner, 1991; Eccles, Lord, & Roeser, 1995). Youth who exhibit problem behavior

during the middle school years often begin substance use and increase their interaction with deviant peers, which in turn leads to academic failure and continued substance use and antisocial behavior in high school (Dishion & Owen, 2002; Kellam, Brown, & Fleming, 1982; Smith & Fogg, 1979). This developmental model has been tested across multiple longitudinal studies with youth and families from a variety of cultural backgrounds (Barrera, Castro, & Biglan, 1999; Kilgore, Snyder, & Lentz, 2000) and suggests that the middle school years are an important target of intervention.

Of interest to researchers, and a primary theme of this special issue, is the question of how to raise “healthy” children who remain on a trajectory of positive development throughout middle school and high school. In the past 15 years an effort has been made to translate developmental theories and empirical findings from longitudinal studies into the design of effective intervention programs targeting a range of problem behavior. This effort has involved the identification of both risk factors and factors that lead to resilience among youth at high risk for problem behavior (Hawkins, Catalano, & Miller, 1992; Loeber & Dishion, 1983).

Interestingly, deficits in parental management and poor family relationships are key predictors of problem behavior, the maintenance of problem behavior, and adolescent depression (Connell & Dishion, 2008; Dishion & McMahon, 1998; Spoth, Kavanagh, & Dishion, 2002; Stormshak, Bierman, McMahon, Lengua, & Conduct Problems Prevention Research Group, 2000). In contrast, consistent family management and healthy parenting relationships protect youth from the development of later problem behavior even when youth are exposed to other risk factors such as stress and poverty (Galambos, Barker, & Almeida, 2003; Ryan, Martin, & Brooks-Gunn, 2006). Intervention research unequivocally demonstrates that interventions targeting caregiver practices are effective interventions for adolescents with problem behavior (Dishion, Nelson & Kavanagh, 2003; Dishion & Stormshak, 2007; Forgatch, DeGarmo, & Beldavs, 2005; Henggeler, Schoenwald, Borduin, Rowland, & Cunningham, 1998; Schmidt, Liddle, & Dakof, 1996; Spoth et al., 2002). As such, parenting practices are appropriate proximal targets for intervention programs that aim to decrease antisocial behavior and reduce substance use during the middle school years. However, it is still unknown if such parenting-focused programs can be successfully implemented in a more ecologically valid context, outside of well-controlled efficacy trials.

The EcoFIT Model

The translation of basic research to practice and to real-world settings has received a great deal of attention in the past few years. This focus can be attributed in part to a shift in the prevention research priorities from efficacy trials to effectiveness trials. Efficacy trials help identify the components of an intervention that are the most clinically significant, whereas effectiveness trials help identify the aspects of the intervention that facilitate adoption by practitioners in real-world settings such as schools. Our model is a combination of both: an efficacy trial housed in public middle schools and intended to be embedded in the school system in order to influence change across both families and schools.

EcoFIT is an ecological approach to family intervention and treatment that is family-centered and based on a health maintenance model, with regular check-ups and support during developmental transitions (Dishion & Stormshak, 2007). The model is grounded in developmental research, and outcomes associated with the intervention include risk reduction and long-term mental health of youth and families. A general intervention approach such as EcoFIT can have multiple benefits to families of adolescents, including improving the quality of family life and the long-term health of the adolescent. A critical step is to design a family-centered intervention that reaches large numbers of families within

a community context. The EcoFIT approach has been found to be effective across multiple settings that go beyond the school milieu; for example, it is also effective as an early childhood intervention. Furthermore, it has been shown to work with both urban and rural populations (Connell & Dishion, 2008; Connell, Dishion, Yasui, & Kavanagh, 2007; Dishion, Kavanagh, Schneiger, Nelson, & Kaufman, 2002; Dishion et al., 2008; Dishion & Stormshak, 2007; Gardner, Shaw, Dishion, Burton, & Supplee, 2007; Shaw, Dishion, Connell, Wilson, & Gardner, 2009; Shaw, Dishion, Supplee, Gardner, & Arnds, 2006; Stormshak, Connell, & Dishion, in press; Stormshak, Dishion, Light, & Yasui, 2005; Stormshak & Dishion, in press).

The EcoFIT model of intervention is a strategy for designing interventions that serve children and families on the basis of empirical findings and theoretical principles developed in the fields of developmental, ecological, and intervention science (Dishion & Stormshak, 2007; Stormshak & Dishion, 2002). This adaptive, tailored approach to intervention delivery is housed within the public school environment (Dishion & Kavanagh, 2003). In this context, the model comprehensively uses universal, selected, and indicated components for family interventions to individualize service distribution and to take into account the needs of each family. The universal intervention involves the establishment of a family resource center (FRC) in the middle school, where resources are provided about parenting topics such as monitoring one's adolescent, homework completion, supervision, and limit setting.

Some families may benefit from additional services because of demographic risks or challenging family circumstances (e.g., single parents, limited financial resources), occurrence of child problems at school, or a desire for additional parenting resources. These families are provided a selected intervention called the Family Check-Up (FCU; Dishion & Stormshak, 2007). The intervention motivates parents to improve parenting practices and uses motivational interviewing, feedback, and an ecological assessment procedure that involves questionnaires and on-site observations to assess child and family circumstances in the context of the school and home environments. It is designed to link intervention services with the school and community, to promote well-being, and to improve both parenting and child behavior (see Dishion & Kavanagh, 2003; Dishion & Stormshak, 2007). Intervention staff in the schools conduct the FCU either at school or in the home and use motivational interviewing to provide feedback to caregivers. A menu of options is then provided to each family. Many parents choose continued support from the intervention staff, parenting skills training, or home-to-school planning, which represents the indicated level of the model that is administered to high-risk families. In this way, the FCU actively promotes self-selection into the most appropriate intervention services.

