

Reducing Adolescents' Aggressive and Hostile Behaviors

Randomized Trial Effects of a Brief Family Intervention 4 Years Past Baseline

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Objective: To examine the long-term effects of a brief family intervention on aggressive and hostile behaviors of adolescents in the general population.

Design: Randomized trial including 22 public schools assigned to the Iowa Strengthening Families Program or a control condition. Analyses supported sample representativeness and failed to show differential attrition effects 4 years after baseline.

Intervention: Seven-session intervention for parents and their sixth-grade children.

Measures: The multi-informant, multimethod measures included independent observer ratings of adolescent aggressive and hostile behaviors in adolescent-parent interactions, family-member report of aggressive and hostile behaviors in those interactions, and adolescent self-report of aggressive and destructive conduct across settings. Data were collected during the 6th (preintervention and postintervention), 7th, 8th, and 10th grades.

Results: All measures showed a generally positive trend in intervention-control group differences over time. During 10th grade, significant intervention-control differences were found for adolescent self-report of aggressive and destructive conduct ($P = .01$), with relative reduction rates ranging from 31.7% to 77.0%. Significant differences were shown for observer-rated aggressive and hostile behaviors in adolescent-parent interactions ($P = .01$); differences in family member reports of those behaviors were not significant. Supplemental analyses of both interactional behavior measures, specific to parent sex, indicated significant experimental group differences in interactions with mothers ($P = .04$ for both measures) but not with fathers.

Conclusions: Brief family competency-training interventions designed for general populations can reduce aggressive and hostile behaviors in adolescents' interactions with parents and adolescent aggressive behaviors outside of the home setting. Thus, this type of intervention has important public health implications.

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EPIDEMIOLOGICAL studies document alarming rates of conduct-related problem behaviors in home, school, and community settings.¹⁻⁹ Among these problems, the prevalence of aggressive and hostile behaviors by youth is of increasing concern. For example, the US Department of Education indicates that 74% of middle schools reported 1 or more incidents of aggression in 1996-1997¹⁰; student fights or assaults on other students are the most frequent types of aggression reported.¹¹ The health and economic costs of adolescent aggressive behaviors figure considerably in the total costs of such behavior among all segments of the population, typically estimated to be many billions of dollars.¹¹

Etiologic studies have clearly demonstrated that key risk factors for serious adolescent aggressive behaviors origi-

nate in the family.^{7,12-19} Further, aggression in the home increases the risk of aggressive behavior in the school and other settings.^{4,16,20,21} Consistent with the etiologic literature, evidence exists that family-focused skills-training interventions with families of high-risk adolescents can reduce aggression and other problem behaviors through cost-effective interventions.²²⁻²⁸ Unfortunately, there are very limited data from randomized controlled studies on the efficacy of brief family interventions designed for general populations, with the objectives of reducing aggressive behaviors, substance use, and other conduct problem behaviors.²⁹⁻³¹ A large number of brief, general-population interventions have been developed and disseminated but have not been designed according to accepted science-based principles of prevention (eg, interventions designed to modify empirically

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SUBJECTS AND METHODS

SAMPLE

Schools in contiguous counties of a midwestern state were selected on the basis of eligibility for school lunch programs ($\geq 15\%$ of district families eligible for free or reduced-cost lunches) and community size (populations of ≤ 8500). Thirty-three schools were blocked on the proportion of students that resided in lower-income households and on school size. Within blocks, each school was randomly assigned to one of the following 3 experimental conditions: the 7-session ISFP, the 5-session Preparing for the Drug Free Years Program, or a minimal-contact control condition. Random assignment was computer generated by a data analyst, and assignment information was provided to intervention implementation staff who in turn sent letters to the schools informing them of their assignment. Although all families of sixth graders were initially informed about potential assignment to an intervention condition, they were recruited for the project as a whole and were not informed of their actual assignment condition (intervention or control) until after pretesting; intervention-specific recruitment was conducted after the pretest assessment and targeted only families who underwent pretesting.

Iowa Strengthening Families Program procedures and outcomes are described herein. The primary long-term adolescent outcomes of interest in a separately funded Preparing for the Drug Free Years evaluation were substance related and are reported in a separate paper that is currently under review (R.L.S., C.R., C.S, unpublished data, July 2000).

All eligible families in the selected schools were sent summary information on the assessment and program components of the prevention trial. Households were initially contacted by mail and, subsequently, by telephone. The mail contact provided summary descriptive information about the project and stated that a telephone contact would follow soon. During the first telephone contact, the interviewer verified that the family had received the mailed summary information on the project and reminded the contacted parent of its content. Families who indicated that their family had not discussed the possibility of participation were asked to do so, and a follow-up call was arranged to further inquire about participation. Subsequently, pretest assessments were conducted with parents who were recruited successfully.

