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A REVIEW OF ELEMENTARY SCHOOL-BASED SUBSTANCE USE PREVENTION PROGRAMS: IDENTIFYING PROGRAM ATTRIBUTES

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ABSTRACT

This article takes a systematic approach to reviewing substance use prevention programs introduced in elementary school (K–6th grade). Previous studies evaluating such programs among elementary school students showed mixed effects on subsequent substance use and related psychosocial factors. Thirty published evaluation studies of 24 elementary school-based substance use prevention programs were reviewed. The study selection criteria included searching for program evaluations from 1980 to 2008. Among 27 evaluation studies that examined program effects on substance use, 56% ($n = 15$) found significant decreases. In addition, programs most often demonstrated effects on increasing negative substance use attitudes, increasing knowledge, decreasing perceptions of prevalence rates (i.e., descriptive norms), and improving resistance skills. These results have implications for the appropriateness and value of introducing substance use prevention programs to youth in elementary school.

In 2005, national survey data from *Monitoring the Future* revealed that 20% of 8th grade students first consumed alcohol by the end of 6th grade, 10% first smoked cigarettes by 5th grade, 6 % first tried marijuana by the end of 6th grade, and nearly 6% first used inhalants by the end of 5th grade (Johnston, O'Malley, Bachman, & Schulenberg, 2005). Trying alcohol, tobacco, or other drugs (ATOD) does not guarantee that youth will use substances in the future; however, previous

research found that early experimentation places youth at risk for future dependency (Breslau, & Peterson, 1996; Grant & Dawson, 1997; Griffin, Botvin, Nichols, & Doyle, 2003). Experimenting with substances may become more appealing during late preadolescence (i.e., 5th and 6th grade) because of the emotional, psychological, and physical changes that youth experience during this developmental period (Kandel, Yamaguchi, & Chen, 1992; Stipek, de la Sota, & Weishaupt, 1999).

Youth can develop positive ATOD expectancies as early as preschool, which may influence their ATOD use intentions and behaviors in elementary school (Dunn & Goldman, 1996). Finke and colleagues (2002) documented in a study of 9 to 12 year olds that a quarter of these youth reported using substances. Similarly, Andrews, Tildesley, Hops, Duncan, and Severson (2003) found that 42% of 5th grade boys and 32% of 5th grade girls reported that they would consume alcohol in their teens and adulthood, and 19% of 5th grade boys and 13% of 5th grade girls intended to use cigarettes in their teens and adulthood. These results reveal that despite their young age, a substantial percentage of preadolescents have knowledge of ATOD use, have formulated positive attitudes toward ATOD use, and may actually even participate in ATOD use. Thus, such findings warrant further investigation into the prevention efforts directed toward preadolescents (≤ 12 years of age).

Past studies found that individuals, who begin using substances at a young age, are less responsive to intervention programs (Ellickson, Bell, & McGuigan, 1993; Murray, Hannan, Wolfinger, Baker, & Dwyer, 1998). Delaying the introduction of substance use prevention programs to middle school or high school may prove ineffective for those adolescents who have positive attitudes toward ATOD use (Stipek et al., 1999). Nevertheless, school-based substance use prevention programs primarily target middle school or high school students (Battistich, Schaps, Watson, Solomon, & Lewis, 2000). In contrast, school-based substance use prevention programs should demonstrate stronger effects effective when introduced to youth at an early age because:

1. a substantial percentage of youth first experiment with ATOD during late preadolescence;
2. preadolescents are in a critical developmental period when they begin to form positive attitudes toward ATOD; and
3. preadolescents are at a young age where substance-use perceptions and behaviors are not consistently reinforced; thus, making them more receptive to prevention programs (Battistich et al., 2000; Bell, Kelley-Baker, Rider, & Ringwalt, 2005b).

Consequently, this article includes a systematic review of evaluation studies focusing on substance use prevention programs that target youth in elementary school (≤ 6 th grade) to summarize their overall success in affecting ATOD behaviors and related psychosocial factors.

THE APPROPRIATE GRADE-LEVEL FOR SUBSTANCE USE PREVENTION IMPLEMENTATION

Despite the aforementioned reasons for introducing substance use prevention programs to elementary school students, arguments exist for waiting until middle school or high school. When deciding on the appropriate age to introduce a prevention program, some researchers question whether preadolescents are developmentally capable of exhibiting self-control over their behaviors. The ability to internally inhibit behaviors plays an important role in preadolescents' substance use refusal skills: inhibitory control increases with age (Mezzacappa, Kindlon, & Earls, 1999). The *Promoting Alternative Thinking Strategies (PATHS)* program targets preadolescents to teach age-appropriate skills for inhibiting impulsive behaviors (Greenberg, Kusche, Cook, & Quamma, 1995). In a study with 2nd and 3rd grade students, children who received the *PATHS* program exhibited greater inhibitory control, which reduced external behaviors such as talking back to their teachers or putting down their peers (Riggs, Greenberg, Kusché, & Pentz, 2006). Such findings suggest that preadolescents may demonstrate similar inhibitory control when faced with substance use offers, indicating their developmental readiness to participate in elementary school-based substance use prevention programs.

