Long-term effects of universal preventive interventions on prescription drug misuse

Richard Spoth, Linda Trudeau, Chungyeol Shin & Cleve Redmond
Partnerships in Prevention Science Institute, Iowa State University, Ames, IA, USA

ABSTRACT

Background  This is a supplemental report on tests of the long-term effects of universal preventive interventions conducted during middle school on 17–21-year-olds’ prescription drug misuse. Design/setting/participants  Two randomized controlled prevention trials were conducted in public schools in the rural midwestern United States. Study 1 began in 1993, with 667 6th-graders; follow-ups with 12th-graders and 21-year-olds included 457 and 483 participants, respectively. Study 2 began in 1998 with 7th-graders (total sample across waves 2127); follow-ups with 11th- and 12th-graders included 1443 and 1212 participants, respectively. Interventions  In study 1, schools were assigned to the Iowa Strengthening Families Program (ISFP), Preparing for the Drug Free Years, or a control condition. In study 2, schools were assigned to the school-based Life Skills Training (LST) plus a revised ISFP, called SFP 10–14 (LST + SFP 10–14), LST-only, or a control condition. Measurements  Self reports of lifetime and past-year prescription drug misuse. Findings  In study 1, ISFP 12th-graders’ past year narcotic misuse was significantly less than controls, as were ISFP 21-year-olds’ life-time narcotic and barbiturate misuse rates. In study 2, LST + SFP 10–14 showed significant effects on life-time prescription drug misuse at the 11th-grade follow-up, while effects at the 12th-grade follow-up were marginally significant. Conclusions  Consistent with intervention effects on other substance use outcomes reported earlier, results suggest that universal interventions have potential for public health impact by reducing some types of prescription drug misuse among adolescents and young adults.

Keywords  Adolescent, partnership-based universal preventive intervention, prescription drug misuse, young adult.

INTRODUCTION

Prescription drug misuse among US adolescents and young adults has increasingly become a public health problem, as documented by recent national surveys [1,2]. Current research indicates that among US adolescents and young adults (ages 12–25) the only illicit drug that is abused more frequently is marijuana [1–4]. There is evidence that, while abuse of other illicit drugs by 12th-graders has been declining in recent years, prescription drug misuse has been rising [5]. In 2005, the rate of past year prescription drug misuse for US young adults (18–25-year-olds) was 15.3%; the life-time rate was 31.3% [1]. In addition, US epidemiological studies indicate that individuals who misuse prescription drugs also are far more likely to use other illicit drugs [3,6]. Moreover, prescription drug misuse is highly comorbid with psychiatric disorders (e.g. depressive and anxiety disorders), as well as with alcohol or drug use disorders [7–9] and other problem behaviors among high school and college students (e.g. suspension or expulsion and driving after drinking) [10,11]. Although the US National Institute on Drug Abuse (NIDA) recommends increased attention to interventions to prevent such misuse, no studies could be found that evaluated long-term findings from preventive interventions for general populations [3,12,13].