Of the 846 families of sixth graders recruited for this study in the ISFP and control conditions, pretests were completed by 446 families (238 ISFP-group families and 208 control-group families). Refusal rates were similar across schools. Previous reviews have shown that these recruitment rates compare favorably or exceed rates commonly reported for prevention trials addressing child problem behaviors with similar evaluation components at the time this trial was undertaken.⁴⁷ Because 400 of 846 recruited families did not undergo pretesting, data from a survey of the entire sampling frame conducted several months before the pretest were used to assess sample representativeness before families were recruited for the intervention. Participating families did not know the experimental condition to which their child's school had been assigned at the time of pretesting. After pretesting, intervention-school families who completed pretest assessments were recruited for the program; intervention-school families not successfully

recruited for pretesting were allowed to enroll in the intervention but were not actively recruited. At the 10th-grade follow-up, 67.9% ($n=303$) of the pretested sample was retained; this rate is comparable to mean rates reported in a review of 85 longitudinal school-based prevention studies.⁴⁸ More important, analyses were conducted to rule out attrition-related biases (**Figure 1**).

Families who provided complete data for the current analyses had an average of 3.2 children, and in 53.1% of these families the target child was a girl. Most families (85.8%) consisted of dual-parent families, which is representative of families of sixth graders in the study region. Of these dual-parent families, 84.0% included both of the target child's biological parents. The mean ages of mothers and fathers were 37.7 and 40.2 years, respectively. Most mothers and fathers (97.6% and 95.0%, respectively) completed high school. In addition, 56.0% of mothers and 50.4% of fathers reported some post-high school education. The median household income in the sample was \$35 000. Virtually all participants were white (98.8%).

INTERVENTION IMPLEMENTATION AND FIDELITY

The ISFP is based on the biopsychosocial model⁴⁹ and other empirically based family risk and protective factor models.⁵⁰ It includes 7 consecutive weekly meetings held on weekday evenings, typically at schools, with separate parent and child skills-building curricula and a family curriculum. Each of the first 6 meetings consist of separate, concurrent training sessions for parents and children, followed by a joint parent-and-child or family session to practice skills learned in their separate sessions. Concurrent and family sessions last 1 hour each. The seventh session consists of the family session only; thus, the total number of intervention hours was 13.

Parents and children were instructed in skills shown to be associated with the reduction of problem behaviors.^{9,13,15,17,24,26,29,30} Parents were taught to clarify expectations based on child development norms, to use appropriate disciplinary practices, to manage strong emotions concerning their child, and to communicate effectively with their child. Children learned skills for dealing with peer pressure (refusal skills) and other personal and social interactional skills (eg, management of stress and strong emotions, and problem solving). Together, family members practiced family conflict resolution and communication skills; they engaged in activities designed to increase family cohesiveness and positive involvement of the child in the family. In addition, parents viewed videotapes that were produced before intervention implementation and included family interactions illustrating key concepts.

Project staff organized a cooperative arrangement between the Cooperative Extension network and local schools to facilitate intervention delivery.^{50,51} Twenty-one 3-person leader teams conducted 21 ISFP groups in the 11 participating schools. A total of 161 families participated in the 21 groups, including 117 families who had completed the in-home pretest assessment. Group sizes ranged from 3 to 15 families, with an average size of 8 families and an average of 20 individuals per session. Approximately 94% of attending families that underwent pretesting were represented by a family member in 5 or more sessions. Trained observers monitored the fidelity of intervention implementation and confirmed that fidelity was achieved.³¹

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Control-group families were mailed 4 leaflets describing different aspects of adolescent development (eg, physical and emotional changes and changes in parent-child relationships) at the same time experimental families participated in the interventions.

To preserve random assignment, analyses presented herein included all assessed intervention-group families, whether or not they actually attended the intervention sessions (an intent-to-treat analysis). This approach includes a substantial portion of families in the analysis who were invited into the intervention but who did not receive any intervention, likely reducing the observed magnitude of the intervention-control differences. The exclusion of families invited, but not participating in the intervention, would have introduced a self-selection bias into the findings.

PROCEDURES

All procedures were approved by the Iowa State University Institutional Review Board.

All eligible families were recruited for the pretest. Families willing to participate in the pretest were contacted by a project staff member to schedule the in-home assessment visit. An informational packet was sent that included an initial questionnaire to be completed individually by the parent(s) and the target child before the in-home visit. The in-home visit involved a household composition interview, followed by completion of independent written questionnaires (taking approximately 60-80 minutes). In addition, the interviewer videotaped the family members as they engaged in structured interaction tasks. Videotapes were subsequently coded by non-interviewers who were unaware of the experimental condition. The complete visit averaged about 2½ hours in length. Each family member was compensated at the rate of approximately \$10/h. The time between pretesting and posttesting was approximately 6 months. Families were scheduled for posttesting in a sequence similar to that for pretesting. All families undergoing pretesting were recruited for posttesting, including intervention-group families not enrolling in the interventions. Families underwent reassessment approximately 1½, 2½, and 4 years after the pretest (when students were in the 7th, 8th, and 10th grades). Because of a brief interruption in funding, 10th-grade assessments for the ISFP group were completed, on average, 3 months later than were assessments of control-group families. Thus, 10th grade measures of adolescent behaviors were adjusted statistically for this time difference, based on a linear rate of change from the 8th- to the 10th-grade assessments.