Another caution against introducing a substance use prevention program too early stems from the idea that implementing such a program before youth have knowledge, attitudes, or experience regarding ATOD may actually have harmful effects or no effects at all (Gottfredson & Wilson, 2003). For instance, a recent evaluation of *keepin' it REAL (kiR)*, a culturally-grounded school-based program implemented at 5th grade, found that compared to the control condition students, those students receiving the intervention believed more peers had tried substances (Hecht, Elek, Wagstaff, Kam, Marsiglia, Dustman, et al., 2008). *kiR* taught anti-ATOD norms and refusal efficacy, along with decision making and resistance skills. Nevertheless, including content modeling substance use offers and resistance may have inadvertently made intervention students believe substance use was a common behavior among their peers.

The program, *Protecting You/Protecting Me (PY/PM)*, includes lessons specifically designed for different developmental stages. For instance, 1st and 2nd grade students learn about the function of the brain and how it develops, whereas 5th grade students learn about the way in which alcohol consumption affects brain function and development (Padget, Bell, Shamblen, & Ringwalt, 2006). Designers of *PY/PM* believe that alcohol content should not be introduced until late elementary-school level. Disagreements over the age or grade-level appropriateness of implementing prevention programs specifically targeting substance use led to following research questions:

RQ1: At what grade-level are elementary school-based programs most commonly introduced?

RQ2: What proportion of elementary school-based substance use prevention programs includes explicit drug information in their curricula?

Commonly Targeted ATOD Psychosocial and Behavioral Factors

To determine the success of a substance use prevention program, researchers must consider the psychosocial factors and the ATOD use behaviors that the program targets and whether the program demonstrates significant effects on such factors in the expected directions. School-based substance use prevention programs have targeted a host of factors; therefore, this article attempts to identify the factors that programs most commonly address. Programs often include lessons on what Skara and Sussman (2003) describe as social competence enhancement strategies (life skills training) and social influence strategies. The former strategy emphasizes personal development such as promoting self-esteem, self-efficacy, and knowledge of the consequences of substance use while the latter strategy emphasizes norms about the prevalence and the acceptability of ATOD use (Botvin, Griffin, Paul, & Macaulay, 2003). Some programs (e.g., Botvin, Baker, Dusenbury, Botvin, & Diaz, 1995; Flay, Koepke, Thomson, Santi, Best, & Brown, 1989) integrate both life skills training and social influence strategies. Given the variety of psychosocial factors that programs can target, the following research questions were developed:

RQ3a: What are the common psychosocial factors that elementary-school substance use prevention programs promote in their curricula?

RQ3b: What proportion of the elementary-school substance use prevention programs had significant effects on psychosocial factors (e.g., ATOD norms, resistance skills, knowledge, attitudes, and intentions)?

RQ3c: What proportion of the elementary-school substance use programs had significant effects on ATOD use?

In addition to certain psychosocial factors, elementary school-based substance use prevention programs may target certain groups of youth. Group differences arise from factors such as gender, culture, ethnicity, socioeconomic status (SES), and whether or not youth are considered at-risk; therefore, program designers may create prevention interventions that meet the needs of a particular group (Amaro, Blake, Schwartz, & Flinchbaugh, 2001). More specifically, programs may target universal, selected, or indicated populations. Universal programs aim to influence the general population, selected programs aim to influence high-risk individuals, and indicated programs focus on individuals with multiple risk factors (Gordon, 1987). Considering these distinctions led to the development of the following research question:

RQ4: What proportion of elementary-school programs target a universal audience?

Structural Program Components

School-based substance use prevention programs form the primary focus of this review; however, a number of these programs integrate other components. Prevention programs incorporate such components as mass media (e.g., Flynn, Warden, Seck-Walker, Badger, & Costanza, 1992), parental training (e.g., Elder, Campbell, Litrownik, Ayala, Slymen, Parra-Medina, et al., 2000; Litrownik, Elder, Campbell, Ayala, Slymen, Parra-Medina, Zavala, & Lovato, 2000), and community support (e.g., Flynn et al., 1992). For example, Flynn et al. (1992) evaluated a multi-component cigarette-smoking prevention program that included school lessons and mass media exposure within communities. Students participating in the media and school condition reported significant decreases in smoking. These students' mean levels of pro-cigarette attitudes, expectancies, and norms also were significantly lower than those students participating in the school-only condition.