Guided by etiological research, a number of substance use preventive interventions have been designed to reduce empirically-based risk and protective factors by modifying family and school socializing environments or building youth competencies in the school setting [14]. The current supplemental report summarizes results of two projects testing universal preventive interventions implemented with middle school students in the US.
eligible) and community size (population lunch program eligibility (greater than 15% of students were recruited in 1993. School selection was based on Families of 6th-graders enrolled in 33 rural Iowa schools Sample and design Setting: study 1 and study 2 Both study 1 and study 2 were randomized controlled studies of universal preventive interventions implemented in understudied rural US Midwestern communities. Study 1 tested two family-focused interventions, whereas study 2 examined a multi-component family-focused and school-based intervention, along with a school-based intervention alone. Institutional Review Board approval for human subject procedures was obtained. Study 1 Sample and design Families of 6th-graders enrolled in 33 rural Iowa schools were recruited in 1993. School selection was based on lunch program eligibility (greater than 15% of students eligible) and community size (population < 8500). All of the 1309 families of 6th-graders in the participating schools were considered eligible and were recruited for the study. A representative sample of 667 (51%) agreed to participate and completed pre-testing—a rate comparable to other studies conducted at the time [14]. Sample representativeness was verified by comparing assessed participants with respondents to a participation factor survey conducted by telephone prior to study 1 recruitment (completed by 90% of eligible families) on a range of family socio-demographic characteristics (e.g. parent education, income, marital status, number of children), child conduct problems and social-economic distress [15]. After blocking on school size and the proportion of lower-income families, schools were assigned randomly to one of three groups: those receiving Preparing for the Drug Free Years (PDFY), those receiving the Iowa Strengthening Families Program (ISFP) or a minimal contact control group. Schools were not aware of their group assignment at the time of their enrollment in the study; similarly, families were not aware of their assignment at the time of pre-testing. Recruitment for the PDFY and ISFP interventions was conducted following completion of baseline assessments. Families in the intervention group school districts who participated in the baseline assessment were recruited for the interventions, but their continuation in the study was not contingent upon intervention participation; all pre-tested families were recruited for follow-up assessments regardless of intervention participation. See Fig. 1 for a summary of participation in assessments and interventions across waves. Follow ups with 12th graders and 21-year-olds included 457 and 483 participants, respectively. Pre-tested families averaged 3.1 children, 86% were dual-parent families, household income averaged $39 560 (1992) and nearly all (98%) were Caucasian.

Procedures

From pre-test (6th-grade) to the 12th-grade, adolescents and their parents were interviewed in their homes by project staff members who administered confidentially and independently completed written questionnaires (60–80 minutes to complete). Following 12th grade, the participants (now young adults, age 22) completed computer-assisted telephone interviews. Data collection methods did not differ across conditions and interviewers were blind to condition.

Intervention implementation

Both interventions were administered in cooperation with public school districts and the outreach arm of the land grant university conducting the studies, called the University Extension System. Partnerships among the researchers, University Extension and the participating public school districts were considered key to the high-quality implementation of universal interventions required for positive intervention outcomes. Earlier reports have summarized this partnership approach and have demonstrated its value in achieving such high-quality implementation [19–23]. These interventions were implemented by trained facilitators in the evenings in local schools, following pre-testing in 6th grade. Adherence to intervention content was assessed by trained observers and averaged >85% across intervention sessions.

The five-session PDFY program, based on the social development model, averages 2 hours per session and focuses on risk and protective factors for substance use, including family management, parent–child bonding and communication. The adolescent component focuses on assisting adolescents in acquiring peer resistance and refusal skills [24,25]. The adolescent participates in one session; the other four sessions are solely for parents. A more detailed description of PDFY is provided in earlier reports [14,15,26].
The seven-session ISFP focuses on empirically-supported family risk and protective factors, such as parental nurturing, child management skills, improved parent–adolescent communication skills and adolescent prosocial skill development (e.g. managing conflict and stress, handling peer pressure, developing positive friendships) [27]. The first six sessions include separate, concurrent youth and parent skills-building curricula (1 hour),
followed by a conjoint family curriculum (1 hour); the seventh session is exclusively a family session. See earlier reports for a more detailed ISFP program description [14,15,26].

**Study 2**

**Sample and design**

Study 2 participants included 7th-graders and their families enrolled in 36 rural Iowa schools in 1998 in a different region of the state than that of study 1. School selection criteria were: eligibility for the lunch program (20% or more of students eligible); district enrollment (<1200 students); and middle school structure (grades 6–8 in one location). Schools were matched on several factors to form 12 blocks of three schools each [16]. The schools in each block were assigned randomly to three experimental groups: those receiving the Life Skills Training (LST) program combined with the Strengthening Family Program for Parents and Youth 10–14 (LST + SFP 10–14), those receiving the LST only, or a minimal-contact control group.

All 7th-grade students were recruited; approximately 1632 (90.3%) of eligible students participated in an in-school assessment at pre-test. In addition, a randomly selected subset of students and their parents (approximately 20 families per school) were recruited for more extensive in-home assessments [16]. The in-home sample is not a focus of this report because relevant questionnaire items did not meet criteria for analysis, as described in the data analysis section below. See Fig. 2 for a summary of participation in interventions and assessments across waves. The total sample across waves was 2127; follow ups with 11th and 12th graders included 1443 and 1212 participants, respectively. Pre-tested families averaged 3.2 children, the majority of families were dual-parent (87%), household income averaged $43 105 and virtually all were Caucasian (99%).

