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Brief Image-based Health Behavior Messages for Adolescents and Their Parents

Chudley (Chad) Werch, PhD [Professor and Director],

Addictive & Health Behaviors Research Institute, University of Florida, 6852 Belfort Oaks Place, Jacksonville, Florida, 32216, USA, Tel: (904) 281-0726, Fax: (904) 296-1153

Michele J. Moore, PhD [Associate Professor], and

Department of Public Health, University of North Florida, 4567 St. Johns Bluff Road, South, Jacksonville, Florida, 32224, USA

Carlo C. DiClemente, PhD [Professor and Chair]

Department of Psychology, University of Maryland Baltimore County, 1000 Hilltop Circle, Baltimore, Maryland, 21250, USA

Chudley (Chad) Werch: cwerch@hhp.ufl.edu

Abstract

This study tested the efficacy of brief image-based print mediated parent/caregiver and adolescent messages integrating physical activity with alcohol use avoidance. A total of 684 high school students were randomly assigned to either the parent postcard or adolescent flyer arm, with baseline and four-month post-intervention data collections. A significant repeated measures interaction (group $\times$ time) was found ($F(4,344)=2.48, p=.04$), with univariate tests showing less alcohol use frequency and problems ($p's<.05$) among adolescents exposed to parent materials. Repeated measures factorial MANOVAs for group $\times$ time $\times$ prior current drug use were significant, with drug using adolescents receiving parent print messages showing less alcohol initiation and frequency, and marijuana initiation and frequency ($p's<.05$). Very brief print materials sent to parents/caregivers may hold some promise for influencing substance use among adolescents, particularly those already using drugs.

Keywords

Brief; image; health behavior; print; parents; adolescents

Introduction

Adolescence is a developmental period in which multiple behavioral risk factors are often established, and contribute to the leading causes of morbidity and mortality among youth and adults. For example, youth risk surveillance data from the Centers for Disease Control and Prevention (Grunbaum, et al., 2004) indicate that numerous high school students engage in behaviors related to the primary causes of death among 10–24 year olds, including 44.9% having drunk alcohol, 30.2% riding with a driver who had been drinking alcohol, and 22.4% having used marijuana in the past 30 days. In addition, many high school students engage in risk behaviors related to the major causes of death among those older than 24 years, including 21.9% smoking cigarettes in the past month, and 33.4% not participating in a

sufficient amount of physical activity (Grunbaum, et al., 2004). Combined, these data indicate the critical need for effective interventions which target multiple risk behaviors among adolescents.

Research on brief interventions (BIs) has been widely reported in the literature (Dunn, Deroo, & Rivara, 2001; Heather, 2002; Miller, & Wilbourne, 2002), with a number of systematic reviews concluding that they are low cost and effective in reducing drug and alcohol consumption (Dunn, Deroo, & Rivara, 2001; Miller, & Wilbourne, 2002; Bien, Miller, & Tonigan, 1993; Tait, & Hulse, 2003; Wutzke, Shiell, Gornell, & Conigrave, 2001). Others have stated that the inherent advantages of BIs make them particularly well suited for translating research into public health and clinical practice (Werch, et al., 2006). While brief interventions exist primarily as interpersonal contacts (Lock, 2004), they can also be administered using print communication. In this later approach, print “mediated” BIs involve contact with participants through a range of possible materials, including letters, pamphlets, newsletters, magazines, booklets, or postcards (Agostinelli, Brown, & Miller, 1995; Collins, Carey, & Sliwinski, 2002; Hodgins, Currie, & el-Guebaly, 2001; Kreuter, et al., 2000). Some of the anticipated benefits of print media include: 1) relatively low cost per contact, 2) ability to reach large numbers of individuals, 3) can cue self-initiated change, 4) minimizes time barriers, and 5) can be reused and kept as a reference (Napolitano & Marcus, 2002).

Studies have shown that print messages are efficacious in promoting short-term physical activity in volunteer samples (Owen, et al., 1987; Marcus, et al., 1998a; Marcus, et al., 1998b; Marshall, et al., 2003a), and have done equally well or outperformed website and telephone delivered interventions for promoting exercise (Humpel, et al., 2004; Marcus, et al., 1998c; Marshall, et al., 2003b). Meanwhile, a number of alcohol and drug prevention programs have used brief print strategies within multi-component programs targeting adolescents or their parents (Perry, et al., 1993; Rohrbach, et al., 1994; Simons-Morton, Hartos & Beck, 2004; Werch, et al., 2000a). While relatively rare, studies examining the effects of stand-alone print materials suggest they can influence substance use risk and protective factors, and show promise for reducing alcohol and other drug use (Carlson, et al., 2000; Young, Kersten & Werch, 1996). Whether or not print messages by themselves can significantly influence adolescent substance use or other health habits directly, or via parent targeted materials, has yet to be fully answered. We know of no studies to date examining brief print mediated messages developed to uniquely address the co-morbidity of adolescent alcohol use and lack of physical activity.

