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

Peters, L.W.H.

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UNIVERSITY OF AMSTERDAM

SEARCHING FOR SIMILARITIES

Transfer-oriented learning in health education at secondary schools

Louk Peters

SEARCHING FOR SIMILARITIES

TRANSFER-ORIENTED LEARNING
IN HEALTH EDUCATION
AT SECONDARY SCHOOLS

UNIVERSITEIT VAN AMSTERDAM

Research Institute of Child Development and Education

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SEARCHING FOR SIMILARITIES

TRANSFER-ORIENTED LEARNING IN HEALTH EDUCATION AT SECONDARY SCHOOLS

ACADEMISCH PROEFSCHRIFT

ter verkrijging van de graad van doctor

aan de Universiteit van Amsterdam

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prof. dr. D.C. van den Boom

ten overstaan van een door het college voor promoties ingestelde commissie, in het openbaar te verdedigen in de Agnietenkapel

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door

Louis Wilhelmus Helena Peters

geboren te Heerlen

Promotiecommissie

Promotor:	Prof. dr. G.T.M. ten Dam
Co-promotoren:	Dr. T.G.W.M. Paulussen
	Prof. dr. G.J. Kok
Overige leden:	Prof. dr. F.J. Oort
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Faculteit:	Maatschappij- en Gedragswetenschappen

Het promotieonderzoek is voorbereid aan Research Institute of Child Development and Education aan de Universiteit van Amsterdam.

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VOORWOORD

Het heeft even geduurd, maar dan heb je ook wat.

Dit proefschrift zou er niet zijn geweest zonder de hulp en medewerking van velen. Graag wil ik alle mensen danken die op enige wijze hebben bijgedragen aan de totstandkoming van dit proefschrift, of aan het Transferproject dat de basis ervoor vormde.

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Chapter 1

INTRODUCTION

1. HEALTH-RELATED BEHAVIORS AND SCHOOL HEALTH PROMOTION

Many health-risk behaviors develop or augment during adolescence. In the E-MOVO study among over 35.000 Dutch secondary school students in Grades 8 and 10 (De Nooijer & De Vries, 2007), large proportions of students did not meet health recommendations for fruit consumption (70%), consistent condom use when having sex (47%), physical activity (29%), alcohol consumption (23%), smoking (22%), and drug use (18%). Other studies have found similar results, both in The Netherlands (e.g., Van Dorsselaer, Zeijl, Van den Eeckhout, Ter Bogt, & Vollebergh, 2007) and in other European countries and the United States (Currie et al., 2006; Eaton et al., 2006). These health-risk behaviors contribute to the leading causes of morbidity and mortality among adults (Hoeymans, Melse, & Schoemaker, 2010).

Because of the prevalence of health-risk behaviors among adolescents, many health education and promotion interventions have been, and continue to be, developed to promote healthful behaviors among this age group. Many of these interventions are intended for use in schools, because schools are a setting where large numbers of adolescents can be reached. Moreover, secondary schools in The Netherlands are required by governmental law to teach about health-related matters in some way in the first two years of secondary education. However, in light of the freedom of education laid down in the Dutch constitution, schools have a lot of freedom in deciding what, how and how much to teach about health. The governmental requirements have, intentionally, been formulated in a very general way in the form of core objectives. The core objective which is most relevant to health and health promotion states: “The student learns to understand the essentials of the constitution and function of the human body, to establish connections with the promotion of physical and mental health, and to take own responsibility in this matter”. Health education is not a separate subject in Dutch secondary schools. Regular textbooks for Biology include some information related to health behavior domains such as nutrition, sexuality, and substance use, but this information is usually limited, both in scope and in

the number of lessons. Given the schools' freedom, it is at the school's discretion to teach these lessons, and to implement additional health promotion interventions: such interventions are mostly implemented as a supplement to the core curriculum, which in many cases is overcrowded as it is.

