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Editor's Corner

Putting Science to Work

Trusting that you will indulge me just a bit, given the shared “Putting Science to Work” focus of the *Report on Emotional and Behavioral Disorders in Youth (EBDY)* and the Center for the Advancement of Children’s Mental Health (CACMH) here at Columbia University, I thought it might be useful to share with you some of the projects and activities currently under way at CACMH that also mesh with the objectives of *EBDY*. As some of you will know, CACMH was founded in Spring 2000, with a “Putting Science to Work” mission to work with parent, school, and professional organizations and agencies across the country to ensure that all children who need mental health care can get high-quality, evidence-based assistance in the communities where they live, rather than travel off to some tertiary care center far from their homes.

To accomplish this mission, CACMH applies three complementary strategies, with each one successively building on the others. The process begins with key partners of CACMH from parent, professional, or school organizations who have agreed to form a strategic “Partnership for Change” consisting of those organizations that have expressed interest in, and have agreed upon, improving the availability of high-

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The Importance of Implementation Fidelity

by Sharon Mihalic*

Over the past several years, a large amount of information has been collected on the risk and protective factors for violence. Research has also identified prevention programs that can modify these risk and protective factors. The Blueprints initiative has been in the forefront in identifying exemplary programs that have been evaluated in rigorous, controlled trials, and much attention has been focused nationally on selecting and implementing quality programs. However, identification of effective programs is only the first step in the efforts to prevent and control violence. Widespread implementation of effective programs is unlikely to affect the incidence of violent crime unless there is careful attention given to the quality of implementation—the degree to which a program is delivered as intended (American Youth Policy Forum, 1999; Biglan & Taylor, 2000; Lipsey, 1999). Research demonstrates that successful implementation is not guaranteed by a site's decision to adopt a best practices program. Many science-based programs have been adopted in different settings with widely varying outcomes. In fact, a high-quality implementation of a less promising program may be more effective than a low-quality implementation of a best practice program (Gottfredson et al., 2000; Wilson & Lipsey, 2000).

Until recently, little emphasis has been given to implementing programs with fidelity in both the science and practice of prevention. As a result, most people do not recognize the importance of implementation fidelity and feel that implementation of at least some program components is better

than nothing. However, this may be an erroneous belief, since we typically do not know which components of a program may be responsible for the reductions in violence. Programs must be implemented with fidelity to the original model to preserve the behavior change mechanisms that made the original model effective (Arthur & Blitz, 2000).

Defining Implementation Fidelity

The concept of implementation fidelity, sometimes called “adherence” or “integrity,” is a determination of how well the program is being implemented in comparison

5. **Program differentiation** identifies the unique features of different components or programs that are reliably differentiated from one another.

Although the concept of implementation fidelity is not new, ways in which to operationalize, or measure fidelity are relatively recent. Fidelity is assessed by conducting a process evaluation. Appendix A (p. 102) describes why a process evaluation should be conducted when implementing a program. It also contains the major elements of the process evaluation that was conducted for the Blueprints replication sites.

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with the original program design. The definition put forth by the Center for Substance Abuse Prevention (CSAP, 2001) is *the degree of fit between the developer-defined elements of a prevention program, and its actual implementation in a given organization or community setting*. There are five primary components examined when considering program fidelity (Dane & Schneider, 1998):

1. **Adherence** refers to whether the program service or intervention is being delivered as it was designed or written, i.e., with all core components being delivered to the appropriate population; staff trained appropriately; using the right protocols, techniques, and materials; and in the locations or contexts prescribed;
2. **Exposure** may include any of the following: the number of sessions implemented, length of each session, or the frequency with which program techniques were implemented;
3. **Quality** of program delivery is the manner in which a teacher, volunteer, or staff member delivers a program (e.g., skill in using the techniques or methods prescribed by the program, enthusiasm, preparedness, attitude);
4. **Participant responsiveness** is the extent to which participants are engaged by and involved in the activities and content of the program; and

Importance of Implementation Fidelity

Although an extremely important topic, program implementation has been relatively neglected in the prevention research literature (Fagan, 1990; Greenberg et al., 2001). In a review of over 1,200 published prevention studies, only 5% provided data on implementation (Durlak, 1997). In a review of 34 rigorously evaluated programs to prevent mental disorders in school-age children, 11 of the 34 studies (32%) utilized implementation information as a source of data for outcome analyses and linked variability in implementation indices to differences in program outcomes (Domitrovich & Greenberg, 2000). Dane & Schneider (1998) found that only 39 of the 162 preventive interventions they examined contained information on program integrity, and only 13 of the 39 considered the impact of fidelity on outcomes. Another examination of 181 experimental studies published between 1980 and 1990 in seven journals known for behaviorally based interventions found that only 15% of the studies had systematically measured and reported integrity data and only 35% had operationally defined treatments (Gresham et al., 1993).

When evaluations do examine program fidelity, many studies have found that they are not being implemented with strength and fidelity to the original model, although sev-

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Since its launch in 1996, Blueprints for Violence Prevention has reviewed more than 600 programs for reducing adolescent violent crime, aggression, delinquency, and substance abuse. It has identified 11 programs as models (Blueprints) for violence prevention and another 21 programs as promising. In addition, Blueprints provides training and technical assistance to help sites choose and implement demonstrated effective programs with a high degree of integrity. This article originally appeared as a chapter in *Blueprints for Violence Prevention Replications: Factors for Implementation Success* (Mihalic et al., 2002). It is reprinted here with permission of the publisher.