Meanwhile, a number of studies have identified image as an important factor in the onset and maintenance of adolescent substance use (Amos, et al., 1997; Gray, Amos & Currie, 1997; Slovic, Finucane, Peters, & MacGregor, 2002). The use of personal and social images is conceptually founded in Social Cognitive Theory (Bandura, 1986) and, more recently, the Behavior-Image Model (BIM) (Werch, Accepted for publication) which postulates that image-based benefit (i.e., gain) and costs (i.e., loss) framed messages activate prototypes and future self-images integrating health promoting and health risk behaviors. Two recent randomized trials of Project Sport, a brief multiple behavior intervention linking physical activity to alcohol use avoidance using salient adolescent images, showed that the image-based intervention resulted in significant modification of exercise and substance use among participating middle and high school students when compared to control students (Werch, et al., 2003; 2005). While Project Sport consists primarily of a one-on-one tailored consultation, the initial trial indicated that the addition of parent print materials appeared to have enhanced adolescent outcomes and increased parent-youth communication (Werch, et al., 2003). Meanwhile, results from both trials of Project Sport showed that the brief

intervention had larger effects among adolescents who used alcohol or drugs prior to intervention.

The current study was designed to test the effects of brief stand-alone image-based print messages based on Project Sport and targeting adolescents and their parents. Specifically, the objectives of this study were to first, test the efficacy of print mediated parent/caregiver and adolescent materials integrating physical activity and other health promoting behaviors with alcohol use avoidance for adolescents, and second, examine the potential role of prior drug use on moderating intervention effects.

Methods

Participants

In fall 2003, a total of 684 adolescents from a suburban high school in the northeast Florida region were recruited to participate in this study. In order to limit the sample size yet still get a representative sample of students, we decided to recruit predominantly from 9th and 11th grade classes, using formal presentations regarding the study aims, procedures, benefits and risks. A total of 66% of adolescents (n=704) attending targeted classes were recruited into the study, of which 97% participated in the baseline data collection.

Half of participating students were Caucasian (49.6%), one-fifth (21.2%) were African American, and the remaining (29.3%) were from all other ethnic groups combined. The majority of subjects were female (56.0%), with a mean age of 15.24 years (SD=1.09). Most were from the 9th (48.2%) and 11th grades (45.6%). A little over one-tenth (12.7%) of participating students were enrolled in the free or reduced cost lunch program. Nearly one in four (38.7%) reported having a family member with an alcohol or drug problem, and a majority of fathers (60.3%) and mothers (53.0%) drank alcohol at least a few times a year. Lastly, just over 60 percent (60.9%) of adolescents had some alcohol or drug education within the last year. These students were demographically similar to those who participated in the Project Sport multi-behavior health intervention trial reported earlier (Werch, et al., 2005).

Design and Procedure

A randomized control trial was conducted, with participating students stratified by grade level and randomly assigned to either the parent postcard or adolescent flyer arm. Parents of adolescents in the parent/caregiver postcard arm were mailed a series of three postcards cueing parent-youth communication regarding fitness promotion and alcohol avoidance, while adolescents in the flyer arm were mailed a series of three flyers pairing commercial quality images of healthy and active youth with brief, fitness promotion and alcohol avoidance messages. Preliminary parent and adolescent health materials were developed based on the Project Sport intervention reported elsewhere (Werch, et al., 2005; 2003), and pre-tested on a sample of parents and youth, respectively. Both content and format changes were made to enhance acceptability and feasibility based on feedback collected from parents and adolescents.

Baseline data were collected at the beginning of the fall 2003 semester, and post-intervention data were collected 4-months after the implementation of the program during spring 2004 semester. All outcome data were collected from participating students assembled by classroom in the school auditorium by trained project staff following a standardized data collection protocol. The research protocol was approved by the University of North Florida's institutional review board (lead author's previous employer) prior to implementing the study, and included that all students submit signed written assent as well as signed parental consent prior to participation in the study.

Interventions

Parent/Caregiver Postcards—Three Parent/Caregiver Postcards, with information adopted from the Project Sport consultation (Werch, et al., 2005), were mailed to the parents, guardians or caregivers of participating adolescents. These 8.5 × 11 inch one-sided postcards requested that the parent/caregiver take a few minutes to read and talk about each of four Health and Fitness Facts found on the card with their son/daughter, which was designed to help promote healthy choices among youth. Content provided gain framed (i.e., benefits) messages related to targeted health promoting behaviors, including exercise, nutrition, and sleep/rest, and loss framed (i.e., costs) messages related to using alcohol, supported by Prospect Theory (Rothman & Salovey, 1997). Specifically, parents/guardians were asked to remind their sons/daughters that engaging in health promoting behaviors, including exercise, good eating habits, and adequate sleep/rest results in the attainment of desirable images, while drinking alcohol interferes with the achievement of favorable images. Postcards were mailed one per week, with an introductory letter from the project coordinator preceding card distribution. Each card was endorsed and signed by the project director, and included an accompanying postage paid comment card for parents/caregivers to mail back their reactions to each set of Health and Fitness Facts. Parents/caregivers returning all three comment cards were provided a surprise incentive consisting of a family gift pass for a local theme park.