In addition to incorporating other channels of dissemination, programs may differ in who implements the actual lessons. Program implementers may range from teachers (e.g., Botvin, Griffin, & Nichols, 2006), to police officers (e.g., Sloboda, Stephens, Pyakuryal, Teasdale, Stephens, Hawthorne, et al., 2008), to high school students (e.g., Padget et al., 2006). The success of elementary school-based substance use prevention programs may vary depending on who teaches the lessons. Hence, the following research questions were developed:

RQ5: How many programs include school-only or multiple components?

RQ6: How are the programs most frequently delivered (e.g., teacher, police officer)?

Short-Term vs. Long-Term Effects

Another aspect to consider when evaluating the success of elementary-school substance use prevention programs is whether the program exhibits short- and/or long-term effects on the targeted factors. Evaluations vary in their follow-up assessments, with studies conducting post-implementation follow-ups within weeks, months, and years. Collins and Graham (2002) described the impact that temporal designs have in the field of substance use prevention research. The time interval between measurement occasions and the duration of the study may result in undetectable effects. Elementary-school substance use prevention program's temporal designs are likely to play a role in whether evaluation studies find significant program effects. Assessing both short-term and long-term effects are essential to evaluating the success of a program. Consequently, the following research question was developed:

RQ7: What proportion of evaluation studies assesses long-term effects (over 6 month)?

METHOD

This study included a review of substance use prevention programs targeting elementary school students (\leq 6th grade) and includes 30 evaluation studies of 24 elementary school-based substance use prevention programs.

Selection of Journals

The initial list of journals selected for inclusion in the study sample consisted of 25 journals covering the domains of prevention, drug prevention, adolescence, and school. This preliminary list was then checked for 2007 impact factor ratings listed on the Institute for Scientific Information (ISI) Web of Knowledge Journal Citation Reports (JCR). A group of prevention experts then assessed the list of peer-reviewed journals and provided input on including additional journals to search for evaluation studies. The final list of 37 journals¹ was systematically searched for evaluation studies of elementary school-based prevention programs.

Selection of Elementary Substance Use Prevention Programs

Twenty-four elementary-school substance use prevention programs met the inclusion criteria and were included in this review (see Table 1). To be included program inclusion criteria were:

- a. only U.S. programs; and
- b. only programs that explicitly included a school-setting component.

Exclusion criteria were

- a. programs where the school curriculum did not explicitly target substance use prevention;
- b. programs that did not have a formal evaluation published in a peer-reviewed journal.

Some programs were evaluated through multiple studies: this review therefore, included 30 evaluation reports on 24 prevention programs.

Selection of Evaluation Studies

The search for this review covered evaluation studies published in peer-reviewed journals between the years 1980 and 2008. Keywords used as search criteria included: elementary school, substance use, prevention, intervention, and preadolescents. Evaluation study inclusion criteria consisted of:

¹List of journals searched available upon request.

Table 1. Elementary School-Based Substance Use Prevention Programs ($N = 24$)

Program name
1. Adolescent Alcohol Prevention Trial (AAPT)
2. Alcohol Misuse Prevention Study (AMPS)
3. Beginning Alcohol and Addiction Basic Education (BABES)
4. Be a Winner
5. Brain Power
6. Caring School Community (formerly Child Development Project)
7. The Child and Adolescent Trial for Cardiovascular Health (CATCH)
8. Coping Power Program (CPP)
9. Drug Abuse Resistance Education (DARE)
10. Early Risers Skills for Success
11. Good Behavior Game (GBG)
12. Growing Healthy
13. I'm Special
14. Keepin' it REAL (kiR)
15. Linking Families with Teachers (LIFT)
16. Life Skills Training (LST)
17. Positive Action (PA)
18. Protecting You/Protecting Me (PYPM)
19. Raising Healthy Children
20. Say Yes First
21. Skills, Opportunity, And Recognition (SOAR; formerly Seattle Social Development Project)
22. Native American Program
23. Tobacco Prevention Program (TPP)
24. Tobacco Free: An Elementary School Challenge

- a. studies must take place in the United States;
- b. evaluations must cover school curricula for substance use prevention (e.g., evaluations focused only on a parent component were excluded);
- c. evaluations must include students in the 1st through the 6th grades; and
- d. evaluations of 6th grade implementation were included only if 6th grade was part of an elementary school; and
- e. evaluations must measure preadolescent outcomes either on substance use or psychosocial variables related to substance use and attitudes.

Model Program Website Searches

In addition to searching peer-reviewed journals, the search also examined several federal databases covering model prevention programs and used those databases to cross check the included programs and ensure identification of key elementary school model programs. Searched databases included three government websites: the National Registry of Evidence-Based Programs and Practices (NREPP; <http://www.nrepp.samhsa.gov/index.asp>), the National Institute on Drug Abuse (NIDA) website of evidence-based programs (<http://www.drugabuse.gov/Prevention/examples.html>), and an interagency federal youth drug prevention website <http://www.findyouthinfo.gov/AboutUs.aspx>, which lists youth prevention programs by age.

