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Opening the “Black Box”: Family–School Intervention Effects on Self-Regulation That Prevent Growth in Problem Behavior and Substance Use

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Abstract

Family–school interventions are a well-established method for preventing and remediating behavior problems in at-risk youth, yet the mechanisms of change underlying their effectiveness are often overlooked or poorly understood. The Family Check-Up (FCU), a school-based, family-centered intervention, has been consistently associated with reductions in youth antisocial behavior, deviant peer group affiliation, and substance use. The purpose of this study was to explore proximal changes in student-level behavior that account for links between implementation of the FCU and changes in youth problem behavior. Data were drawn from a randomized controlled trial study of the efficacy of the FCU among 593 ethnically diverse middle school students followed longitudinally from 6th through 8th grade. Latent growth curve analyses revealed that random assignment to the FCU intervention condition was related to increased mean levels of students’ self-regulation from 6th to 7th grade, which in turn reduced the risk for growth in antisocial behavior, involvement with deviant peers, and alcohol, tobacco, and marijuana use through 8th grade. Overall, these findings highlight the robust implications of self-regulation as a proximal target for family-centered interventions.

Youth antisocial behavior is a significant area of concern from the perspective of students, educators, parents, and society at large (Dishion & Patterson, 2006; Durlak, 1995; Rose & Gallup, 1998). Data collected from the 2011 Centers for Disease Control and Prevention’s Youth Risk Behavior Survey revealed that within the month prior to the survey, 16.6% of youth surveyed had carried a weapon, 18.1% had smoked cigarettes, 38.7% had consumed alcohol, 23.1% had used marijuana, and nearly 39.8% of sexually active youth reported engaging in risky sexual practices (Centers for Disease Control and Prevention, 2011). Developmentally, it is often during the middle school years that antisocial behavior escalates from rule-breaking behaviors, defiance, aggression, lying, and stealing to include more severe behaviors, such as substance use, delinquency, and risky sexual behavior (Dishion & Patterson, 2006; Hiatt & Dishion, 2007). Management of these behaviors in school settings

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poses an ongoing challenge for teachers and school administrators that can occupy a great deal of their time (Buckingham, Donaldson, & Marnik, 2005) and often results in exclusionary disciplinary practices, such as suspension, which have limited success (Skiba & Peterson, 2000; Flannery, Frank, & McGrath-Kato, in press). Students who are suspended typically have the lowest academic achievement (Arcia, 2007) and can least afford to miss instruction. Exclusionary disciplinary practices may perpetuate problems for students who already have difficulties with aggression, hyperactivity, and social skills, which may lead to increased disciplinary referrals (Maag, 2012). Thus, there is good reason to focus on prevention of problem behaviors as an alternative to this approach.

The Family Check-Up Intervention Model

The Family Check-Up (FCU) model developed from the Adolescent Transitions Program (e.g., Dishion & Andrews, 1995) and was adapted for various contexts of implementation, including an early childhood home-visitation intervention model (e.g., Dishion et al., 2008) and a comprehensive, tiered intervention model delivered in public middle schools (Dishion & Kavanagh, 2003); the latter was the focus of the current study. At the universal level of the FCU model, a family resource center is established at the school site and is staffed by a parent consultant trained in the FCU model to provide an infrastructure for collaboration between school and parents, to promote family-centered norms and systems for evidence-based family management strategies, and to facilitate identification and referral of students in need of support services. Family consultants provide general informational and consultation services that are available to all families of children attending the school (e.g., brochures, parenting materials, parenting topics nights, and community resources). Parent consultants also attend behavioral support meetings, teacher meetings, and other relevant school meetings to ensure that family-centered perspectives are represented in school decision-making forums, and, when appropriate, they advocate for the needs of specific families. The family resource center as a universal intervention has been found to prevent escalation of problem behavior in schools (Stormshak, Dishion, Light, & Yasui, 2005).

Another integral part of the FCU model is risk identification and referral for more intensive services. Risk screening in schools or with families may be used to identify students with early signs of risk in emotional, behavioral, or academic domains. At-risk students are then referred for more intensive family support services, referred to as the *selected level* of intervention. At the selected level, families participate in the FCU's three brief family-centered intervention sessions designed to assess family strengths and weaknesses and to motivate parents to improve their parenting practices and engage in intervention services that address the specific needs of their family. These sessions are based on the principles of motivational interviewing and the techniques used in the Drinker's Check-Up (see Miller & Rollnick, 2002). Feedback about assessment results is followed by an opportunity to select intervention options that are tailored to the unique needs of each family and that are grounded in empirically validated family management strategies (Dishion, Stormshak, & Kavanagh, 2011) and school and community resources that can support family change. Therefore, the FCU is an assessment-driven, empirically based conceptualization of family strengths and weaknesses that in turn elicits parent motivation and engagement in change processes. The ultimate goal is to evoke lasting, self-sustained changes for families through brief interventions.

Comparing the Family Check-Up to other school-based prevention models

Several evidence-based interventions are available that target changes in family practices to reduce antisocial behavior and promote academic and social development (see Cox, 2005, and Dusenbury, 2000, for a review). Well-established interventions intended to have an impact on antisocial behavior, peer relations, and substance abuse include evidence-based

programs such as Parent Information and Resource Centers (Kalafat, 2004; Kalafat, Illback, & Sanders, 2007), Families and Schools Together (McDonald, Coe-Bradish, Billingham, Dibble, & Rice, 1991), Positive Action (Flay, Allred, & Ordway, 2001), Strengthening Families (Kumpfer, Alvarado, Tait, & Whiteside, 2006), and the Triple P Positive Parenting Program (Sanders, Markie-Dadds, Tully, & Bor, 2000). A summary of key components of each of these models is provided in Appendix A. Although the FCU has conceptual similarities to aspects of these programs, it is different in that it also offers (a) a model derived from core behavioral family management training programs (Dishion, Reid, & Patterson, 1988), (b) a multiple-gating strategy for identifying students at risk and linking them with FCU services, (c) a tiered approach to ensure that the intensity of services matches the level of student and family need, (d) an emphasis on motivational enhancement to facilitate parent engagement and readiness to change, (e) an assessment-driven model for intensive family interventions, (f) an adaptive and tailored approach to intervention delivery that provides only relevant materials to facilitate maximal impact in an efficient framework, and (g) regular follow-up as part of a health-maintenance model (Dishion & Stormshak, 2007; Stormshak & Dishion, 2009).