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eral hallmark studies of health programs have underscored the importance of the quantity and quality of implementation (Connell et al., 1985; Resnicow et al., 1992; Taggart et al., 1990). Evaluations of prevention programs can lead to conclusions that specific programs do not work, when, in fact, the failure to find treatment effects may be the direct result of weaknesses in program implementation.

Fifty-Seven-Percent Pass Rate for Nation's Schools. The National Study of Delinquency Prevention in Schools provides an example of the quality of implementation in our nation's schools. Several criteria were applied to discretionary prevention activities, with the following representing the average level of intensity and fidelity to good prevention practice (Gottfredson et al., 2000):

- One or more persons are conducting the prevention activity(ies) *from time to time*;
- The activity employs 71% of the *content* elements identified as representing best practices;
- The activity employs 54% of the *methods* elements identified as representing best practices;
- The activity involves 32 sessions or lessons (although there is a large range across activities of different types);
- The activity lasts about 25 weeks;
- Both students and staff participate about once per week;
- 41% of the school's students participate or are exposed;
- There are approximately four program providers per 100 students in the school; and
- If the activity is a classroom or a school-wide activity, it operates nearly all year.

The researchers found that the average prevention activity (i.e., strategy) received a passing grade on only 57% of the quality criteria examined (i.e., only 57% of the indicators of quality or quantity were judged to be strong enough to lead to behavior change), thus concluding that the quality of prevention activities in the nation's schools is generally poor and that prevention activities are not being implemented with sufficient strength and fidelity to be expected to produce a measurable difference in the desired outcomes.

Mixed Use of CDC Guidelines. Another example of the quality of implementation in our nation's schools comes from a study of substance use prevention practice in 1,496 public and private middle schools that assessed the Centers for Disease Control and Prevention (CDC) guidelines for

school-based tobacco use prevention programs (Wenter et al., 2002). The seven CDC recommended guidelines included:

- Policy development and enforcement;
- Instructional content;
- Comprehensive grade range;
- Program-specific teacher training;
- Family involvement;
- Cessation efforts; and
- Program assessment.

On the positive side, two-thirds or more of schools reported adhering to four or more of these recommendations, although only 4% met all seven. Instructional content that has been shown to be effective in drug prevention was utilized in only 67% of the schools, and program-specific teacher train-

tions (effectiveness studies), the chances for key program components to be modified and inconsistencies in program delivery to develop become more likely (Dane & Schneider, 1998). This becomes especially problematic as programs begin being disseminated widely, and the program designer is no longer providing oversight or technical assistance. Depending upon the type of modifications that are made, the program may become less effective in achieving the outcomes sought. In fact, the less involved the researcher is in the design, planning, and delivery of the intervention, the smaller the effect size on behavioral outcomes (Lipsey, 1999).

Modifications may be made by some practitioners with full knowledge of the program in an effort to adapt the program to fit local needs. In other instances, adaptations may be

As programs are proven effective and implemented in naturalistic settings under less favorable conditions, the chances for key program components to be modified and inconsistencies in program delivery to develop become more likely.

ing occurred in only 18% of the sites. The potential for reducing youth substance use will be dependent upon the extent to which schools meet recommended practice for substance use programming.

Implementation Often Not Faithful to Models. In another example, a study that examined school-based programs sponsored by the Department of Education's Safe and Drug Free Schools and Communities Program found that these programs were not implemented with the same attention to core components and dosage as found in the research models (Silvia & Thorne, 1997).

Ensuring that community providers understand and implement the core program components and dosage that are necessary for success is a serious challenge to program developers and disseminators. The original trials (i.e., efficacy studies) of programs are usually under the maximum control of the designer and under optimal conditions with high levels of funding, motivation, and support. The researcher generally exercises extreme care to ensure that the program is thoroughly understood and implemented with a high degree of quality. As programs are proven effective and are implemented in naturalistic settings under less favorable condi-

made because the site does not have a thorough understanding of the program and its underlying causal mechanism. Gresham et al. (1993) found that only 35% of the studies they reviewed even provided an operational definition of the intervention through a detailed description or reference to a manual. However, even when detailed descriptions and manuals are provided, implementation may still fall short of the ideal. For instance, a study to test the effectiveness of the Life Skills Training program in 56 New York State schools (Botvin et al., 1990a) showed that only 27% to 97% (mean of 68%) of the material in the curriculum was covered, with only 75% of the students in the prevention conditions exposed to 60% or more of the prevention program (i.e., one in four students had teachers who implemented less than 60% of the important points of the lessons).

Results May Not Be Achieved With Partial Implementation. Because efficacy studies generally include youth who are receiving all program components, we can only conclude that a program works if implemented in its entirety. If specific components are omitted, it is possible that the omitted component could be the mechanism that is affecting much of the change in behavior, resulting in a loss

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of program effects. For example, the research design of the Adolescent Alcohol Prevention Trial (Donaldson et al., 1994) divided students into four groups. The students received either:

- Information about consequences of drug use only;
- Resistance skills only;
- Normative education only; or
- Resistance skills training in combination with normative education.

Resistance skills alone were not predictive of later substance use, although normative education alone was. Tests of the combined effects showed that the combination of resistance skills training and normative education resulted in the lowest rates of drug use. A school that fails to implement the lessons around both components, or that implements resistance skills alone, might be making little or no impact on drug prevention or reduction, basically wasting time and money.