Most school health promotion interventions in The Netherlands focus on a particular health behavior domain, not on combinations of domains. As each intervention takes up time from school, and each new intervention requires innovative capacity of school staff to get acquainted with the intervention, school staff are becoming more and more overloaded by the abundance of health education and other interventions available to schools (Greenberg et al., 2003; Lee, Keung, & Tsang, 2004; Leurs, Jansen, Schaalma, Mur-Veeman, & De Vries, 2005). In a recent interview, the Dutch Minister of Education Van Bijsterveldt phrased this issue as follows (Gerrits, 2010, p. 7, translation added from Dutch):

> In the past decades, too many societal tasks have been shoved towards schools, from obesity to money problems. Education should not be turned into a portal for public service announcements. […] Schools complain to me that they have been given so many societal tasks that distract attention away from the core.

In the health promotion sector, this situation has given rise to increasing calls for integrative and coordinated approaches to school health promotion (Catalano, Hawkins, Berglund, Pollard, & Arthur, 2002; Flay, 2002; Greenberg et al., 2003; Paulussen, Panis, Peters, Buijs, & Wijnsma, 1998; Prochaska, 2008).

To illustrate some of the above points about interventions, Table 1 presents the results of a query in the Dutch I-Database, a comprehensive database of health promotion interventions available in The Netherlands[1]. The table lists the results of a query for interventions for the target group of 12-17-year-olds. In the query, the target group keyword was combined with keywords for several health behavior domains, and with a keyword for the setting 'secondary school'. Comparison of the top and bottom halves of the table may illustrate that most interventions focus on a specific domain, such as nutrition or smoking, not on combinations of domains. Comparison of the left- and right-hand parts of the table may illustrate that many adolescent health promotion interventions are intended for the school setting. The table includes only interventions which have been judged by a national expert committee to be well-documented, and the numbers are an underrepresentation of interventions available in The Netherlands (Brug et al., 2010). Many interventions have not been judged yet -as judgment is an ongoing process- or have failed to qualify for the judgment 'well-documented'.

[1] *http://www.loketgezondleven.nl/i-database, accessed on December 6, 2010*

Table 1. Number of well-documented interventions for 12-17-year-olds listed in the I-Database by various domains and by setting secondary school

Keyword for a particular domain	Number of interventions	Number of interventions for the setting secondary school
Total number for 12-17-year olds (no key-word for a domain)	48	25
Number of interventions for several selected domains		
Nutrition	13	5
Alcohol	7	5
Smoking	5	4
Sexuality	9	9
Sexually transmitted disease (STD)	3	3
Number of interventions for combinations of selected domains		
Alcohol + Smoking	3	3
Alcohol + Smoking + Nutrition	1	1
Alcohol + Smoking + Sexuality	1	1
Alcohol + Smoking + STD	0	0
Alcohol + Smoking + Nutrition + Sexuality	0	0
Alcohol + Smoking + Nutrition + STD	0	0

2. CO-ORDINATED AND INTEGRATIVE APPROACHES TO SCHOOL HEALTH PROMOTION

The problem of the overload of health promotion interventions offered to schools can be addressed by different approaches. One approach would be to coordinate the supply of and demand for interventions. In such a co-ordinated approach, the focus is on the organizational aspects of how to select, from among the multitude of interventions available, the specific health promotion interventions that match school needs and priorities. As an example of such a co-ordinated approach, the so-called Healthy School approach is currently being promoted for primary schools at a national level in The Netherlands (Rijksinstituut voor Volksgezondheid en Milieu, 2010) and is currently being developed for secondary schools, after having been developed and tested locally (Leurs, 2008). In this approach, regional health authorities support the schools in their region to generate health risk profiles of the student body, which are then used to set up priorities in school-based health promotion planning.

Another approach, the so-called integrative approach, is to focus on integration at the content level of health promotion, by making connections between various health domains. This approach is advocated by many proponents of co-ordinated, integrative programs (Catalano et al., 2002; Flay, 2002; Greenberg et al., 2003; Paulussen et al., 1998; Prochaska, 2008). It is also the approach we have taken.