Adolescent Fitness Flyers—Three Adolescent Fitness Flyers were mailed to participating adolescents, with one flyer sent per week, paralleling the administration of the Parent Postcards. These 8.5 × 11 inch two-sided flyers paired commercial quality positive visual images of healthy and active youth with brief, fitness/health promotion and alcohol avoidance messages. Flyers included messages promoting exercise, nutrition and sleep/rest habits, along with alcohol avoidance messages, similar to but considerably briefer than those found in the Parent Postcards. However unlike the Parent Postcards, the flyers emphasized professional quality, appealing illustrations of youth engaged in physical activity, with models equally representing both males and females, and various major ethnic groups in the study (Whites, Blacks, other ethnic backgrounds). Prevention messages were carefully integrated within the illustrations so as not to detract from the visual images on the flyers. An introductory letter from the project coordinator preceded the flyers and asked adolescents to take a few minutes to carefully look at each visual image and read the message on the flyer. Each flyer was accompanied by a feedback form and self-addressed, postage paid envelope to mail back their reactions to each of the flyers. Adolescents returning all three completed forms were given a surprise incentive consisting of a coupon to play miniature golf at a local theme park.

Measures—The Youth Alcohol and Health Survey (Werch, 2000) was used to collect data on alcohol and drug consumption, risk factors associated with alcohol use, and exercise habits. Slightly different versions of this instrument, along with standardized procedures for implementing the measures, have been used in a number of randomized preventive intervention trials to measure both primary and secondary substance use outcomes (Werch, et al. 1996a; Werch, et al. 1996b; Werch, et al. 2000a; Werch, et al. 2000b).

Alcohol consumption was measured by items adapted from previous substance abuse prevention research (Botvin, et al. 1984; Eggert, et al. 1994; Ellickson & Hays, 1991; Johnson, et al. 1990). Measures used for this study's analysis included items assessing 30-day frequency and quantity of alcohol use; heavy episodic alcohol use, defined as consuming 5 or more drinks in a row during the last 30 days; 13 items measuring negative consequences (problems) experienced during drinking ($\alpha=.99$); and length of time using alcohol (ranging from "30 days or less" to "six months or more.") In addition, a measure of

the stage of initiation of alcohol use was developed from previous stage research and theory (Prochaska & DiClemente, 1983; Werch, et al. 1993; Werch & DiClemente, 1994; Werch, 2001). Adaptations of these items have been found to produce robust and replicable categorical classifications of behavioral stages (DiClemente, 2001; Prochaska & DiClemente, 1983). This item had seven response categories, reflecting advances in staging the initiation of alcohol consumption (Werch, 2001), ranging from a strong precontemplation stage (will never try alcohol) to a maintenance stage (drinking for longer than 6 months).

Drug use measures included 30-day frequency of cigarette smoking and 30-day frequency of marijuana use, which were like the alcohol frequency measure. Measures of cigarette and marijuana stage of initiation were also taken, which were similar to the measure of alcohol use initiation. Measures of moderate and vigorous physical activity were collected, adopted from the Youth Risk Behavior Survey (Centers for Disease Control and Prevention [CDC], 2002). These items measured 7-day participation in *vigorous physical activity* (at least 20 minutes of sweating and breathing hard) and *moderate physical activity* (at least 30 minutes with no sweating or breathing hard).

Cognitive, social and environmental factors found to influence alcohol consumption were also measured. These measures reflected key constructs from Social Cognitive Theory (Bandura, 1986), Behavioral Self-Control Theory, (Kanfer, 1975) and Social Bonding Theory (Hirschi, 1969). Measures of risk factors were previously tested to ensure adequate internal reliability of scales and have been described in detail in prior prevention research reports (Werch, et al., 1996a; 2000a; 2003). They included behavioral capability, resistance self-efficacy, self-control behaviors, lifestyle/value incompatibility, perceived susceptibility, parental monitoring, and parent-child alcohol communication. Lastly, a number of socio-demographic measures were collected and are reported in Table 1.

Even though a number of studies have shown that self-reports by adolescents accurately represent their substance use (Del Boca & Darkes, 2003; Wallace & Bachman, 1993; Williams, Toomey, McGovern, Wagenaar, & Perry, 1995; Wills & Cleary, 1997), we used multiple procedures to ensure the most reliable and valid data for this study. First, trained research staff used standardized protocols to ensure continuity in data collection procedures. Second, participants were thoroughly informed regarding issues of confidentiality, including the use of code numbers on survey instruments; that no individual data would be shared with parents, teachers, or other school personnel, and that questionnaires would be sealed in boxes upon completion of the data collection and locked in file cabinets. Third, participants were informed that all research staff would be required to sign an affidavit stating that they will not disclose the identity of any of the research participants to anyone outside of the research project. Fourth, participants were asked to turn their questionnaires over on their desks immediately upon completion, to further protect the confidentiality of participant data and to help put participants at ease.

Intervention Fidelity—A total of 65% of parents/caregivers reported they received at least one postcard, while 53% reported they received all three postcards, as indicated by returned comment cards which accompanied parent postcards. Similarly, 70% of adolescents reported they received at least one flyer, while 59% reported they received all three flyers, as indicated by returned feedback forms which accompanied flyers. These data show that approximately equal proportions of parents and adolescents reported receiving all three of the print materials. Due to the extremely brief nature of the intervention, only those parents and adolescents reporting having received all of the print materials were included in the analysis as having received the full intervention.

Of those parents/caregivers returning comment cards, 95% reported talking to their son/daughter about the postcards, and 98% would recommend the cards (maybe yes or yes) to other parents/caregivers. Meanwhile, of adolescents returning feedback forms, 91% agreed or strongly agreed that they liked the flyers, and 85% would recommend the flyer to others. Combined, these data suggested that the materials and messages were generally perceived as acceptable and useful by participating parents and adolescents.