Meta-Analysis Demonstrates the Importance of Implementation Quality. Meta-analyses also demonstrate that monitoring of program implementation (DuBois et al., 2002) and better implemented programs produce more change in mediating variables theorized to be responsible for the outcomes (Hansen et al., 1991) and outcome variables (Gresham et al., 1993; Wilson & Lipsey, 2000). One meta-analysis showed that the best interventions can reduce recidivism by about 40% (Lipsey, 1999). Thorough implementation, however, was found to be a significant factor in relation to recidivism effects. Intervention effects were larger when attention was given to the integrity of the program implementation. Additionally, programs of more than six months' duration were, on average, more effective than those of shorter length. Table 1 shows the independent contribution of several program characteristics, described below, to recidivism rates. The comparison is the recidivism rate of routine probation, or treatment-as-usual services found in the control groups of these 200 studies. The base rate of 50% approximates that found in these control groups. The table shows that successive decreases in recidivism occur as a minimal program (a program found to have smaller effect size in the meta-analysis, to be incompletely implemented, and to last less than six months) is added to routine services, and as that minimal program is upgraded to a more effective intervention (with larger effect size, thorough implementation, and longer duration). Similar results were also found for institutionalized offenders.

Table 1: Expected Recidivism With Various Intervention Characteristics for Noninstitutionalized Offenders

Intervention Characteristics	Recidivism
Routine Probation (P)	50%
P + Minimal Program	46%
P + Best Intervention Type (B)	40%
P + B + Good Implementation (I)	35%
P + B + I + Over 6 Months' Duration	32%

A meta-analysis of 196 school-based violence prevention programs demonstrated that implementation quality made the largest contribution of any variable to effect size. This means that programs with successful program implementation resulted in larger mean change effect sizes (Wilson & Lipsey, 2000). A meta-analysis of 143 drug prevention programs (Tobler, 1986) showed that well-implemented programs achieved a mean effect size 0.34

et al., 2000; Gresham et al., 1993; McGrew et al., 1994). For example, analyses typically yield stronger prevention effects for the high fidelity samples than for the full samples (Blakely et al., 1987; Dane & Schneider, 1998; Gottfredson et al., 1993). In an evaluation of the Life Skills Training program (Botvin et al., 1995), results in the full sample indicated that the prevalence of heavy drinking, and weekly and monthly

High fidelity samples generally achieve stronger outcomes and a greater number of outcomes. Some results are achieved only in high fidelity samples.

greater than poorly implemented programs, a substantial difference over the 0.30 mean effect size derived from all the programs.

Examining Implementation Fidelity. Most outcome studies that have examined implementation have used measures of adherence and/or exposure. Fewer studies have examined the quality of program delivery, participant responsiveness, or program differentiation. Several individualized studies are described below, and the preponderance of evidence supports the argument that programs must be implemented with fidelity to achieve behavioral outcomes similar to those achieved in efficacy trials. In fact, the generalized trend is that high fidelity samples generally achieve stronger outcomes and a greater number of outcomes. Some results are achieved only in high fidelity samples.

Studies Examining Adherence

When a fidelity of implementation analysis (i.e., process evaluation) is conducted, it almost consistently shows superior outcomes when the program has been implemented with high fidelity (Domitrovich & Greenberg, 2000; Fors & Doster, 1985; Gray

cigarette smoking was significantly lower for the intervention groups than the control group, and heavy smoking was significantly lower in one of the intervention groups than the control group. There were, however, no significant differences for the monthly, weekly, or three drinks or more per occasion rates, nor were there significant differences for marijuana use. In contrast, in the high fidelity sample, the results were stronger, and more outcomes became significant. The experimental groups were significantly lower than the control group for all measures of cigarette use, weekly alcohol use, three drinks or more per occasion, weekly marijuana use, monthly marijuana use, and monthly alcohol use.

Violent Juvenile Offender Program. In the Violent Juvenile Offender Program to test correctional interventions for chronically violent juvenile offenders, the two sites with stronger implementation of the program design (i.e., most of the core components of the program received moderate to strong implementation ratings) fared much better than two sites that had not implemented the program well (these two pro-

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grams received weak to moderate ratings for most of the core components). The well-implemented programs resulted in significant reductions in the number and severity of arrests for experimental youths compared to control youths, as well as in significantly greater time until rearrest (Fagan, 1990).

Intensive Supervision Program. An evaluation of 13 Massachusetts Intensive Supervision Programs (ISP) compared the degree of implementation with variation in outcomes across sites. This evaluation found that the more fully the ISP program was implemented, the more likely recidivism decreased significantly across a range of alternative outcome measures (Byrne & Kelly, 1989). A study of New Jersey ISP programs assessed the commitment of parole officers to the program and found an inverse relationship to recidivism (Paparozzi, 1994). Parole offices that were most supportive of the program ($n=6$) produced a 17% lower overall arrest rate than non-supportive offices ($n=5$).

Positive Action Program. An intensive case study of the Positive Action Program was conducted in a rural school in northern Florida in the first year of implementation (Flay, 2000). The program was fully implemented in 11 classrooms, partially implemented in seven classrooms, and sporadically or not implemented in seven classrooms. Data were obtained from teachers, students, and parents at the beginning and end of the school year. Overall, teachers who had implemented more of the program improved more in their attitudes about and perceptions of other teachers, their own teaching effectiveness, and parent involvement. Students who received more of the program improved their positive attitudes and behaviors and decreased their negative attitudes and behaviors, such as disciplinary referrals, substance use, and violence. An increased level of implementation also improved parents' readiness to take responsibility for their child's character and behavioral development, decreased their rating of their child's likelihood of giving in to peer pressure, increased the level of communication with their child, and improved their knowledge of their child's friends and their parents. Furthermore, these effects were significant for students from both high and low socioeconomic status. Interestingly, the data suggest that receiving some or even most of the program is not sufficient for low-income students, and that these students need the complete program for substantial effects to occur.

