Searching for similarities: transfer-oriented learning in health education at secondary schools

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Chapter 5

BROADENING THE SCOPE OF HEALTH EDUCATION: EFFECTS OF A TRANSFER-ORIENTED CURRICULUM ABOUT SMOKING AND SAFE SEX ON MULTIPLE HEALTH BEHAVIOR DOMAINS[1]

Many school health promotion curricula address one specific health behavior, without paying attention to learning effects in neighboring behavioral domains. We developed an innovative curriculum about smoking and safe sex that also focused on promoting students' transfer of knowledge, skills and attitudes to other domains. In a quasi-experimental study involving 1107 students (grades 7 and 8) in the Netherlands, the curriculum was compared to regular lessons about smoking and safe sex. The central research questions were to what extent the transfer-oriented curriculum: 1) had effects on psychosocial determinants and behaviors in the domains of smoking and safe sex, 2) had effects on determinants and behaviors in three domains about which no lessons were taught (consumption of alcohol, fruit and breakfast). Multi-level analyses showed that the answer to both questions is positive. The results indicate that a transfer approach may have surplus value over the classic domain-specific approach and warrant further elaboration in the future.

1. INTRODUCTION

Health-compromising lifestyles such as smoking, binge drinking, unsafe sex, poor dietary habits, physical inactivity and behaviors that contribute to unintentional injuries and violence are widely prevalent among young people in western societies (Currie et al., 2004; Eaton et al., 2006). Evidence has accumulated that many of these behaviors tend to co-occur or cluster (Basen-Engquist, Edmundson, & Parcel, 1996; Donovan, Jessor, & Costa, 1991; DuRant, Smith, Kreiter, & Krowchuk, 1999; Li, Stanton, & Yu, 2007;

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Prochaska, Spring, & Nigg, 2008; Van Nieuwenhuijzen et al., 2009; Wiefferink et al., 2006). Although the number and composition of behavioral clusters may vary between studies, most studies report clustering of, or strong associations between, the adolescent 'problem behaviors' of smoking, drinking, drug use and precocious intercourse, and weaker or inverse associations of these behaviors with dietary and physical activity behaviors.

In spite of the evidence for associations between health behaviors, many adolescent health promotion programs focus on a single health-related behavior. In addition, many of these programs address similar psychosocial constructs, such as factual knowledge, attitudinal beliefs, social influences and refusal skills (Botvin, Schinke, & Orlandi, 1995; Schaalma, Abraham, Gillmore, & Kok, 2004; Summerfield, 2002), which suggests at least some conceptual overlap in programs between behavioral domains. The fragmented organisation of health promotion programs neglects the evidence for associations between health behaviors and conceptual overlap between programs. Moreover, most adolescent health programs are implemented in schools, often as supplements to the regular curriculum, and have to compete with other social themes in schools, such as civic and moral education, multiculturalism, and environmental education (Ten Dam, Volman, & Vernooij, 2000). From the perspective of educational practice the multitude of uncoordinated single health-behavior programs threatens to overload the school curriculum and teaching staff (Greenberg et al., 2003; Lee, Keung, & Tsang, 2004; Leurs, Jansen, Schaalma, Mur-Veeman, & De Vries, 2005).

In light of the growing evidence for associations between health behaviors, the conceptual overlap between programs and the curriculum in danger of becoming overloaded, there are increasing calls for integrative approaches to health-related behaviors, in which a single intervention program impacts on multiple behaviors simultaneously (Catalano et al., 2002; Flay, 2002; Greenberg et al., 2003; Paulussen, Panis, Peters, Buijs, & Wijnsma, 1998; Prochaska, 2008).

In the present paper, we report the effectiveness of a particular integrative approach: transfer-oriented learning. This approach originates from educational theory and research and is now applied to the health promotion field, to our knowledge for the first time. In a transfer-oriented approach students are stimulated to apply independently and flexibly the knowledge, attitudes and skills they have learned in one context or domain (e.g., refusal skills with respect to smoking) to other contexts or behavioral domains that are not explicitly addressed (e.g., refusing alcohol or unsafe sex) by focusing on the quality of the teaching-learning processes that stimulate transfer (Campione, Shapiro, & Brown, 1995). We restricted our study to the four health behavior domains that are most often addressed in secondary schools in the Netherlands: smoking, drinking, safe sex and healthy nutrition (Dafesh, 2006).

1.1 Preconditions for a transfer-oriented approach

In theory, a transfer-oriented curriculum can integrate and replace several domain-specific curricula and can produce effects on several behaviors simultaneously while keeping time and effort spent by schools and teachers at an acceptable level. Logically, the following preconditions should be met if a transfer approach is to be possible, effective and efficient (Paulussen et al., 1998): 1) the target behaviors should be associated and have similar determinants, 2) the methods by which these determinants can effectively be modified should be similar across these behaviors, and 3) students should be stimulated to apply the learned knowledge and skills to multiple behaviors. Preliminary research activities in the form of systematic literature reviews indicated that the first two preconditions are fulfilled with respect to the four selected behavioral domains (Peters, Kok, Ten Dam, Buijs, & Paulussen, 2009; Peters, Wiefferink, et al., 2009; Wiefferink et al., 2006). We refer to these reviews for details and suffice to say here that our results for behavioral clustering showed the association between smoking, drinking and precocious sex to be fairly strong and the association with dietary behavior to be weaker; safe sex was hardly examined in relation to other behaviors (Wiefferink et al., 2006) but has been shown to cluster with substance use in at least one study (Basen-Engquist et al., 1996). The third precondition involves the question whether transfer of learning can be expected and how it can be promoted.

1.2 Transfer-oriented learning

Transfer of learning occurs when learning in one context or domain (e.g., smoking) impacts on competences or behavior in another context or domain (e.g., nutrition). Transfer can be said to be 'near' or 'far', depending on the degree of apparent similarity between contexts. Near transfer often involves triggering of semi-automatic responses (e.g., driving a truck is similar to driving a car) and high transfer requires mindful abstraction and a deliberate search for connections. The notions of near and far, however, are not strictly defined (Perkins & Salomon, 1996) and the degree of similarity between contexts may be considered along several dimensions (Barnett & Ceci, 2002).

Transfer is a key concept in education and learning theory because most education aspires to transfer (Barnett & Ceci, 2002), yet research has shown that transfer, especially far transfer, very often does not happen by itself (Perkins & Salomon, 1996). Research into transfer originates from different theoretical perspectives, mainly cognitive psychology and situated learning perspectives[2], and has identified several conditions under which transfer is more likely to occur (Tuomi-Gröhn & Engeström, 2003).

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[2] *The model of situated cognition is based upon the notion that knowledge is contextually situated and is fundamentally influenced by the activity, context and culture in which it is used (see McLellan, 1996, p.6).*

One condition, largely based on situated learning perspectives, is that knowledge should be personally meaningful to students in order for it to be carried over to a similar problem or behavioral domain (Saljö, 2003). Meaningfulness promotes students' deep processing of the subject matter and their ability and willingness to apply the knowledge. Meaningfulness implies that the learning content should build on the students' pre-existing knowledge and experiences, invite them to consider the content in light of their personal goals and questions, and help them look for applications in real life. Active and interactive learning methods and working on authentic problems are best suited to address the students' perspective. A second condition, based on cognitive educational psychology, is alternating explicit abstraction and application in various contexts. The teaching should connect domain-specific issues to general principles and vice versa and requires alternate processes of contextualization (learning new skills in one context), decontextualization (deducing a general principle) and recontextualization (examining application in other contexts) (Elshout-Mohr, Van Hout-Wolters, & Broekkamp, 1999; Wang, Haertel, & Walberg, 1993). If students have practiced recontextualization in several contexts, transfer may occur to contexts that were not rehearsed. A third condition, stemming from both cognitive and situated views, is the explicit promotion of the students' awareness of how and what they are learning and why this is important for them. Within cognitive psychology the metacognitive knowledge of one's own learning processes is emphasized (Perkins & Salomon, 1996). In the social learning domain, metacognition involves reflection on one's own social and emotional processes, such as learning to recognize and regulate group influences on one's own thinking (Volman & Ten Dam, 2000). From a situated perspective, it is argued that in order to bridge different contexts, students need to reflect on their personal development while constructing new knowledge and new ways of looking at issues (Beach, 1999; Boersma, Ten Dam, Volman, & Wardekker, 2010). Finally, self-confidence is an affective condition for far transfer. Various aspects of self-confidence can be distinguished: confidence of students in their ability to learn, in their knowledge base, and in their contribution to the group. Such confidence can be stimulated by positive teacher attitudes and support and gradually giving students more autonomy in their learning process.