Challenges of Evaluating Adaptive Interventions

Some complexities are potentially associated with evaluating the impact of an adaptive intervention approach. One core challenge may be a wide variation in the extent to which families assigned to the treatment condition actually elect to engage with treatment services. Although some families assigned to the treatment condition receive all aspects of the intervention, other families receive minimal or no intervention even though they are part of the intervention group. In this design, engagement moderates intervention outcomes. Intention-to-treat (ITT) analyses, often considered a gold standard for examining intervention effects, evaluate intervention effects by comparing the outcomes for participants in the control group with the outcomes for all participants assigned to the intervention group, regardless of their actual engagement with treatment services. As such, ITT analyses may underestimate the effects of intervention on outcomes for families actually engaging with intervention services, and thus may not be optimal for examining the effects of adaptive intervention programs (Connell et al., 2007; Lachin, 2000). Other

potential procedures for examining outcomes for families who engaged with treatment, such as as-treated analyses, have well-known biases such as disruption of the initial randomization of participants to control and treatment groups, and are not considered acceptable alternatives.

More recently, complier average causal effect (CACE) analyses have provided researchers with a means to account for variations in compliance with intervention activities and to examine outcomes specifically for participants who complied with the intervention, without disrupting the randomization of the experiment (see Jo, 2002; Little & Yau, 1998). In CACE modeling, engagement in the intervention (also called *compliance*) is examined using mixture modeling, which permits the assessment of differential outcomes for the intervention group and the control group while taking into account the contribution of intervention engagement (compliance) to the outcome. We have used CACE analysis in several research studies examining intervention outcomes associated with the EcoFIT model (Connell et al., 2007; Stormshak et al., in press) and found that it yields useful information about intervention efficacy that is not accessible through traditional analytic strategies.

This Study

This study evaluated the efficacy of the implementation of the EcoFIT model in the public school milieu for preventing an increase in both problem behaviors and substance use during the middle school years. Participants were recruited from three public middle schools in an ethnically diverse urban region of the United States. Youth and families participated in the intervention throughout the three years of middle school, and data were collected using youth self-report. The study began in 2005 as an intervention trial designed to improve engagement rates of families beyond those in our previous research, during which we engaged 25% of the intervention families in the FCU (Connell et al., 2007). Our focus was on tailoring the intervention to meet the needs of diverse families as youth transition from middle to high school.

The goal of this intervention is two-fold. First, we set out to double the rate of family engagement with services, including the FCU, in our previous intervention trial by adapting this model to better fit the needs of our diverse sample. Given the higher rates of antisocial behavior among boys and potential ethnic differences in terms of substance use (Cleveland & Weibe, 2003; Lahey, Gordon, Loeber, Stouthamer-Loeber, & Farrington, 1999), gender and ethnicity were used as covariates in the analyses. Second, we sought to reduce antisocial behavior and substance use during the middle school years by engaging parents in a family-centered intervention with their youth. Thus, we hypothesized that engagement in the FCU and linked services would moderate positive outcomes in terms of youth behavior and substance use.

Method

Participants

Participants were 593 adolescents and their families across three public middle schools in an urban area of the country. All three middle schools in this study served an at-risk population of youth and families, with 35%, 89%, and 39% of families across the three schools receiving free/reduced-price lunch. All three schools were Title 1 schools, and approximately 20% of the school population qualified for special education services. Youth and families were recruited in sixth grade across two cohorts. Parents of all sixth grade students were invited to participate in the study, and 80% of all parents agreed to do so. Consent forms were mailed to families or sent home with youth. The sample comprised 51% male participants and 49% female participants. The ethnicity of the sample was as follows:

African American (16%); Latino/Hispanic (18%); White (36%); American Indian (3%); Asian (8%); and biracial/mixed ethnicity (19%).

An unbalanced approach to randomization was used to enhance the power to detect intervention effects specifically for families electing to engage with the selected level of intervention. As such, 386 families (65%) were randomly assigned to the intervention condition, and 207 families (35%) were randomly assigned to the control condition in which families experienced “school as usual,” including regular services offered by the schools, but no access to any of the intervention services available to families in the intervention condition.

Identifying students as “at-risk” can be a barrier to enrolling families in interventions that target parenting and family engagement (Dishion & Kavanagh, 2003; Kavanagh et al., 2000). Teachers rated student behavior problems at the beginning of the study using the Teacher Risk Perception questionnaire (TRISK; Soberman, 1994). These ratings were used to examine the risk status of the sample, but not to identify students for enrollment. The intervention model is intended for all families of middle school youth. There were no differences between intervention and control conditions based on these ratings. The sample was divided into thirds by using the TRISK ratings (low risk, at risk, and high risk), and there were no differences in engagement of families by teacher ratings of risk (chi-square = 2.386; $p = .30$).

Student surveys were collected annually about all youth enrolled in the study. More than 80% of youth were retained across the 3 years of the study (Wave 2, $n = 525$, 87% of sample; Wave 3, $n = 481$, 81% of sample).

Intervention Protocol

The EcoFIT model is a multilevel intervention that comprises three levels. The first level, the family resource center (FRC), is a universal intervention established in each of the middle schools. The goals are to (a) establish an infrastructure for collaboration between school staff and parents, (b) promote norms and strategies for empirically validated family management practices, and (c) provide a vehicle through which a program of specific family-centered interventions can be implemented and coordinated with educational services in the school. Some examples are the FCU, parent management training, and follow-up academic monitoring services to parents. A variety of strategies can be used to engage caregivers at various stages in the continuum of risk, all of which serve to establish rapport and collaboration in the best interest of the student.