Evidence for the Effectiveness of the Family Check-Up Model

Studies evaluating the effectiveness of the FCU model in public middle schools have largely been drawn from two randomized controlled trials. In the first trial, approximately 1,000 students and their families were followed from 6th grade through high school, and data have continued to be collected into early adulthood. The second trial, which expanded on the original trial, used a similar design to examine its effectiveness with ethnic minority families and followed youth and their families from 6th through 10th grade. Both trials were conducted with families of considerable ethnic diversity who resided in a mid-sized urban city in the Pacific Northwest. Families were randomized into intervention and “school as usual” groups. Families in the intervention condition benefited from universal family resource center services and FCU interventions as appropriate. Across trials, evidence showed that engaging in the FCU offers considerable benefits for youth at risk for growth in problem behavior, substance use, involvement in deviant peer friendships, arrest rates, depression, and school absences during middle school and into high school (Connell & Dishion, 2008; Connell, Dishion, Yasui, & Kavanagh, 2007; Connell, Klostermann, & Dishion, 2012; Dishion, Kavanagh, Schneiger, Nelson, & Kaufman, 2002; Stormshak et al., 2011; Van Ryzin, Stormshak, & Dishion, 2012). With respect to academic outcomes, the FCU has also been found to prevent declines in student GPA and growth in school absence (Stormshak, Connell, & Dishion, 2009). Of note, evidence from the first trial indicates that intervention effects reach into early adulthood with regard to antisocial behavior (age 19; Van Ryzin & Dishion, 2012) and high-risk sexual behavior (age 22; Caruthers, Van Ryzin, & Dishion, in press). Taken together, there is considerable evidence in support of the FCU model.

Evaluating the effectiveness of the school-based FCU model requires careful consideration of the study design. Because an integral aspect of the FCU model is to direct intervention services to at-risk students who warrant selected-level interventions, it is appropriate to expect that only a subset of the school population will need and choose to engage in the services. Accordingly, past studies have reported engagement rates of 25% to 42% in selected or more intense intervention services. When evaluating prevention programs with this design, it becomes clear that different analytic approaches offer different advantages. Complier average causal effect analysis (CACE; Jo, 2002) has been used to generate a latent group in the control group for comparison with intervention engagers to predict individual-level rates of growth in outcomes. However, the inability to examine the intervening mechanisms that account for the FCU’s effects on these outcomes of interest is a

fundamental limitation to the CACE modeling studies. Intention-to-treat (ITT) analytic approaches incorporate engagers and nonengagers, and as such, offer a conservative test of the intervention effects that reflect a mean-level change in the school. An advantage of an ITT approach is that it also can test the mechanisms by which the FCU affects youth outcomes.

Opening the “Black Box” of Intervention Effects

The importance of identifying behavioral change mechanisms underlying intervention effects is difficult to overstate (Kraemer, Wilson, Fairburn, & Agras, 2002; La Greca, Silverman, & Lochman, 2009). La Greca and colleagues (2009) stated that “answering not just whether treatment change is produced but how it is produced, is the cornerstone of advancing theoretical understanding about mechanisms of change” (p. 377). Unfortunately, little research has investigated the mechanisms by which family interventions implemented in school settings produce changes in student behavior. With regard to the FCU, some mechanisms have been studied, including parental monitoring as a means of reducing risk for substance use outcomes (Dishion, Nelson, & Kavanagh, 2003), family conflict as a mechanism for antisocial behavior (Van Ryzin & Dishion, 2012), and family relationship quality in relation to high-risk sexual behavior (Caruthers et al., in press).

Individual youth factors have received less attention as mechanisms of the FCU intervention model, however. A promising student-level protective factor is youth effortful control, which is a dimension of self-regulation. Effortful control is characterized by efficiency of executive attention and ability to regulate behavior (Rothbart & Bates, 2006), and accordingly, includes aspects of attention regulation (e.g., effortful allocation of attention) and of behavioral regulation (e.g., ability to inhibit behavior when appropriate to a situation; Eisenberg, Smith, Sadovsky, & Spinrad, 2004). Effortful control facilitates the ability to regulate experiences and exposure to negative thoughts or events by either sustaining attention on desired activities or shifting attention to new activities; this process of regulating attention away from distressing or frustrating thoughts or feelings and focusing attention on positive stimuli or activities facilitates on-task behavior and successful emotion regulation (Derryberry & Reed, 2002; Eisenberg et al., 2009; Silk, Steinberg, & Morris, 2003). Few studies have examined the developmental trajectories of self-regulatory processes in adolescence. Developmental studies indicate that adolescents’ effortful control functioning increases throughout adolescence (King, Lengua, & Monahan, 2012). However, another study, using growth mixture modeling, found that there were distinct trajectory groups of intentional self-regulation, suggesting heterogeneity in developmental trajectories: some are characterized by a general increase in self-regulation over time, and others demonstrate declining self-regulation during this period (Bower et al., 2011).

High levels of effortful control protect youth from peer influences related to substance use (Piehler & Dishion, 2007). Similarly, the extent of youth’s self-regulation is linked with the extent of peer competence, socioemotional functioning, internalizing problems, and externalizing problems (Davidov & Grusec, 2006; Eisenberg et al., 2001; Eisenberg et al., 2003; Eisenberg et al., 2005; Oldehinkel, Hartman, Rerdinand, Verhulst, & Ormel, 2007). Self-regulation also has robust implications for youth’s academic and behavioral functioning: it is associated with higher academic performance (Gumora & Arsenio, 2002), fewer negative emotions and less school-related stress during the transition to middle school (Rudolph, Lambert, Clark, & Kurlakowsky, 2001), and fewer externalizing problems over time (Eisenberg et al., 2005). Clearly, effortful control is a promising mechanism through which interventions may promote better outcomes for youth.