**Procedures**

A passive consent procedure allowed parents to decline participation for their adolescent student in the in-school assessment, and students were allowed to refuse on their own. Approximately 40–45 minutes were required to complete the questionnaires administered by project staff; students were assured confidentiality.

**Intervention implementation**

As in study 1, interventions in this study were administered through partnerships with public school districts and Extension outreach staff. Interventions, implemented in the 7th grade following the pre-test, entailed the LST program and a revision of the ISFP [now called the Strengthening Families Program: For Parents and Youth 10–14 (SFP 10–14)]. The ISFP revision included the same essential content as the original program. The main purpose for the revision was to adapt the program so that it would be more appropriate for a diverse audience. Changes also included the sequencing of topics, increasing the number of interactive, game-like activities for youth and the addition of separate parent and youth components in the seventh session [26]. Implementation of SFP 10–14 was identical to ISFP implementation in study 1. The theoretical underpinnings of the LST program are described elsewhere [28,29]. LST consists of 15 sessions, with self-improvement, decision-making, coping with anxiety, cognitive and social skills training components. LST was taught by trained teachers during 40–45-minute regular classroom periods, and included five booster sessions taught 1 year later; half the schools implementing the 7th-grade LST also were selected at random to implement family and school booster sessions in the eleventh grade. Ratings by trained observers indicated between 85% and 92% adherence to program content across intervention sessions for both SFP 10–14 and LST.

**Study 1 and study 2 measures and analyses**

Prescription drug misuse was assessed with several questions added in later waves of data collection in the studies (i.e. starting in 10th grade in study 1 and 9th grade in study 2). Although baseline measures of prescription drug use were not available, the gateway substances used most commonly by children in the 6th grade (study 1) and 7th grade (study 2) age groups targeted by the tested interventions were assessed. The sample-wide life-time use rates of those substances was 16.1% and 52.6% for alcohol, 8.6% and 22.1% for cigarettes and 0.3% and 2.3% for marijuana, for studies 1 and 2, respectively. Baseline equivalences between groups were established (see Results section). Considering the epidemiological data trends, it was unlikely that there was substantial prescription drug misuse in these samples at the point at which these studies were initiated (early mid-1990s), as suggested by the modest rates of use in the samples at the high school and young adult data points. Indeed, the low prevalence rates are the basis for the application of the following screening criteria to the measures.

In order to obtain stable estimates, we conducted statistical significance testing only for those measures in which misuse prevalence rates were at least 0.5% in the overall sample and five or more participants reported prescription drug misuse in at least one of the three conditions. Prior to 12th grade in study 1 and 11th grade in study 2, no questions met selection criteria; these items included questions about past year and life-time misuse.
School Selection ($n=36$)

Survey ($n=1017$) of All (1836) Families in Sampling Frame for Planned Test of Recruited Sample Representativeness

36 Schools Randomized

Schools ($n=12$)  
Adolescents Enrolled  
7th-12th Grades ($n=770$)

Enrolled in Project and Pre-tested  
Fall 1998 ($n=535$)  
No Assessment ($n=66$)

Schools ($n=12$)  
Adolescents Enrolled  
7th-12th Grades ($n=625$)

Enrolled in Project and Pre-tested  
Fall 1998 ($n=482$)  
No Assessment ($n=47$)

Schools ($n=12$)  
Adolescents Enrolled  
7th-12th Grades ($n=732$)

Enrolled in Project and Pre-tested  
Fall 1998 ($n=615$)  
No Assessment ($n=63$)

Sample Representativeness Tested (Pre-test compared with No Pre-test) and Supported

Pre-tested Families ($n=226$)  
Recruited for SFP 10-14 Intervention

Participated in SFP 10-14 ($n=137$)  
Declined SFP 10-14 ($n=89$)  
Participated in LST ($n=576$)

Mailed Reading Materials ($n=222$)  
(Minimal-Contact Controls)