MEASURES

Multiple informants (independent observer, mother, father, and adolescent) and multiple measurement methods (observer rating, self-report, and parent report) were applied. Measures were selected for expected sensitivity to intended outcomes,⁵²⁻⁵⁴ with a focus on counts or frequencies of adolescent aggressive and hostile behaviors that were well defined and appropriate for modification by means of competency-training interventions for general populations. Each outcome measure was an index, calculated as the number of individual behaviors serious or frequent enough to be considered currently problematic or indicative of progression toward serious aggressive or violent

behaviors.¹⁶ The combination of family-member reports and observer ratings was selected to provide the most comprehensive and balanced overall assessment of adolescent behavior.

Observer Index of Aggressive and Hostile Behaviors in Interactions

Observer ratings of adolescent aggressive and hostile behaviors in interactions with parents were based on the following 9 behavioral scales from the Iowa Family Interaction Rating Scales⁵⁵: Physical Attack, Verbal Attack, Hostility, Escalate Hostile, Reciprocate Hostile, Angry Coercion, Contempt, External Negative, and Antisocial. Based on a standardized 9-point scale ranging from 1 (not at all characteristic) to 9 (mainly characteristic), these ratings address a range of physically or verbally aggressive or hostile behaviors directed toward parents by the adolescent. Adolescents received 1 point for each behavior for which they were given a rating of 5 or higher. These individual dichotomous scores were summed to create an index score. Dichotomous index scoring was used for the following reasons: (1) it allowed the defining of problematic behaviors on substantive grounds, based on guidelines and anchor points used in observer training, thus improving the interpretability of scores, and (2) it can improve the distributional characteristics of measures consisting of nonnormally distributed items (eg, bimodally distributed items).

Video coders were not informed of families' experimental conditions. Although it is possible that families may have made statements alluding to the intervention, few such instances would be expected, given that the intervention was administered approximately 4 years earlier. In addition, coders rate videotapes from a number of research projects and typically are involved in more than 1 study, minimizing the likelihood of rater bias. Interrater reliabilities for the 9 scales in the index ranged from 0.72 to 0.84. Observer ratings have been analyzed in previous work by the authors,³¹ and validity issues raised by families' awareness of being videotaped have been addressed.⁵⁵

Parent-Adolescent Report of Aggressive and Hostile Behaviors in Interactions

Five parallel parent and adolescent written questionnaire items were drawn from the self-report portion of the Iowa Youth and Family Rating Scales on Perceptions of Hostility/Warmth⁵⁶ to assess adolescent aggressive and hostile behaviors in parent-adolescent interactions. These items correspond to a subset of the content in the observer rating scales. Mothers and fathers were each asked to consider interactions with the adolescent during the past month and rate the frequency that their adolescent hit, pushed, or shoved them; shouted or yelled at them; argued whenever they disagreed; criticized their ideas; and got angry at them. Adolescents were asked parallel questions about their own behavior in interactions with each parent living in the home. Questionnaire items were rated on a 7-point scale ranging from 1 (always) to 7 (never). Because the aggregating of scores across reporters has been recommended to capture a greater portion of true score variance relative

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to error variance,^{57,58} parent and adolescent reports were combined. Scores for each behavior reported by the adolescent and parent(s) were averaged. In the case of dual-parent families, scores of the mother and father were averaged; then, their combined score was averaged with their child's score. In single-parent cases, the score of the sole parent was averaged with that of the child. As was the case with observer ratings, index scoring procedures were used. Each item receiving an average rating of 4 or lower was scored as 1; higher ratings, indicating less frequent behaviors, were scored 0; items were then summed. The result was an index with a maximum score of 5.

Adolescent-Reported Index of Aggressive and Destructive Conduct

Adolescents were asked a series of questions on the in-home questionnaire derived from the National Youth Survey⁵⁹ concerning the frequency with which they engaged in identified behaviors during the past year. Four items that specifically addressed physically aggressive behaviors directed toward people or property were selected from a previously described scale that included other conduct problems.⁶⁰ Adolescents responded to 2 items measuring aggression directed toward other people (beating up or physically fighting with someone and throwing rocks or bottles at someone to cause injury) and 2 items measuring aggressive behavior directed toward invading or damaging property (purposely damaging property belonging to others and breaking into a building). To compute the index of aggressive and destructive conduct, adolescents received 1 point for each behavior in which they had engaged (Klein and colleagues¹⁵ illustrate how this type of scoring has been used in previous studies).