3. INTEGRATIVE APPROACHES: THE IMPORTANCE OF CONNECTIONS BETWEEN HEALTH-BEHAVIOR DOMAINS

The integrative approach is based in connections between health behavior domains. The connections can be found at various inter-related levels. At the level of behavior, many behaviors have been found to be associated (or to cluster): adolescents who are involved in one behavior are more likely to also be or become involved in another behavior (Basen-Engquist, Edmundson, & Parcel, 1996; Donovan, Jessor, & Costa, 1991; DuRant, Smith, Kreiter, & Krowchuk, 1999; Li, Stanton, & Ju, 2007; Prochaska, Spring, & Nigg, 2008; Van Nieuwenhuijzen et al., 2009). Evidence of associations between various behaviors is rapidly accumulating, and so far, the literature has shown that the strength of the association varies with the specific combination of behaviors which is examined. Nevertheless, although the number and composition of behavioral clusters may vary between studies, most studies report clustering of or strong associations between health-risk behaviors such as smoking, drinking, and drug use, and weaker or inverse associations of these behaviors with health-promoting behaviors such as dietary and physical activity behaviors.

At the level of behavioral determinants, there are indications that various behaviors have similar determinants (Flay, 2002; Flay & Petraitis, 1994). Determinants can be distinguished at various levels, according to the level and directness of the influence they are theorized to have on behavior. Determinants at a proximal level are posited to have the strongest and most direct influence on behavior. Their influence is likely to be specific to a behavior (Flay, 2002). An example of a proximal determinant is self-efficacy to resist smoking. Determinants at a distal level are posited to have a more indirect influence on behavior through more proximal determinants, and their influence is posited to be more generalizable across various behaviors. Consider the following example: the distal-level determinant self-esteem is posited to have some influence on an adolescent's smoking behavior, among other things via his self-efficacy to resist smoking. Whereas the influence on smoking is stronger and more direct for smoking self-efficacy than for self-esteem, self-esteem is believed to also have some influence on other adolescent behaviors besides smoking (e.g., alcohol, sex, violent behavior, et cetera). Finally, determinants at the ultimate level of influence, such as genetic factors, are posited to have an even more indirect and generalizable effect on behavior.

In line with current frameworks of health promotion planning (Bartholomew, Parcel, Kok, Gottlieb, & Fernández, 2011; Green & Kreuter, 2005), behavioral determinants are the focal points for designing interventions. Various proponents of integrative interventions focus on the more distal determinants (e.g., social competence, self-esteem, school bonding), as these are theorized to be underlying constructs and to have a generalizable influence across behaviors (e.g., Botvin & Griffin, 2004; Hawkins, Kosterman, Catalano, Hill, & Abbott, 2008). Often, this focus on distal determinants is combined with addressing proximal determinants (e.g., outcome expectancies and refusal skills) for various behavior domains in a domain-specific way. Existing integrative interventions are often comprehensive, multi-year programs, as

distal determinants generally require more effort to modify them than do proximal-level determinants.

Most single-domain health promotion interventions focus on determinants at the proximal level of influence. Although proximal determinants are likely to be domain-specific, and thus on surface may not seem to be similar across domains, many of these interventions address similar psychosocial constructs, such as factual knowledge, attitudinal beliefs, social influences from peers and parents and refusal skills (Botvin, Schinke, & Orlandi, 1995; Schaalma, Abraham, Gillmore, & Kok, 2004; Summerfield, 2002). This suggests there is at least some similarity with respect to proximal-level determinants and some conceptual overlap in programs between behavioral domains.

To summarize so far, schools threaten to be overflowed by a multitude of single-domain health promotion programs, whereas an integrative approach that targets and connects various behavioral domains at the same time may be more efficient. An integrative approach seems feasible, as connections between various health domains have been established at the level of behavior, at various levels of determinants, and at the level of determinants targeted by health promotion programs. However, the feasibility of an integrative approach may differ depending on the specific behavioral domains one wishes to combine or integrate. Feasibility may depend on the strength of association between the behaviors (e.g., health-risk behaviors cluster more strongly than do health-risk and health-promoting behaviors), and on the extent to which (it is known that) the behavioral domains have determinants in common. Similarities in determinants between behavioral domains seem to be possible at all three posited levels of determinants (ultimate, distal, and proximal). Therefore, in theory, integrative interventions can focus on any of these levels: ultimate and distal determinants - which are posited to have an influence which is generalizable across behavioral domains and which may be relatively difficult to modify – and on proximal determinants – which are likely to be domain-specific and are less difficult to modify.

