ABSTRACT

Purpose: An earlier randomized controlled study found that a universal, family-focused preventive intervention produced protective shield effects—reduced adolescent exposures to illicit substance opportunities—among adolescents in grade 12. This study examined a follow-up assessment of the sample during young adulthood.

Methods: A randomized controlled trial evaluated the Iowa Strengthening Families Program that was implemented in 22 rural schools (N = 446 families) when the participants were in grade six. Measures included adolescent exposure to illicit substance use and young adult lifetime substance use (age 21; N = 331). Growth curve modeling examined indirect intervention effects through growth factors of adolescent exposure.

Results: Findings from this study confirm protective shield effects that mediate long-term reduction of illicit substance use (β = −.14, p = .02, Relative Reduction Rate = 28.2%).

Conclusions: The benefits of decreasing exposure to substance use during adolescence through universal interventions were supported, with positive effects extending into young adulthood.

A “protective shield” is defined in the epidemiologic literature as mechanisms that shield hosts from contact with pathogens, including environmental factors that protect against agents of a health problem [1]. An earlier examination of preventive intervention outcomes applied this concept, operationally defined as the reduction of young adolescents’ exposures to substance use opportunities. The study evaluated Iowa Strengthening Families Program (ISFP), a universal preventive intervention for sixth graders and their families, designed to improve adolescent and parent skills that would likely reduce adolescent exposures to substance use opportunities. Intervention effects on illicit substance use among adolescents studying in 12th grade were found, mediated by reduced substance exposures, with a 49% reduction in use [2].

The current study evaluated whether the protective shield effect extended into young adulthood (age: 21).

Methods

The approval from University Institutional Review Board and participants’ informed consents were obtained. Families of sixth graders from 22 Iowa schools were recruited in 1993; 446 (49% of those eligible) completed pretesting. Analyses indicated that the sample was representative [3]. School selection was based on school lunch program eligibility (>15%) and community size (<8,500). Schools were randomly assigned to conditions. (Another intervention was included in the project, but because illicit substance use by 12th graders was not significantly affected by that intervention, we could not evaluate the protective shield effect in that earlier study, upon which the present one is based) [3]. Household incomes were an average of $40,600; 98% of the participants were white. Adolescents completed in-home interviews and questionnaires through 12th grade; at age 21 (N = 331), they
Figure 1. Participation summary. Note: Those participating in the Preparing for the Drug Free Years (PDFY) program were not evaluated in this study. No evidence found of threats to internal validity/differential sample attrition at age 21 assessment. Retention rates are similar to comparable longitudinal trials.
completed computer-assisted telephone interviews and questionnaires. Figure 1 summarizes project participation.

Following pretesting, facilitators implemented ISFP in partnerships with public school districts and the University Extension System [3]. ISFP addresses empirically supported family risk and protective factors, such as parental nurturing, involvement, child management skills, and adolescent social skills. Observers reported high implementation fidelity, averaging 85% adherence to intervention content [3].

Measures included *illicit substance use exposure*. Three items assessed general illicit substance use opportunities over the past year, asking: “During the past 12 months, did you ever have a chance to...” (1) “try marijuana?”, (2) “try other drugs, such as cocaine or crack?”, and (3) “sniff glue or inhalants to get high?” The sum of dichotomous responses (No = 0, Yes = 1) and adding a value of “1” yielded scores between 1 and 4. Three additional items assessed opportunities specifically provided by peers, asking “How often do your friends try to get you to...” Items addressed the same three types of substances. Averaging item responses (Never = 1, Often = 4) yielded scores between 1 and 4. The scores on the two measures were averaged.

Because longitudinal assessments occurred at differing intervals, we determined that the most appropriate outcome measure was dichotomous lifetime illicit substance use; its yes/no format avoids the imprecision in estimating amount or frequency of consumption. This measure was scored “0” for respondents until they answered “Yes” to any one of the 11 lifetime illicit substance use items (e.g., marijuana, inhalants, methamphetamine, cocaine, ecstasy, nonmedical prescription drug use), after which it was scored as “1.”