Family and parenting dynamics play a key role in the development of youth's self-regulatory processes, such as effortful control. Parenting behaviors, such as positive engagement, warmth, and sensitivity, are associated with better self-regulation (Eisenberg et al., 2005; Eisenberg et al., 1999; Fosco & Grych, in press). Similarly, well-developed positive family relationships and communication are related to better self-regulation (Fosco, Caruthers, & Dishion, 2012; Fosco & Grych, in press). This research suggests that parenting that is warm and supportive facilitates better emotional control and regulation of attention (Eisenberg et al., 2005). In addition, self-regulation is facilitated by consistency in daily routines and social interaction patterns in the family that entrain automatic patterns (e.g., Bargh & Williams, 2006; Lewis, 2000). The FCU intervention directly targets parents' positive reinforcement of appropriate behavior, consistency in parenting, and positive family relationships and communication (Dishion et al. 2011), and therefore is expected to bolster adolescent effortful control, which would serve as a protective factor against risk for a host of problem behaviors.

Focus of the Study

In a recent study, Stormshak, Fosco, and Dishion (2010) found that effortful control accounted for the link between assignment to the FCU intervention condition and levels of youth depression and school engagement. The purpose of the present study was to explore whether a similar association could be found between effortful control and other key behavioral outcomes, including antisocial behavior, deviant peer affiliation, and cigarette, alcohol, and marijuana use.

The present study used an ITT approach to determine whether intervention effects on youth effortful control might help explain the impact of the FCU intervention on antisocial behavior, deviant peer affiliation, and tobacco, alcohol, or other drug use. ITT analyses require that all participants randomly assigned to one of the treatments in a trial should be included in analyses regardless of what occurs postrandomization, such as each participant's level of compliance, protocol deviations, or study withdrawal (Newell, 1992). The ITT approach can be compared with other approaches, such as on-treatment analyses that include only those individuals who fully comply with treatment procedures (see Chêne et al., 1998). An ITT approach provides a conservative test of the intervention effects, because it includes families that did not engage in services in the treatment condition and evaluates whether meaningful change will be detected across all students as a function of having the FCU intervention made available to them. Thus, the ITT design is more generalizable to the perspective of the school as a whole.

Method

Participants

Study participants were 593 adolescents and their families; the adolescents were students at three public middle schools in an urban area of the Pacific Northwest. During the 6th grade year, 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 "business as usual" school without access to any of the intervention services available to families in the intervention condition. Demographic information for the intervention and control groups is reported in Table 1.

Youth were followed through middle school (6th through 8th grade, 3 years). Parents of all 6th grade students were invited to participate in the study, and 82% of all parents agreed to do so. Consent forms were mailed to families or sent home with students. The sample comprised 51.4% boys and 48.6% girls. Surveys were collected annually from participants.

Approximately 86% of participants were retained across the 3 years of the study (7th grade, $n = 525$, 89% of sample; 8th grade, $n = 510$, 86% of sample). Ethnicity of participants was as follows: European American (36.1%), Latino/Hispanic (18.0%), African American (15.0%), Asian American (7.1%), American Indian/Native American (2.4%), Pacific Islander (1.9%), and biracial/mixed ethnicity (19.3%).

Intervention Implementation

As described earlier and in other work (e.g., Stormshak & Dishion, 2009), the FCU model includes the establishment of a family resource center in each school. The family resource center is staffed by a parent consultant who serves as a resource to all families by providing information about community resources, functioning as a school–family liaison, providing parenting information, and answering families’ questions. At the universal level, parent consultants may provide information to parents about their child’s behavior, attendance, and homework completion and offer brief consultations on topics such as homework completion and home-to-school planning. Seminars about special topics of interest are provided in the school for parents (e.g., supervising your teen during the summer). Another role of the parent consultant at the universal level is to actively implement outreach to all families of students assigned to the intervention condition by disseminating fliers, making phone calls home, and attending student support meetings to increase awareness of family services available at the school. The parent consultant acts as a liaison between the school and the family and targets families that have been identified as at risk by teachers and school personnel for the FCU intervention. The parent consultants attend school behavior meetings, teacher conferences with families, and other meetings related to support services in the school. Thus, the family resource center becomes a “base of operations” and a center for family support services. Also, in the context of the universal intervention, a schoolwide behavioral risk screener, the Teacher Risk Perception questionnaire (TRISK; Soberman, 1994), is completed by teachers to identify student risk status but not to identify students for enrollment. This brief screener includes 16 items that are used to assess students’ self-management, behavior problems, and affiliation with problem peers. The sample is divided into thirds on the basis of the TRISK ratings (low risk, at risk, and high risk). Psychometric evidence from a previous randomized trial revealed that this scale has good internal consistency (Cronbach’s $\alpha = .91$) and is a useful tool for identifying students at risk for substance use and problem behavior (Dishion et al., 2002). One goal of the current intervention trial was to investigate and compare treatment effectiveness among different racial groups (e.g., see Stormshak et al., 2011). To meet this goal, this trial was randomly assigned a larger proportion of families to the intervention condition than the control condition, and efforts were made to engage a larger proportion of families in the intervention condition. Thus, rather than limit the intervention sample to only those families identified as at risk on the basis of universal screening data, the researchers invited all families assigned to the intervention condition to participate in the FCU services even if their child was not identified as at risk. This strategy resulted in nearly a twofold increase in family engagement in FCU services (Stormshak et al., 2011).