Multisystemic Therapy. Multisystemic therapy (MST), a home-based family ther-

apy program that targets violent or chronic juvenile offenders, has demonstrated in randomized trials substantial reductions in rearrests, incarceration, self-reported offending, and a variety of effects on mediating variables related to family and peer relations, family functioning, and parental monitoring. However, in one study of violent and chronic juvenile offenders and their families, which omitted ongoing treatment fidelity checks, adolescent symptomatology and days incarcerated were reduced, but there was a lack of significant effects on criminal behavior and other instrumental (mediating) outcomes. In cases where treatment adherence ratings were high, the outcomes were substantially better (Henggeler et al., 1997). Another sample of substance-abusing juve-

Training Program in 10 suburban New York junior high schools showed no significant differences between the teacher-led implementation and the control group in the full sample on smoking, alcohol, and marijuana use (Botvin et al., 1990b). (It should be noted that a peer-led booster condition did reduce substance use.) Even worse, the control group had significantly fewer drinkers than the teacher-led group on several of the alcohol measures. However, in a restricted sample of teachers who had implemented the program with a reasonable degree of fidelity (i.e., teachers who received a rating of 4 or 5 on a scale ranging from 1 to 5 in terms of implementation fidelity), the proportion of smoking, alcohol, and marijuana users declined. In one other Life Skills Training study (Botvin et al.,

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nile offenders and their primary caregivers showed similar results (Huey et al., 2000). Furthermore, MST adherence had both a direct impact on delinquent behavior, as well as an influence that was partially mediated through its effects on family functioning and cohesion, parent monitoring, and delinquent peer association (Huey et al., 2000).

Child Development Program. Some programs only have significant effects in the high fidelity samples. For example, the Child Development Program was evaluated in 12 program schools, however, only five of these schools showed clear evidence of widespread program implementation. There was no clear evidence of positive program outcomes for students at all 12 program schools; however, at the five high fidelity schools, there were significant declines in alcohol and marijuana use and an increase in students' sense of school as a community, compared to control schools (Battistich et al., 2000).

Life Skills Training Program. A study of the Life Skills Training Program in eight urban New York schools showed that the effects of the program were due only to the high-implementation teachers with a mean completion rate of 78% of the material. The low-implementation teachers implemented the material with a mean of 56% (Botvin et al., 1989). Another study of the Life Skills

1990a), there were no positive effects found in the sample of teachers who exposed students to less than 60% of the material. By using a three-year cumulative implementation score of 60% as the inclusion criteria for the analysis of program effectiveness, significant treatment effects were found for three of five measures of substance use.

Seattle Social Development Project. A test of a theory-based intervention (Seattle Social Development Project) that seeks to change the opportunity, skill, and reinforcement structures of mainstream classrooms by training teachers in educational strategies designed to promote academic achievement and school bonding showed that it was only through thorough implementation of these teacher practices that students' levels of classroom opportunity, involvement, reinforcement, and bonding to school was increased (Abbott et al., 1998).

Modifications to a Program. Modifying or adding components to a program can also present a serious threat to program fidelity, especially if the modification or addition consists of elements that have been found to be harmful to youth. For example, the use of scare tactics in drug or violence prevention have not been found to be effective (Botvin, 1990; Hansen et al., 1988) and in some cases have been found to be harmful

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(Petrosino et al., 2000). Efforts to introduce these elements into already proven programs may backfire and result in a reduction of the program benefits that might have otherwise been expected. In the Midwestern Prevention Project (Pentz et al., 1990), while none of the teachers reported that they had deviated from the program substantially, 68% of the teachers deviated slightly. All deviations were to include additional material, discussion, or sessions to the program. These deviations had no significant effects on cigarette, alcohol, or marijuana use. In some cases, local enhancements (i.e., additions) to a model may enhance effectiveness. In a study of seven education and criminal justice projects in 70 sites, additions to the program model were positively related to positive outcomes, whereas modifications of the existing fidelity components were not related to greater program effectiveness (Blakely et al., 1987). It also appeared that the greater the number of modifications present, the greater the likelihood that key components linked to effectiveness were changed.

Studies Examining Program Exposure

Another serious compromise to implementation fidelity is related to program exposure (sometimes called dosage), the amount of program content received by participants. Although there are some inconsistent findings related to dosage (CPPRG, 1999; Dane & Schneider, 1998), overall, programs are less effective when study participants do not receive the intended dosage (Allen et al., 1990).

Failure to Complete Treatment. One example of incompleteness of delivery occurs when youth fail to complete the treatment. For instance, comparisons of youth completing the Family Empowerment Intervention (FEI) program (58%) versus those that did not complete the FEI intervention (42%) revealed that youths completing the program had lower rates of delinquency (self-reported crimes against persons and total delinquency, general theft and index crimes) and drug use (drug sales and frequency of getting very high or drunk on alcohol, frequency of marijuana and hair test marijuana) than youths not completing the FEI (Dembo et al., 2002).