The above paragraph posits that (far) transfer does not happen by itself and must be actively promoted by taking the above-mentioned conditions into account when designing the teaching-learning process. An interesting question in applying the transfer approach to health behavior intervention research is not only whether this approach is effective, but also whether effectiveness differs with the target behavior in question. We assume that transfer from one behavioral domain to another is easier to realize for behaviors that are strongly correlated than for behaviors with weaker associations. Based on this assumption and the results of our review of behavioral clustering (Wiefferink et al., 2006), we selected smoking and safe sex as domains to address explicitly in the experimental curriculum and we select-

ed the closely related domain of alcohol consumption and the less closely related nutritional domains of fruit and breakfast consumption as the criterion domains for examining transfer effects. The research questions for the study are:

1) To what extent is a transfer-oriented curriculum about smoking and safe sex effective in changing student behavior and behavioral determinants in the domains of smoking and safe sex that were taught?
2) To what extent is a transfer-oriented curriculum about smoking and safe sex effective in changing student behavior and behavioral determinants in the domains of alcohol, fruit and breakfast consumption that were not taught?
3) Does the effectiveness of the transfer-oriented curriculum differ for the domains that were not taught? If so, can this difference be attributed to the strength of association between taught domains and untaught domains?

2. METHODS

2.1 Study design

The evaluation study was conducted from September 2006 – July 2007. It featured a quasi-experimental design, with teachers assigned to the experimental condition (Exp) or to a control condition (Con). Teachers in the experimental group taught the transfer-oriented curriculum about smoking and safe sex, control group teachers taught their regular (non-transfer-oriented) lessons about smoking and safe sex. Thirty-three teachers from 23 schools from all regions of the Netherlands participated. Due to recruitment difficulties the assignment to conditions was not fully random: 12 teachers, 6 in each group, were allocated randomly.

Student data were collected in three waves of questionnaires (baseline, post-test, follow-up). Teachers were instructed to teach the experimental curriculum (Exp) or their regular lessons about smoking and safe sex (Con) between baseline and posttest, and to not teach about alcohol or nutrition in that period. Between post-test and follow-up teachers were free to teach about all subjects, including alcohol and nutrition; it was not considered feasible in Dutch educational practice to have schools not teach about alcohol or nutrition all year. The baseline was administered between September and December 2006, the post-test within 1 month after intervention ending, and the follow-up on average 4 months after intervention ending.

2.2 Participants

Secondary schools from all regions of the Netherlands were randomly selected and were contacted by telephone to recruit teachers in relevant school subjects (Biology and Care). Eligibility criteria involved: a) teaching students in grade 7 or 8, b) in a school level that prepares for at least higher vocational education, and c) willingness to adhere to the study protocol with

respect to timing of lessons (see Study design). Over 200 schools and teachers were contacted; 33 teachers from 23 schools agreed to participate.

At baseline, 15 teachers from 12 schools participated in the experimental group with a total of 25 classes and 568 students. In the control group, 18 teachers from 14 schools took part with 23 classes and 539 students. In three schools, teachers from both conditions participated, in the remaining schools only one condition was represented; therefore, the total number of schools was 23. The participating students were in grade 7 (16%) or 8 (84%), were on average 13.50 years old (range 11.83-16.08) at baseline, and were 48.3% female. As for ethnic origin, 12.6% had at least one parent who was born in a non-western country and 5.7% had at least one parent who was born in a western country other than the Netherlands. Baseline differences between the two experimental conditions were observed for some background factors and psychosocial determinants (see Supplement 1 at the end of this chapter for more information, including a table). Background factors and baseline scores were controlled for in all analyses of effects.

Attrition. In total, 134 students (12.1%) dropped out at post-test (Exp *n*=67, 11.8% vs Con *n*=67, 12.4%, *ns*), and 365 (33.0%) dropped out at follow-up (Exp *n*=182, 32.0% vs Con *n*=183, 34.0%, *ns*). See Supplement 1 for more information about dropout and any baseline differences between dropout groups.

2.3 Intervention

The experimental curriculum 'Multiple Choice 4 U' was designed as a 10-session classroom curriculum and consisted of a student book, a video and a teacher manual. It focused sequentially on the domains of smoking and safe sex and, throughout the curriculum, included assignments to stimulate transfer to other health behavior domains. The curriculum focused mainly on three psychosocial constructs that are important not only in the domains of tobacco and safe sex, but also in the domains of alcohol and nutrition (Peters, Wiefferink, et al., 2009; Wiefferink et al., 2006): outcome expectancies (short-term physical, social and other consequences and health risks), social influences (prevalence estimates, social norms, peer pressure) and self-efficacy (risky situations, refusal and negotiation skills, condom use skills). The domain-specific portions were partly adapted from existing Dutch interventions on smoking (Crone, Dijkstra, Frissen, & Paulussen, 2005; Cuijpers, Jonkers, De Weerdt, & De Jong, 2002) and safe sex (Schaalma et al., 1996; Van Fulpen et al., 2002) and were based on theory and research in health promotion and social psychology. The selection of learning goals was mainly based on the theory of planned behavior (Ajzen, 1991), social-cognitive theory (Bandura, 1986) and the concept of anticipated regret (Richard, Van der Pligt, & De Vries, 1995; Sandberg & Conner, 2008). The theory of triadic influence (Flay & Petraitis, 1994), which integrates these and other theories, was used as a unifying framework (see also Peters, Wief-

ferink, et al., 2009; Wiefferink et al., 2006). The methods for delivering intervention content were mainly based on social-cognitive theory.

The transfer-oriented approach was based on educational psychology and was operationalized mainly by a) stimulating reflection on the learning content and its personal relevance, b) addressing personal beliefs and giving students opportunities to make their own choices in curriculum assignments in order to enhance personal meaningfulness of learning), c) addressing general (decontextualized) cognitive and behavioral principles pertaining to decision-making, problem-solving, refusal and negotiation skills, and d) prompting students to apply these general principles to other behaviors in so-called 'excursion assignments' (recontextualization). The theme of making choices was chosen as the central theme that connected all general principles. It was partitioned into three subthemes, which correspond to the main determinants in the theory of planned behavior: making your own choices (attitude), other people's choices (social influences), and implementing your choices (self-efficacy).

The lessons were interactive, were mostly conducted in pairs or small groups and used a variety of instructional strategies, including: small and large group discussion, creative assignments (creating a poster, writing a film script or cartoon, giving advice to fictional characters in a letter or rap song), elicitation and modeling of refusal skills on video, condom demonstration and practice, interviewing smokers and non-smokers, self-tests, and searching information on the Internet.

Teachers in the experimental group attended a minimal (3-hour) instruction session, in which the study design, the conditions for transfer and the importance of adherence to critical learning activities were explained and discussed. Teachers in both groups were instructed to give no lessons about alcohol or nutrition between baseline and post-test. If students spontaneously mentioned alcohol or nutrition examples as a result of 'excursion assignments', experimental teachers were allowed to discuss these examples briefly -similar as for other examples- since this can be regarded as a spontaneous result of the transfer approach. Teacher log sheets indicated some degree of alcohol and nutrition examples: on a sum scale from 0=no examples to 26=many examples, mean scores were 8.61 (*SD* 5.14) for alcohol and 7.22 (*SD* 5.06) for nutrition.

Implementation. On average, experimental teachers taught the experimental curriculum in 13.73 (*SD* 4.84) sessions of 50 minutes. The control teachers taught an average of 2.18 (*SD* 2.42) sessions on smoking and 5.65 (*SD* 4.73) sessions on sexuality or reproduction, of which 1.65 (*SD* 1.27) specifically on safe sex. More than half of the control group teachers used one particular Biology/Care textbook for their lessons.