DATA ANALYSES

Because of the nested design of the study (families were clustered within schools), multilevel (mixed-model) analysis of covariance (ANCOVA) with restricted maximum likelihood estimation, using commercially available software (SAS; SAS Institute, Cary, NC), was used to test for intervention effects. Because assignment to experimental conditions was made at the school level, multilevel analyses are appropriate because they can incorporate random effects associated with higher-level factors (school, in this case), resulting in intraunit dependence.

An additional source of intraunit dependence was also considered. Although 6 ISFP schools had more than 1 group, ANCOVAs showed no evidence of effects associated with group membership within schools. This result is consistent with (1) the observed uniformity in implementation indicated across groups by observation-based fidelity scores and (2) the fact that families who could not attend their regular group meeting sometimes attended an alternate group session in their locality. Given these considerations, school effects associated with the study design were included in outcome analyses; effects related to intervention group were not.

In the multilevel ANCOVA, pretest scores and adolescent sex were included as covariates in the models. Adolescent sex was included as a covariate to control for possible male-female differences in aggressive and hostile behaviors. To illustrate the cross-time development of the aggressive and hostile behaviors assessed at 10th grade, plots of scores across all waves of data collection also were constructed for each of the 2 experimental conditions. Each plot covers a range of approximately 1 SD on the measures graphed. Finally, supplemental analyses were conducted to examine aggressive and hostile behaviors in adolescent-parent interactions specific to mothers and fathers.

supported risk and protective factors, with developmentally appropriate intervention timing and content) and/or have evaluations with methodological limitations (eg, quasi-experimental designs, inappropriate statistical analyses).^{30,32-39}

To address the substantive gaps and methodological issues discussed in the literature, we reported the longitudinal outcomes of a randomized controlled trial evaluating the Iowa Strengthening Families Program (ISFP). Previous work by the authors has focused on shorter-term effects, including parenting outcomes,^{31,40} or longer-term effects on adolescent substance use.^{39,41}

The focus of the present report is on adolescent aggressive, hostile, and destructive behaviors expected to be influenced by the tested universal intervention. These behaviors typically are considered to be a subset of adolescent conduct problem behaviors and disruptive behavior disorders; 2 subsets of these behaviors are addressed in the present report. The first subset concerns aggressive and hostile behaviors demonstrated in interactions with parents in the home setting, behavior that has been associated with an increased risk of aggression in school and other settings. The second subset consists of aggressive and destructive behaviors that can occur in home, school, and community settings, including physi-

cal aggression against persons and invasion or destruction of property.

Intervention-based skills training (eg, effective communication and problem solving between parents and children, effective child management, and resistance of peer pressure directed toward antisocial or illegal activity) was expected to affect both subsets of adolescent aggressive behaviors. More specifically, the authors hypothesized that, relative to 10th-grade adolescents in control-group families, 10th graders in intervention-group families would demonstrate (1) lower levels of aggressive and hostile behaviors in interactions with parents, as rated by independent observers and as indicated by family member reports, and (2) lower levels of aggressive and destructive behaviors directed toward persons and property in multiple settings, as indicated by adolescent self-report.

The tested intervention was designed as part of a public health, primary prevention approach to the reduction of adolescent problem behaviors.^{11,29,30,41} It was theory based, addressing well-established risk and protective factors originating in the family that have been shown to influence the development of adolescent problem behaviors.^{12,18,42-44} In addition, it was developmentally well timed.⁴¹ To maximize its impact, the intervention was offered during the first semester of sixth grade, before in-