The FRC is staffed with a part-time parent consultant who provides services to families within the school context. The parent consultant attends behavioral support meetings, teacher meetings, and any other important school meetings related to child behavior. The parent consultant serves as a bridge between the school and the family and provides information to parents about their child’s behavior, attendance, and homework completion. Brief consultations are also offered to parents, and they include topics such as homework completion and home-to-school planning. Furthermore, special seminars are provided about topics of interest to families in the school (e.g., supervising your teen during the summer).

The selected intervention is the FCU, a brief three-session intervention based on motivational interviewing and modeled after the Drinker’s Check-Up (Miller & Rollnick, 2002). The FCU was offered to all families who were randomly assigned to the intervention group. The FCU is central to our intervention with children and families in that it reduces the amount of intervention time needed to effect change in problematic parenting practices. Briefly, the FCU involves three meetings with caregivers. The first meeting is an initial

interview during which the practitioner facilitates a discussion about goals and concerns with parents and about their personal motivation for change. This meeting establishes a collaborative base for future meetings. The second session involves a brief assessment packet given to the parent, child, and teacher and a videotaped family interaction assessment. The third meeting is a feedback session to discuss the results of the assessment in terms of (a) providing motivation to change, and (b) identifying the appropriate resources with respect to a menu of family-based intervention options. The feedback interview leans heavily on Miller and Rollnick's motivational interviewing techniques.

Feedback

Motivational interviewing was designed as an intervention technique to “trigger” the behavior change process by focusing on motivation to change (Miller & Rollnick, 1991). Drawing from a broad base of research, Miller and colleagues (Brown & Miller, 1993; Miller, 1987, 1989; Miller & Sovereign, 1989) designed a set of procedures that provides parents with a basis for better decision making regarding the need for change. Motivational intervention incorporates a set of five behavior change principles, encapsulated in the FRAMES model.

F refers to providing parents with data-based *feedback* about their behavior and the implications of their behavior for the future. *R* stands for communicating to the parent their *responsibility* for the behavior change process. *A* reflects the need for sound *advice* from an expert about developmental and behavior change issues. *M* means that rather than providing parents with a single behavior change option, it is essential for a *menu* of behavior change options to be developed. Taking an active role in deciding on an optimal behavior change strategy is self-motivating. *E* refers to the need to express *empathy* for the parents' situation. Therapists must cultivate understanding and compassion for a variety of circumstantial and cultural experiences presented by parents who are considering healthy changes. Finally, the *S* in *FRAMES* means that parents should leave the motivational interview with a sense of *self-efficacy*. One of the best ways to promote self-efficacy is to collaborate with parents in selecting behavior change goals that are realistic, measurable, and under their control.

Data are a critical feature of motivational interviewing and change. Not only are data useful for helping parents reconsider “issues” (e.g., homework completion) as serious problems that need attention and change, but data also guide the tailoring of the intervention to fit the school setting and individual family. Thus, a fundamental component of the feedback session is sharing data with the parent. Especially useful are data that come from other sources such as teachers and family observations. Research suggests that providing feedback to parents from the findings of psychological assessments is conducive to change (Sanders & Lawton, 1993). The critical feature of such feedback is that it can be presented in a supportive and motivating manner. The primary goal is to explore potential intervention services that support family management practices and to motivate parents to seek support for parenting and to make changes in family management. At this juncture, some families decline further services, whereas others receive both consultation from the parent consultant and follow-up.

In our study, the parent consultants who delivered this service were full-time University of Oregon employees with intervention experience and expertise working with families. Their education level ranged from doctoral degree to bachelor's degree. For this project, parent consultant ethnicity was matched with family ethnicity whenever possible. Parent consultants reflected the primary ethnicities represented in this study, and included one Latino consultant fluent in Spanish, one African American consultant, and two European American consultants. Consultants were trained through a series of workshops during the 3 years of the study, including one week-long initial training and several follow-up training

workshops of equivalent length. Supervision was provided weekly by a doctoral-level practitioner and included feedback to consultants, planning for the FCUs, role plays, and support for using the family management curriculum.

The majority of the family management curriculum, which was used to create the brochures in the FRC, handouts for parents, and content of the follow-up intervention, was derived from the Adolescent Transitions Program curriculum, a well-developed and empirically validated parenting program (Dishion & Kavanagh, 2003).

Of the 386 families in the intervention condition, 51% ($n = 197$) received consultation from a parent consultant, 42% ($n = 163$) received the full FCU intervention, and 49% percent declined the service ($n = 189$). Of the families receiving the FCU, 29% received additional follow-up support after the feedback such as parent skills training or the development of a home-to-school plan. The average intervention family received 146 minutes (or 2.5 hours) of intervention time. The majority of the contacts occurred with families within the seventh and eighth grade time frame (80%).

One basic consideration is the level of engagement of families of all demographics, such as gender and ethnic status. With respect to gender, 47% ($n = 76$) of families who engaged in the FCU had a girl, and 53% ($n = 87$) of families had a boy as a target of the intervention. The percentages of families engaging in the intervention by family ethnicity were as follows: 47% ($n = 33$) of Latino families, 42% ($n = 59$) of European American families, 36% ($n = 22$) of African American families, 51% ($n = 37$) of youth from multiethnic backgrounds, and 7% ($n = 12$) of youth from other ethnic backgrounds engaged in the FCU.

Assessment Procedures

In the spring quarter of each year, from sixth through eighth grade, students were surveyed with a questionnaire that measures a variety of problem behaviors. This questionnaire was derived from a survey used by the Oregon Research Institute to assess these behaviors (Metzler, Biglan, Rusby, & Sprague, 2001). Assessments were conducted primarily in the schools unless a student moved or was absent. In those cases, assessments were mailed to the home. Each youth who participated received \$20 for each year he or she completed the assessment.