2.4 Data collection

Students. Teachers administered self-report student surveys during regular class periods. To ensure validity of the data, the student instruction explained the confidential nature of the answers. After completion, students

put their survey in a blank envelope and sealed it. Teachers were instructed to put the sealed envelopes in a larger envelope and seal it before the eyes of their students. The student survey was practically identical at each measurement point. Most items were based on existing Dutch questionnaires about smoking (Crone et al., 2003; Crone et al., 2005), safe sex (Schaalma et al., 1996; Van Fulpen et al., 2002; Yzer, Siero, & Buunk, 2000; www.monitorgezondheid.nl), alcohol (Cuijpers et al., 2002; De Graaff & Poort, 2003; Van Dorsselaer, Zeijl, Van den Eeckhout, Ter Bogt, & Vollebergh, 2007), and fruit and breakfast consumption (Martens, Van Assema, & Brug, 2005; www.monitorgezondheid.nl). The survey assessed demographics, students' involvement with the behavior for each behavioral domain (tobacco, safe sex, alcohol, fruit, breakfast), and psychosocial determinants of these behaviors. The psychosocial constructs pertained to: knowledge (only measured for smoking and safe sex), attitude, outcome expectancies, risk expectancy, anticipated regret, self-efficacy, normative beliefs from parents and friends, and intention. Also a composite measure of determinants was constructed for each domain (see Data analysis). Supplement 2 displays information about the measures used. Because of their skewed distribution, some of the behavioral variables were recoded into binary measures (see Supplement 2). Constructs that were measured only once were: ethnic background (baseline), Rosenberg's (Rosenberg, 1965) Self-Esteem scale (baseline; 10 items, Cronbach's α=.85), a self-developed scale of attitude towards school (baseline; 16 items; Cronbach's α=.84), and evaluation statements about lessons on tobacco and safe sex (post-test) and alcohol and nutrition (follow-up).

Teachers. Teachers were asked to record the timing of the student surveys, the number of lessons on each of the domains, and the additional educational materials used for these lessons. Experimental teachers were also asked to complete log sheets and to evaluate the intervention.

2.5 Data analysis

Psychometric properties of scales were examined, and scale means were computed for students who had answered at least 30% of scale items, to include as many students with single missing values as possible (scales had a maximum of 3.2% missing values, which was decreased by 1% at most). All continuous measures were tested for normality distribution and, if necessary, were log-transformed.

We used multilevel generalized linear models with a random intercept to estimate the treatment group effects. For continuous outcome measures, multilevel linear regression analyses with two levels (students nested within teachers) was used. Effect sizes (Cohen's *d*) for these outcome measures were calculated using *t* test values and degrees of freedom. Binary outcome measures were analyzed with multilevel logistic regression analyses. All analyses of effects were performed on single variables and controlled for baseline score, background factors (gender, ethnicity, grade, school level),

self esteem, and attitude to school. Self esteem and attitude to school were controlled to reduce the error variance, as these variables were related to most of the outcome variables. In analyses of psychosocial determinants, the baseline score on the relevant measure of behavior was also controlled for, because experience with the behavior may influence the determinants (e.g., Schaalma, Kok, & Peters, 1993). Analyses in the domains of alcohol, fruit and breakfast consumption also controlled for instruction time on alcohol and nutrition, respectively. Because in both groups some teachers had taught about alcohol or nutrition between baseline and post-test or between baseline and follow-up (see below), the effect of the program in these domains could depend on whether or not teachers had taught such lessons. This could hinder the interpretation of program effects as true transfer effects. Therefore, additional analyses were performed including an extra predictor in the model: the interaction term between instruction time (yes or no) and group (experimental vs. control). This was done to inspect whether the strength of the program effect depended on instruction time. Unfortunately, controlling for instruction time led to additional but small drop-out, as some teachers failed to provide clear information about this. Student retention rates in the experimental group ranged between 90% and 100%, depending on the specific measurement point (post-test, follow-up) and domain (alcohol, nutrition), and those in the control group ranged between 76% and 89%. For teachers/students with information about alcohol- or nutrition-specific instruction, the percentages are as follows. Alcohol instruction had been given to 26% of experimental students and 40% of control students at post-test [mean number of sessions 0.84 vs. 0.55, $p<.001$], and to 37% of experimental and 60% of control students at follow-up [mean 0.89 vs. 1.36, $p<.001$]. For nutrition instruction, the percentages were 19% experimental vs. 40% control at post-test [mean 1.55 vs 1.04, $p<.01$] and 74% experimental vs. 65% control at follow-up [mean 6.43 vs. 2.44, $p<.001$].

Because of the large number of psychosocial determinants per domain, and the concurrent risk of capitalizing on chance, a composite measure of determinants was calculated for each domain by averaging the standardized scores on psychosocial determinants. This measure included all determinants, except the knowledge measure in the domains of smoking and safe sex, and had satisfactory internal consistency in all domains (all Cronbach's α's > .70). Analyses of the composite measures were used as a proxy for multivariate testing of effects on psychosocial determinants: effects on individual determinants were considered only if there was a statistically significant effect on the composite measure of determinants. All analyses were performed with SPSS version 17.0, except multilevel analyses of effects on binary outcome measures, which were analyzed with MLwiN (Multilevel Models Project, 1998).

3. RESULTS

3.1 Effects on domains that were taught: tobacco and safe sex

Table 1 presents the program effects at post-test and follow-up in the tobacco domain. A significant positive program effect on behavior was observed at post-test and follow-up, with experimental students being less likely than control students to be current smokers. At both measurement points, there were significant effects on the composite measure of psychosocial determinants. At the level of individual determinants, significant effects occurred on three factors at post-test (outcome expectancies, anticipated regret, intention) and on four factors at follow-up (outcome expectancies, knowledge, perceived risk and self-efficacy). In addition, an effect that approached significance was observed for intention at follow-up (p=.06). The effect sizes (Cohen's d) for these factors ranged between 0.08 and 0.35.

Results in the safe sex domain (not shown in table) revealed that fewer experimental students than controls had recent experience with intercourse at post-test (OR=0.19, CI=0.05–0.73). There were no other effects on sexual behavior items or on the composite measure of determinants, neither at post-test nor follow-up.

3.2 Effects on domains that were not taught: alcohol, fruit, and breakfast

Table 2 displays the program effects in the alcohol domain. At post-test, no effect on alcohol behavior was observed. At follow-up, significant effects were found for both measures of behavior: frequency of consumption (d=0.23, p<.02) and binge drinking (OR=0.47, CI=0.23-0.98). At the level of determinants, an effect on the composite measure of determinants was significant at both measurement points. At post-test, significant positive program effects were observed for anticipated regret and self-efficacy. At follow-up, significant effects were found for three psychosocial variables (anticipated regret, social norm, intention). In the fruit and breakfast domains, no effects on behavior were found at post-test or follow-up. There were significant effects on the composite measure of determinants at both measurement points in both domains. In both domains there were favorable program effects on two to three psychosocial predictors at each measurement point (see Table 3 and Table 4, respectively), with effect sizes (Cohen's d) ranging from 0.06 to 0.19.

Do the program effects on alcohol, fruit and breakfast depend on instruction time?

Because some teachers had taught about alcohol or nutrition between baseline and post-test or between baseline and follow-up, we inspected whether the interaction term between alcohol or nutrition instruction (yes/no) and group was significant. The interaction term was significant only for two outcomes at post-test (results not shown): the composite measure of determinants within the domains of alcohol and breakfast. Additional subgroup

analyses revealed that the program effect was higher in the subgroup without alcohol or nutrition instruction than in the group with instruction (composite measure alcohol *d*=0.22 vs 0.02; composite measure breakfast *d*=0.16 vs -0.14). For all outcomes the interaction term was not significant at follow-up.