Families who engage in the FCU participate in a three-session assessment and feedback process. The first meeting consists of an initial interview with parents to discuss goals, concerns, and level of motivation for change. A fundamental goal of this session is to establish a collaborative base for future meetings. In the second session, parents, students, and teachers are asked to complete a brief assessment packet to ensure a multi-informant case conceptualization. In addition to these self-report assessments, families are also videotaped during a structured interaction task. While coding each videotape, parent consultants use a coding protocol designed to assess the nature of family dynamics and quality of parenting practices. During the third session, parent consultants provide the family

with feedback about the results of assessments and make careful efforts to (a) increase parents' motivation to change and (b) identify appropriate evidence-based intervention options.

The feedback session and a list of intervention options are the basis for more intensive family support services. It is conducted using motivational interviewing strategies (Miller & Rollnick, 2002) to enhance parents' motivation to engage in services and improve their parenting practices. Guided by assessment results, the parent consultant presents a menu of relevant evidence-based parenting strategies (e.g., positive behavior support, parental monitoring, limit setting, and problem solving; see Dishion et al., 2011) and other complementary school- or community-based resources that are tailored to each school and community and that are relevant to the specific needs of each family. Families are free to select which intervention services they are motivated to engage in, consistent with principles of motivational interviewing (Miller & Rollnick, 2002). At this juncture, some families decline further services, whereas others move on to the third level, which is to receive consultation from the parent consultant and follow-up.

The parent consultants who delivered FCU services and who staffed the family resource centers were full-time University of Oregon employees with intervention experience and expertise in working with families. Their education level ranged from doctoral degree to bachelor's degree. For the current 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 who speaks Spanish, one African American consultant, and one European American consultant. Consultants received intensive training and supervision throughout the 3 years of the study, including one week-long initial training and several follow-up training workshops of equivalent length. Ongoing supervision and integrity monitoring were provided by the intervention developers and included watching videotaped FCUs, giving feedback to consultants, planning for the FCUs, conducting role plays, and providing guidance for use of the family management curriculum. Confidentiality was maintained for families participating in intensive FCU interventions (i.e., selected or indicated) by the parent consultants; however, as a part of the consent process, parents gave permission for their student to be referred so that interventions could be coordinated with school staff. Nonetheless, because interventionists in this study were not employed by the schools they served, private family information was stored separately from school records, and only pertinent information was provided for referrals. The majority of the family management curriculum, which supplied content for the brochures in the family resource center, handouts for parents, and the follow-up intervention, was derived from the Everyday Parenting curriculum, a well-developed and empirically validated parenting program (Dishion et al., 2011).

Of the 386 families in the intervention condition, 51% received consultation from a parent consultant and 42% received the full FCU intervention. Of the families receiving the FCU, 78% received additional follow-up assistance after the feedback, such as parent skills training, and education-related concerns were addressed as needed, such as strategies for supporting success with homework, attendance, and grades; improving school behavior; or facilitating parent-teacher communication to support students. Because the FCU is a tailored intervention, emphasis on specific family management components varied. Of the 180 families, 36% received positive behavior support, 68% received support in limit setting and monitoring skills, and 73% received communication and problem-solving support. School-related support was received by 67%. Intervention families received an average of 94.2 minutes of intervention time.

Assessment Procedures and Measures

In the spring term of each academic year, from 6th through 8th grade, students were surveyed with a questionnaire that measures a variety of problem behaviors as well as other constructs, such as self-regulation. This questionnaire was derived from a survey used by the Oregon Research Institute (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.

The measures of outcome variables (antisocial behavior, deviant peers, and substance use) were drawn from assessment items originally developed to study the efficacy of family-based school interventions (Dishion et al., 2002) and to study antisocial behavior, tobacco use, and other substance use (Ary et al., 1999; Biglan, Ary, Smolkowski, Duncan, & Black, 2000). In addition to demonstrating satisfactory reliability and validity, they also have demonstrated sensitivity to change in previous studies (Biglan et al., 2000; Dishion & Kavanagh, 2003; Gordon, Biglan, & Smolkowski, 2008).

Self-regulation—The Effortful Control scale was used as a measure of self-regulation. It included items such as “I have a hard time finishing tasks,” “It is easy for me to stop doing something when someone tells me to stop,” “It is easy for me to keep a secret,” “I stick with my plans and goals,” and “I pay close attention when someone tells me how to do something.” Youth rated items from 1 (*almost always not true*) to 5 (*almost always true*). Scale scores were computed by summing scores (some items were reverse scored) so that higher scores reflected better effortful control. The scale was originally derived from the Early Adolescent Temperament Questionnaire (EATQ; Ellis & Rothbart, 2005). The EATQ is a widely used scale used to assess effortful control and has demonstrated considerable reliability and validity evidence across longitudinal studies of early to late adolescents (e.g., Eisenberg et al., 2005; Eisenberg et al., 1999; Fosco, Caruthers et al., 2012). Cronbach’s alpha for this scale was .79 at both time points.

Antisocial behavior—Youth responded to 11 items used to assess antisocial behavior during the past month. These behaviors included lying to parents about where they had been, skipping school without an excuse, purposely damaging or trying to damage property, and getting into fights. Items were rated on a 6-point scale ranging from 1 (*never*) to 6 (*more than 20 times*) and yielded adequate reliability across waves (Cronbach’s alpha = .84 to .86). A scale mean was computed so that scores retained the item metric. Previous studies have found these items to converge on a latent construct with mother and father report (standardized loadings range from .46 to .89; Van Ryzin & Dishion, 2012) and to be correlated with mother- and father-reported substance use (e.g., $r = .37$; Fosco, Stormshak, Dishion, & Winter, 2012) and association with deviant peers (e.g., r s range from .55 to .60; Fosco, Stormshak et al., 2012). Finally, this measure also is associated with later arrest records (Connell et al., 2012).

Deviant peers—Youth also completed a five-item Deviant Peer Affiliation scale to assess how often they spent time with peers who (a) get in trouble a lot, (b) fight a lot, (c) take things that don’t belong to them, (d) smoke cigarettes or chew tobacco, and (e) use alcohol or other drugs. Items were rated on a 7-point scale ranging from 0 (*never*) to 6 (*more than 20 times*). This scale also had adequate reliability across waves (Cronbach’s alpha = .72 to .80). A scale mean was computed so that scores retained the item metric.