Failure to Deliver Entire Program. In other examples, there is a failure by the implementers to deliver the program in its entirety:

- **Midwestern Prevention Project:** In the Midwestern Prevention Project, the differences between high- and low-implementation schools, as measured by amount

of implementation or program exposure, was greater than the differences between the treatment and control schools for all measures of substance use. Additionally, the percentage of change in prevalence rates (i.e., proportion of youth using substances) from baseline to one year for cigarette, alcohol, and marijuana use was lowest in the high-implementation schools and highest in the low-implementation and no-implementation schools. For example, in the most dramatic example of change, the percentage of students who self-reported smoking within the past month *increased* from 13% to 24% for the control group, *increased* from 13% to 20% in low-

omental growth in hostile attributional biases and aggressive interpersonal negotiation strategies and the decline in competent interpersonal negotiation strategies.

As important as it is to receive the intended number of sessions, implementing staff are often responsible for compromising the dosage because of their own lack of time, commitment, and resources, undermining any effects that the program may have. Although a common theme reported by implementers is that some exposure to the program elements is better than none, in the case of the RCCP program, children in the low-lessons group fared worse than children who received no lessons (Aber et al., 1998).

The percentage of students who self-reported smoking within the past month increased for the control group, increased in low-implementation schools, but decreased from 1 in high-implementation schools

implementation schools, but *decreased* from 15% to 14% in high-implementation schools (Pentz et al., 1990).

- **Social Competence and School Success Middle School Program:** A comprehensive middle school program aimed at increasing social competencies, social bonding, and school success, using program components that had previously demonstrated success in reducing problem behaviors, failed to achieve the expected levels of implementation. The percentage of students receiving the dosage standard set for each component ranged from 0% to 67%, with a mean of 28% across all components. Effects on youth behavior or attitudes were absent (Gottfredson et al., 1998).
- **Bullying Prevention Program:** In a study of the Bullying Prevention Program, those classes that showed larger reductions in bully/victim problems had implemented the three classroom components of the program to a greater extent than those with smaller changes (Olweus & Alsaker, 1991).
- **Resolving Conflict Creatively Program:** In the Resolving Conflict Creatively Program (RCCP), children whose teachers exposed them to a high number of lessons did better than children exposed to a low number or no lessons. Involvement in a high-lessons RCCP classroom slowed down by an entire year the normal devel-

Quality of Program Delivery and Participant Responsiveness

Fewer studies have examined how the quality of program delivery and participant responsiveness impact program outcomes. One study utilized both of these measures of program integrity to create an integrity index consisting of ratings on eight items by program specialists, who taught the program to students:

- Program specialist enthusiasm;
- Degree to which the delivery met the goals of the program;
- Degree to which program specialist involved all versus a selected few students;
- Classroom control;
- Class enthusiasm;
- Students' responsiveness;
- Students' degree of participation; and
- Overall smoothness of the lesson.

These ratings of program integrity were found to significantly moderate outcomes for three of seven mediating variables (Hansen et al., 1991).

Conclusion

It is clear from these empirical studies that implementation fidelity is important in achieving successful outcomes. In short, these stud-

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ies show that the closer an intervention adheres to the original design, the greater the degree of behavior change. These findings underscore the need to understand and document the reasons leading to poor implementation and improve the conditions that can facilitate a high-quality implementation.

Defining Core Program Elements. High-quality implementation is more likely when core program components are defined in advance and then systematically monitored to ensure compliance (CSAP, 1997; Gresham et al., 1993). The Blueprints initiative emphasizes, through each Blueprints book (Elliott, 1997), all core program components and includes a chapter on implementation issues to help sites considering the adoption of a program to think through some of the obstacles that they may face.

Funding for Planning, Training, and Technical Assistance. Federal and state agencies and private foundations should not be content to just provide money to implement a best practice program. Funding should also be provided to organizations that can help agencies and communities identify empirically supported programs, assess the needs of the site and select an appropriate program, educate all key players as to the core components of the program and the need for quality implementation, and then help the site to implement the program with fidelity by providing training and technical assistance and some standard for assessing fidelity of implementation. Fidelity assessment instruments, designed by the program developers or the funding agency in collaboration with the program developers, should be used to provide feedback to the implementing agency and the funders.

Independent Monitoring. In large-scale projects, monitoring can be done by an outside agency, as CSPV has done in the Blueprints project. Many of the Blueprints replication sites and Blueprints designers have appreciated this role being assumed by our organization. Technical assistance (TA) providers have not wanted to assume this role, preferring to devote their time and energies to providing needed support through training and technical assistance. Ambivalence among TA providers regarding fidelity may also arise in the ongoing struggle to balance fidelity with the stated needs or demands of the site for adaptation. This struggle can become especially difficult if it appears that dissatisfaction with the program is emerging. Implementing sites generally do not have ample time and resources to

Because implementation quality is related to program effectiveness, it is important to identify and understand the factors that impede and enhance high-quality implementation.

devote to the monitoring process and often don't recognize deviations or understand the importance of fidelity to all program components. Thus, the monitoring role is often more easily assumed by an independent agency, since it has the least amount of conflicting interests and possesses the technical expertise to help community providers plan for implementation, and develop and sustain a program infrastructure that will exist after the TA providers and evaluators are gone.

Our own experience in this role has shown that adherence to a program can be increased by having an outside agency monitor implementation. For example, the Life Skills Training program had an average implementation coverage of 68% in a clinical trial monitored by the program designer (Botvin et al., 1990a). The intervention material covered in the replications of Life Skills Training in approximately 100 sites, monitored by Blueprints, ranged from an overall average of 80% to 86% (across six cohorts over three years), a substantial increase over that found in the clinical trial conducted under the most favorable of conditions. This suggests that implementation fidelity can be greatly enhanced in real world applications of programs, where conditions are not usually as favorable for achieving a comprehensive implementation.