Data Analysis

Descriptive statistics including frequencies, percentages, means and standard deviations were generated to describe the sample. Baseline measures were compared by experimental group using chi-square tests for categorical data, and independent t-tests for continuous scores. Intervention fidelity and attrition analyses were conducted using chi-square and independent samples t-tests. To take into account baseline scores, repeated measures MANOVAs were used to examine outcome measures, and factorial repeated measures MANOVAs were conducted to examine the interaction effects of prior drug use (past 30-day marijuana and/or cigarette use) by experimental group on health behavior outcomes.

Results

Baseline and Attrition Analyses

Adolescents assigned to the parent postcard group had fewer two-parent living situations (54.1%) than adolescents assigned to the fitness flyers (58.7%), $p=.03$. Adolescents assigned to the parent postcard group had more fathers (79.4%) and mothers (63.1%) who drank alcohol than adolescents assigned to the fitness flyers (72.4%, 53.7%, respectively), $p's<.05$. No differences were found between groups on any measures of adolescent alcohol, drug use, or exercise behaviors ($p's>.05$).

At four-month post-intervention, 94% of participants were successfully followed up. Attrition did not differ significantly across experimental conditions, with 8% of adolescents receiving parent postcards and 5% of adolescents receiving flyers not completing the postintervention data collection. In addition, no significant differences existed between those participants returning all three parent contact cards or fitness feedback forms and those returning less than three, on all alcohol, drug and exercise behaviors ($p's>.05$). Two significant interaction effects were found between experimental group and whether or not all three parent comment cards/fitness forms were returned, on baseline 30-day cigarette frequency, $F(1,678)=6.39$, $p=.01$, and alcohol consequences, $F(1,668)=4.18$, $p=.04$, with participants returning less than all three fitness forms reporting the greatest smoking and alcohol problems, compared to those returning all three fitness forms or parent comment cards.

Outcome Analysis

Table 1 shows the estimated marginal means of outcome measures by experimental group and time. A significant overall repeated measures group x time interaction was found for alcohol behaviors ($F(4,344)=2.48$, $p=.04$), with univariate tests showing significantly less alcohol use frequency and problems over time ($p's<.05$) among adolescents exposed to parent versus adolescent print materials. While the omnibus test for alcohol risk factors was not significant ($p=.17$), univariate group x time interactions were found for self-control behaviors ($F(1,215)=4.67$, $p=.03$) and parent monitoring ($F(1,215)=4.18$, $p=.04$), with self-control and parent monitoring increasing over time for adolescents receiving parent materials.

Outcomes by Drug Use Status—Table 2 shows the estimated marginal means of outcome measures by experimental group, time, and baseline current drug use. Overall repeated measures factorial MANOVAs for group $\times$ time $\times$ prior current (past 30-day) drug use were significant for alcohol behaviors, alcohol initiation, drug behaviors, and drug initiation (p 's $<.05$). Univariate tests indicated that drug using adolescents receiving parent print messages showed less alcohol frequency ($F(1,342)=11.57$, $p=.001$), alcohol initiation ($F(1,327)=8.26$, $p=.004$), marijuana frequency ($F(1,358)=5.61$, $p=.01$), and marijuana initiation ($F(1,296)=13.84$, $p=.000$) over time, compared to adolescents receiving fitness flyers. In addition, while not significant, a similar pattern was found for all other measures of alcohol use and problems, as well as cigarette initiation and frequency, with reductions seen among drug using adolescents who received parent postcards. No interaction effects were found for either of the exercise behaviors, although a pattern indicated slight increases in vigorous physical activity for both drug using and non-drug using adolescents receiving fitness flyers, and moderate physical activity for non-drug users receiving fitness flyers.

Discussion

This research is the first to examine brief stand-alone print messages developed to address the co-morbidity of adolescent alcohol use and lack of physical activity. Results indicated that three parent postcards may have reduced the frequency of alcohol consumption and alcohol problems among adolescents over time. These findings were supported by data showing that parent materials increased adolescent frequency of alcohol self-control behaviors, and parent monitoring of youth. Our initial study examining the effects of Project Sport also found that image-based parent postcards enhanced adolescent alcohol self-control (Werch, et al., 2003), suggesting that self-control may be one of the key mechanisms by which these messages are mediated. Results from the current and previous research (Werch, et al., 2003) support the contention that brief print materials also appear to enhance parent behaviors, including monitoring of their adolescent's whereabouts and friends, or communication about alcohol avoidance with their youth. Other parents, however, may be opting to simply give the materials to their adolescents to read, instead of discussing it with them or altering their youth monitoring habits.

While the outcome from the parent materials were positive, they were considerably less extensive than those seen resulting from a recent face to face consult providing similar image-based communication (Werch, et al., 2005). Research by Bauman and colleagues (2002), however, suggests that more extensive family targeted print-based interventions mailed directly to homes can have a considerable impact on adolescent substance use. It may be that the parent/caregiver materials used in the present study were too brief to affect a larger impact. However, even multicomponent interventions using print materials appear to have had limited success in increasing physical activity among adolescents (Prochaska, et al., 2005; Prochaska & Sallis, 2004), indicating the challenges faced with attempting to increase exercise among youth. Further research is needed to examine the effects of variations on the number, types, and targeted behaviors of print materials for parents and caregivers on adolescents. In addition, studies directly comparing the same imagebased content, but administered in different formats including adolescent and parent/caregiver print materials, face-to-face communication, and even computer-based approaches, are needed to enhance our understanding of the role of varying modes of image-based communication on impacting multiple behavior outcomes. Lastly, print communication targeting family members, as well as adolescents directly, should be examined as adjuncts to other brief or existing interventions for enhancing and extending intervention effects.