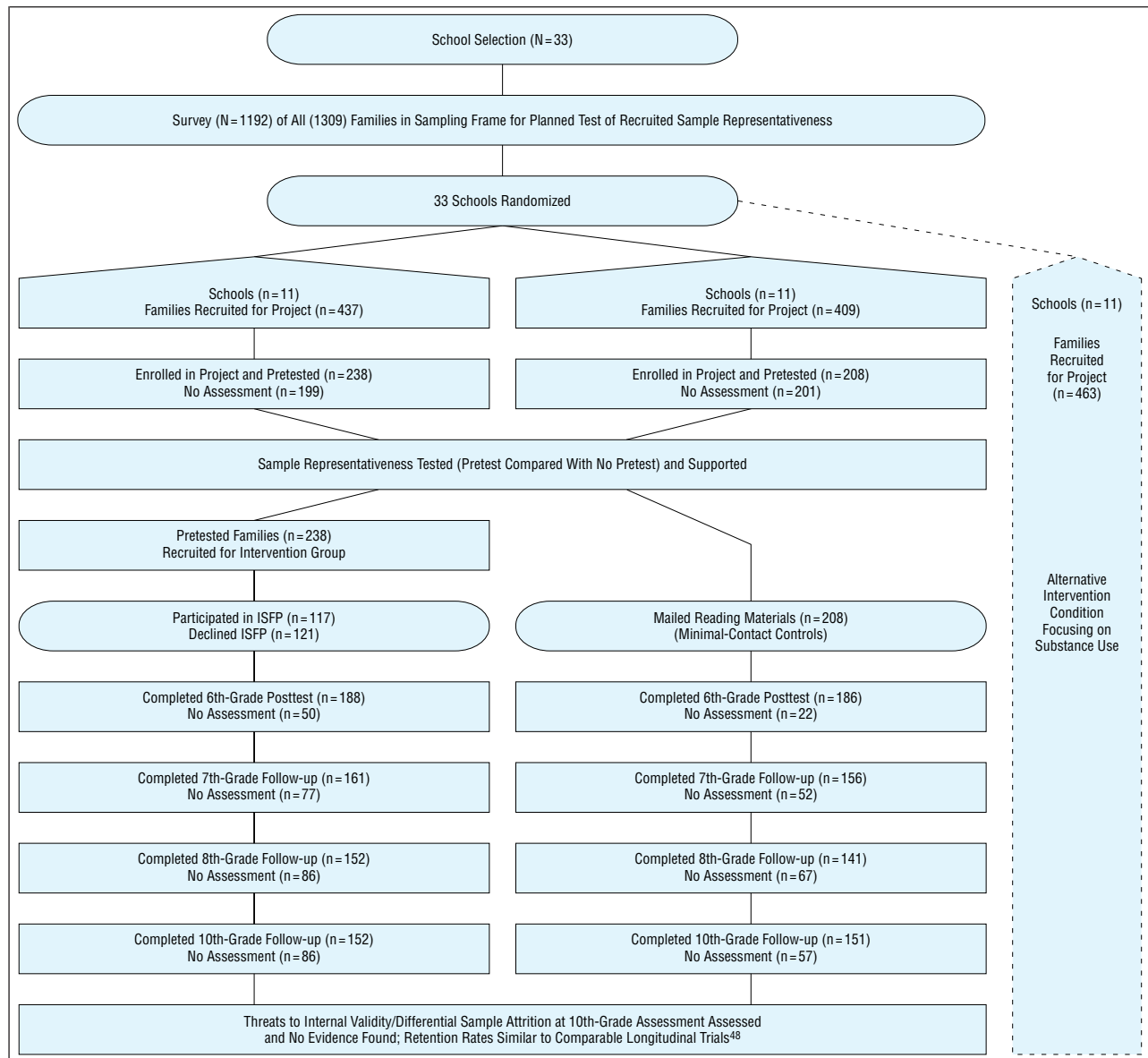


Figure 1. Profile of randomized preventive intervention trial. No assessment includes refusals, families who could not be contacted, and those who became ineligible (eg, student no longer residing in the home). The number not undergoing assessment at pretesting is based on the number recruited; the number not undergoing assessment at subsequent waves is based on the number pretested. Retention rates of comparable longitudinal trials are discussed in Hansen et al.⁴⁸ ISFP indicates Iowa Strengthening Families Program.

creased exposure to opportunities for problem behaviors and to peers' encouragement of those problem behaviors.⁴⁵ Also, the intervention taught skills to reduce risks and to increase protective factors through the use of research-based interactive skills training techniques (eg, modeling, behavioral rehearsal, feedback, and home practice) that involve both parents and their child, separately and together. Finally, a number of procedures were used to ensure active engagement of the families and quality implementation of the intervention components.^{46,47} For example, interactive skills training methods were used, and small incentives were provided (eg, grocery coupons) to encourage participation. Also, intervention facilitator training materials and methods were designed to ensure facilitator adherence to the intervention protocol.

RESULTS

REPRESENTATIVENESS, EQUIVALENCE, AND ATTRITION OF SAMPLE

Approximately 6 months before the start of pretest recruitment, a prospective participation predictor survey was conducted by telephone to allow subsequent assessment of the representativeness of the families successfully recruited for the preventive intervention study. The participation factor survey had a 90% completion rate among all families eligible for the prevention study at the time the survey was administered. Analyses of data from the prospective survey (N=1192) were conducted for a range of family sociodemographic characteristics (par-

ent education, household income, target child sex, parent marital status, and number of children) and for parent social-emotional distress (eg, "During the past year have you felt tense, nervous, or anxious continuously for 2 weeks or longer?") to determine whether families subsequently participating in the project were representative of the target population. Parent education was significantly predictive of trial participation⁶¹; however, the mean levels of education differed by only 0.4 years between trial participants in ISFP and control conditions and nonparticipants, with participants showing the higher level. No other sociodemographic or social-emotional distress variables were predictive of project participation in the multivariate analyses conducted. Because the sample was generally representative of the eligible population, it also was expected to be representative of the spectrum of risk-related characteristics in that population.