Although some implementing sites may at first resent the attention being paid by the monitoring agency to all the details of the project, over time, most sites learn to appreciate the higher quality implementation they eventually achieve and its impact on outcomes. One of the Blueprints site coordinators stated the following:

There was a demand for attention to "dotting the i's and crossing the t's" that was beyond the norm. Initially, this attention to detail was experienced as overly anal and as a pain in the [delete]. Eventually, how-

ever, over the course of a year of implementation, it became crystal clear that fidelity to the model is as important as the model itself. Now I can see that it is this painstaking fidelity that makes [name of program] (and undoubtedly the other Best Practices modalities) a truly effective program with juvenile offenders and their families."

This sentiment was also reported in the CSAP replication initiative of 16 projects replicating 11 model programs. Most of the replicating agencies felt an obligation to implement with high fidelity. One site had complained to CSAP staff about several of the core program components. Yet, six months later, they were grateful for the encouragement to stick to the original program design, because the results promised by the program materialized in a robust way (Gray et al., 2000).

Understanding the Barriers. Because implementation quality is related to program effectiveness, it is important to identify and understand the factors that impede and enhance high-quality implementation. Designers, implementers, and sponsors of programs all share responsibility for implementation quality, and they must work together to develop strategies to facilitate and enhance implementation. "The key to understanding how successful research can be translated into successful practice lies in understanding how programs and policies can be implemented so that quality is maintained and the programmatic objectives intended by the program developers are achieved" (Dusenbury et al., 2001).

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Appendix A: Process Evaluation Studies					
Program/Study	Program Type/ Target Population	Evaluation Design/High Fidelity Sample	Full Sample Results	High Fidelity Results	
Abbott, O'Donnell, Hawkins, Hill, Koslerman & Catalano, 1998 Seattle Social Development Project	Intervention to modify teaching practices in grades 1-6 (full intervention). This study focused on teachers in grades 5 and 6 (a late intervention condition).	Non-randomized field trial in which an intervention initiated in grade 1 was nested within a longitudinal panel study. All consenting 5 th grade students in 18 public schools in Seattle included in this study. Classroom observation ratings determined the extent that targeted teaching strategies used by each teacher. Teaching practices applied with fidelity received +1, 0 for ineffective strategies, and -1 for strategies in conflict with program. These scores were transformed into a single implementation score ranging from 23 to 46.	Intervention produced higher student achievement.	Results primarily among high-implementation teachers. The degree of implementation resulted in significant differences in opportunities for involvement, actual involvement in the classroom, and reinforcement for classroom involvement, and higher levels of bonding to the school. Student achievement marginally significant.	
Allen, Philliber & Hoggson, 1990 Teen Outreach Program	Dropout & pregnancy prevention for junior and high school students at risk of dropout and teenage pregnancy	Matched control group in 35 sites in 30 schools nationwide Dosage: total volunteer hours and total classroom hours	Overall results showed significantly lower levels of suspension, dropout, and pregnancy.	Results stronger. Students in programs where more volunteer work was performed had fewer problems at exit. More classroom hours and higher levels of curriculum use were related to fewer problems for younger students but not older students.	
Battistich, Schaps, Watson, Solomon & Lewis, 2000 Child Development Project	School-based comprehensive, ecological intervention program for elementary school students (K-8)	Quasi-experimental cohort sequential design with 24 matched schools (12 control and 12 experimental) High fidelity sample included 5 schools in which most or all of teachers showed at least moderate positive changes in implementation scores from baseline over the 3 implementation years	Significantly less alcohol use among program students compared to controls.	Results primarily in high-implementation schools. High-implementation schools showed reductions in alcohol and marijuana and increases in school bonding and intrinsic academic motivation, acceptance of out-groups, conflict resolution, and concern for others. Fifty-two percent of outcomes showed statistically reliable effects favoring students in the 5 high-implementation schools, and there were no significant effects favoring control schools.	
Botvin, Baker, Dusenbury, Tortu & Botvin, 1990a Life Skills Training	Drug prevention targeted at junior/middle schools	Randomized trial including 56 public schools (n=4,466 students). 3-year follow-up at end of grade 9. E1 – one day formal training E2 – videotape training High fidelity sample (n=3,684 from 50 schools) received 60% of intervention over 3 years, based on classroom observations of objectives covered.	No effects in full sample	Results only among students with high-implementation teachers. Significant reductions in cigarette smoking and marijuana use (E1 and E2) compared to controls, and frequency of getting drunk less for E2 condition than controls.	
Botvin, Baker, Dusenbury, Botvin & Diaz, 1995 (6-year follow-up of Botvin, Baker, Dusenbury, Tortu & Botvin, 1990a) Life Skills Training	Drug prevention targeted at junior/middle schools	Randomized trial including 56 public schools. 6-year follow-up at grade 12. E1 – one day formal training E2 – videotape training High fidelity sample received 60% of intervention over 3 years, based on classroom observations of objectives covered.	Weekly and monthly cigarette smoking and heavy drinking in both intervention groups lower than control group. Heavy smoking in E2 group only lower than control group.	Results stronger & more outcomes significant. The experimental groups were significantly different from the control group for all measures of cigarette use, weekly alcohol use, 3 drinks or more per occasion, drunk, and weekly marijuana use. Monthly marijuana use was lower for E1 compared to the control group. Monthly alcohol use was lower for E2 compared to controls.	