The behavior outcomes seen in this study appear to be moderated by prior substance use, with those adolescents using marijuana and/or cigarettes prior to intervention more likely to

be positively affected by parent postcards. Specifically, youth currently using drugs who received the brief parent materials appeared to reduce alcohol use initiation and frequency, as well as marijuana use initiation and frequency. Similar patterns, although not significant, were seen for all other alcohol use measures, as well as for all cigarette use measures. The finding that brief image-based materials may be particularly efficacious for adolescents who need intervention the most is supported by our previous research (Werch, et al., 2003; 2005). Combined, these studies indicate that both print and interpersonal formats of health communication using image to link health promoting and health risk behaviors may hold particular promise as selective prevention strategies for high risk drug using adolescents.

One of the more interesting findings of this study was the positive effects found on marijuana use, and to a lesser extent cigarette use, among drug using youth exposed to parent postcards, given that neither substance were directly addressed in the print materials. Similar, although somewhat stronger, cigarette and marijuana effects were found in our previous investigation of the Project Sport consultation (Werch, et al., 2005). Together, these two studies of brief communication using salient images to couple physical activity (a health promoting behavior) and alcohol use (a health risk behavior) suggest that adolescents may extrapolate image-based information to other health risk behaviors, including marijuana and cigarette consumption. Further research should explore to what extent overtly addressing additional behavior couplings in image-based interventions might enhance multiple behavior outcomes. For example, addressing how binge drinking or smoking cigarettes interferes with the attainment of desirable images associated with being a physically fit and active young person might further activate salient images linking targeted behaviors, thereby enhancing motivation and readiness to change substance use and exercise behaviors.

Fitness flyers were found to have no significant effect on the outcome measures of participating adolescents over time. Aside from the obvious targeted audience difference, there were two additional key differences between the parent postcards and the fitness flyers which may account for this. First, fitness flyers emphasized visual images to portray exercise gain messages, unlike the parent postcards which contained no illustrations and instead addressed exercise gains by text. Second, the flyers contained very limited narrative content to communicate gain and loss messages linking physical activity and alcohol use, compared to the parent postcards which presented a considerable amount of written content. It may be that the flyers simply contained too little content to communicate salient images. In addition, it is possible that using visual models is a more complicated approach for communicating concrete ideas (Messaris, 1996) such as personal and social images associated with health habits, than the use of words.

This study had a number of limitations to be considered in lieu of the results. One limitation was that both of the communication strategies studied consisted of only three pieces of print material. As such, they are considered brief even by print communication standards. However, even with only three parent/caregiver postcards, significant effects were found suggesting that additional materials could possibly increase intervention strength, resulting in additional outcomes. This study also lacked a true control condition. The reductions in alcohol use and problems, improvements in self-control and parental monitoring, and declines in alcohol and marijuana initiation and use among drug users over time for those adolescents exposed to parent materials, however, are highly unlikely to have occurred without successful intervention. Another concern was with the relatively low number of participants, both adolescents and parents/guardians, who reported reading all print materials as indicated by returned feedback surveys. Unfortunately, due to time and financial constraints, we did not employ aggressive follow-up methods found useful in ensuring high response rates in previous studies (Bauman, et al., 2002; Werch, et al., 2003). The study was

also limited to a single suburban high school. While these final two limitations raise questions about the generalizability of the findings to other adolescents, they do not detract from the finding that positive outcomes were indicated for those youth receiving brief parent/caregiver materials, and that these effects appeared even stronger for drug using youth most in need of intervention.

In conclusion, this study found that as few as three image-based print mediated messages mailed to parents and caregivers may positively influence adolescent alcohol use and for adolescents currently using drugs, successfully impact both alcohol and marijuana initiation and use. While the cost of implementing face to face image-based consultations has been estimated to be relatively low (Werch, et al., 2005), the expense for implementing a similar print version of the Project Sport intervention would most likely be even less. Meanwhile, a print version of Project Sport could be easily translated to school, health care, home, and community settings, thereby having the potential to reach very large numbers of adolescents as a stand-alone strategy, or as an add-on component to other existing prevention and health promotion programs. Future studies are needed to determine the acceptability and efficacy of an expanded edition of print materials based on Project Sport administered to a more diverse population of high risk adolescents.