Participated in LST ($n=646$)

Completed 7th Grade Posttest ($n=546$)  
No Assessment ($n=54$)

Completed 7th Grade Follow-up ($n=531$)  
No Assessment ($n=55$)

Completed 7th Grade Follow-up ($n=557$)  
No Assessment ($n=68$)

Completed 8th Grade Follow-up ($n=552$)  
No Assessment ($n=117$)

Completed 8th Grade Follow-up ($n=491$)  
No Assessment ($n=43$)

Completed 8th Grade Follow-up ($n=481$)  
No Assessment ($n=48$)

Completed 8th Grade Follow-up ($n=479$)  
No Assessment ($n=68$)

Completed 9th Grade Follow-up ($n=444$)  
No Assessment ($n=178$)

Completed 9th Grade Follow-up ($n=615$)  
No Assessment ($n=63$)

Completed 9th Grade Follow-up ($n=479$)  
No Assessment ($n=68$)

Completed 9th Grade Follow-up ($n=581$)  
No Assessment ($n=86$)

Completed 9th Grade Follow-up ($n=554$)  
No Assessment ($n=97$)

Completed 10th Grade Follow-up ($n=444$)  
No Assessment ($n=178$)

Completed 10th Grade Follow-up ($n=460$)  
No Assessment ($n=78$)

Completed 10th Grade Follow-up ($n=460$)  
No Assessment ($n=78$)

Completed 10th Grade Follow-up ($n=532$)  
No Assessment ($n=117$)

Completed 10th Grade Follow-up ($n=474$)  
No Assessment ($n=133$)

Completed 11th Grade Follow-up ($n=444$)  
No Assessment ($n=178$)

Completed 11th Grade Follow-up ($n=452$)  
No Assessment ($n=62$)

Completed 11th Grade Follow-up ($n=474$)  
No Assessment ($n=133$)

Completed 12th Grade Follow-up ($n=444$)  
No Assessment ($n=178$)

Completed 12th Grade Follow-up ($n=343$)  
No Assessment ($n=156$)

Completed 12th Grade Follow-up ($n=425$)  
No Assessment ($n=173$)

Note: No evidence found for threats to internal validity/differential sample attrition at 12th grade assessment. Participation rates similar to comparable longitudinal trials. Adolescents did not need to be present at prior waves to participate in later waves of data collection; as a result, the number of enrolled participants (4th row) is larger than any single wave of data collection. Those who changed conditions were eliminated from the sample. Participation in LST was estimated by subtracting those who declined participation or were ineligible from the pre-test population. (see Ref. 17)

Figure 2 Study 2 participation summary
of narcotics, barbiturates, quaaludes, tranquilizers and amphetamines.

In study 1, one question met analytical inclusion criteria for the 12th-grade sample: ‘In the past year, did you take narcotics other than heroin (e.g. morphine, codeine, Demerol) to get high?’ For young adults, two questions met criteria: (1) ‘Have you ever used narcotics (e.g. Vicodin, Oxycontin, or Percocet), not under a doctor’s orders?’; and (2) ‘Have you ever used barbiturates (sedatives), not under a doctor’s orders?’ These items are similar to self-report items from national surveys [1-3]. Although bias can be a concern with self-reported substance use, widely accepted methodological practices for ensuring validity, such as assurances of confidentiality, were utilized. In addition, by the time participants responded to the data collection reported here, a long-term relationship had been established and they had probably become comfortable with the protection of their confidentiality. Importantly, intervention design and data collection procedures ensure that any bias in reporting would apply to both intervention and control participants; thus, intervention-control comparisons would be valid.

For study 2, one question met criteria for both 11th- and 12th-graders: ‘Have you ever used drugs or medications that were prescribed by a doctor to someone else?’ Although this item does not address specifically one important component of prescription drug misuse—that is, use of prescribed medicine non-medically, for the experience or feeling that the drug causes—it addresses the other important component—using medication not prescribed to the user [1].

