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Reducing the Risks of Alcohol Use among Urban Youth: Three-Year Effects of a Computer-Based Intervention with and without Parent Involvement*

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Abstract

Objective—This study tested a CD-ROM intervention with and without a parent involvement component to reduce risk of alcohol use among an urban sample of early adolescents.

Method—Youths ($N = 514$, mean age 11.5 years at recruitment) were assigned randomly by community site to receive the CD-ROM intervention, the CD-ROM plus parent intervention, or no intervention. All youths completed pretest, posttest and three annual follow-up measurements. After pretesting, youths and parents received their respective interventions.

Results—Main effects of the intervention and for measurement occasion as well as interaction effects of the intervention by measurement occasion were seen for substance use and related outcomes. Over time, youths in all 3 groups reported increased use of alcohol, tobacco and marijuana; youths who received the interventions reported smaller increases than control youths. At 3-year follow-up, alcohol use was lower for CD-ROM plus parent intervention youths than for CD-ROM only youths, who, in turn, reported less use than controls. Cigarette use was lower for youths in either intervention group than in the control group at posttest and at 1-, 2- and 3-year follow-ups. Marijuana use was lower for youths in either intervention than for controls at 1-, 2- and 3-year follow-ups. Youths in both intervention groups outperformed control youths at posttest and at 1- and 3-year follow-ups on levels of negative and peer influence toward substance use. Finally, at the 3-year follow-up, youths in the CD-ROM plus parent intervention group reported more family involvement in their alcohol use prevention efforts than did youths in the CD-ROM group, who, in turn, reported more positive levels of family involvement than youths in the control group.

Conclusions—Study findings modestly support the CD-ROM intervention with and without the parent intervention to reduce alcohol use risks among urban early adolescents.

Considerable research has been invested in discovering effective approaches to prevent alcohol use among American youth. Most approaches use theory-driven principles to help young people resist peer pressure, offset media influences, debunk myths, correct normative beliefs, increase positive bonding and control stress—all toward preventing alcohol use and misuse. The bulk of prevention programs interactively engage youths in schools and other aggregate group contexts; fewer but no less effective alcohol use prevention programs employ mass media or seek community or environmental change (Gruenewald et al., 1993; Perry et al., 1996; Wagenaar et al., 1999). Alcohol use prevention is becoming a mature science. To advance that science, new research must find reliable, inexpensive and effective ways to deliver prevention programs.

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Nearly all prevention programs today are delivered by teachers or other youth services professionals. Following a long pedagogic tradition, the live delivery of prevention programs is the preferred means for imparting information. It also allows intervention agents to adapt programs to particular contexts and constituencies. But live program delivery constrains the dissemination of science-based approaches. Limits on the available time of trained professionals restrict the number of prevention program replications. Moreover, professionals of differing backgrounds, capacities and motivations can cause unwelcome variations in program fidelity. The labor intensity of live prevention programs increases their cost, further constraining their reach and dissemination. Better methods for delivering alcohol use prevention programs are needed.

A promising venue for prevention program delivery is computer technology. Computer-based interventions are portable and cost-effective, and their novelty and game-like appearance appeal to youths. Branched programming allows content tailoring to meet youths' cultural-, age- and gender-specific prerogatives. Animation, audio tracks, multiple menu choices and high-speed graphics sustain youths' interest. Computers are ideal for imparting and discussing sensitive information (Paperny, 1997; Paperny et al., 1990). In addition, all respondents receive the same information, allowing consistent delivery over repeated administrations. Finally, computer programs can concurrently collect, aggregate and analyze information, making data available for quick and objective interpretation.