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References

- Agostinelli G, Brown JM, Miller WR. Effects of normative feedback on consumption among heavy drinking college students. *Journal of Drug Education* 1995;25(1):31–40. [PubMed: 7776148]
- Amos A, Gray D, Currie C, Elton R. Healthy or druggy? Selfimage, ideal image and smoking behavior among young people. *Social Science Medicine* 1997;45(6):847–858. [PubMed: 9255917]
- Bandura, A. *Social Foundations of Thought and Action: A Social Cognitive Theory*. New Jersey: Prentice-Hall; 1986.
- Bauman KE, Ennett ST, Foshee VA, Pemberton M, King TS, Koch GG. Influence of a family-directed program on adolescent cigarette and alcohol cessation. *Prevention Science* 2002;3(1):35–42. [PubMed: 12002557]
- Bien TH, Miller WR, Tonigan S. Brief interventions for alcohol problems: A review. *Addiction* 1993;88:315–336. [PubMed: 8461850]
- Botvin GJ, Baker E, Botvin E, Filazzola A, Millman R. Prevention of alcohol misuse through the development of personal and social competence: a pilot study. *Journal of Studies on Alcohol* 1984;45:550–552. [PubMed: 6521482]
- Carlson JM, Moore MJ, Pappas DM, Werch CE, Watts GF, Edgemon PA. A pilot intervention to increase parent-child communication about alcohol avoidance. *Journal of Alcohol and Drug Education* 2000;45(2):59–70.
- Centers for Disease Control and Prevention. CDC Surveillance Summaries, June 28, 2002. *MMWR* 2002;51(SS–4)
- Collins SE, Carey KB, Sliwinski MJ. Mailed personalized normative feedback as a brief intervention for at-risk college drinkers. *Journal of Studies on Alcohol* 2002;63(5):559–567. [PubMed: 12380852]
- Del Boca FK, Darkes J. The validity of self-reports of alcohol consumption: State of the science and challenges for research. *Addiction* 2003;98(2):1–12. [PubMed: 14984237]
- DiClemente CC. Il processo di cambiamento. *Italian Heart Journal* 2001;2(S-1):1–5.

- Dunn C, Deroo L, Rivara TP. The use of brief interventions adapted from motivational interviewing across behavioral domains: A systematic review. *Addiction* 2001;96:1725–1742. [PubMed: 11784466]
- Eggert LL, Thompson EA, Herting JR, Nicholas LJ, Dicker BG. Preventing adolescent drug abuse and high school dropout through an intensive school-based social network development program. *American Journal of Health Promotion* 1994;8(3):202–215. [PubMed: 10172017]
- Ellickson PL, Hays RD. Beliefs about resistance self-efficacy and drug prevalence: Do they really affect drug use? *International Journal of the Addictions* 1991;25:1353–1378. [PubMed: 2132718]
- Gray D, Amos A, Currie C. Decoding the image-consumption, young people, magazines and smoking: An exploration of theoretical and methodological issues. *Health Promotion Research* 1997;12(4): 505–517.
- Grunbaum J, Kann L, Kinchen S, Ross J, et al. Youth Risk Behavior Surveillance. Morbidity and Mortality Weekly Report 2004;53(SS-2):1–95.
- Heather N. Effectiveness of brief interventions proved beyond reasonable doubt. *Addiction* 2002;97:293–294. [PubMed: 11964102]
- Hirschi, T. Causes of Delinquency. Berkeley, CA: University of California Press; 1969.
- Hodgins DC, Currie SR, el-Guebaly N. Motivational enhancement and self-help treatments for problem gambling. *Journal of Consulting and Clinical Psychology* 2001;69(1):50–57. [PubMed: 11302277]
- Humpel N, Marshall AL, Iverson D, Leslie E, Owen N. Trial of print and telephone delivered interventions to influence walking. *Preventive Medicine* 2004;39:635–641. [PubMed: 15313106]
- Johnson CA, Pentz MA, Weber MD, Dwyer JH, Baer N, MacKinnon DP, et al. Relative effectiveness of comprehensive community programming for drug abuse prevention with high-risk and low-risk adolescents. *Journal of Consulting and Clinical Psychology* 1990;58:447–456. [PubMed: 2212182]
- Kanfer, F. Self-management methods. In: Kanfer, F.; Goldstein, A., editors. *Helping People Change: A Textbook of Methods*. New York, NY: Pergamon Press; 1975.
- Kreuter MW, Lezin NA, Yung LA. Evaluating communitybased collaborative mechanisms: Implications for practitioners. *Health Promotion Practice* 2000;1(1):49–63.
- Lock CA. Screening and brief alcohol interventions: What, why, who, where and when? A review of the literature. *Journal of Substance Use* 2004;9(2):91–101.
- Marcus BH, Bock B, Pinto B, Forsyth L, Roberts M, Traficante R. Efficacy of an individualized, motivationally-tailored physical activity intervention. *Annals of Behavioral Medicine* 1998a;20(3): 174–180. [PubMed: 9989324]
- Marcus BH, Emmons K, Simkin-Silverman L, Linnan L, Taylor E, Bock B, et al. Evaluation of motivationally tailored vs. standard self-help physical activity interventions. *American Journal of Health Promotion* 1998b;12(4):246–253. [PubMed: 10178617]
- Marcus BH, Owen N, Forsyth LH, Cavill NA, Fridinger F. Physical activity interventions using mass media, print media, and information technology. *American Journal of Preventive Medicine* 1998c; 15(4):362–378. [PubMed: 9838978]
- Marshall AL, Bauman AE, Owen N, Booth ML, Crawford D, Marcus BH. Population-based randomizes controlled trial of a stage-targeted physical activity intervention. *Annals of Behavioral Medicine* 2003a;25(3):194–202. [PubMed: 12763714]
- Marshall AL, Leslie ER, Bauman AE, Marcus BH, Owen N. Print versus website physical activity programs. *American Journal of Preventive Medicine* 2003b;25(2):88–94. [PubMed: 12880874]
- Messaris, P. Visual “literacy” in cross-cultural perspective. In: Kubey, R., editor. *Media Literacy in the Information Age*. Somerset, New Jersey: Transaction Publishers; 1996. p. 135–162.
- Miller WR, Wilbourne PL. Mesa Grande: A methodological analysis of clinical trials of treatments for alcohol use disorders. *Addiction* 2002;97:265–277. [PubMed: 11964100]
- Napolitano MA, Marcus BH. Targeting and tailoring physical activity information using print and information technologies. *Exercise and Sport Sciences Reviews* 2002;30(3):122–128. [PubMed: 12150571]
- Owen N, Lee C, Naccarella L, et al. Efficacy of an individualized, motivationally-tailored physical activity intervention. *Journal of Sport Psychology* 1987;9:174–180.