Latent variable factor loadings indicate convergent validity of this self-report measure with mother and father report of deviant behavior (standardized loadings of these survey

measures ranged from .58 to .69; Van Ryzin & Dishion, 2012). This measure is correlated with concurrent assessments of antisocial behavior in middle school (r s range from .55 to .60; Fosco, Stormshak et al., 2012) and with substance use across adolescence (r s range from .24 to .46; Van Ryzin, Fosco, & Dishion, 2012). The measure also has demonstrated predictive validity with respect to longitudinal association between substance use in middle school and high school (Van Ryzin et al., 2012) and when predicting antisocial behavior from adolescence to early adulthood (Van Ryzin & Dishion, 2012).

Cigarette, alcohol, and marijuana use—At each annual assessment, youth responded to three items regarding the frequency with which they had used tobacco, alcohol, and marijuana during the previous month (e.g., “How many alcoholic drinks did you have last month?”). Response formats are listed in Table 2 for these items. Single-item measures of substance use have demonstrated validity evidence in terms of longitudinal stability and prediction of later problematic substance use (Van Ryzin et al., 2012). These single-item measures of substance use have been used in several other studies of intervention effectiveness (e.g., Stormshak et al., 2011; Van Ryzin et al., 2012).

Results

Descriptive statistics are provided in Table 2. As shown, levels of antisocial behavior, deviant peer affiliation, and cigarette, alcohol, and marijuana use generally increased from 6th through 8th grade. Correlations between the intervention, gender, and outcome variables are presented in Table 3.

For analyses, structural equation modeling techniques were conducted using Mplus 6.1 (Muthén & Muthén, 2008). Models were estimated using full information maximum likelihood estimation to reduce bias resulting from missing data (Widaman, 2006). Standard measures of fit are reported for antisocial behavior and deviant peer affiliation, including the comparative fit index (CFI), standardized root mean square residual (SRMR), and root mean square error of approximation (RMSEA). CFI values greater than .95, SRMR values less than .08, RMSEA values less than 0.08 indicate good fit (Bentler, 1990; Bentler & Bonett, 1980; Hu & Bentler, 1999). The three substance use models were computed by estimating the outcomes as count variables; therefore, it was not possible to compute absolute fit indices. Regarding tests of statistical significance, an alpha of .05 was used.

As suggested previously, this study was not a cluster-randomized trial and was implemented by randomly assigning individual students to treatment or control groups in each school (i.e., blocking on school), and data were analyzed at this level of randomization (i.e., student). Because of this design and the low number of schools, variance across schools was not expected. To test this assumption, a null model was fitted and intraclass correlations (ICC) values were examined to assess whether or not there was sufficient variance to warrant multilevel modeling (Bryk & Raudenbush, 1992; Kreft & de Leeuw, 1998). Only a very small percentage of the total variance in the outcome lies systematically between schools (ICCs for effortful control = 0.02, deviant peers = 0.0002, antisocial behavior = 0.005, cigarette use = 0.002, alcohol = 0.002, and marijuana = 0.002). For all six variables, ICC values were in the trivial range (less than 5% of total variance in the outcome), indicating that adjustment of standard errors through multilevel modeling was unnecessary (Muthén & Satorra, 1995). Thus, more parsimonious, nonnested growth models were estimated.

Preliminary unconditional growth models were estimated for all five outcome variables and revealed that each had statistically significant variance for the intercept and slope, suggesting it was appropriate to estimate conditional models (Duncan, Duncan, & Stryker, 2006). Study hypotheses were evaluated by analyzing the links between assignment to the

intervention condition, adolescent self-regulation, and the problem behavior outcomes: antisocial behavior, deviant peer affiliation, cigarette use, alcohol use, and marijuana use. As shown in Figure 1, models were estimated to test three key paths to test our hypotheses for the five outcome variables. First, paths were estimated to test whether random assignment to the intervention condition was associated with self-regulation in 7th grade (Path A), accounting for previous levels in 6th grade (Path B). In turn, self-regulation in 7th grade was tested as a predictor of the slope of individual trajectories in dependent variables (Path C) to capture rates of change across 6th through 8th grades. These estimates controlled for possible gender differences (Path D). Readers should note that these standardized path coefficients can be interpreted as effect sizes (see Kline, 2005).

Findings for the five models are summarized in Table 4.¹ Estimated model fit was good (CFI > .95, SRMR < .04, RMSEA < .08) for the models predicting antisocial behavior and deviant peer affiliation growth. As expected, random assignment to the intervention condition was associated with modest, but statistically significant increases in self-regulation from 6th to 7th grade (Path A; $\beta = .08$), and this finding was consistent across all five models. In turn, self-regulation evidenced small to moderate associations with growth in all the outcomes evaluated (Path C). In the first model tested, youth self-regulation in 7th grade was associated with less growth in antisocial behavior from 6th through 8th grade ($\beta = -.12$). In the second model, youth with higher levels of self-regulation reported less growth in deviant friendships over time ($\beta = -.18$). In the third, fourth, and fifth models, a consistent, statistically significant association between self-regulation and substance use emerged. Specifically, self-regulation was related to less growth in cigarette use ($\beta = -.30$), alcohol use ($\beta = -.22$), and marijuana use ($\beta = -.39$) over the middle school years. Across these models, youth gender was associated only with deviant friendship growth ($\beta = .12$), suggesting that girls evidenced faster rates of growth in deviant peer affiliation than boys.

Discussion

This study evaluated the role of the FCU, a school-based, family-centered intervention implemented in public middle schools, in relation to students' effortful control, an important dimension of self-regulation that has robust implications for antisocial behavior and for a host of other indices of functioning, such as internalizing problems (Eisenberg et al., 2001), and academic indices, including grade point average (Gumora & Arsenio, 2002), overall achievement (Brigman & Campbell, 2003; Fonagy, Twemlow, Vernberg, Sacco, & Little, 2005), and graduation rates (Zins, Bloodworth, Weissberg, & Walberg, 2004).