Measures

Adolescent substance use and antisocial behavior—Youth completed a self-report survey about their drug use and antisocial behavior each year of the study (sixth through eighth grades). Each year they were asked to report about the frequency with which they used alcohol, tobacco, and marijuana during the previous month (e.g., How many alcoholic drinks did you have last month?). Youth reports of engagement in antisocial behavior were measured averaging across 11 items on a 6-point scale ranging from *never* to *more than 20 times* during the past month. The items included content such as lying to parents, staying out all night without permission, stealing, carrying a weapon, and physical aggression. These items have been used in previous research on antisocial behavior and are a reliable estimate of this construct (Cronbach's $\alpha = .836$).

Child gender—Gender was coded as 0 = female and 1 = male in the analyses.

Child ethnicity—Four categories of youth ethnicity were examined in the analyses, including European American, African American, Latino, and "other." The "other" category comprised several different ethnic groupings that consisted of too few individuals to feasibly examine in isolation, including American Indian, Asian American, Pacific Islander, multiple

ethnicities, and unknown. European American families served as the reference group in CACE analyses.

Intervention status—Random assignment was coded as 0 = control and 1 = intervention.

Engagement status—Engagement status was coded with two variables (comply and noncomply) to reflect family participation in the FCU and further intervention services as warranted. Families in the intervention condition who elected to receive the FCU were coded as 1 for the comply variable and 0 for the noncomply variable. Families in the intervention condition who did not receive the FCU were coded 0 for the comply variable and 1 for the noncomply variable. In the control condition, families were coded a 1 for both the comply and noncomply variables to reflect that their compliance status was unknown (i.e., they were allowed to be members in either the complier or the noncomplier class).

Analytic Strategy

We performed CACE analyses (Jo, 2002) within a latent growth model to examine the effect of intervention for families who engaged with the FCU. In the CACE analyses, the goal was first to estimate membership in a categorical latent “engagement” class, and then to examine the effect of intervention on the linear rate of change in problem behaviors within the latent class of participants identified as engaging with the FCU. In CACE models, engagement status is treated as an observed variable within the intervention condition (we can directly observe which families elected to receive the FCU), but as an unobserved status in the control condition, so that the latent engagement class estimation identifies families in the control condition who are most likely to have engaged with the FCU if they had been randomly assigned to the intervention rather than the control condition. In this regard, engagement is modeled as a moderator of intervention outcomes.

As detailed by Jo (2002), CACE analysis is predicated on several assumptions that are necessary for CACE to provide an unbiased estimate of the intervention effect for compliers. These assumptions are (a) assignment to intervention is random; (b) potential outcomes for each participant are independent of the outcomes for other participants; (c) for noncompliers in either the intervention or control condition (i.e., never-takers or always-takers), the distribution of potential outcomes is independent of the intervention assignment; (d) there are no “defiers,” or individuals who will always do the opposite of instructions regardless of the instruction; and (e) the average causal effect of assignment to intervention on the actual receipt of intervention is not zero. The design of the trial makes most of these assumptions quite reasonable. Assumption (a) is that treatment assignment is random, and the current study in fact used random assignment procedures. Assumption (b) is that the potential outcomes for each participant are independent of outcomes for other participants. Because the FCU was delivered individually to families, we are reasonably confident about meeting this criterion. Assumption (d) refers to the absence of “defiers.” There were no “defiers” in the control group because treatment records indicate that we did not deliver any intervention components to any control participants. Because of randomization, we assume that the same lack of defiers would be found in the intervention group. Finally, Assumption (e) is that the rate of compliance is not zero, and we can observe a non-zero rate of compliance among participants assigned to treatment. Because of randomization, we assume that the compliance rate is equal across the control and intervention conditions.

The third assumption (c), known as the “exclusion restriction,” is typically the most questionable (Jo, 2002). Violations of this assumption may lead to biased CACE estimates of intervention effects, particularly in the face of low compliance rates (Jo, 2002). However,

the potential effects of bias resulting from violations of the exclusion restriction can be ameliorated by the use of covariates to predict compliance status (for details see Jo, 2002).

Latent growth modeling (LGM; Singer & Willett, 2003) was used to examine change in the outcomes over time within the CACE analytic framework. LGM analyses were conducted with Mplus 5.1, using full information maximum likelihood estimation to account for missing data (Muthén & Muthén, 2008), so that the N was 593 for all models even when there was occasional missing data on the covariates or outcomes. The LGM intercept was parameterized to reflect the initial level of the outcome variable in sixth grade (prior to any intervention), and the slope was parameterized to reflect the linear rate of change in the outcome variable from sixth through eighth grade. Alcohol use, tobacco use, and marijuana use outcomes were modeled as count variables in all analyses to account for the nature of the data collected and for nonnormal distributions of these variables, but antisocial behavior was modeled as a continuous variable.

Results

Descriptive Statistics

Descriptive statistics for the three outcome variables are shown in Table 1 and bivariate correlations are shown in Table 2. Means in Table 1 suggest an increase in problem behavior from sixth to eighth grade for all four outcomes. Correlations in Table 2 reveal a general pattern of moderate correlations between the variables both within time and across outcomes.

School-Level Differences

Given the low number of schools ($N = 3$), we had limited ability to detect differences by school in response to the intervention. We did, however, examine potential differences in the level of antisocial behavior and substance use between schools. Using the eighth grade outcomes, we found no differences between schools in the level or rates of antisocial behavior ($F = 1.43, p = .24$), alcohol use ($F = .79, p = .45$), tobacco use ($F = .67, p = .51$), or marijuana use ($F = .66, p = .51$). We also found no differences relevant to the ethnicity of students at each school ($F = 1.35, p = .25$).