Before conducting the outcome analyses, family sociodemographic characteristics (household income, parent education, parent age, target child age, target child sex, parent marital status, and number of children in the household) were examined for equivalence across intervention and control groups, as measured during the in-home pretest assessment. In addition, schools assigned to the experimental condition were compared to verify ISFP-group equivalence with the control group on a range of school- and community-level variables (eg, school enrollment, number of classrooms, student achievement ranks, student attendance, school lunch program eligibility rates, and community population). Pretest equivalence across the intervention and control groups was observed; there were no significant condition differences for any of the family, school, or community variables examined. **Table 1** summarizes the background characteristics of families and the characteristics of schools, students, and communities involved in both experimental conditions.

Group pretest equivalence of all outcome measures also was assessed. Pretest equivalence was found for all measures except one (adolescent report of aggressive and destructive conduct); pretest score differences in each outcome measure were controlled in the outcome analyses.

Attrition rates across waves of data collection decreased and leveled off, showing an improvement in wave-specific retention rates during the course of the study. Subject loss between the 7th- and 10th-grade follow-up assessments declined to approximately 4% of the pretest sample. Approximately 12% of families refusing to complete assessments after the pretest assessment had moved out of state. Analyses were conducted to examine differential attrition across experimental conditions from pretesting to each of the 4 subsequent data collection points. Similar to previous studies,^{31,39} 2-factor analyses of variance were used to assess attrition effects for each outcome measure and for each family sociodemographic factor at each of the 4 postintervention data collection points. Among the outcome measures, there were no instances in which a significant experimental condition by attrition interaction was found (which would have indicated differential attrition in the ISFP vs the control groups) for any of the variables between pretest and any of the subsequent 4 data collection points. Similarly, no

Table 1. Pretest Equivalence of Experimental Conditions on Participant Background, School/Student, and Community Characteristics*

Variables	Experimental Condition, Mean (SE)	
	ISFP	Control
Family characteristics		
Household income, ×\$1000	42.3 (2.2)	38.7 (2.2)
Parent education, y	13.3 (0.1)	13.4 (0.1)
Parent age, y	38.2 (0.4)	38.2 (0.3)
Target age, y	11.3 (0.0)	11.3 (0.0)
No. of children in family	3.2 (0.1)	3.0 (0.1)
Parent marital status, % dual-parent families	88.7 (2.1)	83.7 (2.6)
Target sex, % female	51.9 (3.2)	52.4 (3.5)
School and student characteristics		
Sixth-grade class enrollment	46.5 (9.7)	43.8 (9.5)
School enrollment	263.1 (38.4)	201.6 (32.6)
District enrollment	727.0 (121.0)	638.9 (121.8)
No. of sixth-grade classrooms	2.1 (0.3)	2.2 (0.4)
Aggregate sixth-grade state achievement rank, percentile	32.1 (6.4)	35.7 (6.6)
Average daily attendance rate, % of sixth graders at school each day	96.7 (0.6)	96.4 (0.4)
Proportion of district families eligible for school lunch program	26.3 (2.3)	23.6 (1.6)
Community characteristics		
Community population	1407.5 (358.3)	1487.6 (664.9)
Distance to nearest city of ≥50 000, miles	75.6 (7.0)	71.9 (6.1)

*There were no statistically significant differences between ISFP and control conditions at the .05 level. ISFP indicates Iowa Strengthening Families Program.

evidence of differential attrition across conditions was found for any family sociodemographic factor.

OBSERVER RATINGS OF AGGRESSIVE AND HOSTILE BEHAVIORS IN INTERACTIONS

Multilevel ANCOVAs showed significantly lower scores on the observer-rated index of aggressive and hostile behaviors in the ISFP group at the 10th-grade assessment, relative to the control group, as reported in **Table 2**. Table 2 includes effect sizes. The effect size is a standardized metric indicating magnitude of effect in SD terms, independent of sample size. Guidelines for interpretation of the effect size are provided in Table 2. In the case of this measure, the effect was in the lower portion of the medium-effect size range.

Further examination of results showed that just under half (49.2%) of the adolescents in the control group exhibited at least some observable problematic behaviors; such behaviors were observed in approximately 10% fewer (39.7%) ISFP-group adolescents. Experimental group trends across all waves of data collection are plotted in **Figure 2**. When adolescent interactions with mothers and fathers underwent separate supplemental analyses, there was a significant experimental group difference in the aggressive and hostile behaviors directed toward mothers ($t_{1,20}=2.24$; $P=.04$), with lower levels of aggression and hos-

Table 2. Indices of Aggression and Hostility at the 10th-Grade Follow-up*

Index	Experimental Condition, Adjusted Mean (SD)		†	Effect Size‡
	ISFP	Control		
Aggression and Hostility, observer rated	0.70 (0.13)	1.18 (0.12)	2.74§	0.33
Aggression and Hostility, family member reported	0.40 (0.07)	0.47 (0.07)	0.67	0.08
Aggressive and Destructive Conduct, self-report	0.19 (0.05)	0.41 (0.05)	2.88	0.35

*Results are based on multilevel analysis of covariance incorporating school as a random effect and child sex as an individual-level covariate. ISFP indicates Iowa Strengthening Families Program.