The NREPP database was searched by clicking on the Intervention tab and checking the following inclusion criteria: 1) topics—substance abuse prevention; 2) areas of interest—alcohol, tobacco/smoking, 3) age—6-12 (childhood), 4) experimental design—experimental, quasi-, and pre-experimental. This search yielded 23 interventions, all of which overlapped with programs uncovered through the literature search.

Coding of Evaluation Studies

Once the final number of 30 evaluation studies on 24 programs was identified, four researchers coded independently each for:

- a. prevention program characteristics;
- b. school characteristics; and
- c. sample population characteristics.

Prevention program characteristics included study design (e.g., experimental, quasi-experimental), implementer (e.g., teacher, police officer), whether the intervention demonstrated significant programs effects with respect to substance use outcomes and substance use related psychosocial variables (e.g., ATOD attitudes, knowledge, expectancies), grade level in which the prevention program was implemented, year in which the program was implemented, and length of the follow-up evaluation study (e.g., short-term versus long-term; short-term was defined as less than 6 months). School characteristics coded for included whether

schools were public or private, region of country, urbanicity (urban, suburban, or rural), and number of schools included in the evaluation study. Sample population characteristics included total sample size in the study, and whether the program evaluation targeted a particular high-risk group of preadolescents (e.g., low SES, history of delinquent behavior). The following section reports on findings from the review by four independent coders of 30 evaluation studies on 24 elementary-school substance use prevention programs.

RESULTS

This review included 30 evaluation studies of 24 elementary-school substance use prevention programs. Of these 30 evaluation studies, 17 (57%) were experimental (randomized controlled trial) studies, 7 (23%) were quasi-experimental, 5 (17%) were matched (e.g., by demographics), and 1 (3%) included a control school with no randomization or matching. The following paragraphs describe the results for the seven research questions.

Grade Level and Explicit Drug Information

The first research question sought to determine which grade-level prevention programs targeted most frequently for elementary schools. Among 30 evaluation studies, 57% ($n = 17$) were implemented in 5th grade, 37% ($n = 11$) in 4th grade, 17% ($n = 5$) in 3rd grade, 20% ($n = 6$) in 2nd grade, and 23% ($n = 7$) in 1st grade (see Table 2). Because several programs were implemented at multiple grade levels, the sum is greater than 100%. Here, several programs were introduced in early elementary school, which warrants the second research question, asking what proportion of programs included explicit drug information in their curricula. Of the 24 programs, 58% ($n = 14$) included references to ATOD content in their lessons, 17% ($n = 4$) did not, and 25% ($n = 6$) did not report whether they discussed such issues in their curricula (see Table 3). Several programs such as *Beginning Alcohol and Addiction Basic Education (BABES)*; Abbey, Oliansky, Stilianos, Hohlstein, & Kaczynski, 1990) taught information about alcohol and drugs as early as 2nd grade. In contrast, other programs such as *Protecting You Protecting Me* (Bell et al., 2005b) intentionally designed their curricula to correspond with youths' developmental stage, arguing that youth in early elementary school should only learn about brain function and programs should not introduce information about ATOD's effects on brain function until 5th grade.

Commonly Targeted Psychosocial Factors and Significant Effects

The third research question examined the most commonly targeted psychosocial factors (see Table 3), what proportion of programs demonstrated significant

Table 2. A Summary of the Evaluation Studies ($N = 30$) Design Structure

Program	Data collection	Study design	Grade level	Time of posttest	Target population	Students	Schools	Location
AAPT	NR	Experimental	5th	3 years	Universal	3,077	124	CA
AAPT	NR	Experimental	5th	3 years	Universal	11,995	130	CA
AMPS	1984-1987	Experimental ^a	5th	26 months	Universal	5,000	49	MI
BABES	1990	Experimental	2nd	2 months	Selective	55	2	MI
Be A Winner	1988-1989	Matched	5th	5th	Selective	1,256	13	AR
Brain Power	NR	Quasi-experimental	4th and 5th	2 weeks	Universal	112	2	Washington, DC
CATCH	1991-1994	Multi-center experimental	5th	5th	Universal	6,527	96	CA/MN/LA/TX
Coping Power Program	1997-1999	Experimental	4th, 5th, and 6th	15 months	Selective	183	11	AL
CSC (formerly Child Development Project)	1992-1995	Quasi-experimental	5th and 6th	3 years	Universal	5,500	24	West Coast; South; Southeast; Northeast
CSC	1991-1994	Quasi-experimental	5th and 6th	3 years	Universal	10,805	24	West Coast; South; Southeast; Northeast
DARE	1990	Experimental	5th and 6th	4-6 weeks	Universal	1,584	36	IL