CACE Model Analyses Strategy

CACE analyses were conducted in three steps. First, separate CACE models that included only intervention assignment as a predictor of outcome slopes in the engager class were examined for each of the four youth outcomes. For example, intervention assignment was set to predict the growth (i.e., slope) of antisocial behavior in the engager class, but not the growth of antisocial behavior in the nonengager class. Intervention assignment was not set to be a predictor of the initial level (i.e., intercept) of antisocial behavior in any of the compliance classes, and it was not set as a predictor of membership in the latent compliance classes.

In the second step, the CACE models were extended to include gender and ethnicity as covariates, which were allowed to predict intercept and slope (i.e., initial status and growth in the outcome) for both of the compliance classes, along with class membership. In the two previously described modeling steps, each of the four outcomes (antisocial behavior, alcohol use, tobacco use, and marijuana use) was examined in separate CACE analyses. Because these CACE models ran without any error for all four outcomes of interest, we then proceeded to the next step.

As a third and final step, we examined a single CACE analysis considering growth trajectories for antisocial behavior, alcohol use, tobacco use, and marijuana use in one model. The advantage of this final larger model is that compliance class membership is estimated only once. Although the compliance class is always the same within the intervention group because it is an observed variable, it must be estimated as a latent variable for the control group, which involves some variability from one analysis to the next. When estimating all outcomes in the same model, the compliance class membership is necessarily the same across outcomes when we consider the effects of intervention on the slopes. In the prior set of analyses considering each outcome in separate models, it is possible that the exact composition of the compliance class may vary slightly across each of the analyses, because compliance class membership is estimated separately.

This final larger model is shown schematically in Figure 1. In this final model, gender and ethnicity were also included as covariates and allowed to predict compliance class membership along with the intercepts and slopes of each of the outcomes within each class. It is important to emphasize that there were no substantial differences in the magnitude of the CACE estimates of intervention effects across the first and second steps of our modeling strategy as described earlier for any of the four outcome variables. Because the prediction of compliance class membership and the magnitude of the intervention effects for compliers were so consistent across modeling steps, we present here only the findings from the third step.

CACE Model Analysis Results

Compliance class membership—In the final model, neither youth gender nor family ethnicity were significantly related to family compliance with the FCU and linked services, suggesting equal participation from all ethnicities and families of boys and of girls (see Table 3). The significant intercept value means that the level of treatment compliance in the sample was significantly different from zero.

Within-class variation in trajectories for noncomplier class members—

Covariate effects (i.e., gender and ethnicity) on variation within the noncomplier class on intercepts and slopes for antisocial behavior, alcohol use, tobacco use, and marijuana use are shown in Table 4, and they are described below. The average intercepts and slopes for all outcomes were statistically significant; notably, significant growth in antisocial behavior, alcohol use, tobacco use, and marijuana use were observed from sixth through eighth grade.

For antisocial behavior, boys showed significantly higher initial levels of antisocial behavior than did girls, as shown in the “intercept” column. African American youth and youth in the “other” ethnicity grouping exhibited significantly higher initial levels of antisocial behavior than did European American youth. No covariate effects were found for the initial level or for the growth in alcohol or tobacco use trajectories. For marijuana use, African American and Latino youth showed significantly slower rates of growth compared with European American youth.

Within-class variation in trajectories for complier class members—Covariate effects on variation within the complier class in intercepts and slopes for antisocial behavior, alcohol use, tobacco use, and marijuana use are shown in Table 5, and they are described below. As was found in the noncomplier class, intercepts and slopes of all outcomes were statistically significant in the complier class. Notably, significant growth in antisocial behavior, alcohol use, tobacco use, and marijuana use were observed from sixth through eighth grade.

The “slope” column for each outcome in Table 5 shows that there was significant intervention effects for all four outcomes, with intervention predicting significantly less growth in antisocial behavior, alcohol use, tobacco use, and marijuana use. For illustrative purposes, the estimated trajectories of all four outcomes are shown in Figure 2. The relatively low and flat trajectory of noncompliers in both the control and the intervention groups shows that families who selected themselves out of the intervention did relatively well over time. More important, this figure shows a steeper increase in all four outcomes for control participants who would have complied if they had been assigned to the treatment group, as compared with those who did comply with the intervention because they were in the treatment group.

Several additional covariate effects were observed within the complier class. African American youth and youth in the “other” ethnicity grouping exhibited significantly higher initial levels of antisocial behavior than did European American youth. African American youth showed greater declines in alcohol use but greater growth in marijuana use relative to European American youth. Finally, youth in the “other ethnicity” group exhibited significantly greater growth in tobacco use relative to European American youth.

Effect Sizes

To calculate effect sizes, class estimates created in Mplus were saved and then compared with the observed means and the standard deviations of all outcomes at Wave 3 for individuals estimated as belonging to the complier class in the control and intervention groups. This approach may exaggerate the effect size estimates somewhat because it does not account fully for the uncertainty in class membership. Effect sizes in this study were large for each outcome, based upon Cohen’s criteria for effect size d (Cohen, 1988; large, $d = .80$; medium, $d = .50$; small, $d = .30$). The effect size for antisocial behavior based on Cohen’s d was $d = 1.42$. Substance use effect sizes were as follows: cigarette use, $d = .75$; alcohol use, $d = 1.69$; and marijuana use, $d = 1.10$.

Summary

Fifty-one percent of families had contact with a parent consultant, and 42% of families in the intervention group engaged in the FCU. These rates double our rates of engagement in our initial study (Project Alliance 1; Connell et al., 2007). When a CACE modeling approach was used to examine treatment effects on youth whose families engaged with the FCU, intervention effects for all four outcomes were found, indicating that the EcoFIT intervention was successful at reducing the growth of antisocial behavior, alcohol use, tobacco use, and marijuana use among middle school youth whose families engaged with treatment. These intervention effects did not vary by gender or ethnicity.