- Perry CL, Williams CL, Forster JL, Wolfson M, Wagenaar AC, Finnegan JR, et al. Background, conceptualization, and design of a community-wide research program on adolescent alcohol use: Project Northland. *Health Education Research* 1993;8:125–136. [PubMed: 11067180]
- Prochaska J, DiClemente CC. Stages and processes of self-change of smoking: Toward an integrative model of change. *Journal of Consulting and Clinical Psychology* 1983;51(3):390–395. [PubMed: 6863699]
- Prochaska JJ, Sallis JF. A randomized controlled trial of single versus multiple health behavior change: Promoting physical activity and nutrition among adolescents. *Health Psychology* 2004;23(3):314–318. [PubMed: 15099173]
- Prochaska JO, Velicer WF, Redding C, Rossi JS, Goldstein M, DePue J, et al. Stage-based expert systems to guide a population of primary care patients to quit smoking, eat healthier, prevent skin cancer, and receive regular mammograms. *Preventive Medicine* 2005;41:406–416. [PubMed: 15896835]
- Rohrbach LA, Hodgson CS, Broder BI, Montgomery SB, Flay BR, Hansen WB, et al. Parental participation in drug abuse prevention: Results from the Midwestern Prevention Project. *Journal of Research on Adolescence* 1994;4(2):295–317.
- Rothman AJ, Salovey P. Shaping perceptions to motivate healthy behavior: The role of message framing. *Psychological Bulletin* 1997;121(1):3–19. [PubMed: 9000890]
- Simons-Morton BG, Hartos JL, Beck KH. Increased parent limits on teen driving: Positive effects from a brief intervention administered at the motor vehicle administration. *Prevention Science* 2004;5(2):101–111. [PubMed: 15134315]
- Slovic, P.; Fincane, ML.; Peters, E.; MacGregor, DG. The affect heuristic. In: Gilovich, T.; Griffin, D.; Kahneman, D., editors. *Heuristics and Biases: The Psychology of Intuitive Judgment*. New York, NY: Cambridge University Press; 2002. p. 397–420.
- Tait RJ, Hulse GK. A systematic review of the effectiveness of brief interventions with substance using adolescents by type of drug. *Drug and Alcohol Review* 2003;22:337–346. [PubMed: 15385228]
- Wallace, JM., Jr; Bachman, JG. Validity of self-reports in student based studies on minority populations: issues and concerns. In: De La Rosa, MR.; Adrados, JR., editors. *Drug Abuse Among Minority Youth: Advances in Research and Methodology*. Rockville, MD: NIDA Research Monograph; 1993. p. 167–200.
- Werch, CE. The Youth Alcohol and Health Survey. Jacksonville, Fla: University of North Florida. Center for Drug Prevention Research; 2000.
- Werch CE. Preventive alcohol interventions based on a stages of acquisition model. *American Journal of Health Behavior* 2001;25(3):206–216. [PubMed: 11322619]
- Werch C, Anzalone D, Brokiewicz L, Felker J, Carlson J, Castellon-Vogel E. An intervention for preventing alcohol use among inner-city middle school students. *Archives of Family Medicine* 1996a;5:146–152. [PubMed: 8620255]
- Werch C, Carlson J, Pappas D, DiClemente CC. Brief nurse consultations for preventing alcohol use among urban school youth. *Journal of School Health* 1996b;66(9):335–338. [PubMed: 8959593]
- Werch CE, Carlson JM, Pappas DM, DiClemente CC, Carbonari JP. Evaluation of a brief alcohol prevention program for urban school youth. *American Journal of Health Behavior* 2000a;24(2):120–131.
- Werch CE, Carlson JM, Pappas DM, Edgemon P, Watts G, DiClemente CC. Effects of a brief alcohol preventive intervention for youth attending school sports physical examinations. *Substance Use & Misuse* 2000b;35(3):421–432. [PubMed: 10714454]
- Werch CE, DiClemente CC. A multi-component stage model for matching drug prevention strategies and messages to youth stage of use. *Health Education Research: Theory & Practice* 1994;9(1):37–46.
- Werch CE, Grenard JL, Burnett J, Watkins JA, Ames S, Jobli E. Translation as a function of modality: The potential of brief interventions. *Evaluation & the Health Professions* 2006;29(1):89–125.
- Werch C. The behavior-image model: A paradigm for integrating prevention and health promotion in brief interventions. *Health Education Research*. (Accepted for publication).