4. TRANSFER-ORIENTED APPROACH

The particular integrative approach we examined in our project was one that focuses on the concept of transfer. This approach originates from educational theory and research and, to our knowledge, has never before been applied to the health promotion field. 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 behavioral domain (e.g., refusal skills with respect to smoking) to another context or domain that is not explicitly addressed (e.g., refusing alcohol). Research and theory from the field of educational psychology have generated insights into the conditions under which transfer is more likely to occur, and how these conditions can be translated into aspects of the teaching-learning process to promote transfer among students (Campione, Shapiro, & Brown, 1995; Tuomi-Gröhn & Engeström, 2003). Two such transfer-promoting aspects are addressed here briefly. One aspect

is that the learning content should explicitly address general principles or procedures that are relevant for various student behaviors (e.g., general rules for how to say no to something/someone) and should prompt students to apply these general principles to various specific domains (e.g. how would you refuse an offer of tobacco, sex, etc.). The examples may indicate that general principles in the health promotion field are likely to have a cognitive-behavioral nature. The other aspect is that the learning process and content, such as the general principles, should be meaningful to students. If students don't see the relevance for their personal or professional life, they will not be likely to have a meaningful learning experience which they can translate to other domains. Combining these two aspects leads to the expectation: if students grasp the general principles, practice them in several domains, and find the principles and their application personally meaningful, it is expected that they will be able and motivated to use them also in domains that were not explicitly taught and practiced.

In the transfer literature it is almost a given that the extent of transfer to other domains, or the ease with which transfer may be expected to occur, can vary between domains, depending on the closeness or degree of similarity between the transfer domain and the original domain in which the knowledge or skill was learned (Barnett & Ceci, 2002). Applying this finding to the literature on behavioral clustering leads to the expectation that transfer from one behavioral domain to another is easier to accomplish if the transfer domain and the original domain are more strongly associated. Hence, in light of the results for behavioral clustering mentioned earlier, one would assume that transfer from one risk behavior to another (e.g., from smoking to alcohol) is more likely to occur or easier to produce than transfer from a risk behavior to a health-promoting behavior (e.g., from smoking to nutrition).

5. OUR STUDY

The basic premise of our study was to develop a transfer-oriented curriculum and to examine its effects in behavioral domains that would be addressed by the curriculum as well as in domains that would not be addressed explicitly by the curriculum. As the number of behavioral domains that could be assessed in this study was limited, e.g. due to constraints of questionnaire length, we chose to include four domains which are known to be addressed rather frequently in health promotion classes at Dutch secondary schools (Dafesh, 2006): smoking, safe sex, alcohol use, and healthy nutrition. Moreover, we selected smoking and safe sex as domains to be addressed by the curriculum because these domains are expected to be relatively close, and examined possible transfer effects in the relatively 'near' domain of alcohol and in the relatively 'far' domain of nutrition.

5.1 Objectives and research questions of this study

With this study, we hope to contribute to the knowledge base regarding transfer-oriented learning in health education at secondary schools.

The main research question of the study is:

> Is it possible, with a specially designed transfer-oriented intervention about smoking and safe sex, to achieve effects on behavior and determinants not only in the domains of smoking and safe sex, but also in the closely related domain of alcohol and the less closely related domain of healthy nutrition?

The main research question is partitioned into four subquestions:

1. To what extent are the domains of smoking, alcohol abuse, safe sex and healthy nutrition associated at the level of behavior, and which similarities exist between these domains at the level of behavioral determinants?
2. Which conditions for effectiveness of school health promotion appear to be similar across the domains of smoking, alcohol abuse, safe sex and healthy nutrition?
3. To what extent is a transfer-oriented curriculum about smoking and safe sex effective in changing behavior and behavioral determinants in the domains of smoking and safe sex, and in the closely related domain of alcohol consumption and the less closely related domains of fruit and breakfast consumption?
4. To what extent are transfer effects in the closely related domain of alcohol consumption, and in the less closely related domains of fruit and breakfast consumption mediated by students' learning experiences with respect to general cognitive-behavioral principles?