Analyses were conducted with intent-to-treat samples to minimize self-selection bias associated with participation in the family-focused interventions. Because of the small cell sizes, Fisher’s exact test [30] was used to assess intervention-control differences. Given the small numbers of prescription drug misusers, a multi-level analysis to address the nested structure of the data with traditional Pearson $\chi^2$ tests was not appropriate. Specifically, the small cell sizes would likely lead to unstable estimates of misusers in each school. An examination of prescription drug misuse frequencies by school did not show evidence of within-school dependence (the reason for conducting multi-level analyses). For example, the 105 respondents reporting life-time prescription drug misuse at the study 2 12th-grade assessment were distributed across 31 of the 36 schools.

**RESULTS**

**Tests for pre-test equivalence and differential attrition**

Earlier reports provided detailed descriptions of tests conducted to establish sample representativeness and pre-test equivalence, as well as to rule out differential attrition [14-16,26]. In study 1, pre-test equivalence between intervention and control conditions was found for family socio-demographic characteristics (e.g. parent income, education, age, marital status, number of children, target child age and gender) and school/community characteristics (e.g. enrollment, number of classrooms, student achievement ranks, attendance, school lunch program eligibility rates, population). Pre-test equivalence of gateway substance use initiation (alcohol, cigarettes, marijuana and composite indices) was also evaluated; equivalence was found for all but one measure; tobacco initiation rates at pre-test for PDFY students were higher than they were for control condition students. In study 2, there was no evidence of inequivalence on substance initiation measures at the school level (i.e. alcohol, cigarettes, marijuana); however, despite school-matching procedures and the confirmation of the homogeneity of the blocks from which schools were assigned, there was evidence of inequivalence on one of the socio-demographic factors—the proportion of dual biological parents. The control group contained more dual-biological parent families (78%) than both the LST-only group (69.6%) and the LST + SFP 10–14 group (71.6%), suggesting that the control group was at lower risk.

Importantly, no significant condition $\times$ attrition interaction effects were found for any socio-demographic or substance use variables between the pre-test and 12th-grade/young adult follow-ups for studies 1 or 2. Although higher-risk students (e.g. those with lower parental education, younger parental age, higher levels of substance use) were more likely to drop out than lower-risk students, the proportions of higher-risk study dropouts were similar across conditions. Therefore, differences between the intervention and control conditions on substance use outcomes can be attributed reasonably to intervention effects, rather than bias related to differential attrition rates.

**Experimental differences in prescription drug misuse**

Figure 3 summarizes results for both studies. For study 1, 12th-grade ISFP intervention condition participants reported significantly less narcotic misuse [Fisher’s exact test (df = 1) = 5.788, $P = 0.02$] in the past year than control condition participants, and PDFY participants reported less misuse than controls that was marginally significant [Fisher’s exact test (df = 1) = 3.285, $P = 0.07$]. The study 1 ISFP group young adults reported significantly less life-time narcotic misuse [Fisher’s exact test (df = 1) = 12.442, $P < 0.0001$] and barbiturate misuse than controls [Fisher’s exact test (df = 1) = 5.313, $P = 0.03$], whereas the PDFY group young adults’ life-time narcotic misuse [Fisher’s exact test (df = 1) = 2.039,
**DISCUSSION**

Because prescription drug misuse is growing [1–5], the need to identify effective interventions to address this problem has become increasingly more important [12,13]. No previously documented long-term effects for general population preventive interventions on prescription drug misuse from randomized controlled studies could be found. Considering this knowledge gap, the results of the current study are noteworthy, indicating the effectiveness of the tested interventions on life-time or annual prescription drug misuse across two randomized studies. The current report extends earlier findings on these universal preventive interventions that showed positive longitudinal effects on other drug and alcohol outcomes [14–18]. It is also noteworthy that none of the interventions had content specific to the prevention of prescription drug misuse; the observed intervention effects probably were obtained by addressing general factors predictive of substance abuse targeted by the family and school preventive interventions.