Table 1. Program effects in the tobacco domain at post-test and follow-up

		Post-test				Follow-up			
Variable[1]	**Group**	***N***	***M* (*SD*) baseline**	***M* (*SD*) post-test**	**Effect size[2]**	***N***	***M* (*SD*) baseline**	***M* (*SD*) follow-up**	**Effect size[2]**
Behavior: % current smoker (*OR*, CI)	Exp	487	25 (5.1%)	25 (5.1%)	0.30 (0.11-0.83)*	376	20 (5.3%)	31 (8.2%)	0.44 (0.20-0.96)*
	Con	460	19 (4.1%)	35 (7.6%)		347	13 (3.7%)	36 (10.4%)	
Composite of determinants (mean of Zscores)	Exp	489	0.07 (.60)	0.10 (.61)	0.21*	377	0.07 (.63)	0.10 (.69)	0.13*
	Con	458	-0.00 (.59)	-0.08 (.67)		348	-0.00 (.59)	-0.05 (.67)	
Knowledge^{t} (0-5)	Exp	465	4.01 (.99)	4.41 (.91)	0.19	368	4.04 (.98)	4.48 (.85)	0.35*
	Con	455	4.32 (.83)	4.53 (.74)		344	4.33 (.86)	4.39 (1.00)	
Attitude^{t} (1-5)	Exp	489	4.70 (.49)	4.73 (.55)	0.11	377	4.69 (.50)	4.62 (.80)	-0.12
	Con	458	4.66 (.56)	4.62 (.66)		347	4.65 (.57)	4.66 (.63)	
Outcome expectancies	Exp	489	0.71 (.62)	0.82 (.61)	0.21**	377	0.71 (.65)	0.86 (.65)	0.21*
(-1.875 – +2.25)	Con	462	0.69 (.56)	0.69 (.59)		350	0.70 (.57)	0.73 (.61)	
Risk^{t} (1-4)	Exp	490	3.51 (.59)	3.47 (.59)	0.04	378	3.52 (.59)	3.45 (.68)	0.13*
	Con	463	3.48 (.57)	3.43 (.61)		349	3.48 (.60)	3.32 (.65)	
Regret^{t} (1-4)	Exp	488	3.74 (.59)	3.72 (.59)	0.12***	377	3.73 (.59)	3.62 (.72)	0.07
	Con	460	3.67 (.63)	3.57 (.72)		347	3.67 (.62)	3.51 (.78)	
Self-efficacy^{t} (1-5)	Exp	489	4.15 (.86)	4.25 (.78)	0.16	377	4.20 (.84)	4.24 (.87)	0.08*
	Con	457	4.14 (.85)	4.12 (.88)		346	4.11 (.84)	4.07 (.74)	
Social norm^{t} (1-5)	Exp	488	4.40 (.59)	4.32 (.65)	0.00	377	4.38 (.58)	4.29 (.72)	0.00
	Con	457	4.29 (.59)	4.20 (.66)		348	4.29 (.59)	4.19 (.74)	
Intention t (1-5)	Exp	488	4.79 (.65)	4.75 (.68)	0.26***	376	4.76 (.70)	4.60 (.94)	0.17
	Con	453	4.77 (.65)	4.55 (.92)		345	4.80 (.61)	4.48 (1.02)	

Notes: High-end scores on determinants are conducive to preventive behavior.[1] Variables indicated by superscript ^{t} were logtransformed in analyses of effects. The means and sd presented are for original variables. [2] Effect sizes are Cohen's d *for continuous variables and Odds Ratio (*OR, *CI) for binary variables.* P*-values are based on multilevel analyses and are indicated by: *<.05, **<.01, ***<.001.*

Table 2. Program effects in the alcohol domain at post-test and follow-up, corrected for sessions about alcohol

		Post-test				Follow-up			
Variable[1]	**Group**	***N***	***M* (*SD*) baseline**	***M* (*SD*) post-test**	**Effect size**[2]	***N***	***M* (*SD*) baseline**	***M* (*SD*) follow-up**	**Effect size**[2]
Behavior: alcohol frequency past 4 wk[t] (1-7)	Exp	441	1.56 (1.00)	1.68 (1.07)	-0.24	334	1.60 (1.04)	1.79 (1.25)	-0.23*
	Con	366	1.57 (.94)	1.93 (1.22)		265	1.54 (.86)	1.98 (1.28)	
Behavior: % binge drinking past 2 wks (*OR*, CI)	Exp	443	24 (5.4%)	29 (6.5%)	0.83 (0.37-1.88)	335	17 (5.1%)	28 (8.4%)	0.47* (0.23-0.98)
	Con	365	27 (7.4%)	31 (8.5%)		265	18 (6.8%)	41 (15.5%)	
Composite of determinants (mean of Zscores)	Exp	442	0.09 (.73)	0.11 (.69)	0.14***	338	0.07 (.73)	0.13 (.76)	0.23*
	Con	365	-0.05 (.64)	-0.10 (.63)		265	-0.05 (.64)	-0.10 (.67)	
Attitude (1-5)	Exp	442	3.51 (.98)	3.42 (.99)	0.06	338	3.49 (.96)	3.57 (1.10)	0.02
	Con	368	3.41 (.92)	3.27 (.87)		266	3.40 (.92)	3.45 (1.01)	
Outcome expectancies (-3.429 – + 1.714)	Exp	442	-0.72 (.79)	-0.90 (.81)	0.13	337	-0.74 (.80)	-0.85 (.85)	0.14
	Con	367	-0.90 (.71)	-1.16 (.75)		265	-0.87 (.70)	-1.06 (.75)	
Risk (1-4)	Exp	441	2.49 (.96)	2.31 (.89)	0.00	337	2.50 (.99)	2.56 (.92)	0.02
	Con	365	2.34 (.88)	2.17 (.78)		264	2.31 (.87)	2.36 (.90)	
Regret[t] (1-4)	Exp	439	2.03 (1.11)	1.85 (1.03)	0.11***	337	1.99 (1.09)	1.99 (1.09)	0.14*
	Con	366	1.86 (1.01)	1.57 (.87)		265	1.85 (.98)	1.71 (.95)	
Self-efficacy (1-5)	Exp	442	3.81 (.95)	3.76 (.95)	0.11*	338	3.82 (.95)	3.89 (1.00)	0.16
	Con	364	3.70 (.95)	3.54 (1.02)		266	3.71 (.93)	3.63 (1.02)	
Social norm (1-5)	Exp	441	3.47 (.75)	3.34 (.72)	0.05	338	3.43 (.74)	3.43 (.78)	0.14*
	Con	364	3.36 (.63)	3.20 (.62)		266	3.35 (.63)	3.25 (.69)	
Intention[t] (1-5)	Exp	441	4.12 (1.10)	3.93 (1.20)	0.04	337	4.09 (1.12)	3.88 (1.30)	0.23**
	Con	363	4.05 (1.11)	3.82 (1.20)		265	4.11 (1.06)	3.63 (1.29)	

Notes: High-end scores on determinants are conducive to preventive behavior. Frequency of alcohol consumption: 1=0 times, 7=10 times or more. [1] *Variables indicated by super-script* [t] *were logtransformed in analyses of effects. The means and sd presented are for original variables.*[2] *Effect sizes are Cohen's* d *for continuous variables and Odds Ratio (*OR, *CI) for binary variables.* P*-values are based on multilevel analyses and are indicated by: *<.05, **<.01, ***<.001.*

Table 3. Program effects in the fruit domain at post-test and follow-up, corrected for sessions about nutrition