An ITT design was used to gauge effects of the FCU on overall mean levels of youth effortful control and to evaluate whether there was an overall benefit to the population served rather than to only those who engaged in treatment. Because less than one-half of the students in the intervention condition completed the FCU, the ITT approach provided a conservative test of the intervention effects. It also provided a perspective on the net effect of the intervention on the school population as a whole (those who did and those who did not receive the intervention). As with a prior test of ITT effect of the FCU on effortful control (Stormshak et al., 2010), intervention effects were found for youth effortful control, such that participants assigned to the intervention condition had greater increases in effortful control, on average, than did those in the control group from 6th to 7th grades. In turn, youth effortful control in 7th grade was linked with lower rates of individual growth in each of the outcomes. Specifically, higher levels of effortful control were associated with less growth in

¹Post-hoc analyses were conducted to control for possible difference across schools in this study. Dummy-coded indicators were added to models as covariates, but no substantive changes to the findings in the original models surfaced. Therefore, the original models were retained for this study.

antisocial behavior, friendship with deviant peers, and alcohol, tobacco, and marijuana use over the middle school years. As a whole, these findings underscore the importance of family-centered interventions in early adolescence and of effortful control as an intervention target to promote resiliency with regard to a broad range of outcomes.

The FCU intervention used a multilevel system and a flexible, tailored approach to targeting youth's families to ensure efficient allocation of resources for maximal benefit to the student body (Dishion & Kavanagh, 2003; Dishion & Stormshak, 2007). This design is particularly well suited for use in school settings and can enhance family-school connections, an increasingly essential concern in today's educational climate (Christenson & Sheridan, 2001). The FCU intervention required only a minimal amount of time (approximately 98 minutes) for students over the course of 3 years. Thus, not only is the FCU's design cost effective, it enhances students' effortful control without burdening teachers with implementation of the intervention curriculum or interfering with valuable classroom instruction time. This approach, which effectively engages families at risk, is of particular value during the middle school years, a pivotal period of transition during which youth are at heightened risk for engaging in problem behavior (Dishion & Patterson, 2006).

As indicated by the current findings and those previously reported (Stormshak et al., 2010), effortful control appears to be a consistent and robust protective factor. Given its preventive effects in terms of problem behavior, substance use, and depressive symptoms, as well as enhancement of school engagement, focusing on this one dimension may be particularly valuable for preventive interventions and may have wide-ranging benefits. Because experimentation with substances typically does not begin until 7th or 8th grade (Johnston, O'Malley, Bachman, & Schulenberg, 2008), emphasizing effortful control in programs aimed at middle school populations could prevent problems before they get started. Moreover, benefits of the FCU intervention delivered in middle school have been found to have lasting effects on trajectories of substance use, antisocial behavior, depression, and GPA well into the high school years (Connell & Dishion, 2008; Connell et al., 2007; Stormshak et al., 2009).

The current study contributes to the literature by focusing on the mechanisms of change underlying distal youth risk behavior outcomes. In future research to determine how to bolster FCU intervention benefits to increase early adolescents' effortful control, two principal steps should be taken: (a) address effortful control in the FCU assessment and feedback sessions, and (b) tailor parenting interventions to support improvement of effortful control. Youth effortful control may be a particularly meaningful dimension to concentrate on in feedback sessions, because it captures youth's ability to initiate and sustain on-task work and avoid distraction, skills that are salient to many parents. As such, stigmatizing labels related to attention are avoided that may elicit parental defensiveness or undermine confidence in a youth's ability to improve in this area. Subsequent and intensive parenting support interventions that target monitoring and structuring, positive reinforcement and limit setting, and emotion coaching related to task initiation and persistence may further improve youth's effortful control. Parental monitoring and structure/routines may allay stress and neutralize the temptation to engage in activities such as drug use (Dishion & McMahon, 1998). Similarly, effective positive reinforcement and limit setting can support engagement and persistence in constructive activities, thereby enhancing effortful control (Horner, Day, & Day, 1997). Finally, enhancing parenting practices such as warmth, sensitivity, and emotion coaching can foster greater emotion regulation and effortful control (Eisenberg et al., 1999; Gottman, Katz, & Hooven, 1996; Wu Shortt, Stoolmiller, Smith-Shine, Eddy, & Sheeber, 2010).

Limitations and Future Directions

This study had several strengths, including a randomized design, randomization of groups, a diverse sample, large sample size, and use of latent growth curve modeling to capture change in each outcome over a 3-year period, yet it is not without limitations. For one, reliance on youth self-report for assessments of the variables was a methodological limitation. Further research in which multiple raters and methods are used to assess constructs would offer a more complete evaluation of these outcomes.

Although intervention effects of the FCU on youth effortful control were found in this study, the effect size for the intervention was small. This small effect size resulted in part from the analytical approach we chose because we were interested in evaluating the average benefit to all students to better approximate a school-level benefit. Less than half of the intervention group did not engage in the FCU, so the reported effect size for the intervention may underrepresent the degree to which the FCU promotes effortful control at an individual level. The effect size for the intervention may also have been affected because parenting interventions in the FCU menu of options did not directly target effortful control. Future development of the FCU model could include the addition of modules that directly target youth self-regulation.

Use of a randomized design also limits implementation of the FCU model in schools. Randomization occurred at the student level rather than at the school level so that nesting effects could be avoided. This type of randomization resulted in a portion of each school's student body was not part of the intervention condition, and schools were limited with respect to integrating the universal-level FCU into the school culture and the degree to which outreach could be conducted with all students. As a result, the potential impact of universal-level family supports may be underestimated in this study. This limitation could generate a compelling research question as the FCU is examined using an effectiveness trial design.

Another future direction for this research is to assess other dimensions of youth problem behaviors, such as rates of change in office disciplinary referrals or problem behaviors at school. This study used a global measure of problem behaviors that was not specific to context, and although it likely generalizes to the school setting, further information would be gained by assessing school-specific problem behaviors.