6. PHASES IN THE PROJECT AND OUTLINE OF THE THESIS

It seems logical to assume that there has to be some kind of similarity or connection between domains if meaningful transfer between these domains is to be possible. After all, if students are expected to transfer the knowledge or skill they have acquired (in the form of a general principle or procedure) from one domain to another, they have to perceive it to be worthwhile and applicable in the new domain.

Therefore, the first step in the project is to examine associations and similarities between the four domains. In **chapter 2** we address **research question 1** by examining, in a literature review, the extent to which the four behavioral domains are associated at the level of behavior, and which determinants at a proximal, distal and ultimate level appear similar across the four domains.

Chapter 3 also pertains to **research question 1**. In this chapter, we take a closer look at the review results for similarities between domain-specific determinants. Domain-specific determinants are determinants which are framed in terms of a particular domain or whose content varies with the domain in question. Think, for instance, of attitudinal beliefs: beliefs about smoking are different from beliefs about condom use, because the behavioral consequences and circumstances of smoking and condom use differ. Despite their domain-specific content, domain-specific factors may share common ground on a more general level. This common ground may create opportunities for teaching for transfer, since transfer-oriented learning is about discovering and applying general issues in specific factors across domains.

For instance, continuing the above example about beliefs: although attitudinal beliefs about behavioral consequences of smoking and condom use may differ, there may be similarities across these domains in the types of behavioral consequences as well as their personal relevance (e.g., beliefs about immediate physiological consequences, about health consequences and about social consequences). Such similarities can be used to generate general principles which may be addressed in a transfer-oriented intervention.

In **chapter 4** we address **research question 2** and examine, again by means of a literature review, which commonalities and differences exist in the conditions for effectiveness of interventions across the four domains of smoking, alcohol use, safe sex and nutrition. The reason for this review is our expectation that it will not be sufficient to examine the extent to which the four domains share similar determinants. We also believe it to be important that the intervention methods with which the determinants can best be targeted, will suit our purpose of designing a transfer-oriented curriculum that has the potential to be effective in each domain and across domains.

The results of chapters 2 to 4 showed a sufficient degree of similarity across the four domains – in terms of behavior, determinants and methods for change– for us to conclude that a transfer-oriented approach is feasible.

The next step in our project is the development of a transfer-oriented curriculum about smoking and safe sex. The curriculum is based on various sources: (1) the results of the review of determinants, especially those with respect to domain-specific determinants, are used to select target determinants for the intervention, (2) the selected determinants are compared to those found in previous quantitative Dutch research and to beliefs that appear salient in our qualitative focus groups with students, (3) specification of learning objectives, both domain-specific and with respect to general principles, (4) designing curriculum content and specific assignments based on theories and empirical insights into effect conditions for transfer and for domain-specific school health promotion interventions, (5) consultation of health promotion and education experts, (6) pilot testing the feasibility of the prototype curriculum in classroom practices, and (7) if necessary, revising the prototype curriculum into a final version.

Chapter 5 addresses **research question 3** and describes the effect study of the curriculum. In this study, we assess the effects of the curriculum - compared to a control condition consisting of usual lessons about smoking and safe sex – on behavior and determinants in the taught domains of smoking and safe sex and the untaught domains of alcohol and nutrition. As dietary behavior consists of a vast array of subbehaviors, two dietary subdomains are assessed: fruit consumption and breakfast consumption.

As we indeed observed transfer effects in the domains of alcohol, fruit and breakfast consumption in the effect study, we additionally examine whether mediation mechanisms can be found, which can explain the mechanism(s) by which the transfer effects are produced. This mediation study, addressing **research question 4**, is reported in **chapter 6**. Specifically, it is examined to what extent students report

learning a general principle, and to what extent these learning experiences mediate the intervention effects in the untaught domains.