Still in their infancy, computer-delivered programs are beginning to emerge. Some have been subjected to careful research and found effective. The Body Awareness Resource Network (BARN), for example, is a computer program for adolescents and addresses alcohol and other drug use, sexuality, smoking, AIDS and stress management (Bosworth et al., 1994). After 2 years, youths exposed to the BARN program were less likely to engage in risk-taking behaviors than unexposed control youths. Other studies also show the promise of interactive computer programs for helping children and youth learn and apply prevention material (Bosworth et al., 1998; Gropper et al., 1995; Schinke et al., 1994; Thomas, 1991).

Their promise notwithstanding, computer interventions need theory-driven, carefully controlled longitudinal work before they are ready for widespread application. The present study begins to address this need. Drawing from social learning theory, problem behavior theory and family interaction theory, the study crafted an intervention for youth, which was subsequently programmed onto CD-ROM. Recognizing the role of family members in alcohol and other substance misuse prevention, the study developed a parent intervention aspect to enhance the effects of the CD-ROM.

According to learning theory, such factors as modeling and reinforcement of alcohol-related cognitions, attitudes and beliefs influence young people to drink. Youths are particularly susceptible to perceived norms. In one large study, perceived norms accounted for 33% to 38% of the variance in adolescent alcohol use (Roski et al., 1997). Modeling by family and peers influences adolescent substance use. Drinking among youths may be related to attaining a desired self-image that includes feelings of maturity, independence, sexuality and sociability. If peers respond favorably, young drinkers may continue drinking because the behavior is functional (Chassin et al., 1989, 1990). The media also play a role by depicting alcohol use as powerful, glamorous and successful. Social learning theory further suggests that behavior is determined and mediated by self-efficacy (Bandura, 1986). That self-efficacy is linked to health practices argues for its relevance to theoretically guide alcohol misuse prevention (Bandura, 1994; Maibach et al., 1991). The prevention program developed for the present study addresses social influences and self-efficacy. By including character modeling, norms correction, refusal skills and self-efficacy strategies, the program reflects this theory.

Problem behavior theory explains why teens engage in deviant acts (Jessor and Jessor, 1977). According to this theory, early alcohol use results from an interaction of personal, behavioral and environmental factors (Epstein, 1992). Underage drinking is a component of a lifestyle that includes a variety of deviant behaviors and may reflect underlying characteristics of rebelliousness and motivations for short-term gratification. This theory suggests that youths find deviance functional because it helps them achieve personal goals. For example, alcohol use may increase popularity and acceptance among one's peers. Although deviant behavior is difficult to prevent if it is functional, that functionality is vitiated when teens have alternative, positive ways of achieving goals. Accordingly, the intervention in the present study incorporated personal management skills to help youths handle situations that could lead to alcohol use. Further, the program helped youths set and achieve goals, manage their time and deal with disappointment and frustration.

Family interaction theory guided development of the parent intervention aspect of the study. Family interaction theory integrates social learning theory, attachment theory, psychoanalytic theory and deviant behavior proneness (Brook et al., 1990). According to family interaction theory, youths' emotional attachment to their parents, social learning and intrapersonal characteristics influence substance use. Parent-adolescent relationships and adolescent personality and behavior shape adolescent drinking directly and through their influence on adolescent peer relations. This theory describes how parent-child dynamics during adolescence might contribute to later alcohol use and misuse. Informed by family interaction theory, the parent intervention in this study sought to prevent underage drinking by increasing youths' attachment to parents and by enhancing parents' awareness and support of the program objectives, components and strategies.

Method

Sample and setting

Study participants were 514 youths, ages 10 to 12 years (mean [SD] = 11.5 [0.53]) at the time of recruitment. The sample was 51.4% female; and 54% black, 30% Hispanic, 11% white and 5% Asian or other ethnic-racial group. All youths spoke English; 11.5% of Hispanic youths' parents preferred speaking Spanish. Youths were recruited from 43 New York City, New Jersey and Delaware community agencies offering such services as recreation, after-school programs and social services. Through notices and announcements at collaborating sites, youths were informed of the study's requirements, procedures and risks. Youths received assent forms in English, and their parents received consent statements in English and Spanish to read and complete.