<p>Botvin, Baker, Filazzola & Botvin, 1990b Life Skills Training</p>	<p>Drug prevention in junior/middle school</p>	<p>10 schools (7th graders) randomly assigned to (1) LST taught by older peer leaders, (2) taught by teachers, (3) LST with 8th grade booster taught by peers, (4) LST with 8th grade booster taught by teachers, (5) control group. (n=998 students at 1 year follow-up) Teachers were rated on a scale of 1 to 5 by field staff who had observed implementation. Teachers who received ratings of 4 or 5 constituted a restricted sample of high fidelity implementers.</p>	<p>At the one-year follow-up, the peer-led booster condition was the only one to produce significant behavioral effects on smoking (4 of 4 measures), alcohol (1 of 5 measures), and marijuana (2 of 5 measures). No differences between teacher-led conditions and controls. In some instances, the teacher-led booster condition produced results which were worse than the control condition.</p>	<p>Only results in high-implementation sample for teacher-led condition. Differences favoring teacher-led condition on proportion of weekly and daily smokers and smoking index for females; ever use of marijuana for females; and weekly alcohol use and drunkenness index.</p>
<p>Botvin, Dusenbury, Baker, James-Ortiz & Kerner, 1989 Life Skills Training</p>	<p>Drug prevention for junior/middle school</p>	<p>Random assignment of 8 schools (7th grade, n=345 students) whose student body was at least 50% Hispanic. Classroom observers rated teachers on points and objectives made in lessons, resulting in a quantity score based on proportion of points made. Also assessment made of teacher effectiveness. Experimental group broken into 2 subgroups: high implementation (above the mean in terms of program completeness, n=156) and low implementation (n=99).</p>	<p>Intervention shows marginally significant reduction on smoking (p=.0618)</p>	<p>Effects due to high implementation. High levels of intervention significantly predicted reductions in smoking. No effects in the low-implementation subgroup. This suggests that the marginally significant effect of the two combined treatment subgroups derive solely from the effects produced by the high-implementation subgroup.</p>
<p>Connell, Turner & Mason, 1985 School Health Curriculum Project</p>	<p>Health instruction for grades 4-7</p>	<p>30,000 children in 1,071 classrooms from 20 states (article does not describe evaluation) Full implementation required instruction hours equal or greater than minimums prescribed by program designers, more than 80% of the program activities taught and greater than the program average degree of fidelity to program materials.</p>	<p>Significant differences between program and comparison classroom performance on program-specific knowledge, general knowledge, general attitude, and self-reported practices.</p>	<p>Results stronger. In comparison to differences reported for the entire sample of program classrooms, the effects in the classrooms that fully implemented are 5% greater for program-specific knowledge, 20% greater for general knowledge, 90% greater for attitude, and 85% greater for practice measures.</p>
<p>Dembo et al., 2002 Family Empowerment Intervention</p>	<p>Family preservation model using home visitation by paraprofessionals Juvenile offenders and their families</p>	<p>Youth randomly assigned to intervention or minimal control with monthly phone contact after stratification by gender, race, ethnicity. High fidelity sample completed 58% of program.</p>	<p>Reported getting high or drunk on alcohol less often than controls; less marijuana use.</p>	<p>More outcomes significant. Lower rates of delinquency (self-reported crimes against persons and total delinquency) and drug use (sales and frequency of getting very high or drunk on alcohol, frequency of marijuana) than youths not completing program. Lower rates of new charges and fewer new arrests.</p>
<p>Fagan, 1990 Violent Juvenile Offender Program</p>	<p>Reintegration program (transitional residential) for violent juvenile offenders</p>	<p>Random assignment to facility with treatment program or mainstream correctional facility (control) in 4 cities. A composite assessment (high, medium, low) of implementation was derived from implementation ratings for each of the program elements: case management, reintegration of multiple phases assessed through field observations, and reviews of program documents and individual case records.</p>	<p>Results are reported by site only—high-implementation and low-implementation sites.</p>	<p>Results only in high-implementation sites. In the 2 sites with strong implementation, there were fewer arrests for felonies, fewer rearrests, and a longer interval until the first arrest over 3 at-risk periods. In the 2 sites with weak implementation, there were few significant differences over the 3 time periods in the recidivism indicators.</p>