Differential outcomes from the ISFP and PDFY interventions in study 1 are important to address. Earlier analyses have found positive PDFY effects on other types of substance use [15]. When ISFP has shown stronger effects, the relative difference in effects has been attributed primarily to the higher number of ISFP intervention sessions [15]. Differential effects also were seen in the LST + SFP 10–14 versus control comparisons, in contrast to the LST-only versus control comparisons. It was expected that the combination of the family-focused and school-based universal interventions would produce stronger effects than the school-based intervention alone. This was the case for study 2 at the 11th-grade assessment. The LST + SFP 10–14 versus control comparison demonstrated a significant difference, whereas the LST-only versus control difference was non-significant; the relatively stronger effect for the LST + SFP 10–14 also was present at the 12th-grade assessment but, in that case, the LST + SFP 10–14 versus control comparison was only marginally significant. Notably, although the LST group demonstrated a trend towards lower rates of prescription drug misuse than the control group, comparisons were non-significant. However, comparisons between LST-only and LST + SFP 10–14 also were non-significant. Thus, although the general pattern of
relevant results suggests the advantage of combining a school-based and a family-focused intervention, findings are not definitive in this regard.

**Study limitations**

The degree to which the findings will generalize to non-rural populations, rural populations in other regions of the United States, other countries or populations with different ethnic compositions is not known. Both LST and SFP 10–14, however, have been implemented and have demonstrated positive effects on substance use and other problem behaviors in a range of US populations, including Spanish-speaking and African American populations (http://www.mystrongfamily.co.uk/index.htm, accessed 6 November 2007; http://www.lifeskillstraining.com/index.php, accessed 6 November 2007). Currently, SFP 10–14 implementations are ongoing in the United Kingdom and Spain; they are planned in other European countries as well (http://www.mystrongfamily.co.uk/index.htm, accessed 6 November 2007; http://www.lifeskillstraining.com/index.php, accessed 6 November 2007). Also, because of the relatively small numbers of participants per condition who reported prescription drug misuse, specific estimates of use rates are sensitive to small changes in numbers of users. This concern is somewhat abated by the observation that the use pattern across conditions generally was stable. That is, the intervention groups demonstrated a lower rate of use than controls for all prescription drug misuse across time and across studies. These results are consistent with previously reported positive intervention results on many other types of substance use across several settings [14–16]. Another limitation related to the small number of prescription drug misusers concerns the potential bias due to school effects. That concern also is somewhat abated, given the distribution of reported use across sites (e.g., 31 of 36 schools in study 2 had at least one individual reporting prescription drug misuse). Further, young adult results include use that developed following high school; many respondents no longer live in the community in which they went to middle and high school.

**Study implications**

To address further the practical significance of the current findings, it is useful to consider relative reduction rates. Considering life-time prescription drug misuse of 11th-graders in study 2 for the LST + SFP 10–14 condition as an example, the relative reduction rate was 50%. In practical terms, if such rates held in general population implementation of the intervention, this means that for every 100 11th-graders in the general population who reported life-time prescription drug misuse there would be only 50 in the intervention population reporting such misuse.

To achieve positive results from universal family and school preventive interventions, high-quality implementation is essential—the type of implementation that can best be achieved by effective partnerships among families, schools and communities that overcome barriers to implementation [22,23,31,32,33]. The community–university partnership-based prevention trials reported here implemented programs through existing delivery systems—schools and university extension—under relatively more ‘real world’ conditions [22]. Further, partnership process evaluations have provided useful information for scaling-up the interventions for greater public health impact [22,23,31,32].

In conclusion, results of these studies suggest that universal interventions targeting substance use conducted with early adolescent samples in the United States and implemented with quality have the potential to lower some types of prescription drug misuse later in adolescence and young adulthood. As we collect additional waves of data from these studies, follow-up analyses to age 25 + will determine whether the intervention effects tracked to date continue through the emerging adulthood years.

**Acknowledgements**

Work on this paper was supported by research grants DA010815 from the National Institute on Drug Abuse (current approval date 1 September 2007) and by grants MH 49217-01A1 from the National Institute of Mental Health and AA 014702-13 from the National Institute on Alcohol Abuse and Alcoholism (current approval date 29 May 2007). The authors wish to thank the Partnerships in Prevention Science Institute staff, the Data Acquisition Unit at the Institute for Social and Behavioral Research, the study participants and the school districts that participated in the projects.

**References**