Procedure

Informed and assenting youths who had parental consent were pretested, and collaborating sites were stratified by geography and ethnic-racial background of the youth population served. Randomly within strata, sites were divided among three study groups: CD-ROM intervention, CD-ROM plus parent intervention and control. Following delivery of the respective interventions to youths and to parents in the first two groups, all youths completed posttests. Three annual follow-up measurements were administered beginning 1 year after posttesting. Youths in both intervention groups and parents in the parent intervention group received booster sessions between follow-up measurements. As incentives for completing posttest and follow-up measurements, youths received coupons for small purchases at clothing, music and toy stores.

Measurement

Outcome measures covered the following variables:

Tracking items—Youths reported demographic and contact information for themselves, their families and three persons not in their households who always knew how to reach them. At each data collection after pretest, youths confirmed and updated tracking items.

Family involvement—Youths reported the extent to which their parents were involved in family discussions, monitoring and rule setting regarding their children's alcohol use, and youths described their access to alcohol in their households, obtained with or without parental permission (Perry et al., 1996). An illustrative question was: "How many times have your parents talked to you about not drinking alcohol in the last MONTH?" Test-retest reliabilities across family involvement items ranged from 0.82 to 0.93. To create a single score, all items from the family involvement measure were averaged into a composite value.

Peer influences—Youths responded to items on their peer network, including the number of their closest friends who drink, smoke, use drugs and have been drunk; perceptions of the influence peers have on their drinking and other substance use; and youths' ability to resist negative peer influences and to positively shape their friends' behavior (Centers for Disease Control and Prevention, 1999; Oetting et al., 1994). An example was, "How hard would it be for you to say 'No' to a friend who offered you beer or alcohol?" Youths responded by selecting a scaled answer (in the example given, the range was from "Very hard" to "Very easy"). Test-retest reliability for peer influences items averaged 0.84.

Substance use—Youths reported their alcohol and other substance use by responding to such questions as: "During the past MONTH, how many times have you had a drink of beer or alcohol?" Scaled responses allowed youths to indicate the specific range of occurrences (Centers for Disease Control and Prevention, 1999; Oetting et al., 1994). Test-retest data for substance use questions ranged from 0.78 to 0.94.

To ease administration and facilitate youths' comprehension of questions and completeness of answers, all items were Likert-scaled with four to six response categories. Youths completed pretest measures at collaborating sites. Posttest and follow-up measures occurred by telephone and online. In telephone administrations, youths were sent response booklets without questions to increase confidentiality. Research assistants read the questions, and youths referred to the booklet for their answers. Online administration took place via a secure website. Youths received user names and passwords, and, whenever convenient within a window of time, completed and transmitted their questionnaires to a secure database.

Intervention

Youths in the intervention groups completed 10 sessions, each 45-minutes long, of a prevention program delivered by CD-ROM. Grounded in social learning and problem behavior theories, the program covered goal setting, coping, peer pressure, refusal skills, norm correcting, self-efficacy, problem solving, decision making, effective communication and time management. The program employed instruction and skills practices of problem-solving steps to help youths assimilate information on avoiding alcohol. Each session began with skill-specific objectives for youths to meet in order to advance to the next session. Navigating through an edgy urban landscape, youths encountered simulated yet realistic obstacles and distractions depicted by animated characters similar to their age, gender and ethnic-racial background. To successfully maneuver through each session, youths applied problem-solving steps of Stop, Options, Decide, Act and Self-Praise.

Applying the Stop step, youths paused, defined problems and identified their responsibility in solving problems related to alcohol use and other personal issues. With the second step, Options, youths generated, considered and evaluated alternative solutions to problems. For the

Decide step, youths chose the solution they considered best for the situation. In Act, the fourth step, youths witnessed (through the actions of animated characters) the consequences of their chosen solution. When youths chose the correct solution, they saw the positive results of their decision making. If they chose incorrectly, youths witnessed the negative consequences of the poor decision and were rerouted to the original list of options. Youths then worked through the Decide and Act steps until the correct option was chosen and the positive consequence obtained. With Self-Praise, youths rewarded themselves for practicing the problem-solving steps. Self-Praise gave youths a predictable reward when they correctly problem solved, regardless of consequences.