Discussion

This study examined intervention effects on four outcomes measured over 3 years, after implementation of the EcoFIT intervention model in three middle schools. The EcoFIT intervention included diffusion of information among families assigned to the treatment group about healthy parenting practices, a comprehensive family assessment and feedback (FCU), support for family management skills, and more intensive interventions designed to help parents reduce their youth’s high-risk behavior. We found that the relatively brief, family-centered, school-based approach to intervention within an ecologically valid setting had a positive impact on both antisocial behavior and substance use. In particular, youth whose families engaged in the intervention showed less growth in antisocial behavior and substance use during the middle school years.

We used a CACE modeling approach to analyze the data (Jo, 2002). CACE modeling permits a fine-grained examination of factors that relate to families electing to receive the FCU and of the effects of this more active level of family intervention on youth outcomes among that group of families. When analyzing interventions that are neither appropriate nor desirable for a significant group of participants in a community, using the ITT model has serious limitations in that effectiveness cannot be disentangled from issues of engagement. In CACE modeling, engagement in the intervention is conceptualized as a moderator of intervention outcomes. In this study, engagement in the intervention was associated with a decrease in the growth of problem behavior when compared with matched participants in the control group over 3 years.

Using CACE analyses, we found that effects for the intervention on all four outcomes within the complier group, including antisocial behavior, alcohol use, tobacco use, and marijuana use, were significant and large in magnitude. It is particularly noteworthy that our outcomes were assessed by youth self-report, yet the intervention focused primarily on parents and caregivers. Although there are limitations to youth self-report, in this research the use of self-reports strengthens our conclusion about the treatment effects on targeted outcomes because youth were not a direct target of the intervention. Our analyses were thus more conservative than if we had assessed only the proximal parenting variables that we expected to eventually have a positive impact on adolescents' problem behaviors.

As indicated, one advantage of the CACE modeling approach is that it facilitates the examination of factors associated with families' engagement in the FCU. Consistent with other of our published findings from this body of research (Connell et al., 2007; Stormshak et al., 2005), we found that neither gender nor ethnicity predicted who engaged in the intervention: there was equal participation by both males and females and by families of different ethnic backgrounds. Our results are consistent with the notion that providing interventions that are culturally competent is significant to maintaining engagement of diverse families (Hudley & Taylor, 2006). This is particularly critical when working with parenting and family management skills, which are tightly linked to family values, communities, and culture (Yasui & Dishion, 2008). Our success at engaging families of multiple cultural backgrounds in the EcoFIT approach to intervention is likely tied to the specific qualities of the treatment approach: it is tailored to individual family strengths, areas of growth, and parenting values, and it allows adaptation of content to meet the needs of diverse families (Dishion & Stormshak, 2007). As mentioned earlier, therapist ethnicity was matched with that of each family.

These results have important implications for the field of family-centered, school-based prevention and for the field of research into the prevention of substance use and antisocial behavior. Ample research supports the implementation of parenting skills interventions across early, middle, and late childhood as an effective approach to reducing problem behavior, increasing healthy development, and enhancing family management skills (Kazdin, 2003; Weisz, Weiss, Han, Granger, & Morton, 1995). Our results suggest that the transition to middle school is also an appropriate time to implement these interventions, and that family-centered interventions can have an impact not only on problem behaviors, but also on substance use.

Parenting skills training can be administered as an individual-level intervention, a group intervention, or a school-based intervention, and evidence in the literature supports each of these delivery approaches (Stormshak, Kaminski, & Goodman, 2002; Webster-Stratton & Hammond, 1990). This flexibility with regard to format and setting helps make skills training available to families who otherwise would be unable or unwilling to participate when the program is administered by means of a single delivery method. Because schools

are faced with limited resources and increasing rates of mental health problems in their student populations, the infusion of multilevel, family-centered approaches to addressing mental health problems may not only be the most effective way to reduce problem behavior at home and in school, but also the most cost efficient. In fact, the combination of universal, selected, and indicated services, together with self-selection of families into the most appropriate level of service, contributes to an efficient management of resources because extensive services are delivered only to families who engage in the intervention and need additional services.

Engaging high-risk youth and their families in an intervention directed at changing parenting skills and family management can be a challenging endeavor. Recruitment rates into parenting programs such as ours are typically quite low. Heinrichs, Bertram, Kuschel, and Hahlweg (2006) examined recruitment issues and participation in parent training groups in their sample of approximately 600 families enrolled in the Triple P parenting program. They successfully recruited 31% of families into the intervention. Recruitment and attendance problems such as this have led to the development of brief parenting interventions (Lim, Stormshak, & Dishion, 2005; Stormshak et al., 2002) and tailored, individualized family interventions (Dishion & Stormshak, 2007). Our study results suggest these strategies are effective, because we successfully engaged 51% of the intervention group in the intervention, double the engagement rates of previous projects. A number of factors can be credited, including the matching of therapist ethnicity with family ethnicity and the further adaptation of our program to engage and retain culturally diverse families.

For many families, considerations such as childcare constraints, work schedules, and the time commitment required to attend parenting groups can reduce or prohibit participation. The psychological health of other family members, including parents' own interpersonal problems such as depression, substance use, and limited resources, also can affect intervention participation and outcomes (Martin, Brooks-Gunn, Klebouv, Buka, & McCormick, 2008; Smith, Landry, & Swank, 2005; Webster-Stratton & Hammond, 1990). The flexibility of program delivery in our study (e.g., ability to meet families at home and at school, flexible scheduling) likely helped engage and retain families by reducing logistics constraints. Furthermore, the flexibility of the intervention target (e.g., child's behavior, family dynamics, parenting skills, parents' capacity to seek help for their own mental health issues) probably helped participants remain motivated throughout the intervention as they worked on issues that seemed most relevant to them.