DARE	1999	Control Group	5th and 6th	5th and 6th	Universal	236	1	TN
DARE	1998-1989	Experimental	5th and 6th	5th and 6th	Universal	1,270	20	NC
Early Risers	1997	Experimental	1st-3rd	3 years	Indicated	245	20	MN
Good Behavior Game	1985-1987	Experimental	1st and 2nd	12-13 years	Universal	922	16	MD
Growing Healthy	1982-1983	Quasi-experimental	4th and 5th	4th and 5th	Universal	1,909	74	NR
I'm Special	1980-1986	Quasi-experimental	4th	1-6 years; 5th-12th	Universal	11,892	37	NC
kiR	NR	Experimental	5th	2 months; 1 year	Universal Selective	1,566	23	AZ
LIFT	1991-1994	Experimental	1st and 5th	3 years; 5 years	Universal	671	12	OR
Life Skills	NR	Experimental	3rd-6th	3 months	Universal	1,090	20	NR
Positive Actio	1993-1998	Matched	4th	4th, 8th, and 10th	Universal	3,129	93	FL
PY/PM	1999-2004	Matched	1st-5th	4-6 months	Universal	1,214	9	MT/TX
PY/PM	1999-2000	Matched	1st-5th	5 years	Universal	493	9	MT/TX
Raising Healthy Children	1999-2000	Experimental	1st and 2nd	6-10 years	Universal	959	10	WA

Table 2. (Cont'd.)

Program	Data collection	Study design	Grade level	Time of posttest	Target population	Students	Schools	Location
Say Yes First	1991-1996	Experimental	4th-6th	7th and 8th	Universal	395	4	CO
Say Yes First	2000	Experimental	4th-8th	4 years	Universal	395	1	CO
SOAR (formerly SSDP)	1981-1987	Quasi-experimental	1st	5th and 6th	Universal	177	8	WA
Native American Program	NR	Experimental	3rd-5th	6, 18, 30, and 42 months	Selective	1,199	27	ND/SD/ID/MT/OK
Tobacco Free	1993-1996	Quasi-experimental	4th	6, 12, and 18 months	Universal	440	8	Midwest
Tobacco Prevention Program	NR	Matched	4th	2-4 weeks	Universal	2,139	28	FL

^aMatched to select schools, followed by random assignment at the school level.

Note: NR = not reported.

effects on such factors, and what proportion of programs demonstrated significant effects on actual ATOD use (see Table 4). Among the 24 programs, 42% ($n = 10$) taught lessons on normative education, with an emphasis on correcting misperceptions of ATOD use prevalence rates (i.e., descriptive norms), peer acceptance of ATOD use (i.e., peer injunctive norms), and youths' own evaluation of ATOD use as an acceptable behavior (i.e., personal norms). In addition, 12 out of the 24 programs (50%) taught students information and knowledge about ATOD use, often discussing the negative consequences of engaging in such behaviors. Of the 24 programs, 50% ($n = 12$) taught youth resistance skills. For instance, *keepin' it REAL* (Hecht et al., 2008) instructed youth in how to refuse, explain, avoid, or leave situations when ATOD offers occurred or where ATOD were present. Finally, 17 of the 24 programs (71%) instructed youth in personal development, promoting self-esteem, taking responsibility for one's actions, gaining self-efficacy, and coping strategies. The reviewed programs most often taught these four types of strategies, but programs often taught multiple strategies; therefore, the aforementioned percentages sum to greater than 100%.

Given the types of strategies that the programs taught, research question 3 also asked what proportion of the elementary-school substance use programs demonstrated significant effects on psychosocial factors and actual ATOD use behaviors (see Table 4). Not all programs were designed to address each psychosocial factor or ATOD use behavior; therefore, the denominators refer to the number of programs that specifically included lessons targeting a particular factor.

Of the psychosocial factors, the evaluation studies revealed that many programs significantly impacted youth by increasing negative ATOD attitudes (8/8 programs; 100%), increasing resistance skills (5/7 programs; 71%), improving personal norms (2/2 programs; 100%), increasing ATOD knowledge (6/7 programs; 86%), decreasing descriptive norms (5/7 programs; 71%), and decreasing ATOD use intentions (3/5 programs; 60%). Two out of seven programs had iatrogenic effects on descriptive norms, increasing youths' perceptions of ATOD use prevalence rates (*keepin' it R.E.A.L.* and AAPT). With respect to actual ATOD use behaviors, 56% (15/27 evaluation studies) significantly decreased ATOD use rates and 25% (1/4 programs) significantly delayed the initiation of ATOD use. Two out of four programs had significant indirect effects on ATOD use through improving resistance skills and norms.