Booster sessions reinforced previously covered subject matter and introduced new areas that required use of the problem-solving steps and other initial intervention material. Each 30-minute booster session, delivered via CD-ROM, began with a review of the intervention components. Youths were then exposed to developmentally appropriate information indexed to theoretically and empirically supported risks for alcohol use and misuse. Topics included peer pressure, especially from dating partners, media influences, greater access to alcohol and increased amounts of unsupervised time. Intervention youths completed booster sessions at the community agency through which they were originally recruited, in their home or school or at the investigators' office, according to individual preferences and scheduling.

During initial CD-ROM intervention sessions, youths were observed as they completed the program. Booster intervention fidelity was assessed by a code generated at the end of the session. Codes were recorded by research staff when the session was completed under supervision and were reported by youth when they completed boosters on their own.

The initial parent intervention, delivered concurrently with the youth intervention, was presented as a 30-minute videotape and print materials. Produced in English and Spanish, the videotape acquainted parents with the goals and nature of the youth intervention, demonstrated how parents could help their children integrate intervention content to avoid problems with alcohol and explained and illustrated the value of family rituals, rules and bonding in the service of alcohol use prevention. Parents were sent two newsletters with child management tips. For watching the videotape, parents received movie and food coupons.

A 2-hour workshop—also available in English and Spanish—constituted the first parent intervention booster session. Delivered between the 1st- and 2nd-year follow-up measurements, the workshop reviewed and expanded material introduced in the videotape and offered parents an intimate forum to discuss problems with their adolescents regarding alcohol and related topics. Parents received a take-home manual, were given exercises to complete with their children and returned a postcard reporting on the exercise. For attending the workshop, parents received a certificate of completion and were reimbursed for transportation.

The second parent booster session occurred between the 2nd- and 3rd-year follow-up measurements. For this booster session, parents interacted with expressly designed CD-ROM programs that engaged them and their research participant child in gender-specific content on how adolescent girls and boys can reduce their risks for alcohol use and misuse. The CD-ROM program required parents and their participating child to interact not only with the content but also, and more importantly, with each other around gender-specific topics (e.g., how girls may be pressured by boyfriends to drink; how boys may influence one another to drink toward proving their masculinity).

Fidelity of initial intervention for parents was assessed when parents called a toll-free number after viewing the videotape and completed a brief questionnaire on its content. Booster session fidelity was assessed as parents were monitored for their workshop attendance and involvement

and for their completion of the interactive CD-ROM with their adolescent children who were also study participants.

Results

Attrition rates at the 3-year follow-up for the CD-ROM intervention, the CD-ROM plus parent intervention and the control groups were 7.9%, 11.8% and 6.7%, respectively. Analyses of pretest scores of those who did or did not complete the follow-up failed to show differences.

Intervention delivery data from observations, parent reports and monitoring revealed consistently high levels of fidelity in both intervention groups. In the CD-ROM intervention and the CD-ROM plus parent intervention, 95% and 91% of youths, respectively, completed both the initial and booster interventions. As for parents, 163 (83%) watched the videotape, 131 (67%) attended the workshop and 155 (79%) completed the interactive CD-ROM exercise with their adolescent children.

Analyses of pretest data failed to show differences between groups on any outcome variable. Repeated measures MANOVA were subsequently performed. Beginning with family involvement outcomes, these analyses found significant main effects for intervention ($F = 34.94$, 2/1,320 df, $p < .001$) and for measurement occasion (time) ($F = 418.24$, 4/5,280 df, $p < .001$) and intervention by time interactions ($F = 60.79$, 8/5,280 df, $p < .001$). Results of comparisons within time measurements and across measurement occasions within study group for family involvement and all outcomes are reported in Table 1.