†df = 20.

‡A t test–based effect size of 0.20 is considered small; 0.50, medium; and 0.80, large.

§P ≤ .05.

||P ≤ .01.

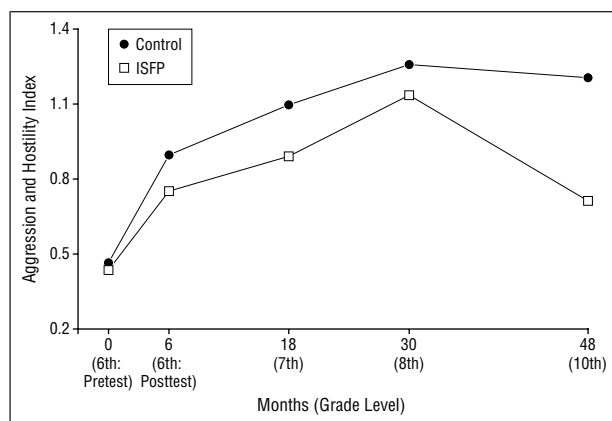


Figure 2. Observer-rated aggressive and hostile behaviors in adolescent interaction with parent(s) across waves of data collection. ISFP indicates Iowa Strengthening Families Program condition.

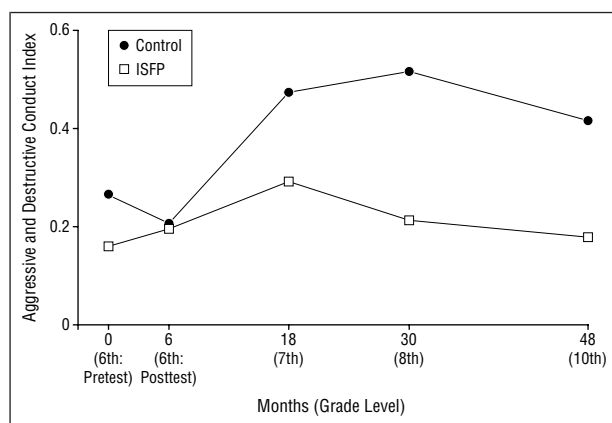


Figure 3. Adolescent self-reported aggressive and destructive conduct across waves of data collection. ISFP indicates Iowa Strengthening Families Program condition.

tility in the intervention group. Analyses of aggressive and hostile behaviors directed toward fathers failed to show significant experimental group differences. Adolescent sex effects were similar across parent sex analyses.

FAMILY MEMBER REPORT ON AGGRESSIVE AND HOSTILE BEHAVIORS IN INTERACTIONS

Although the observed aggressive and hostile behavior score was lower in the ISFP group, analyses failed to show sig-

nificant intervention-control group differences in the family-member report of aggressive and hostile behaviors in parent-adolescent interactions at the 10th-grade assessment. Table 2 reports these results. Supplemental analyses of outcomes using individual family member reports showed a significant experimental group difference in adolescents' hostility and aggression in their interactions with mothers ($t_{1,20} = 2.32$; $P = .04$), with a lower level reported in the intervention group, but not in interactions with fathers. As was the case with the observational measure, adolescent sex effects were similar across parent sex analyses.

ADOLESCENT-REPORTED INDEX OF AGGRESSIVE AND DESTRUCTIVE CONDUCT

The ISFP group demonstrated a significantly lower score than the control group on the adolescent report of aggressive and destructive conduct at the 10th-grade follow-up assessment. Multilevel ANCOVA results for the 10th-grade follow-up assessment are presented in Table 2.

In this case, the test showed an effect size near the low end of the medium-effect size range. In practical terms, the results showed that nearly 1 in 4 (24.5%) of all control-group adolescents reported 1 or more aggressive or destructive behaviors, whereas approximately 1 in 7 (14.6%) of all ISFP-group adolescents reported at least 1 of these behaviors. Differential trends in the experimental groups on this measure are illustrated in **Figure 3**. The range of scores shown on the y-axis of the plot is equal to approximately 1 SD on the aggressive and destructive conduct measure. (As noted earlier, group differences at pretest were controlled in the multilevel ANCOVAs.)

As an indication of the practical significance of the ANCOVA finding, individual behavior counts were used to calculate relative reduction rates. For example, 7.9% of 10th-grade control-group students reported breaking and entering 1 or more times, compared with 2.0% of intervention-group students. This yields a relative reduction rate of 74.7%, albeit based on relatively low frequencies of occurrence. With an absolute risk reduction value of 5.9%, the number needed to treat in this case would be 17. The relative reduction rates for physical fighting, throwing items to cause injury, and purposely damaging property were 31.7%, 53.5%, and 77.0%, respectively.