		Post-test				Follow-up			
Variable[1]	**Group**	***N***	***M* (*SD*) baseline**	***M* (*SD*) post-test**	**Effect size**[2]	***N***	***M* (*SD*) baseline**	***M* (*SD*) follow-up**	**Effect size**[2]
Behavior: number of portions per wk [t] (0-21)	Exp	480	5.89 (4.76)	6.08 (5.30)	0.00	375	5.80 (4.57)	6.31 (5.33)	-0.00
	Con	398	6.08 (4.67)	6.26 (5.10)		302	5.92 (4.72)	6.44 (5.33)	
Composite of determinants (mean of Zscores)	Exp	478	-0.01 (.66)	0.02 (.69)	0.11**	375	0.00 (.65)	0.05 (.68)	0.16**
	Con	397	-0.00 (.61)	-0.02 (.60)		302	-0.00 (.62)	-0.04 (.64)	
Attitude [t] (1-5)	Exp	480	4.01 (.74)	3.94 (.79)	0.03	375	4.06 (.74)	4.01 (.84)	0.12*
	Con	400	4.08 (.68)	3.98 (.73)		302	4.08 (.70)	3.94 (.82)	
Outcome expectancies (1-5)	Exp	481	3.29 (.71)	3.35 (.78)	0.18*	372	3.32 (.72)	3.35 (.86)	0.07
	Con	398	3.37 (.70)	3.29 (.72)		302	3.37 (.68)	3.35 (.78)	
Risk (1-4)	Exp	474	2.12 (.89)	2.12 (.90)	0.06	372	2.14 (.88)	2.14 (.92)	-0.03
	Con	393	2.08 (.83)	2.02 (.85)		302	2.11 (.85)	2.14 (.86)	
Regret [t] (1-4)	Exp	478	1.34 (.69)	1.42 (.77)	0.07*	372	1.34 (.69)	1.47 (.84)	0.09
	Con	395	1.27 (.60)	1.30 (.66)		300	1.27 (.62)	1.33 (.70)	
Self-efficacy [t] (1-5)	Exp	474	4.21 (1.09)	4.23 (1.02)	0.11	374	4.20 (1.10)	4.32 (1.01)	0.19***
	Con	396	4.36 (.94)	4.25 (.99)		300	4.31 (.99)	4.22 (.99)	
Social norm parents [t] (1-5)	Exp	478	4.12 (1.01)	4.10 (1.04)	-0.04	375	4.17 (.97)	4.19 (.96)	0.09
	Con	398	4.19 (.94)	4.21 (.91)		301	4.19 (.92)	4.12 (1.05)	
Social norm friends (1-5)	Exp	477	3.03 (1.02)	3.12 (1.10)	-0.10	372	3.09 (1.01)	3.44 (1.10)	0.03
	Con	399	2.98 (1.08)	3.19 (1.02)		302	2.97 (1.08)	3.28 (1.05)	
Intention (1-5)	Exp	480	3.75 (1.16)	3.78 (1.18)	0.00	376	3.76 (1.17)	3.79 (1.23)	0.07
	Con	399	3.74 (1.16)	3.76 (1.18)		302	3.73 (1.14)	3.68 (1.22)	

Notes: High-end scores on determinants are conducive to preventive behavior .[1] Variables indicated by superscript [t] were logtransformed in analyses of effects. The means and sd presented are for original variables.[2] Effect sizes are Cohen's d. P*-values are based on multilevel analyses and are indicated by: *<.05, **<.01, ***<.001.*

Table 4. Program effects in the breakfast domain at post-test and follow-up, corrected for sessions about nutrition

		Post-test				Follow-up			
Variable[1]	**Group**	***N***	***M* (*SD*) baseline**	***M* (*SD*) post-test**	**Effect size[2]**	***N***	***M* (*SD*) baseline**	***M* (*SD*) follow-up**	**Effect size[2]**
Behavior: number of days per wk (0-7)	Exp	475	6.29 (1.71)	6.13 (1.90)	-0.03	371	6.24 (1.78)	6.14 (1.93)	0.05
	Con	397	6.36 (1.63)	6.24 (1.73)		298	6.35 (1.65)	6.16 (1.87)	
Composite of determinants (mean of Zscores)	Exp	478	0.04 (.68)	0.06 (.68)	0.09*	383	0.04 (.70)	0.07 (.68)	0.10*
	Con	397	0.00 (.63)	-0.02 (.62)		302	0.00 (.62)	-0.03 (.65)	
Attitude^{t} (1-5)	Exp	479	4.22 (.69)	4.18 (.76)	0.09*	373	4.23 (.70)	4.18 (.82)	0.18**
	Con	400	4.26 (.71)	4.16 (.79)		302	4.32 (.66)	4.12 (.87)	
Outcome expectancies^{t} (1-5)	Exp	480	4.16 (.71)	4.06 (.74)	-0.03	371	4.18 (.69)	4.08 (.80)	0.06*
	Con	398	4.14 (.67)	4.06 (.72)		302	4.16 (.64)	4.01 (.74)	
Risk (1-4)	Exp	476	2.38 (.96)	2.41 (.93)	0.17*	372	2.37 (.95)	2.35 (.99)	0.04
	Con	394	2.39 (.91)	2.24 (.94)		302	2.35 (.91)	2.29 (.90)	
Regret (1-4)	Exp	477	1.95 (1.03)	1.96 (1.03)	0.04	370	1.95 (1.02)	1.90 (1.05)	-0.02
	Con	395	1.91 (.98)	1.88 (.96)		301	1.91 (.96)	1.89 (.97)	
Self-efficacy^{t} (1-5)	Exp	472	4.41 (.83)	4.40 (.85)	0.08*	372	4.36 (.84)	4.43 (.87)	0.14***
	Con	395	4.39 (.81)	4.31 (.84)		300	4.38 (.82)	4.31 (.88)	
Social norm parents^{t} (1-5)	Exp	480	4.69 (.66)	4.62 (.70)	-0.04	374	4.72 (.61)	4.55 (.88)	0.03
	Con	399	4.70 (.61)	4.66 (.68)		302	4.70 (.61)	4.50 (.94)	
Social norm friends (1-5)	Exp	478	3.76 (1.02)	3.81 (1.02)	-0.05	374	3.74 (1.02)	3.82 (1.07)	0.03
	Con	399	3.62 (1.05)	3.72 (1.07)		302	3.64 (1.04)	3.68 (1.03)	
Intention^{t} (1-5)	Exp	480	4.17 (.82)	4.14 (.87)	-0.01	375	4.19 (.83)	4.12 (.97)	-0.08
	Con	399	4.10 (.85)	4.09 (.86)		302	4.07 (.83)	4.08 (.92)	

*Notes: High-end scores on determinants are conducive to preventive behavior. [1] Variables indicated by superscript ^{t} were logtransformed in analyses of effects. The means and sd presented are for original variables. [2] Effect sizes are Cohen's d. P-values are based on multilevel analyses and are indicated by: *<.05, **<.01, ***<.001.*

4. DISCUSSION

This study was designed to test the effectiveness of a transfer-oriented curriculum in promoting positive changes – and preventing negative changes - not only in the domains of smoking and safe sex that were taught, but also in domains that were not explicitly taught: alcohol, fruit and breakfast. Three research questions were examined. The first research question – whether effects on the taught domains of smoking and safe sex occurred – can be answered in a positive way to a large extent. In the tobacco domain, there were significant program effects on several behavioral determinants and on behavior. The magnitude of behavioral effects is comparable to that found in meta-analyses and reviews of smoking prevention programs (see Peters, Kok, et al., 2009). In the safe sex domain, however, there was only one significant program effect, namely on recent experience with sexual intercourse at post-test. Possibly, our safe sex component was not stronger than the lessons in the control group, despite its larger number of sessions and its basis in an effective safe sex program (Schaalma et al., 1996; Van Fulpen et al., 2002). Another possible explanation for the relative absence of effects on safe sex and for the difference in effects between the smoking and safe sex domains may lie in the quality of implementation. Teacher log sheets indicated a somewhat lower degree of implementation of assignments about safe sex compared to tobacco. Most teachers needed more than ten sessions to teach the experimental curriculum and some were confronted with limitations on available time, leading them to spend less time on assignments or skip some assignments altogether. As the domains of smoking and safe sex were addressed sequentially in the curriculum, problems with time limitations became more urgent during the safe sex unit. Another explanation may be that the teachers may not have been sufficiently equipped to teach about sexuality/STD. Whereas various sources point to the need for adequate teacher training in sexuality/STD education (Peters, Kok, et al., 2009; Schaalma et al., 1996), our teacher training only focused on transfer, not on sexuality.