Statistical modeling procedures replicated those reported in detail earlier [2,4]. The growth of illicit substance use exposure was modeled as linear across the postintervention period thought to be most critical—through 10th grade—based on means across time. The model controlled for preintervention exposure. The intercept was set at posttest. The slope value was the estimated rate of linear increase in exposure (Figure 2). The intervention (vs. control) effect on exposure was estimated by specifying direct effects on both the intercept (path a) and slope (path b). In turn, the model included direct effects of the growth factors on illicit substance use (paths c and d) and also evaluated the direct effect of intervention. Analyses were conducted in Mplus 5.2 (Muthén and Muthén, Los Angeles, CA) [5], using full-information maximum likelihood estimation to address missing data.

**Results**

Results are presented in Figure 2. Two compound paths assessed mediation of ISFPs influence on illicit substance use through protective shield effects: (1) exposure immediately postintervention (path ac), and (2) rates of increase in exposures across adolescence (path bd). Mediation of ISFP effects through reduction in exposures immediately postintervention was not found ($\beta = .01, p = \text{n.s.}$). As expected, results supported an indirect effect of ISFP on lifetime illicit substance use of young adults through reduction in the rate of increase of illicit substance use exposure across adolescence ($\beta = -.14, p = .02$; see Figure 2 for confidence intervals and total ISFP indirect effects). Direct effects were not found. The model-based estimate of the percentage of ISFP participants who initiated illicit substance use at age 21 was 27.5%, and the corresponding percentage in the control group was 38.3%. The relative reduction rate (the difference between the control and intervention rates, expressed as a percentage of the control rate) was 28.2% (i.e., [38.3% – 27.5%]/38.3%).

**Figure 2.** Growth curve model. Note: ***$p < .001$ one-tailed tests; $t$-values in parentheses; 95% confidence intervals (CIs) for significant effects in brackets. One-tailed tests were used because all observed intervention effects in all prior waves of the study (from the grade six to age 21 assessments) were in the expected direction. Mediated effects correspond to the specific indirect effects of the intervention on illicit substance use through the illicit substance use exposure growth trajectory factors and are calculated as $a \times c$ and $b \times d$. Total indirect effect is $\beta = -.14, p = .02 (-2.14)(-26.00 to -.01)$. Not depicted are the following: the pretest control for exposure (with paths to the growth factors) and the estimated correlation between the growth factor residuals. $\chi^2$ (degrees of freedom = 14, $N = 446$) = 13.66, $p = .48$, comparative fit index = 1.00, root mean square error of approximation = .00.
Discussion

The results support the idea that ISFP reduced illicit substance use in young adulthood by providing adolescents with a protective shield critical in preventing illicit substance use at a later stage. Relevant etiologic research [2,4–8] demonstrates how youth behaviors (e.g., participation in supervised, structured, prosocial activities) discourage substance use. The ISFP was designed to improve prosocial child behaviors, in addition to enhancing parenting behaviors (e.g., parental monitoring) and fostering positive parent–child involvement—factors that can also decrease substance-use opportunities. Specifically, previous research has demonstrated that the ISFP effects on parenting and adolescent skills are expected to limit exposure to substance use [3,6].

A unique contribution of this research is the demonstrated effect of ISFP through age 21, a developmental period when most young adults no longer live with their parents. The current findings—especially considered in conjunction with other published intervention outcomes during young adulthood—contribute to an emerging literature on long-term effects of universal preventive interventions that illustrate the duration and size of effects [4]. It does so by showing how intervention effects during adolescence can positively impact young adulthood, when the highest levels of substance abuse can be observed. Nonetheless, the generalizability of results to nonrural and more ethnically diverse populations remains to be examined.

The findings from this study also suggest the public health benefits of scaling up family-focused interventions. If the relative reduction rate results were to replicate, for every 100 young adults (age 21) initiating illicit substance use in communities not offering an intervention, there could be as few as 72 initiating in intervention communities. Scaling up the delivery of universal preventive interventions is critically important if these positive results are to produce wide-scale public health benefits [9]. The present study was one in a series of projects informing the development and testing of effective community-based intervention delivery models that capitalize on the University Cooperative Extension System’s success in spreading program innovations [10].

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References