On the family involvement variable, youths in CD-ROM plus parent intervention group had higher (better) scores than youths in the control group at posttest and at 2-year follow-up. Both intervention groups scored higher than controls at the 1-year follow-up. By the 3-year follow-up, youths who received CD-ROM plus parent intervention performed better than did those who received the CD-ROM intervention alone, who in turn outscored the control youths. Over time, family involvement scores increased from pretest to final follow-up for both intervention groups, whereas the scores for the control youths were stable.

Comparisons of peer influence outcomes revealed significant main effects for intervention ($F = 35.70$, 2/1,316 df, $p < .001$) and time ($F = 34.93$, 4/5,264 df, $p < .001$) and intervention by time interactions ($F = 21.21$, 8/5,264 df, $p < .001$). Youths in either intervention group scored lower than control youths in their susceptibility to peer influences at posttest and at 1- and 3-year follow-ups. Peer influence data 2 years after posttest showed that the CD-ROM plus parent intervention youths outscored CD-ROM-only youths who outscored control youths. From pretest to 3-year follow-up, peer influence outcomes improved (i.e., scores decreased) in both intervention groups while these outcomes worsened (i.e., scores increased) in the control group.

For alcohol use in the past 30 days, main effects were seen for intervention ($F = 25.85$, 2/1,316 df, $p < .001$) and time ($F = 80.20$, 4/5,264 df, $p < .001$) and for interactions of the two ($F = 14.43$, 8/5,264 df, $p < .001$). Youths in either intervention group reported less monthly alcohol use than control youths at posttest and at 1- and 2-year follow-ups. At the 3-year follow-up, youths who received the CD-ROM plus parent intervention reported less monthly alcohol use than youths who received the CD-ROM intervention only, who themselves reported less use than control youths. Reports of 30-day alcohol use by all groups rose from pre-test to final follow-up, but the rise was less marked for youths who received either intervention than for control youths over the 3-year measurement period. Unlike youths in the intervention groups, those in the control group reported steadily greater use of alcohol at every measurement after pretesting.

Analyses of youths' self-reported cigarette use during the past 30 days found main effects for intervention ($F = 103.37$, 2/1,316 df, $p < .001$) and time ($F = 47.96$, 4/5,264 df, $p < .001$) and for intervention by time interactions ($F = 9.28$, 8/5,264 df, $p < .001$). Cigarette use was lower among youths receiving either intervention than among control youths at posttest and at 1-, 2- and 3-year follow-ups. Over time, cigarette use reports increased in all three groups, with the greatest rises by control youths.

Reported marijuana use in the past 30 days also differed by intervention ($F = 131.88$, 2/1,316 df, $p < .001$) over time ($F = 62.18$, 4/5,264 df, $p < .001$) and by interactions of intervention by time ($F = 9.34$, 8/5,264 df, $p < .001$). Marijuana use was less for youths who received the CD-ROM plus parent intervention than for control youths at posttest. At 1-, 2- and 3-year follow-up measurements, reported 30-day marijuana use was lower in both intervention groups than in the control group. Although all three groups of youths reported more use of marijuana with time, youths in the control group reported greater marijuana use with each measurement occasion following the posttest.

Discussion

These study findings suggest the value of the computer-based intervention alone and combined with the parent involvement intervention to reduce risks of alcohol and other substance use among urban adolescents. Relative to their control counterparts and 3 years after initial program delivery, youths who received either intervention reported lower rates of monthly alcohol, cigarette and marijuana use, less negative peer influence and stronger family involvement. Albeit substance use rates rose across the sample from pre-test to final follow-up, rates of increase were lower for youths who received either intervention than for control youths who received no intervention. The parent involvement intervention appeared to exert greatest effects by the 3-year measurement. At that time, youths in the CD-ROM plus parent intervention group reported higher levels of family involvement to help them avoid problems with alcohol, and these youths reported less alcohol use in the past 30 days relative to youths who received only the CD-ROM intervention, who had better outcomes on these variables than control youths.