The second research question – whether transfer effects occurred on the untaught domains of alcohol and nutrition – can also be answered positively. We found favorable program effects on several psychosocial factors in the domains of alcohol, fruit and breakfast. In the alcohol domain we even found significant behavioral effects at follow-up, with effect sizes exceeding those reported in a meta-analysis of alcohol and substance abuse prevention programs (d=0.08-0.11 in Tobler et al., 2000). The absence of behavioral effects on intake of fruit and breakfast appears to be not uncommon in the nutrition literature, as a recent review reported that only one of four nutrition programs for adolescents had produced an effect on fruit or vegetable intake (Knai, Pomerleau, Lock, & McKee, 2006).

Judging from the effects on alcohol behavior and the larger effect size for the composite measure of alcohol determinants compared to the nutrition domains, the effects in the alcohol domain are stronger than those in the nutrition domains. The third research question – whether effectiveness differs between the untaught domains – can thus be answered affirmatively. The stronger alcohol effects in this study are in line with our expectation that transfer is more likely to occur to behav-

iors that belong to the same cluster than for behaviors that are relatively external to that cluster.

The results in the domains of alcohol and nutrition in this study can be attributed to the transfer-promoting qualities of the experimental program and suggest that the transfer approach, as applied here, is promising. The transfer-oriented approach in our program mainly relied on processes of contextualization (learning new knowledge and skills in one domain), decontextualization (generalizing the knowledge and skills) and recontextualization (prompting students to actively look for application of the knowledge and skills in several other domains), on stimulating students' awareness of their learning process and on paying explicit attention to meaningfulness of the learning content.

4.1 Other integrative programs and their relation to transfer

In addition to our program, various other integrative school programs have successfully impacted on multiple behaviors (Flay, 2002; Greenberg et al., 2003), some with impressive and long-lasting results (e.g., Hawkins, Kosterman, Catalano, Hill, & Abbott, 2008). Greenberg (Greenberg et al., 2003) captures these programs under the heading of social emotional learning (SEL). SEL programs constitute a broad range of programs, including classroom-based programs that address social-emotional competence (Botvin & Griffin, 2004; Frey, Hirschstein, & Guzzo, 2000), and environment-focused efforts such as coordinated school level organization and planning (e.g., Cook, Murphy, & Hunt, 2000), creation of caring communities of learners and enhancement of school and classroom climate (e.g., Battistich, Schaps, Watson, Solomon, & Lewis, 2000) or changing teacher instructional practices, increasing family involvement, teaching parenting practices, and teaching social and emotional skills (e.g., Hawkins et al., 2008).

Most of these programs focus on combining positive youth development with the prevention of typical problem behaviors such as substance use, precocious intercourse, and disruptive or delinquent behavior. The environment-focused program components address distal-level factors that are relevant in the etiology of multiple behaviors, such as bonding to school and family, and parenting practices. These components do not appear to be amenable to a transfer approach at the student level, since they do not require the deliberate and intentional application of knowledge or skills to multiple domains by students. The transfer approach does seem to be relevant for the curriculum-based program components. These components address the distal-level factors of social and emotional competence, usually by teaching a broad array of social-emotional skills (basic social skills, decision-making, problem-solving, anxiety and anger management, goal-setting, conflict resolution, empathy, recognizing and resisting social and media influences), often in a large number of sessions and over several years. Most of these programs also address problem-behavior-specific factors such as outcome expectancies. A collaborative group that promotes SEL programs advises to apply the social-emotional skills specifically and intentionally to the targeted problem behaviors, as students may not be able to generalize these skills to a range of behavioral domains (Payton et al., 2000). However,

transfer theory and the results of this study suggest that generalization to other domains is possible under specific conditions. To the extent that current SEL programs incorporate the conditions that promote transfer of learning, they may be able to achieve far transfer effects on domains they do not specifically address. To our knowledge, one other program besides our program has indeed been shown to have effects on behavioral domains that were not taught. The Life Skills Training (LST) program for substance abuse prevention, which can be categorized as a SEL program (Greenberg et al., 2003), has not only had preventive effects on the taught domains of substance use (Botvin & Griffin, 2004) but also on the untaught domains of risky driving and HIV risk behavior (Griffin, Botvin, & Nichols, 2004, 2006). The authors of these studies and others (Noar, Chabot, & Zimmerman, 2008) attribute these effects to the strong program focus on generic self-management and social skills.

Whereas SEL programs might benefit from explicitly using insights into transfer, the positive results of SEL programs on multiple domains may suggest that our program could even be stronger if it would incorporate a broader array of skills (e.g., also basic social skills, goal setting, anger and anxiety management, empathy, conflict resolution).

4.2 Strengths and limitations

Strengths of this study include the theoretical and empirical underpinning from the perspectives of health sciences and education, the relatively large sample size, and the attention to implementation, which allowed us to control for important implementation variables in analyses. The study also had some limitations. One limitation is that assignment to conditions was only partly random, which may have led to the observed baseline differences in demographic factors and some psychosocial factors. These differences led us to control for background factors and baseline scores in analyses of effects. Another limitation may be that teachers, and not schools, were assigned to conditions, thereby creating the risk that experimental and control teachers and students within schools may have influenced each other. This risk was present but was limited, as both conditions were represented in only three of the 23 schools, involving three experimental and three control teachers. A third limitation is that teachers administered the student questionnaires, which may have led students to provide desirable responses, although efforts were made to ensure validity of responses. There are no reasons to expect this limitation to differ between the conditions. A fourth limitation is that attrition at follow-up was substantial, which may have affected the results. However, attrition rates did not differ between the conditions. Unfortunately, controlling for instruction time in analyses of the alcohol or nutrition domains led to additional drop-out of teachers and students at post-test and follow-up, as some teachers had failed to provide information on instruction time. However, most of the students in the post-test and follow-up samples were retained in these analyses. Moreover, most of the observed effects were also found in analyses that did not control for instruction time. A fifth limitation is the considerably smaller number of sessions about tobacco and safe sex in the control group compared to the experimental group. We cannot exclude the possibility that the ef-

fects in the tobacco and sexuality domains in the experimental group may at least partly be attributed to amount of instruction time rather than to quality of the instruction. However, high-quality reviews in the substance use and sexuality domains have shown conflicting results with respect to the importance of instruction time (see Peters, Kok, et al., 2009) and it is likely that a combination of both time and quality is important for obtaining effects. Also, differences in instruction time for tobacco and safe sex cannot logically be used to explain the transfer effects in the alcohol and nutrition domains. Nevertheless, we recommend repeating the experiment with a control condition that has the same number of lessons as the experimental condition. A sixth limitation is the relatively short duration of the study, which is not optimal for examining behavior change effects. It is all the more promising that we have observed program effects on consumption of tobacco and alcohol.

4.3 Issues for practice and research

Notwithstanding the above-mentioned limitations, this study has convincingly shown that a health promotion program about smoking and safe sex that was designed to stimulate transfer of learning to other domains, not only had effects on the taught domains, but also on several untaught domains. The results of this study suggest that a transfer approach may have surplus value over the classic domain-specific approach and deserves further attention in health promotion planning.

The results of this study may challenge program developers, practitioners, and researchers to adopt a transfer approach, look beyond the boundaries of their particular behavioral domain of interest, and develop, implement and test more integrative and coordinated programming that connects multiple domains. Such programming may be welcomed by schools, as it may place a lesser burden on instruction time and continuous innovation than the myriad of single-domain programs. This paper has specified which preconditions and methods are relevant for promoting transfer of learning, and has indicated which types of general skills may be relevant for program content. The emphasis on general skills in this paper, however, does not mean that domain-specific knowledge and skills are unimportant: programs that seek to impact a particular behavior should ensure that students have correct knowledge about this behavior and its consequences and have the skills necessary for performing the behavior. It may be worthwhile to develop a comprehensive program that can impact a whole range of health-promoting and health-compromizing behaviors by adopting a transfer approach and including both domain-transcending skills and domain-specific knowledge and skills.