Limitations and Future Directions

One limitation of this study is that the data collected and the analytical framework were not appropriate to directly test the mediational model that stood as a theoretical basis for this work. In fact, we assume that the underlying mechanism for change was the impact the intervention had on parenting strategies such as supervision and monitoring, implementation of skills to alleviate family conflict, and positive parenting, but it is still technically impossible to test for mediation processes within CACE models. However, we have found in previous research that the intervention has a positive effect on parenting strategies (Dishion et al., 2003), which tends to support our theoretical assumptions.

A second limitation of this study is that when we increased our rates of service delivery, we also increased the rates of engagement in the low-risk portion of the sample. There are many ways to define risk status. For example, neighborhoods, schools, families, and peer relationships all may constitute areas of risk for youth. We collected teacher ratings of behavior at the beginning of the study to quantify risk. On the basis of these ratings, our rates of engagement in the FCU were similar across low, at-risk, and high-risk groups. This is quite different from our previous research during which we engaged fewer families;

however, risk status predicted engagement in the treatment (Connell et al., 2007; Stormshak et al., 2005; Stormshak et al., in press). The highest risk group of youth in this sample were those rated high on teacher-rated behavior problems who did not receive any intervention services at all.

Finally, given the low number of schools involved in this study, we were unable to directly test the impact of our intervention by school or to analyze school-level effects. Understanding how a family-centered intervention such as the Family Check-Up affects schools generally, including school policy and programming relevant to family services, will be an important area of future research.

Raising Healthy Children: Implications for Policy and Practice

The results of this research suggest that school-based, family-centered programs to reduce risk behavior can be successful, even during the difficult middle school years. Two principal concerns typically make schools reluctant to administer these programs, however (Christensen, Whitehouse, & VanGetson, 2007). First, schools lack the funding necessary to provide this type of support at the universal level, even though funding models that change this systemic problem are clearly needed for long-range benefits to youth and families. Second, many school personnel are trained to focus on the individual child rather than on the systems that support the child and maintain behavior. This child-centered philosophy is pervasive in schools and potentially detrimental because it prevents schools from implementing interventions solidly based in recent research and changing current models for addressing problem behavior. For example, many middle schools do not notify parents of “low incidence” problem behaviors. Instead, when behavior escalates, parents become involved and often feel disenfranchised from the school because involvement is initiated only after the problem is severe. It is particularly noteworthy that our family-centered model did not directly target youth, yet the outcomes were measured by youth report and were sustained over 3 years of middle school. A public health prevention focus that involves families in problem solving early on, before problems escalated, is consistent with our model, is more beneficial for families and youth, and leads to reductions in problem behavior over time and increased involvement of parents in remedying school behavior problems.

Current findings are significant for the delivery of mental health interventions across home and school. They support a shift in emphasis from traditional school service delivery models, which tend to favor individual child outcomes over the role of parents and families, to those that are family centered. Clearly, mental health services that are school based and focus on family management, parenting, and especially on engaging parents in intervention and service distribution for their youth are going to be the most successful at maximizing change for both children and their families for generations to come.

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Figure 1.

Schematic representation of final CACE model, for all three outcomes.

Note: Dashed lines indicate that effect of intervention on growth parameter is set to be null for participants who are assigned to the noncomplier class.

Figure 2. Complier Average Causal Effect results of the intervention effect on the development of antisocial behavior, alcohol use, tobacco use, and marijuana use during the middle school years.

Table 1

Descriptive Statistics

	<i>M</i>	<i>SD</i>	<i>N</i>	Min	Max	Notes
Antisocial (Grade 6)	1.19	0.37	583	1	3.8	Scale range: 1 (<i>never</i>) to 6 (> 20 times)
Antisocial (Grade 7)	1.26	0.44	524	1	4.6	Scale range: 1 (<i>never</i>) to 6 (> 20 times)
Antisocial (Grade 8)	1.32	0.47	479	1	3.7	Scale range: 1 (<i>never</i>) to 6 (> 20 times)
Alcohol use (Grade 6)	0.09	0.62	592	0	11	Scale range: 0 (<i>never</i>) to 11 (10–20 drinks)
Alcohol use (Grade 7)	0.31	1.12	523	0	11	Scale range: 0 (<i>never</i>) to 11 (10–20 drinks)
Alcohol use (Grade 8)	0.61	1.84	480	0	13	Scale range: 0 (<i>never</i>) to 13 (41+ drinks)
Tobacco use (Grade 6)	0.03	0.29	592	0	5	Scale range: 0 (<i>never</i>) to 5 (5 cigarettes)
Tobacco use (Grade 7)	0.14	0.91	525	0	12	Scale range: 0 (<i>never</i>) to 12 (1 pack)
Tobacco use (Grade 8)	0.33	1.8	481	0	16	Scale range: 0 (<i>never</i>) to 16 (5+ packs)
Marijuana use (Grade 6)	0.03	0.34	592	0	6	Scale range: 0 (<i>never</i>) to 6 (6 times)
Marijuana use (Grade 7)	0.17	1.12	524	0	13	Scale range: 0 (<i>never</i>) to 13 (41+ times)
Marijuana use (Grade 8)	0.47	1.98	480	0	13	Scale range: 0 (<i>never</i>) to 13 (41+ times)