Interaction effects of intervention by data collection occasion were witnessed for every measured outcome. Because early adolescents increase their experimentation with and use of tobacco, alcohol and illicit drugs over time, such increased substance use is not surprising. Most substance use prevention programs, therefore, seek to delay the onset of use or to reduce the incidence of use. In our study, although all youths reported increased substance use over time, control youths reported greater alcohol use in the past 30 days with each measurement following the pretest occasion. In contrast, intervention youths did not report increased use over pretest levels until the 2-year follow-up, suggesting early and salubrious intervention effects.

Notwithstanding the potential benefits of computer-based programs for reducing alcohol use problems among adolescents, our program was long, demanding a total of 7.5 hours for initial intervention delivery, plus added time for booster sessions. This time commitment arguably puts demands on youths and those who administer programs, offsetting somewhat the attraction, engagement and ease of delivery associated with computer programs. Yet the minimal involvement of professional staff in delivering the program equates considerable time and cost savings for organizations that offer a science-based CD-ROM prevention program.

The study has notable flaws. These include self-report measures, low rates of parent participation, relatively small outcome differences and analyses at the individual rather than at the site level. Self-reported data, inherently limiting conclusions in most substance use prevention trials, could be positively biased for intervention youths if, relative to control youths,

they were more inclined to regard themselves as benefitting from study participation. The parent involvement rates in this study, although high by the standards of related interventions, evince the challenges of engaging mothers and fathers who face multiple competing demands on their time. Outcome differences among the three groups were statistically significant but of relatively small magnitude, likely because these youths have yet to enter the high-risk years for drinking. Last, despite collaborating community agency sites serving as the units of randomization, their numbers were too few to allow tests of site-level data. Since most youths had attenuated relationships with the community site through which they were recruited, site membership would not appear to account for a great deal of variance, especially at the 3-year follow-up.

Its limitations notwithstanding, the study augurs well for computer interventions. The CD-ROM intervention was portable and inexpensive, and it demanded and realized high levels of completion, consistency and fidelity. Partially delivered by videotape and newsletters, the parent intervention also proved easy to implement. The study suggests the advantages of using community sites rather than schools to recruit youths and to deliver prevention programming. Not having to structure intervention and measurements around tight school schedules and being freed of the negative atmosphere that can sometimes attend urban schools were clear benefits.

Computer interventions, still in their nascence, require additional research. Future studies could explore the merits of creating single interventions with multiple branching options. These options could address the individual prerogatives of youths from different ethnic-racial, geographic and socioeconomic backgrounds, all within the same product. Growing access to the Internet and high bandwidth transmission will expand the range and sophistication of computer-based programs. Research that compares live delivery to computer-mediated approaches is also called for. Perhaps our modest study will encourage others to advance the young science of computer interventions for the ultimate benefit of American youth and those who serve them.