Universal versus Selective Programs

To further understand the structure of the elementary school-based substance use prevention programs, the fourth research question inquired as to the proportion of programs targeting a universal audience. The majority of evaluation studies examined a universal program ($n = 24$ studies; 80%), and six studies (20%) evaluated as non-universal programs. Further inspection into the design of the programs led to the fifth and sixth research questions. The fifth research question

Table 3. Components of Elementary School-Based Substance Use Prevention Programs (N = 24 Programs)

Program	Implementer	Components	Program strategies	Drug mention
AAPT	Teacher	School	Normative Education/Resistance Training/ATOD Knowledge	ATOD
AMPS	Teacher	School	Resistance Training/ATOD Knowledge	Alcohol
BABES	NCA-GDA staff member	School/family	Normative Education/Resistance Training/ATOD Knowledge/Personal Development	ATOD
Be A Winner	Police officer	School	Normative Education/Resistance Training/ATOD Knowledge/Personal Development	ATOD
Brain Power	Teacher	School	ATOD Knowledge	ATOD
CATCH	School staff	School/family	Normative Education/ATOD Knowledge	Tobacco
Coping Power Program	Family-school specialist and school guidance counselor	School/family	Resistance Training/ATOD Knowledge/Personal Development	ATOD
CSC (formerly Child Development Project)	Teacher	School/family	Personal Development	None
DARE	Police officer	School	Resistance Training/ATOD Knowledge/Personal Development	ATOD
Early Risers	Teacher	School/family	Personal Development	NR
Good Behavior Game	Teacher	School	Personal Development	None

Growing Healthy	Teacher	School	Personal Development	None
I'm Special	Teacher	School	ATOD Knowledge/Personal Development	ATOD
KiR	Teacher	School	Normative Education/Resistance Training	ATOD
LIFT	Instructors—members of LIFT research staff	School/family	Personal Development	NR
LifeSkills	Teacher	School	Normative Education/Resistance Training/ATOD Knowledge/Personal Development	ATOD
Positive Action	Teacher	School/family	Personal Development	ATOD
PY/PM	Teacher	School	Normative Education/ATOD Knowledge/Personal Development	Alcohol
Raising Healthy Children	Teacher	School/family	Resistance Training/Personal Development	NR
Say Yes First	Teacher	School/family	Normative Education/Resistance Training/ATOD Knowledge/Personal Development	None
SOAR (formerly SSDP)	Teacher	School/family	Personal Development	None
Native American Program	Teacher	School/community	Normative Education/Resistance Training/ATOD Knowledge/Personal Development	ATOD
Tobacco Free	Prevention Specialist and Teachers	School	Normative Education/Resistance Training/ATOD Knowledge	Tobacco
Tobacco Prevention Program	Teacher	School	ATOD Knowledge	Tobacco

Table 4. Significant Intervention Effects on ATOD Related-Outcomes

Significant effects	Yes*	No
Increased negative ATOD attitudes	100% (8/8)	—
Decreased ATOD use	56% (15/27)	44% (12/27)
Increased resistance skills	71% (5/7)	14% (1/7)
Increased descriptive norms (iatrogenic effect)	26% (2/7)	—
Decreased descriptive norms	71% (5/7)	—
Increased less ATOD acceptability	100% (2/2)	—
Decreased ATOD use intentions	60% (3/5)	40% (2/5)
Increased ATOD knowledge	86% (6/7)	14% (1/7)
Decreased ATOD initiation	25% (1/4)	75% (3/4)
Mediator-Resistance skills (i.e., program effects on ATOD use through improving resistance skills)	50% (2/4)	50% (2/4)
Mediator-Norms (i.e., program effects on ATOD use through improving norms)	100% (1/1)	—

*Significant effects were at the $p < .05$ level.

Note: Denominators represent evaluation studies (not programs).

asked how many programs consisted of school-only or multi-component structures, and the sixth research question asked how the programs were delivered. Among 24 programs, 13 (54%) comprised of school-only interventions, 9 (38%) incorporated school and family, one program (4%) included school, family, and the community, and one program (4%) combined school and community. In addition, teachers taught 18 (75%) of the programs' lessons, police officers taught two (8%) programs' lessons, and prevention specialists or trained program personnel taught five (21%) programs' lessons. These percentages do not sum to 100% because several programs included lessons taught by multiple types of implementers.

Short- and Long-Term Evaluations

The last research question asked what proportion of evaluation studies assessed long-term effects (over 6 months). Across the 30 evaluation studies, 19 studies (64%) conducted long-term follow-up assessments 6 months or more after program implementation. Twelve evaluation studies (40%) conducted short-term assessments less than 6 months after implementation. Because several studies conducted both short- and long-term evaluations, these percentages sum to greater than 100%.