Conclusion

The current study revealed effortful control to be a robust protective factor that can be enhanced by effective use of the FCU, a family-centered intervention model that can be implemented with reasonable efficiency and long-lasting effects. As findings indicate, promoting effortful control can reduce risk for growth of a wide range of problem behaviors, including antisocial behavior, forming friendships with deviant peers, and alcohol, tobacco, and marijuana use. In addition, a previous study found that enhanced effortful control had an impact on students' school engagement and symptoms of depression (Stormshak et al., 2010). Together, these two studies speak to the value of bolstering FCU intervention effects on effortful control as a strategy that can have wide-ranging preventive implications.

Another important step for the FCU intervention is to examine feasibility of implementation in school settings and translation from efficacy to effectiveness. For example, a large-scale effectiveness trial of the FCU intervention in Oregon middle schools has required adaptations to make this model feasible for implementation with school personnel (Fosco et al., in press). Other adaptations have also been integrated into schoolwide FCU intervention models (Dishion, 2011) for more effective assimilation into the school context. This work reflects a necessary next step for a growing evidence base for the FCU model.

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Appendix A: Comparison of Family-Support Programs

Program	Description	Outcomes
Family Resource Center Model	School-based service centers designed to enhance participation of families in the educational process and strengthen the capacity of families to enable children's readiness for learning. This is accomplished by connecting families to a variety of community-level services. Implementation is overseen by center coordinators who may have a background in human services, teachers, or paraprofessionals with knowledge of local community services.	Increased Use of Resources (Kalafat, 2004; Kalafat et al., 2007)
Positive Action	Comprehensive school-based program designed to teach and reinforce youth engaging in positive physical, intellectual, social, and emotional actions. Supplemental ATOD, conflict resolution, school climate, community engagement, and family curriculum are available. Full version of family curriculum includes forty-two 30- to 40-minute lessons complementing core curriculum.	Alcohol, Tobacco, or Drug Use (ATOD) (Beets et al., 2009) Antisocial Behavior (Beets et al., 2009) Academics (Snyder et al., 2010)
Families and Schools Together	Multifamily group intervention designed to build relationships between families, schools, and communities. Activities include parent outreach, participation in eight weekly group sessions, and monthly parent support meetings for up to 2 years. Typically implemented in school settings facilitated by school staff.	ATOD (McDonald et al., 1991) Problem Behaviors (McDonald et al., 2006) Academics (McDonald et al., 2006) Family Relations (McDonald & Sayger, 1998)
Strengthening Families Program For ages 10–14 years	Family skills training program designed to increase resilience and reduce risk for behavioral, emotional, academic, and social problems. Families engage in 14 two-hour training sessions targeting key parenting skills, such as use of rewards/punishment, communication, problem-solving, etc. Implemented in a variety of settings by certified facilitators.	Problem Behaviors (Spoth, Redmond, & Shin, 2000) ATOD (Spoth, Redmond, & Shin, 2004) Family Relations (Spoth, Redmond, & Shin, 1998) Parenting Skills (Spoth et al., 1998)
Triple P-Positive Parenting Program	A five-level parenting support program designed to prevent social, emotional, behavioral, and developmental problems in children. Level 1 includes the use of media to promote awareness of parenting resources and strategies. Level 2 provides advice on solving common parenting programs. Level 3 provides parents with skills training on mild to moderate behavior problems. Level 4 provides individual or group training sessions for managing more severe behaviors. Level 5 provides additional three to five sessions of enhanced support for multiproblem families.	Problem Behaviors Parenting Skills Parental Well-Being (Meta-analysis: Nowak & Heinrichs, 2008)
Family Check-Up	The middle-school implementation of the FCU model incorporates a tiered	ATOD (Stormshak et al., 2011) Antisocial Behavior

Program	Description	Outcomes
	<p>approach in which general information and consultation are available at the universal level regarding behavior, academic work, and attendance at school.</p> <p>Multiple gating strategies are used to identify students at risk for behavior, ATOD, social, and academic problems. Selected-level intervention includes a Family Check-Up three-session interview, assessment, and feedback using principles of motivational interviewing. Feedback session provides a menu of intervention services, including family management sessions, community resources, and school-based intervention options that are tailored to the unique needs of each family to maximize engagement and relevance to parents' concerns and motivation. Family management sessions are delivered in home or school settings and are derived from the Everyday Parenting curriculum (Dishion, Stormshak, & Kavanagh, 2011). The FCU model follows a health-maintenance model in which regular follow-ups are conducted with families to ensure that problems do not recur.</p>	<p>(Stormshak et al., 2011) Mental Health (Connell & Dishion, 2008) Academics (Connell et al., 2009) Family Relations (Caruthers et al., in press; Van Ryzin & Dishion, 2012)</p>

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Figure 1.
Conceptual model predicting outcomes.

Table 1

Demographic Information for the Intervention Group, Control Group, and Overall Sample

	Intervention group <i>n</i> = 386		Control group <i>n</i> = 207		Overall sample <i>n</i> = 593	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
School 1	161	41.7	93	44.9	254	42.8
School 2	105	27.2	74	35.7	179	30.2
School 3	120	31.1	40	19.3	160	27.0
Sex: Girls	186	48.2	102	49.3	288	48.6
Ethnicity						
European American	138	35.8	76	36.7	214	36.1
Latino/Hispanic	69	17.9	38	18.4	107	18.0
African American	60	15.5	30	14.5	90	15.0
Asian American	29	7.5	13	6.3	42	7.1
American Indian/ Native American	10	2.6	4	1.9	14	2.4
Pacific Islander	7	1.8	4	1.9	11	1.9
Biracial/mixed ethnicity	73	18.9	42	20.3	115	19.3