References

- Bandura, A. *Social Foundations of Thought and Action: A Social Cognitive Theory*. Upper Saddle River, NJ: Prentice-Hall; 1986.
- Bandura, A. Social cognitive theory and exercise of control over HIV infection. In: DiClemente, R.J.; Peterson, J.L., editors. *Preventing AIDS: Theories and Methods of Behavioral Interventions*. New York: Plenum Press; 1994. p. 25-59.
- Bosworth K, Espelage D, DuBay T. A computer-based violence prevention intervention for young adolescents: Pilot study. *Adolescence* 1998;33:785-795. [PubMed: 9886006]
- Bosworth K, Gustafson DH, Hawkins RP. The BARN System: Use and impact of adolescent health promotion via computer. *Comput Human Behav* 1994;10:467-482.
- Brook JS, Brook DW, Gordon AS, Whiteman M, Cohen P. The psychosocial etiology of adolescent drug use: A family interactional approach. *Genet Social Gen Psychol Monogr* 1990;116:111-267.
- Centers for Disease Control and Prevention. Youth Risk Behavior Surveillance System. 1999. (available at: <http://www.cdc.gov/nccdphp/dash/yrebs/index.htm>)
- Chassin L, Presson CC, Sherman SJ. "Constructive" vs. "destructive" deviance in adolescent health-related behaviors. *J Youth Adolesc* 1989;18:245-262.
- Chassin L, Presson CC, Sherman SJ. Social psychological contributions to the understanding and prevention of adolescent cigarette smoking. *Pers Social Psychol Bull* 1990;16:133-151.
- Epstein LH. Role of behavior theory in behavioral medicine. *J Cons Clin Psychol* 1992;60:493-498.
- Gropper M, Liraz Z, Portowicz D, Schindler M. Computer integrated drug prevention: A new approach to teach lower socioeconomic 5th and 6th grade Israeli children to say no to drugs. *Social Work Hlth Care* 1995;22 (2):87-103.

- Gruenewald PJ, Ponicki WR, Holder HD. The relationship of outlet densities to alcohol consumption: A time series cross-sectional analysis. *Alcsm Clin Exp Res* 1993;17:38–47.
- Jessor, R.; Jessor, SL. *Problem Behavior and Psychosocial Development: A Longitudinal Study of Youth*. San Diego, CA: Academic Press; 1977.
- Maibach E, Flora JA, Nass C. Changes in self-efficacy and health behavior in response to a minimal contact community campaign. *Hlth Commun* 1991;3:1–15.
- Oetting, ER.; Beauvais, F.; Edwards, R. *The American Drug and Alcohol Use Survey*. Fort Collins, CO: Rocky Mountain Behavioral Science Institute; 1994.
- Paperny DM. Computerized health assessment and education for adolescent HIV and STD prevention in health care settings and schools. *Hlth Educ Behav* 1997;24:54–70.
- Paperny DM, Aono JY, Lehman RM, Hammar SL, Risser J. Computer-assisted detection and intervention in adolescent high-risk health behaviors. *J Pediat* 1990;116:456–462. [PubMed: 2308041]
- Perry CL, Williams CL, Veblen-Mortenson S, Toomey TL, Komro KA, Anstine PS, McGovern PG, Finnegan JR, Forster JL, Wagenaar AC, Wolfson M. Project Northland: Outcomes of a communitywide alcohol abuse prevention program during early adolescence. *Amer J Publ Hlth* 1996;86:956–965.
- Roski J, Perry CL, McGovern PG, Williams CL, Farbakhsh K, Veblen-Mortenson S. School and community influences on adolescent alcohol and drug use. *Hlth Educ Res* 1997;12:255–266.
- Schinke SP, Moncher MS, Singer BR. Native American youths and cancer risk reduction: Effects of software intervention. *J Adolesc Hlth* 1994;15:105–110.
- Thomas BS. Computer-assisted decision making: A strategy for primary prevention of substance abuse. *J Pediat Hlth Care* 1991;5:257–263.
- Wagenaar AC, Gehan JP, Jones-Webb R, Toomey TL, Forster JL, Wolfson M, Murray DM. Communities mobilizing for change on alcohol: Lessons and results from a 15-community randomized trial. *J Commun Psychol* 1999;27:315–326.