SUPPLEMENT 1: INFORMATION ABOUT ATTRITION AND BASELINE EQUIVALENCE

This document presents more information about a) baseline equivalence of the two experimental conditions, and b) attrition and baseline equivalence of dropout groups. Table 5 presents data with respect to baseline equivalence for both these issues.

Baseline equivalence of experimental conditions. Students in the two conditions did not differ on measures of behavior in the five domains, but did differ significantly on all background factors measured (gender, ethnicity, age, grade and school level) and on psychosocial determinants in the domains of tobacco (composite determinants, knowledge, anticipated regret, social norm), safe sex (knowledge), alcohol (composite determinants, outcome expectancies, risk expectancy, anticipated regret, social norm) and breakfast (social norm peers). Experimental students had less favorable scores on the knowledge scales and more favorable scores on the other determinant measures. Background factors and baseline scores were controlled for in all analyses of effects.

Attrition. In total, 134 students (12.1%) dropped out at post-test (Exp *n*=67, 11.8% vs Con *n*=67, 12.4%, *ns*), and 365 (33.0%) dropped out at follow-up (Exp *n*=182, 32.0% vs Con *n*=183, 34.0%, *ns*). Dropout of individual students was limited and was mainly due to absenteeism (post-test *n*=85, follow-up *n*=73). Relatively much attrition occurred at the level of teachers or entire classes. At post-test, one control group teacher dropped out (*n*=25), and one experimental teacher was removed from the analyses because of failure to administer the post-test within a one-month interval after intervention ending (*n*=24). At follow-up, three experimental and five control group teachers dropped out. This was due to lack of time to administer the follow-up survey before summer holiday (time needed for lessons, *n*=51), late administration of the post-test which left an insufficient time interval for the follow-up (*n*=166), and teacher illness (*n*=26).

Students who dropped out at post-test differed significantly from non-dropouts on some background factors (age, ethnicity, school level) and on baseline measures of a tobacco determinant (social norm), sexual behavior and determinants (intercourse ever, ever and recent intercourse without condom, outcome expectancies physical sensations, risk expectancy), and on an alcohol determinant (self-efficacy). Dropouts at follow-up differed significantly from non-dropouts on various background factors (grade, age, school level) and on baseline measures of safe sex determinants (outcome expectancies responsible condom use, risk expectancy, intention), and breakfast determinants (attitude, outcome expectancies, self-efficacy). Dropouts had more favorable scores than non-dropouts on the risk expectancy and self-efficacy measures mentioned above and less favorable scores on the other measures.

Table 5: Baseline equivalence of experimental conditions and of dropout groups at post-test and follow-up

		Experimental conditions			**Dropout at post-test**			**Dropout at follow-up**		
Variable *=logtransformed	**Range or no. of levels**	**Exp** ***N*=568** ***M* / %**	**Con** ***N*=539** ***M* / %**	p^1	**Non-dropout** ***N*=973** ***M* / %**	**Dropout** ***N*=134** ***M* / %**	p^1	**Non-dropout** ***N*=742** ***M* / %**	**Dropout** ***N*=365** ***M* / %**	p^1
Demographics										
Grade	2 levels									
7		167 (29.4%	14 (2.6%)	***	161 (16.5%)	20 (14.9%)		64 (8.6%)	117 (32.1%)	***
8		401 (70.6%	525 (97.4%		812 (83.5%)	114 (85.1%)		678 (91.4%)	248 (67.9%)	
Age at baseline	11.83-16.08	13.33	13.69	***	13.48	13.67	**	13.57	13.37	***
Gender (% female)	2 levels	254 (44.8%	281 (52.1%	*	477 (49.1%)	58 (43.3 %)		370 (50.1%)	165 (54.7%)	
Ethnicity	3 levels									
Dutch		429 (77.0%	452 (85.9%	***	794 (82.8%	87 (70.2%)	***	608 (82.9%)	273 (78.0%)	
Other western		33 (5.9%)	30 (5.7%)		56 (5.8%)	7 (5.6%)		41 (5.6%)	22 (6.3%)	
Non-western		95 (17.1%)	44 (8.4%)		109 (11.4%	30 (24.2%)		84 (11.5%)	55 (15.7%)	
School level	4 levels									
Vmbo-havo (low)		145 (25.5%	0 (0%)	***	130 (13.4%)	15 (11.2%)	***	67 (9.0%)	78 (21.4%)	***
Havo		141 (24.8%	209 (38.8%		292 (30.0%)	58 (43.3%)		242 (32.6%)	108 (29.6%)	
Havo-vwo		187 (32.9%	129 (23.9%		266 (27.3%)	50 (37.3%)		202 (27.2%)	114 (31.2%)	
Vwo (high)		95 (8.6%)	201 (37.3%		285 (29.3%)	11 (8.2%)		231 (31.1%)	65 (17.8%)	
Non-behavior specific attitudes										
Self esteem*	1-4	3.15	3.20		3.17	3.21		3.18	3.15	
Attitude towards school	1-5	3.09	3.06		3.09	2.99		3.05	3.13	
Tobacco use										
Behavior % Current smoking	Yes-no	27 (4.8%)	23 (4.3%)		44 (4.5%)	6 (4.5%)		34 (4.6%)	16 (4.4%)	
Composite determi-nants	Mean of Z-scores	.07	-.02	*	.03	-.02		.04	.01	
Knowledge*	0-5	3.99	4.32	***	4.15	4.18		4.16	4.13	

Variable *=logtransformed	Range or no. of levels	Experimental conditions Exp *N*=568 *M* / %	 Con *N*=539 *M* / %	 *p*[1]	Dropout at post-test Non-dropout *N*=973 *M* / %	 Dropout *N*=134 *M* / %	 *p*[1]	Dropout at follow-up Non-dropout *N*=742 *M* / %	 Dropout *N*=365 *M* / %	 *p*[1]
Attitude*	1-5	4.70	4.65		4.68	4.66		4.67	4.68	
Outcome expectancies	-1.875 – +2.25	0.71	0.70		0.70	0.77		0.71	0.71	
Risk expectancy*	1-4	3.51	3.46		3.49	3.41		3.50	3.45	
Anticipated regret*	1-4	3.73	3.66	*	3.71	3.60		3.72	3.66	
Self-efficacy*	1-5	4.17	4.16		4.15	4.27		4.15	4.19	
Social norm*	1-5	4.38	4.26	***	4.34	4.19	*	4.33	4.30	
Intention*	1-5	4.78	4.77		4.78	4.68		4.78	4.75	
Safe sex										
Behavior % Inter-course ever	Yes-no	19 (3.4%)	13 (2.4%)		23 (2.4%)	9 (6.7%)	*	20 (2.7%)	12 (3.3%)	
Behavior % Inter-course ever without condom	Yes-no	7 (1.2%)	6 (1.1%)		7 (0.7%)	6 (4.5%)	**	6 (0.8%)	7 (1.9%)	
Behavior % Inter-course past 6 wks	Yes-no	12 (2.1%)	6 (1.1%)		13 (1.3%)	5 (3.7%)		10 (1.4%)	8 (2.2%)	
Behavior % Inter-course without condom past 6 wks	Yes-no	3 (0.5%)	3 (0.6%)		3 (0.3%)	3 (2.2%)	*	3 (0.4%)	3 (0.8%)	
Composite determi-nants	Mean of Z-scores	-.01	.01		-.00	-.02		.01	-.02	
Knowledge*	0-5	3.38	3.62	**	3.51	3.38		3.56	3.37	
Attitude	1-5	2.99	2.98		2.99	2.95		2.98	2.99	
Outcome expectancies 1: Responsible condom use*	1-5	4.21	4.21		4.21	4.17		4.24	4.14	*
Outcome expectancies 2: Negative physical (e.g., feel less)	1-5	3.18	3.16		3.19	3.00	**	3.17	3.16	
Risk expectancy	1-5	3.71	3.76		3.71	3.88	*	3.69	3.83	**
Anticipated regret*	1-4	3.21	3.19		3.20	3.18		3.22	3.16	