- Werch CE, Meers BW, Farrell J. Stages of drug use acquisition among college students: Implications for the prevention of drug abuse. *Journal of Drug Education* 1993;23(4):375–386. [PubMed: 8145114]
- Werch CE, Moore MJ, DiClemente CC, Bledsoe R, Jobli E. A multi-health behavior intervention integrating physical activity and substance use prevention for adolescents. *Prevention Science* 2005;6(3):213–226. [PubMed: 16133900]
- Werch CE, Moore MJ, DiClemente CC, Owen DM, Jobli E, Bledsoe R. A sport-based intervention for preventing alcohol use and promoting physical activity among adolescents. *Journal of School Health* 2003;73(10):380–388. [PubMed: 14727390]
- Williams CL, Toomey T, McGovern P, Wagenaar AC, Perry CL. Development, reliability, and validity of self-report alcohol-use measures with young adolescents. *Journal of Child and Adolescent Substance Abuse* 1995;4:17–40.
- Wills TA, Cleary SD. The validity of self-reports of smoking: analysis by race/ethnicity in a school sample of urban adolescents. *American Journal of Public Health* 1997;87:56–61. [PubMed: 9065227]
- Wutzke SE, Shiell A, Gomel MK, Conigrave KM. Cost effectiveness of brief interventions for reducing alcohol consumption. *Social Science & Medicine* 2001;52:863–870. [PubMed: 11234861]
- Young M, Kersten C, Werch CE. Evaluation of a parent-child drug education program. *Journal of Drug Education* 1996;26(1):57–68. [PubMed: 8991969]

Table 1

Estimated Marginal Means of Health Behaviors by Group and Time

Measures	Parent Postcards n=182				Fitness Flyers n=202				p-value [*]
	Pretest		Posttest		Pretest		Posttest		
	Mean	Std Err	Mean	Std Err	Mean	Std Err	Mean	Std Err	
Alcohol Behaviors									
	F= 2.48 df 4,344 p=.04								
30-Day Alcohol Frequency	0.63	0.08	0.55	0.08	0.48	0.08	0.68	0.08	.01
30-Day Alcohol Quantity	0.86	0.11	0.90	0.12	0.66	0.10	1.00	0.11	.07
30-Day Alcohol Heavy Use	0.22	0.05	0.21	0.06	0.20	0.05	0.30	0.05	.17
Alcohol Problems	1.66	0.19	1.40	0.20	1.23	0.18	1.72	0.19	.009
Alcohol Initiation									
	F= 0.56 df 2,331 p=.57								
Length of Alcohol Use	1.99	0.10	2.10	0.11	1.91	0.10	2.08	0.10	.61
Alcohol Initiation	3.38	0.16	3.52	0.17	3.12	0.15	3.47	0.17	.29
Drug Behaviors									
	F= 1.89 df 2,359 p=.15								
30-Day Cigarette Frequency	0.51	0.09	0.47	0.10	0.22	0.09	0.40	0.09	.10
30-Day Marijuana Frequency	0.50	0.09	0.52	0.10	0.23	0.08	0.42	0.09	.13
Drug Initiation									
	F= 1.40 df 2,298 p=.24								
Cigarette Stage of Initiation	1.57	0.10	1.63	0.12	1.45	0.09	1.76	0.11	.10
Marijuana Stage of Initiation	1.75	0.12	1.97	0.15	1.58	0.11	1.85	0.14	.79
Exercise Behaviors									
	F= 1.35 df 2,355 p=.26								
Vigorous Physical Activity	3.38	0.18	3.92	0.18	3.80	0.17	3.90	0.17	.10
Moderate Physical Activity	4.29	0.20	4.40	0.19	4.84	0.19	4.82	0.18	.69
Alcohol Risk Factors									
	F= 1.48 df 7,209 p=.17								
Behavioral Capability	4.48	0.17	4.0	0.18	4.42	0.17	4.67	0.18	.09
Self-Control	19.65	0.33	19.38	0.37	19.79	0.32	20.72	0.36	.03
Parent/Child Alcohol Communication	9.67	0.29	9.11	0.31	9.63	0.28	9.61	0.30	.23
Resistance Self-Efficacy	5.49	0.27	5.20	0.27	5.63	0.26	5.73	0.26	.30
Lifestyle/Value Incompatibility	3.78	0.15	3.94	0.15	3.94	0.15	4.25	0.15	.48
Perceived Susceptibility	3.64	0.14	3.82	0.15	3.77	0.14	3.86	0.15	.67
Parent Monitoring	4.8	0.21	3.84	0.20	4.12	0.21	4.21	0.19	.04

Higher mean score = higher risk

* p value by Time $\times$ Assignment

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Table 2

Estimated Marginal Means of Health Behaviors by Group x Current Drug Use** x Time

Measures	Drug Use										No drug use										p value
	Parent Postcards					Fitness Flyers					Parent Postcards					Fitness Flyers					
	Pretest		Posttest		SE	Pretest		Posttest		SE	Pretest		Posttest		SE	Pretest		Posttest		SE	
	Mean	SE	Mean	SE		Mean	SE	Mean	SE		Mean	SE	Mean	SE		Mean	SE	Mean	SE		
F= 3.17 df 4,339 p =.01																					
F= 4.26 df 2,326 p = .01																					
F= 2.86 df 2,357 p =.05																					
F= 7.02 df 2,295 p =.001																					
F= 0.23 df 2,350 p=.79																					
 																					

Higher mean score = higher risk

** Drug Use = Yes/No to Cigarette OR Marijuana Use at Baseline