DISCUSSION

A prevention paradigm suggests that the optimal time for introducing substance use prevention interventions is *before* the onset of substance use exposure and experimentation. Such an approach implies that elementary-school aged children should be introduced to substance use prevention concepts. The importance of school-based prevention programs targeting *precursors* of substance use has been acknowledged increasingly in the prevention literature (Donovan, Leech, Zucker, Loveland-Cherry, Jester, Fitzgerald, et al., 2004; Spoth, Greenberg, & Turrisi, 2008), including in a recent report by the National Research Council and the Institute of Medicine (2009). The current systematic literature review of elementary-level evaluation studies supports the introduction of school-based substance use prevention programs at the elementary level (i.e., preadolescent age within the school setting).

A substantial proportion of programs demonstrated significant effects on precursors of substance use both short- and long-term evaluation. These precursor effects ranged from increasing negative ATOD attitudes, to strengthening resistance skills, to improving personal norms, to decreasing descriptive norms, and to reducing actual substance use. This review further raises several important considerations that inform strategies for delaying the onset of substance use experimentation among preadolescents. The following discussion relates emerging themes relevant to implementing elementary school-based substance use prevention programs including:

- a. maximizing the advantages that school settings offer as a context for prevention;
- b. understanding elementary prevention programs from a developmental framework;
- c. incorporating beneficial program characteristics (c) watching for potential iatrogenic effects;
- d. examining possible mediators and moderators of program effects;
- e. assessing the durability of effects; and
- f. examining whether universal programs produce general common effects.

Thus, the discussion turns to discussion of ways in which elementary school-based programs can maximize protective effects and minimize iatrogenic effects on preadolescent youth.

Advantages of the School Settings for Prevention

School settings are second only to families in their potential to affect children's substance use attitudes and behavior. School-based programs contribute to youths' successful development by providing nurturance and the opportunity to develop cooperative social relations and social and psychological skills. At

the elementary level, using a school setting ensures reaching a large number of preadolescents. These youth are mandated to attend elementary school; thus, delivery of substance use prevention in schools offers efficient access to large numbers of youth (Botvin et al., 2003).

At the preadolescent stage, family components play a critical role and elementary-school programs can serve to reinforce and complement family interventions (National Research Council and IOM, 2009). In this review, five of the seven elementary-school prevention programs, which included both school and family components demonstrated significant effects on decreases in ATOD use. Nearly half of the elementary-school programs (46%; 11/24) included multiple components combining school and family or school, family, and community prevention interventions.

A Developmental Perspective on Substance Use Prevention

To further develop effective programs, it is essential to understand how developmental and contextual factors at younger ages influence outcomes at older ages. There is increasing recognition that a child's development is powerfully influenced by school contexts (Boyce, Frank, Jensen, Kessler, Nelson, & Steinberg, 1998). Preventive interventions begun early in life may have comparatively stronger effects because of the malleability of several developmental risk factors such as family relationships, peer interactions, cognitive development, and emotion regulation. In response to increasing discussions regarding the nature and timing of potentially effective school programs, a review of the literature on elementary-school programs (Sarvela, Monge, Shannon, & Nawrot, 1999) suggests that a critical time period for implementation occurs between 3rd and 5th grade. Others have cited the "tweener" years—during 5th and 6th grades—as a ripe prevention opportunity (Pasch, Perry, Stigler, & Komro, 2008).

A developmental framework focuses the lens onto whether preadolescents exhibit the readiness for, awareness of, and ability to process substance use prevention messages. In this review of the evaluation studies with significant effects on ATOD use, 10 programs targeted at least 4th grade or later while six programs targeted 3rd grade or earlier. Including explicit drug information as part of curricula is likely beneficial when introduced in later elementary grades (5th grade or older) to avoid the potential for iatrogenic effects. Of programs with significant effects on ATOD use, six referred to ATOD in their lessons, five did not, and two did not report whether explicit drug information was part of the curricula. Among early elementary-school programs (1st–3rd grade) demonstrating significant effects on ATOD-related behaviors, two programs included specific drug information, two did not mention explicit drug information, and two programs did not report whether explicit drug information was

included. Thus, confident conclusions about appropriate grade levels cannot be drawn. We turn to examining program characteristics that distinguished elementary school-based programs.

Program Characteristics

How have elementary school-based programs addressed risk and protective factors? According to the literature, the most promising prevention approaches identified thus far at the preadolescent stage include teaching substance use resistance skills and norm setting in combination with general personal and social skills (Botvin, 2000; Hawkins, Catalano, & Arthur, 2002). From our review of existing evaluation studies, five out of seven evaluation studies that included resistance skills training showed significant effects. The findings, that 17 (70%) of the elementary school programs did not include resistance skills as part of their curriculum, presents an opportunity to include more resistance skills training with preadolescents. Caution, however, must be taken to avoid iatrogenic effects given that in this review, boomerang effects (increased prevalence of perceptions of peer use) were shown in two of seven programs.