Table 2

Means, Standard Deviations, Range, and Scales of Outcome Variables

Outcome Variables	<i>M</i>	<i>SD</i>	<i>N</i>	Min	Max	Scale range
Effortful Control (6th)	3.63	0.59	577	1.75	5.00	1 (<i>almost always untrue</i>) to 5 (<i>almost always true</i>)
Effortful Control (7th)	3.46	0.58	523	1.75	5.00	1 (<i>almost always untrue</i>) to 5 (<i>almost always true</i>)
Antisocial (6th)	1.19	0.37	583	1.00	3.82	1 (<i>never</i>) to 6 (> 20 times)
Antisocial (7th)	1.26	0.44	524	1.00	4.55	1 (<i>never</i>) to 6 (> 20 times)
Antisocial (8th)	1.32	0.47	479	1.00	3.73	1 (<i>never</i>) to 6 (> 20 times)
Deviant Peers (6th)	0.60	0.91	590	0	6.00	0 (<i>never</i>) to 6 (> 20 times)
Deviant Peers (7th)	1.00	1.30	523	0	6.00	0 (<i>never</i>) to 6 (> 20 times)
Deviant Peers (8th)	1.29	1.51	481	0	6.00	0 (<i>never</i>) to 6 (> 20 times)
Cigarette Use (6th)	0.03	0.29	592	0	5.00	0 (<i>never</i>) to 5 (5 cigarettes)
Cigarette Use (7th)	0.14	0.91	525	0	12.00	0 (<i>never</i>) to 12 (1 pack)
Cigarette Use (8th)	0.33	1.80	481	0	16.00	0 (<i>never</i>) to 16 (5+ packs)
Alcohol Use (6th)	0.09	0.62	592	0	11.00	0 (<i>never</i>) to 11 (10–20 drinks)
Alcohol Use (7th)	0.31	1.12	523	0	11.00	0 (<i>never</i>) to 11 (10–20 drinks)
Alcohol Use (8th)	0.61	1.84	480	0	13.00	0 (<i>never</i>) to 13 (41+ drinks)
Marijuana Use (6th)	0.03	0.34	592	0	6.00	0 (<i>never</i>) to 6 (6 times)
Marijuana Use (7th)	0.17	1.12	524	0	13.00	0 (<i>never</i>) to 13 (41+ times)
Marijuana Use (8th)	0.47	1.98	480	0	13.00	0 (<i>never</i>) to 13 (41+ times)

Note. Assessment occasion is noted in parentheses by grade.

Table 3

Correlations between Intervention Group, Demographic, and Outcome Measures

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Group	–																	
2. Gender	-.01	–																
3. SR (Gr. 6)	.00	.03	–															
4. SR (Gr. 7)	.07	.04	.61*	–														
5. Anti (Gr.6)	.04	-.10*	-.40*	-.27*	–													
6. Anti (Gr.7)	-.04	-.11*	-.28*	-.32*	.37*	–												
7. Anti (Gr. 8)	-.05	-.06	-.18*	-.29*	.26*	.58*	–											
8. Peers (Gr.6)	.06	-.11*	-.31*	-.26*	.54*	.48*	.39*	–										
9. Peers (Gr.7)	.05	-.05	-.23*	-.31*	.31*	.63*	.44*	.52*	–									
10. Peers (Gr.8)	-.01	.04	-.12*	-.25*	.20*	.50*	.57*	.33*	.56*	–								
11. Cigs (Gr.6)	-.06	-.06	-.03	-.09*	.10*	.18*	.08	.11*	.09*	.10*	–							
12. Cigs (Gr.7)	-.06	-.05	-.13*	-.13*	.38*	.26*	.15*	.36*	.34*	.19*	.04	–						
13. Cigs (Gr.8)	.00	.02	.00	-.12*	.14*	.21*	.32*	.14*	.13*	.23*	.11*	.21*	–					
14. Alc (Gr.6)	.02	-.04	-.07	-.11*	.38*	.21*	.13*	.28*	.18*	.39*	.26*	.40*	.40*	–				
15. Alc (Gr.7)	.02	.02	-.08	-.17*	.24*	.42*	.26*	.27*	.34*	.28*	.10*	.40*	.31*	.50*	–			
16. Alc (Gr.8)	-.05	.07	.00	-.10*	.11*	.22*	.47*	.10*	.19*	.33*	.02	.13*	.53*	.16*	.43*	–		
17. Marij (Gr.6)	.06	-.07	-.04	-.06	.15*	-.03	-.01	.08	.03	-.01	.20*	.00	-.02	.29*	.00	-.02	–	
18. Marij (Gr.7)	-.01	-.01	-.11*	-.11*	.22*	.28*	.19*	.24*	.30*	.24*	.03	.62*	.23*	.18*	.30*	.27*	-.10	–
19. Marij (Gr.8)	-.01	-.04	-.10*	-.14*	.16*	.32*	.43*	.21*	.29*	.29*	.07	.48*	.45*	.30*	.39*	.46*	-.02	.48*

Note. Group = control group (0) or intervention group (1); SR = self-regulation; Anti = antisocial behavior; Peers = deviant peers; Cigs = cigarette use; Alc = alcohol use; Marij = marijuana use.

* $p < .05$

Table 4

Summary of Model Fit and Path Coefficients for Five Models

Outcome variable	Model fit indices					Hypothesized paths			
	χ^2 (9)	p	CFI	SRMR	RMSEA	A Int→ SR6	B SR6→ SR7	C SR7→ slope	D Gender→slope
1. Antisocial behavior	25.99	.002	.97	.035	.058	.08 *	.61 *	-.12 *	.02
2. Deviant peer affiliation	29.86	.001	.97	.036	.063	.08 *	.61 *	-.18 *	.12 *
3. Cigarette use (last mo.)						.08 *	.61 *	-.30 *	.05
4. Alcohol use (last mo.)						.08 *	.61 *	-.22 *	.16
5. Marijuana use (last mo.)						.08 *	.61 *	-.39 *	.15

Note. CFI = comparative fit index; SRMR = standardized root mean square residual; RMSEA = root mean square error of approximation.

The three substance use models (3 through 5) were computed by estimating the outcomes as count variables; therefore, it was not possible to compute absolute fit indices.

*
 $p < .05$