Finally, in **Chapter 7** we present a summary of the project and its results, followed by a discussion of the project's strengths and limitations and the relevance for educational practice, theory and research. We conclude this thesis with recommendations for future research.

Chapter 2

CLUSTERING OF HEALTH-RELATED BEHAVIORS AND THEIR DETERMINANTS: POSSIBLE CONSEQUENCES FOR SCHOOL HEALTH INTERVENTIONS[1]

Characterizing school health-promotion is its category-by-category approach, in which each separate health-related behavior is addressed independently. Such an approach creates a risk that extra-curricular activities become overloaded, and that teaching staff are distracted by continuous innovations. Within the health promotion sector there are thus increasing calls for an integrative approach to health-related behaviors. However, a meaningful integrative approach to different lifestyles will be possible only if there is some clustering of individual health-related behaviors and if health-related behaviors have a minimum number of determinants in common. This systematic review aims to identify to what extent the four health-related behaviors smoking, alcohol abuse, safe sex and healthy nutrition cluster; and how their determinants are associated. Potentially modifiable determinants that offer clues for an integrative approach of school health-promotion programs are identified. Besides, the direction in which health educators should look for a more efficient instructional design is indicated.

1. INTRODUCTION

Characterizing school health-promotion is its category-by-category approach, in which each separate health-related behavior is addressed independently. Such an approach creates a risk that extra-curricular activities (including health promotion programs) become overloaded, and that teaching staff are distracted by continuous innovations (Ten Dam, 2002).

In the Netherlands, health promotion is not the only social theme requiring attention in schools: emancipation, cultural education and environmental education have all been around for a considerable time, joined more recently by peace education. Within the health promotion sector there are thus increasing calls for an integrative approach to health-related behaviors. These envisage a single intervention program

[1] *Wiefferink, C. H., Peters, L., Hoekstra, F., Ten Dam, G., Buijs, G. J., & Paulussen, T. G. W. M. (2006). Clustering of health-related behaviors and their determinants: Possible consequences for school health interventions.* Prevention Science, 7, *127-149.*

that addresses several health-related behaviors simultaneously, simultaneously saving costs and making fewer demands on the limited innovative capacity of schools.

However, Paulussen has assumed that a meaningful integrative approach to different lifestyles will be possible only if, at the very minimum, the following criteria are met: 1) that there is some clustering of individual health-related behaviors and 2) that these health-related behaviors have a minimum number of predictors in common (Paulussen, Panis, Peters, Buijs, & Wijnsma, 1998). While there is some evidence of clustering among health-compromising behaviors, such as smoking, alcohol abuse, and high fat intake, there is little evidence of it among health-enhancing behaviors, such as safe sex, exercise, and fruit and vegetable consumption (Aarø, Laberg, & Wold, 1995; Burke et al., 1997; Flay, 2002; Lytle, Kelder, Perry, & Klepp, 1995; Schaalma et al., 1997). Neither is it clear how health-enhancing behaviors relate to health-compromising behaviors (Flay, 2002). Although there have been extensive studies and reviews on psychosocial constructs as predictors of individual health-related behaviors, it is still not clear which predictors are broadly common to all behaviors, and which are behavior-specific.

Because there has been no systematic review indicating the predictors that can be included in an integrative approach, this study aims to fill the gap by presenting the results of a systematic review of 1) the clustering of four health-related behaviors: smoking, alcohol abuse, safe sex and healthy nutrition; and 2) the relationships between predictors of these four behaviors.

1.1 Theoretical approaches to predicting health-related behaviors

There are very many theories on predicting health-related behaviors. Probably the most common ones are the psychological theories of decision making, which describe the cognitive variables that are thought to predict behavior. Some of these theories, such as the Health Belief Model, Protection Motivation Theory, and Theory of Planned Behavior, focus on the individual (Ajzen, 1991; Becker, 1974; Rogers, 1983). Other theories, such as the Social Learning Theory, are interpersonal theories which include the social context (Bandura, 1986). These theories assume that each specific behavior has its own set of specific beliefs that directly predict behavior. Such beliefs, known as proximal determinants because they are believed to have the most direct link to behavior, are in turn influenced by other factors, so-called distal determinants, which are more distant from behavior than proximal determinants.