Appendix A: Process Evaluation Studies				
Program/Study	Program Type/ Target Population	Evaluation Design/High Fidelity Sample	Full Sample Results	High Fidelity Results
Flay, 2000 Positive Action Program	Character education program that teaches students to feel good about themselves by doing positive actions.	Case study of one rural Florida school that implemented program during the 1999–2000 school year. Classrooms were classified as fully implemented (n=11), partially implemented (n=7), and sporadic or no implementation (n=7). It was not reported how these categories were derived.	No full sample results.	Results stronger. Kindergarten Students: More improvement in positive behaviors with more implementation. Grade 1–3 Students (analysis limited to 2 levels of implementation, some/most or all): In fully implemented classrooms, feelings of students about other people and themselves improved more; attitudes about doing positive behaviors improved while they decreased in classrooms that did not fully implement; and more time spent doing positive behaviors. Grade 4–5 Students: With more implementation, there was greater improvement in attitudes about positive behaviors and fewer negative behaviors (i.e., substance use and violence) and disciplinary referrals. With more implementation, teachers and parents also improved attitudes and behaviors.
Gottfredson & Hybl, 1993 Multiyear, Multischool Study	School, classroom, and individual level interventions aimed at reducing middle school student misbehavior (grades 6–8)	Non-equivalent control group design with 8 public middle schools in Charleston, SC. Two schools were designated as comparison, primarily on the basis of demographics. Implementation data come primarily from end-of-year teacher survey. Low-implementation schools consisted of the 2 control schools that participated only in some aspects of the program. Medium-implementation schools consisted of 3 treatment schools that experienced visible implementation problems or low levels of administrative support. High-implementation schools consisted of 3 treatment schools that had no visible signs of implementation breakdown and had administrative support.	Significant changes in the desired direction were found for 5 of the differences examined: 1 significant change in the undesirable direction.	Positive results primarily in high-implementation schools, with more outcomes significant. Significant changes in the desired direction were found for the high-, medium-, and low-implementation schools for 9, 2, and 1 of the 13 differences examined. Significant changes in the undesirable direction were found for 1, 2, and 1 of the differences examined for the 3 levels of implementation.
Henggeler, Melton, Brondino, Scherer & Hanley, 1997 Schoenwald, Henggeler, Brondino & Rowland, 2000 Multisystemic Therapy	Clinical, home-based family therapy	2x2x2 Condition (MST vs. Usual Juvenile Justice Services) x Time (pretest vs. posttest) x Site (Site 1 vs. Site 2) design, with random assignment to treatment conditions (n=155 chronic or violent juvenile offenders and their families). Factor analysis of a 26-item scale designed to measure family and therapist behaviors specific to the practice of MST (completed by parents, adolescents, and therapists) after randomly selected therapy sessions during the 4 th and 6 th weeks of therapy). Factor scores were derived from the average ratings from each time period, for each informant. Multiple regression was run against Time 2 outcome measures with the respective Time 1 variables and treatment adherence factors as independent variables.	MST significantly improved adolescent psychiatric symptomatology at posttest and decreased incarceration by 47% at 1.7 year follow-up. No significant differences on arrests and criminal activity.	Outcomes were better in cases where treatment adherence ratings were high. Various aspects of adherence affect key ultimate outcomes. Specifically, parent and adolescent ratings of treatment adherence predicted low rates of arrest. Therapist ratings of treatment adherence and treatment engagement predicted decreased self-reported index offenses and low probability of incarceration.

<p>McGrew, Bond, Dietzen & Salyers, 1994 Thresholds Bridge Programs</p>	<p>Assertive community treatment (mental health service model)—training in community living after discharge from state psychiatric hospital) Clients satisfied the state's definition for serious mental illness and evidence of high use of psychiatric hospital services</p>	<p>Eighteen programs were evaluated over a 10-year period: 3 were the original Bridge program (1978–1980), 6 were first generation (1986–1987), 6 were second generation (1989–1991), and 3 were third generation (1990–1991). Individual studies are not described, but the outcome measure was effect size of reduction in number of days hospitalized. Fidelity was measured by a 17-item subset of expert-identified critical ingredients that formed a fidelity index with three subscales: staffing, organization, and service.</p>	<p>The mean effect size of 0.55 shows that these programs had a moderate impact on reducing days in hospital.</p>	<p>Increased fidelity scores at the total scale, organization subscale, and staffing subscale were moderately to strongly correlated with reduction in days hospitalized. Only the service subscale was not significantly correlated; however, the individual item—total number of contacts—in this subscale was significantly correlated.</p>
<p>Olweus & Alsaker, 1991 Bullying Prevention Program</p>	<p>Anti-bullying program for primary and secondary students</p>	<p>Cohort longitudinal design with consecutive cohorts. Approximately 2,500 students, originally in grades 4–7 from 42 Bergen, Norway, schools. A composite score was comprised at the classroom level for dosage (i.e., whether there were class rules against bullying, whether there had been regular class meetings about bully/victim problems, and whether the class had set up role plays about bully/victim problems).</p>	<p>Bullying/victimization reduced; also reductions in general antisocial behavior such as vandalism, theft, and truancy; increase in student satisfaction.</p>	<p>Results stronger in high fidelity classrooms. Those classes that showed larger reductions in bully/victim problems had implemented the 3 components of the program to a greater extent than those with smaller changes.</p>
<p>Pentz, Dwyer, MacKinnon, Flay, Hansen, Wang & Johnson, 1989 Pentz, Trebow, Hansen, MacKinnon, Dwyer, Johnson, Flay, Daniels & Cormack, 1990 Midwestern Prevention Project</p>	<p>Community-based drug prevention with middle/junior school students as primary focus</p>	<p>Quasi-experimental—50 middle and junior schools in Kansas City SMSA. Eight schools randomly selected for longitudinal assessment. In the 42 schools a 25% sample of students was randomly selected by classroom in a cross-sectional cohort design. Exposure was calculated by multiplying the number of sessions by average time per session and dividing by 60. The median was used to construct high- and low-implementation groups.</p>	<p>One year after intervention, drug use significantly higher in control than program condition for all measures of drug use: last-month and last-week alcohol, cigarette, and marijuana use.</p>	<p>Results stronger. Last-month and last-week cigarette, alcohol, and marijuana use (prevalence) significantly lower than control group. All scores in high-implementation group increased less than those for low-implementation group (all ps, .05). The low-implementation group had less increase in use rates compared to the control group, although none of the comparisons was significant.</p>

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