		Experimental conditions			Dropout at post-test			Dropout at follow-up		
Variable *=logtransformed	**Range or no. of levels**	**Exp** ***N*=568** ***M* / %**	**Con** ***N*=539** ***M* / %**	***p*[1]	**Non-dropout** ***N*=973** ***M* / %**	**Dropout** ***N*=134** ***M* / %**	***p*[1]	**Non-dropout** ***N*=742** ***M* / %**	**Dropout** ***N*=365** ***M* / %**	***p*[1]
Self-efficacy*	1-5	3.64	3.73		3.68	3.71		3.69	3.66	
Social norm*	1-5	4.06	4.08		4.06	4.11		4.08	4.05	
Intention*	1-5	4.51	4.55		4.54	4.44		4.57	4.45	*
Alcohol use										
Behavior Freq. drinking occasions past mnth*	1-7	1.55	1.60		1.56	1.71		1.57	1.59	
Behavior % Binge (>=5 drinks) past 2 wks	Yes-no	34 (6.0%)	40 (7.4%)		61 (6.3%)	13 (9.8%)		42 (5.7%)	32 (8.8%)	
Composite determinants	Mean of Z-scores	.11	-.06	***	.03	.06		.02	.05	
Attitude	1-5	3.53	3.43		3.47	3.52		3.46	3.52	
Outcome expectancies	-3.429 – + 1.714	-0.69	-0.89	***	-0.80	-0.71		-0.80	-0.76	
Risk expectancy	1-4	2.48	2.34	**	2.41	2.39		2.42	2.38	
Anticipated regret*	1-4	2.08	1.81	***	1.95	1.94		1.94	1.96	
Self-efficacy	1-5	3.84	3.74		3.77	3.96	*	3.76	3.86	
Social norm	1-5	3.49	3.33	***	3.41	3.42		3.40	3.44	
Intention*	1-5	4.10	4.04		4.10	3.88		4.10	4.03	
Fruit										
Behavior No. portions per wk	0-21	5.70	6.16		5.91	6.08		5.81	6.16	
Composite determinants	Mean of Z-scores	-.00	-.00		-.01	.05		-.00	-.00	
Attitude*	1-5	4.04	4.07		4.05	4.06		4.07	4.01	
Outcome expectancies	1-5	3.29	3.34		3.32	3.31		3.32	3.32	
Risk expectancy*	1-4	2.13	2.05		2.08	2.17		2.12	2.03	
Anticipated regret	1-4	1.35	1.29		1.31	1.40		1.31	1.34	
Self-efficacy*	1-5	4.24	4.36		4.29	4.34		4.26	4.38	
Social norm parents*	1-5	4.13	4.19		4.15	4.20		4.18	4.11	

Variable *=logtransformed	Range or no. of levels	Experimental conditions Exp *N*=568 *M* / %	 Con *N*=539 *M* / %	 *p*[1]	Dropout at post-test Non-dropout *N*=973 *M* / %	 Dropout *N*=134 *M* / %	 *p*[1]	Dropout at follow-up Non-dropout *N*=742 *M* / %	 Dropout *N*=365 *M* / %	 *p*[1]
Social norm peers	1-5	3.04	2.97		3.01	2.99		3.02	2.97	
Intention	1-5	3.76	3.78		3.76	3.85		3.75	3.81	
Breakfast										
Behavior No. days per week	0-7	6.24	6.30		6.29	6.12		6.31	6.18	
Composite determinants	Mean of Z-scores	.03	-.02		.01	-.00		.02	-.01	
Attitude*	1-5	4.20	4.24		4.23	4.14		4.27	4.11	***
Outcome expectancies*	1-5	4.15	4.11		4.14	4.07		4.16	4.07	*
Risk expectancy	1-4	2.40	2.37		2.37	2.49		2.37	2.42	
Anticipated regret	1-4	1.96	1.88		1.93	1.86		1.92	1.93	
Self-efficacy*	1-5	4.42	4.41		4.40	4.48		4.38	4.48	*
Social norm parents*	1-5	4.68	4.69		4.69	4.63		4.70	4.64	
Social norm peers	1-5	3.75	3.59	*	3.68	3.61		3.68	3.65	
Intention*	1-5	4.18	4.11		4.14	4.16		4.14	4.14	

*Notes: High-end scores on determinants are conducive to preventative behavior. Variables: *=logtransformed; the range and means presented are for original variables.*
[1] *p<*.05*, **p<*.01*, ***p<*.001*.

SUPPLEMENT 2: INFORMATION ABOUT MEASURES OF PSYCHOSOCIAL DETERMINANTS, BEHAVIOR AND GENERIC CONSTRUCTS

Table 6: Information about measures of psychosocial determinants, behavior and generic constructs (n items and Cronbach alpha)

	Psychosocial determinants									
	Tobacco		**Safe sex**		**Alcohol**		**Fruit**		**Breakfast**	
Variable. Sample item for tobacco	***n***	***α***	***n***	***α***	***n***	***α***	***n***	***α***	***n***	***α***
Knowledge. You only get addicted to cigarettes if you smoke for years (true, not true, don't know). Correct answers (each 1 point) were summed.	5	-	5	-	-	-	-	-	-	-
General attitude. Smoking is bad for me (1=certainly not, 5=certainly yes)	3	.83	3	.65	3	.89	4	.80	4	.80
Outcome expectancies. (Safe sex 2 scales: condom use is responsible; condom use interferes with pleasure). If I (would) smoke, I (would) get into contact with others (-3) much easier, (+3) much more difficult	8	.70	3 2	.58 .64	7	.84	4	.43*	4	.62
Risk expectancy. If I (would) smoke, my chance of getting lung cancer later will be (1) much larger, (4) equal to if I don't smoke	2	.69	2	.75	1	-	1	-	1	-
Anticipated regret. If I (would) smoke now, I will have (1) much, (4) no regret that I ever started when I am older	1	-	1	-	1	-	1	-	1	-
Self-efficacy. Imagine you're at a party where almost everyone smokes. Will you be able not to smoke? (1=certainly not, 5=certainly yes)	3	.84	5	.73	3	.79	1	-	2	.69
Social norm parents and friends. (Fruit and breakfast: separate variables). How would your parents or caretakers think about you smoking? (1=very good, 5=very bad)	2	.50*	2	.70	2	.69	2	-	2	-
Intention. Do you intend to start or keep smoking in the next six months? (1=certainly not, 5=certainly yes)	1	-	2	.72	1	-	1	-	2	.48*
Composite measure of determinants: mean of Z-scores on all determinants, excluding knowledge	7	.74	8	.72	7	.84	8	.76	8	.78
Behavior items										
Tobacco: 1 item: current smoking. Which of these statements describes you best? (1=I smoke at least once a day, 9=I have never smoked, not even a puff). Cut-off for yes-no dichotomization between 5 (I try smoking occasionally) and 6 (I have quit smoking after having smoked at least once a week for a while).										
Safe sex: 4 items: 2 sexual intercourse (ever, past 6 weeks), 2 intercourse without condom (ever, past 6 weeks). Have you ever had sexual intercourse? (1=no, never, 4=yes, regularly). Intercourse dichotomized into no-yes. Intercourse without condom dichotomized into safe (not had sex or always used condom) vs unsafe (not always used condom).										
Alcohol: 2 items: frequency of consumption, binge drinking. How often have you had alcohol in the past 4 weeks? (1=0 times, 7=more than 10 times)										
Fruit: 2 items: days per week x servings per day. In the past 4 weeks, how many days a week did you eat fruit? (0=(almost) never, 7=every day)										
Breakfast: 1 item. In the past 4 weeks, how many days a week did you eat breakfast? (0=(almost) never, 7=every day)										
Generic scales										
Self-esteem: 10 items, α=.84. Sometimes I feel useless (1=describes me well, 4=describes me not at all)										
Attitude to school: 16 items, α=.84. I am glad I am at this school (1=is not correct, 5=is totally correct)										

*Notes: - = not applicable. *Although Cronbach's α was too low for these variables, αs at post-test and follow-up were higher and in most cases >.60. For normative beliefs smoking: .60 and .69 at post-test and follow-up, respectively. For outcome expectancies fruit: .56 and .67. For intention breakfast: .53 and .62.*