There are also some theories on distal determinants, such as The Five Factor Model and Problem Behavior Theory (Gullone & Moore, 2000; Jessor, 1991). Including determinants such as self-esteem, extraversion, sensation seeking, and relations with adults, such theories are assumed to be predictive for multiple health-related behaviors.

Finally, there are integrative theories that combine proximal, distal, intrapersonal and interpersonal determinants; these include the Biopsychosocial Model, the Ecologic Perspective, and the Theory of Triadic Influence (TTI) (Bronfenbrenner, 1986; Flay & Petraitis, 1994; Irwin & Millstein, 1986; Irwin, Igra, Eyre, & Millstein, 1997).

A more comprehensive overview of predictive theories of health-related behavior is given by Petraitis (Petraitis, Flay, & Miller, 1995). Of all attempts to formulate an integrative theory that predicts health-related behaviors, the Theory of Triadic Influence (TTI) appears to be the most comprehensive one (Flay & Petraitis, 1994). It includes not only determinants at different levels (i.e., proximal, distal, and ultimate), but also determinants of different types (i.e., intrapersonal determinants in the biology/personality stream, interpersonal determinants in the social situation stream, and cultural determinants in the cultural environment stream). For the purpose of this study we decided to use the TTI as a basis for modeling the determinants of health behaviors.

1.2 Framework for organizing psychosocial variables

Figure 1 shows the framework we used for modeling these determinants. It is a simplified version of the TTI (Flay & Petraitis, 1994). The top line represents the ultimate determinants of behavior, i.e., determinants that are predictive for multiple behaviors but are believed to be almost unchangeable. They include the culture and society one lives in, the more immediate social environment, and one's inherited traits. The second line represents the distal determinants of behavior, including knowledge and values, social relationships, and sense of self and social competence. These determinants are more immediate causes of behavior than ultimate causes, and are also supposed to be predictive for multiple behaviors. The third line represents proximal determinants, such as attitudes, social normative beliefs, and self-efficacy. Although proximal determinants are highly predictive for one behavior, the specific content of these belief structures are supposed to differ between specific behaviors.

Ultimate determinants are more deeply rooted and less predictive of behavior than distal and proximal determinants, but are (almost) impossible to change. While people cannot change their inherited traits or personality dispositions, it is possible to change distal determinants (such as social competence), and proximal determinants (such as self-efficacy).

Like Flay, we assume that there are "interstream pathways" between ultimate and distal determinants (Flay & Petraitis, 1994). For instance, personality can not only influence distal determinants in the same stream, such as social competence, but also, to a lesser extent, distal determinants in the other streams, such as social bonding.