A number of programs ($n = 17$) included norm-based concepts in their curricula. Of the eight programs, which addressed personal norms (e.g., ATOD acceptability), all (100%) increased negative ATOD attitudes significantly. Of the seven programs targeting descriptive norms, five significantly decreased perceptions of prevalence rates while two significantly increased perceptions of prevalence rates among youth (iatrogenic or boomerang effect). Finally, among the two programs targeting injunctive norms (peer acceptability of ATOD), those two programs (100%) significantly decreased ATOD acceptability among preadolescents.

The Potential for Iatrogenic Effects

A potential caveat to introducing substance use prevention at the preadolescent period is the unintended consequence that preadolescents may acquire increased perceptions of peer ATOD use (National Research Council and Institute of Medicine [IOM], 2009). For preadolescents, program curricula may benefit from first focusing on resistance skills that illustrate exemplary responses and communication with examples of peer pressure about non-drug related activities, and avoid mention of explicit drug information. This strategy may avoid the potential boomerang effect of increased ATOD descriptive norms. Including only age-appropriate substance use prevention concepts may help implementers avoid the potential pitfall of producing unintended adverse outcomes in relation to ATOD attitudes and expectancies.

Mediators and Moderators

Important elementary school attributes to consider for understanding intervention effects may include moderators (e.g., subgroups) and mediators (i.e., indirect effects on substance use outcomes). The evaluation studies examined two types of mediators, norms and resistance, and three program conditions demonstrated significant mediation on ATOD use (see Table 4). Prevention researchers need to conduct more studies to shed further understanding on possible mediators and the stability of mediation findings.

Potential moderators of program effects on substance use and more importantly, on substance use risk and protective factors at the elementary grade-level, that need further investigation include:

- a. ATOD availability at school or on school grounds (Johnston et al., 2005);
- b. urbanicity of school settings (urban, suburban, or rural);
- c. public versus private designation (Donaldson, Graham, Piccinin, & Hansen, 1995);
- d. counselor availability to counsel and support students at school; and
- e. SES of the average student.

Selective elementary interventions included in this review targeted low-income rural schools, aggressive boys, preadolescents at-risk for conduct problems, Native-American preadolescents, and Mexican-American preadolescents. Other at-risk factors that warrant further investigation are:

- a. early initiation of anti-social, delinquent behaviors in school (including depression);
- b. low SES and living in high crime neighborhoods with daily exposure to drug offers, availability, and violence; and
- c. parental alcoholism or family ATOD use.

Prioritizing precursors or targets for prevention is warranted given that relative strengths of certain risk and protective factors differ. For instance, it has been shown that at the elementary-school level, poor academic achievement in Grades 1 and 2 does not appear to be a stable predictor of teenage drug abuse (Kellam & Brown, 1982) though poor achievement in later grades does. By contrast, aggressive behavior at ages 5 through 7 predicts later drug abuse and, if it continues becomes more strongly predictive of drug abuse with increasing age (Hawkins, Catalano, & Miller, 1992). The *Good Behavior Game* yielded positive effects for aggressive boys at the elementary grade-level. Program characteristics of elementary school programs are aimed at minimizing risk factors for drug abuse such as early aggression while bolstering protective factors such as self-control, emotional awareness, communication, social problem-solving, and academic support.

Durability of Program Effects

An unanswered question among prevention experts remains as to the sustainability of elementary level program effects. Ten of 19 (53%) evaluation studies showed significant long-term (> 6 months) effects. While one of four programs demonstrated significant program effects on delaying onset of drug use (only four programs measured this outcome), at the preadolescent stage more meaningful impacts involve effects on ATOD expectancies, attitudes, norm setting, resistance skills, and personal social competence skills. Among the seven elementary programs that targeted these precursors, a majority (5; 71%) showed significant effects on strengthening resistance skills and on decreasing the acceptability of ATOD. Results thus far point to the potential for long-term effects of elementary-school interventions, but prevention researchers need to conduct further evaluations.

Implications for Future Substance Use Prevention

Prevention interventions implemented during preadolescence provide a great opportunity to impact life trajectories. Targeting precursors to substance use through elementary school-based programs appears effective in bolstering protective factors and minimizing risk factors. Future research should further examine the mechanisms (i.e., mediators) needed to maximize the protective factors and minimize risk factors in the most efficient way possible.

This review primarily focused on school curricula content and whether efforts to date successfully impacted substance use and related psychosocial factors among preadolescents. Indeed, they appear to, as at least some programs showed significant effects through increased negative ATOD attitudes, increased resistance skills, decreased descriptive norms, decreased ATOD acceptability (personal norms), decreased ATOD use intentions, increased ATOD knowledge, and decreased ATOD experimentation. Although the last outcome, decreased ATOD experimentation (onset) demonstrated a more tenuous impact on later substance use, this points to the importance of booster programs to sustain intervention effects.

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