Table 1

Youths' scores on outcome variables¹ by group and measurement occasion

	Pretest (<i>n</i> = 514)		Posttest (<i>n</i> = 514)		1 year (<i>n</i> = 513)		2 years (<i>n</i> = 452)		3 years (<i>n</i> = 469)	
	Mean	(SD)	Mean	(SD)	Mean	(SD)	Mean	(SD)	Mean	(SD)
Family involvement ²										
CD	2.2 _A	(0.12)	2.2 _{a,b,A}	(0.10)	2.3 _{a,A,B}	(0.83)	2.3 _{a,b,A,B}	(0.89)	2.4 _{a,B}	(0.51)
CD and parent	2.2 _A	(0.19)	2.3 _{a,b,A,B}	(0.08)	2.4 _{a,B}	(0.65)	2.4 _{a,B}	(0.64)	2.6 _{b,C}	(0.44)
Control	2.1 _A	(0.08)	2.1 _{b,A}	(0.08)	2.2 _{b,A}	(0.82)	2.2 _{b,A}	(0.91)	2.2 _{c,A}	(0.73)
Peer influence										
CD	3.7 _A	(0.27)	3.7 _{a,A}	(0.16)	3.7 _{a,A}	(0.69)	3.8 _{a,A}	(0.89)	3.2 _{a,B}	(0.60)
CD and parent	3.8 _A	(0.26)	3.7 _{a,b,A,B}	(0.14)	3.6 _{a,B}	(0.75)	3.6 _{b,B}	(0.77)	3.2 _{a,C}	(0.55)
Control	3.7 _A	(0.17)	3.8 _{b,A,B}	(0.14)	3.8 _{b,A,B}	(0.76)	3.9 _{c,B,C}	(0.74)	3.9 _{b,B,C}	(0.63)
Alcohol, past 30 days										
CD	0.7 _A	(0.18)	0.8 _{a,b,A,B}	(0.33)	0.8 _{a,b,A,B}	(0.16)	0.9 _{a,B,C}	(0.38)	1.0 _{a,C}	(0.22)
CD and parent	0.7 _A	(0.21)	0.7 _{a,A}	(0.32)	0.8 _{a,b,A,B}	(0.14)	0.9 _{a,B}	(0.19)	0.9 _{b,B}	(0.17)
Control	0.7 _A	(0.17)	1.0 _{b,B}	(0.31)	1.2 _{b,C}	(0.24)	1.4 _{b,D}	(0.41)	1.6 _{c,E}	(0.34)
Cigarettes, past 30 days										
CD	0.6 _A	(0.22)	0.7 _{a,b,A,B}	(0.07)	0.7 _{a,b,A,B}	(0.13)	0.8 _{a,B,C}	(0.36)	0.9 _{a,C}	(0.28)
CD and parent	0.6 _A	(0.32)	0.6 _{a,A}	(0.12)	0.7 _{a,b,A,B}	(0.09)	0.7 _{a,b,A,B}	(0.12)	0.8 _{a,b,C}	(0.20)
Control	0.7 _A	(0.17)	0.8 _{b,A,B}	(0.05)	0.9 _{b,B}	(0.38)	1.2 _{b,C}	(0.50)	1.3 _{b,C,D}	(0.53)
Marijuana, past 30 days										
CD	0.5 _A	(0.02)	0.6 _{a,b,A,B}	(0.04)	0.7 _{a,b,C}	(0.07)	0.7 _{a,B,C}	(0.27)	0.8 _{a,C}	(0.21)
CD and parent	0.5 _A	(0.16)	0.5 _{a,A}	(0.09)	0.6 _{a,b,A,B}	(0.04)	0.7 _{a,B}	(0.11)	0.7 _{a,B}	(0.19)
Control	0.6 _A	(0.16)	0.7 _{b,A}	(0.06)	0.9 _{b,B}	(0.07)	1.2 _{b,C}	(0.34)	1.4 _{b,D}	(0.37)

¹ Notes: Unless noted otherwise, lower scores are better.

² Higher scores are better. Means with different lowercase subscripts differ at $p < .05$ by Scheffé post hoc comparisons across groups within measurement occasions. Means with different uppercase subscripts differ at $p < .05$ by Scheffé post hoc comparisons across measurement occasions within groups.