Findings provide evidence of ISFP reductions in adolescent aggressive and hostile behaviors. Significant effects were detected 4 years past baseline, as measured by ratings from independent observers of aggressive and hostile behaviors in adolescent-parent interactions and by an index of adolescent reports of aggressive and destructive conduct. These positive effects were near the lower end of the medium-effect size range. They were observed at the point at which adolescents are typically at their highest risk stage for initiating serious aggressive behaviors.⁴

Although it might seem unlikely that a short-duration general-population intervention would produce effects detectable 4 years past baseline, a number of intervention characteristics may have contributed to the observed outcomes. These intervention characteristics were summarized in the introduction. They include the theory-based design of the intervention, addressing known risk and protective factors originating in the family, and the developmental timing of the intervention. That is, the intervention occurred during the middle-school transition period when there is generally diminished adult monitoring as well as greater opportunities for problem behaviors and peer encouragement of such behaviors. Other intervention characteristics possibly contributing to observed outcomes include the research-based interactive skills-training techniques applied with parents and children and strategies to ensure active engagement of families in the intervention and quality intervention implementation. Also, it may be the case that intervention-induced changes in parent-child interactions evident at posttest and the 1½-year postbaseline follow-ups^{31,40} directly contributed to decreases in the level of subsequent problem behaviors in the home setting (eg, at the 2½-year follow-up³⁹), while indirectly decreasing the generalization of such problem behaviors to the school setting.

Aggressive and hostile behaviors in parent-adolescent interactions, as assessed by family-member report, were not significantly different for the intervention and control groups. One explanation of the failure to attain significance on this outcome, in contrast with the observer-rated outcome, is that observers applying uniform standards across families may note interactional behaviors that family members fail to report. In this connection, there is a significant body of literature suggesting that parent reports of their child's behaviors can be less predictive of more objective indicators of conduct problems (such as police arrests), compared with observer ratings.^{53,62,63} In this regard, family member thresholds for reporting hostile behavior could covary systematically with adolescent aggressive and hostile behavior, thus making it difficult to detect an association. Also, although overlapping, the behaviors addressed by the observer-rated and family-reported measures differed; the rating system applied by observers required that they rate a broader range of behaviors. Conversely, the validity of family-member reports should not be discounted, since outsider observations of behaviors in a single setting conducted at a specific point in time may not capture a fully adequate sampling of family interactional behavior.

Supplemental analyses of adolescent aggressive and hostile behaviors specific to interactions with mothers and fathers showed that experimental group differences were significant only in interactions with mothers, and that overall mean levels of scores in interactions with mothers were higher than those with fathers. These results are consistent with reports of differences in parent-child interactions associated with parent sex.^{64,65} The likelihood of producing an intervention effect with fathers in both experimental conditions was lower, given the lower frequencies and limited variability in scores concerning adolescent aggressive and hostile behaviors in interactions with fathers in this study.

Data indicating trends toward increasing rates and costs of aggressive and hostile behaviors among adolescents also suggest the possible public health benefits of cost-effective interventions for general populations designed to reduce those behaviors. Parent training interventions previously examined for cost-effectiveness^{27,28} are considerably more intensive and more costly than the interventions in the present study (eg, 3050 hours of group-based parent training, compared with 13 hours in the present study); it is reasonable to expect that the cost-effectiveness of the tested intervention will be strong. A study is currently under way to examine that issue.

In addition to the measurement issues previously discussed, key study limitations concern issues related to sample attrition, representativeness, and generalizability of the findings. Examination of threats to internal validity in the form of inequivalent experimental groups and differential attrition suggested these threats were minimal. Notably, the overall attrition rate was comparable to that in other longitudinal prevention studies. In addition, empirical results indicated that the sample was representative of the targeted population. Previous investigation indicates that time and scheduling issues were the primary reasons for nonparticipation in this study.^{61,66} Nonetheless, the reader should remain cognizant of possible study limitations when interpreting the results. Also, although the sample was representative of the rural-area families targeted for the intervention evaluation study, almost all of the families were white, and most were dual-parent families. Thus, the extent to which study findings would generalize to more culturally diverse rural or urban populations remains to be tested. Replication studies with other rural and urban populations are in their early stages.

CONCLUSIONS

This study showed evidence of intervention-related reductions in (1) aggressive and hostile behaviors in interactions with parents, as rated by independent observers, but not as rated by family members, and (2) aggressive and destructive conduct, as reported by the adolescent. Although the family-report and observer-based findings appear to be inconsistent, supplemental analyses indicated that there were significant intervention effects on adolescent interactions with mothers for observer-rated and family-member reported measures; in both instances, effects on interactions with fathers were non-significant. These findings may reflect lower frequen-

cies and less variability in scores of aggressive and hostile behaviors with fathers. The demonstration of positive outcomes of the short-duration intervention 4 years past baseline is likely a result of a number of key features of the intervention, including its theory base, involvement of parents and children in research-based interactive-skills training, and developmental timing. Future research will examine mechanisms of intervention change and will test effects in urban populations. If borne out by further study, the findings carry important implications for positive public health impacts through cost-effective family-focused interventions.

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