Table 2

Correlations

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.
1. Treatment assignment	—													
2. Gender	-.10	—												
3. Antisocial (Grade 6)	.04	-.10*	—											
4. Antisocial (Grade 7)	-.04	-.11*	.37*	—										
5. Antisocial (Grade 8)	-.05	-.06*	.26*	.58*	—									
6. Alcohol use (Grade 6)	.02	-.04	.38*	.21*	.13*	—								
7. Alcohol use (Grade 7)	.02	.02	.24*	.42*	.26*	.50*	—							
8. Alcohol use (Grade 8)	-.05	.07	.11*	.22*	.47*	.16*	.43*	—						
9. Tobacco use (Grade 6)	-.06	-.06	.10*	.18*	.08	.39*	.10*	.02	—					
10. Tobacco use (Grade 7)	-.06	-.05	.38*	.26*	.15*	.26*	.40*	.13*	.04	—				
11. Tobacco use (Grade 8)	.00	.02	.14*	.214*	.32*	.40*	.31*	.53*	.11*	.21*	—			
12. Marijuana use (Grade 6)	.06	-.07	.15*	-.03	-.01	.29*	.00	-.02	.20*	.00	-.02	—		
13. Marijuana use (Grade 7)	-.01	-.01	.22*	.27*	.19*	.18*	.30*	.27*	.03	.62*	.23*	-.01	—	
14. Marijuana use (Grade 8)	-.01	-.04	.16*	.32*	.43*	.30*	.39*	.48*	.07	.48*	.45*	-.02	.48*	—

*
p < .05

Table 3

CACE Model Results for Final Joint Trajectories Model

<u>Class membership</u>	
Complier vs. noncomplier	
	Logit (SE)
Intervention status	Fixed at 0
Gender	-.21 (.18)
African American vs. European American	.05 (.28)
Latino vs. European American	.20 (.25)
Other ethnicity vs. European American	.15 (.22)
Parameter intercept	.87 (.18) *

Note. Intervention status (0 = control, 1 = intervention), gender (0 = female, 1 = male).

*
 $p < .01$

Table 4
CACE Model Results for Final Joint Trajectories Model for Noncomplier Class

	Antisocial behavior			Alcohol use			Tobacco use			Marijuana use		
	Intercept Est. (SE)	Slope Est. (SE)	Fixed at 0	Intercept Est. (SE)	Slope Est. (SE)	Fixed at 0	Intercept Est. (SE)	Slope Est. (SE)	Fixed at 0	Intercept Est. (SE)	Slope Est. (SE)	Fixed at 0
Intervention status	Fixed at 0			Fixed at 0			Fixed at 0			Fixed at 0		Fixed at 0
Gender	.08 (.03)*	-.03 (.02)		.03 (.68)	-.43 (.39)		1.49 (1.02)	-1.33 (.59)		.99 (1.23)	-.84 (.71)	
African American vs. European American	.19 (.06)*	.04 (.05)		.34 (.86)	-.15 (.52)		1.02 (1.50)	-.22 (.97)		5.52 (2.98)	-2.69 (1.31)*	
Latino vs. European American	.06 (.04)	.02 (.02)		-.40 (.79)	-.46 (.50)		2.17 (1.28)	-1.21 (.92)		5.09 (2.28)	-3.25 (1.10)*	
Other ethnicity vs. European American	.14 (.04)*	-.02 (.03)		.93 (.66)	-.51 (.35)		1.73 (1.21)	-.30 (.72)		4.54 (2.07)	-2.20 (1.14)	
Parameter intercept/mean	1.06 (.02)*	.05 (.02)*		-2.79 (.44)*	1.18 (.23)*		-6.02 (1.04)*	2.31 (.59)*		-8.92 (2.03)*	3.89 (1.07)*	
Parameter residual variance	Fixed at 0	.04 (.01)*		N/A	N/A		N/A	N/A		N/A	N/A	N/A

Note. Intervention status (0 = control, 1 = intervention), gender (0 = female, 1 = male).

*
p < .05

Table 5

CACE Model Results for Final Joint Trajectories Model for Complier Class

	Antisocial behavior			Alcohol use			Tobacco use			Marijuana use		
	Intercept Est. (SE)	Slope Est. (SE)	Intercept Est. (SE)	Intercept Est. (SE)	Slope Est. (SE)	Intercept Est. (SE)	Intercept Est. (SE)	Slope Est. (SE)	Intercept Est. (SE)	Intercept Est. (SE)	Slope Est. (SE)	Slope Est. (SE)
Intervention status	Fixed at 0	-.61 (.10) *	Fixed at 0	Fixed at 0	-1.24 (.13) *	Fixed at 0	Fixed at 0	-1.73 (.22) *	Fixed at 0	Fixed at 0	-1.13 (.21) *	
Gender	.10 (.06)	-.01 (.04)	.65 (.56)		-.44 (.29)	.89 (.71)		.02 (.36)	.39 (.73)		.11 (.34)	
African American vs. European American	.32 (.10) *	-.01 (.07)	.97 (.73)		-.80 (.38) *	.44 (1.04)		-.30 (.39)	-2.07 (1.15)		1.44 (.60) *	
Latino vs. European American	.16 (.08)	.02 (.06)	.51 (.63)		-.11 (.38)	.23 (1.27)		.75 (.58)	.01 (1.06)		.16 (.52)	
Other ethnicity vs. European American	.12 (.06) *	.04 (.05)	1.55 (.66)		-.37 (.36)	.36 (1.00)		.82 (.41) *	.10 (.89)		.73 (.44)	
Parameter intercept/mean	1.04 (.04) *	.64 (.10) *	-3.12 (.59) *		2.40 (.30) *	-3.24 (.83) *		1.35 (.37) *	-2.42 (.77) *		1.43 (.34) *	
Parameter residual variance	Fixed at 0	.05 (.01) *	N/A		N/A	N/A		N/A	N/A		N/A	N/A

Note. Intervention status (0 = control, 1 = intervention), gender (0 = female, 1 = male).

*
p < .05