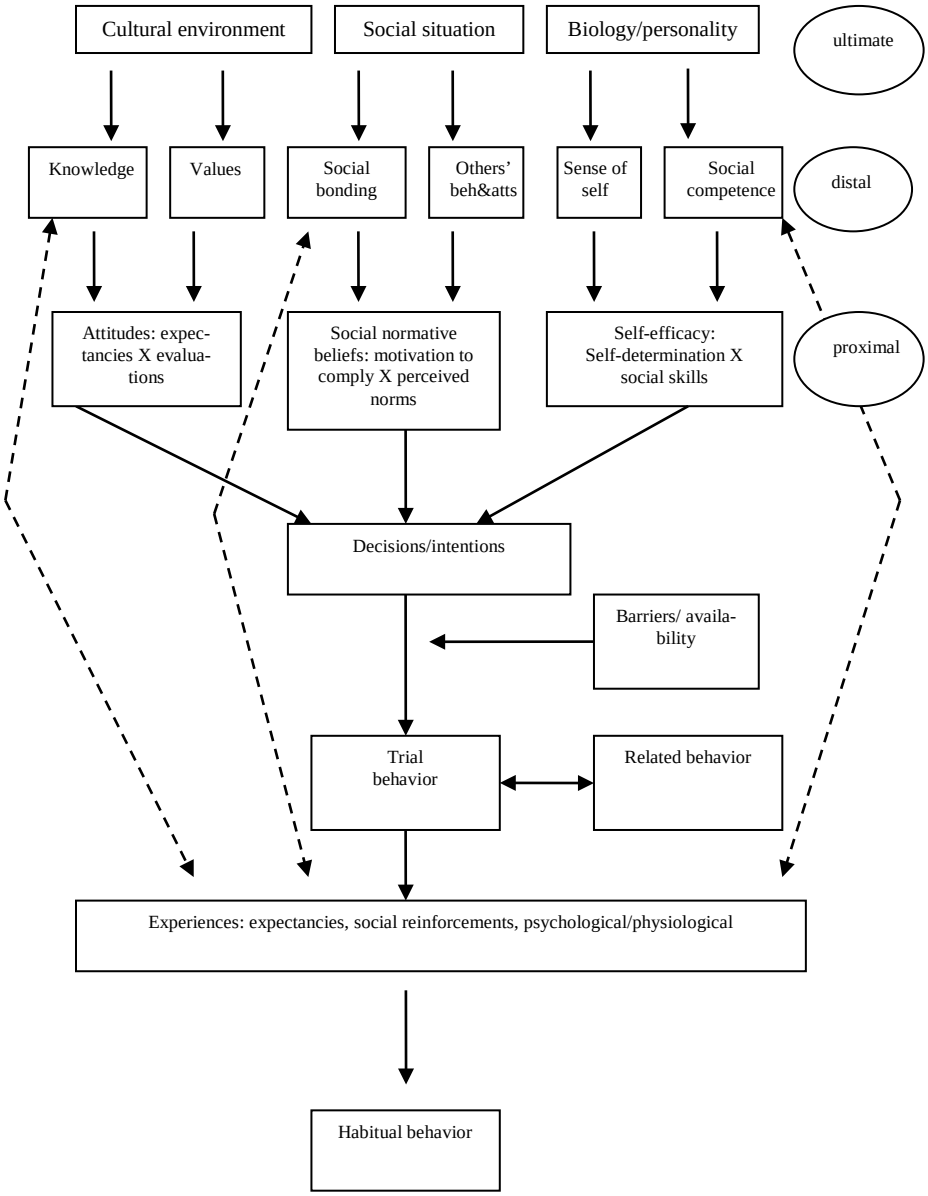

Figure 1. Framework of determinants predicting health-related behaviors.

1.3 Aims of this study

Using the TTI, we organized the determinants of health-related behaviors in order to answer the following questions:

1) To what extent are the four health-related behaviors (smoking, alcohol abuse, safe sex and healthy nutrition) associated?
2) Which determinants are correlated with two or more of these four behaviors?

We expected that health-compromising behaviors, such as smoking and alcohol abuse would be related more to each other than to health-enhancing behaviors such as safe sex and healthy nutrition. We also expected that determinants of behaviors would be more similar on a distal and ultimate level than on a proximal level.

It should be noted that this study was limited to determinants on the ultimate, distal and proximal levels that influence intentions to carry out the behavior. And although we are aware that there is a gap between intention and actual behavior, it was beyond the scope of this study to study and to explain this gap.

2. METHOD

2.1 Sample of studies

To generate the sample of studies, we searched the Medline and PsycINFO databases using the following keywords: risk-taking, risk factors, risk perception, psychosocial factors, psychology, intention, motivation, personality (characteristics), personality correlates, predisposition, knowledge, attitudes, and practice. Five searches were performed, one each for the four individual behaviors, and one for multiple behaviors. Each search featured keywords specific to the behavior or behaviors in question. For instance, for safe sex we used the following keywords: safe sex, contraception behavior, condoms, Acquired Immunodeficiency Syndrome/prevention and control, AIDS prevention, sexual risk-taking, psychosexual behavior, and attitudes to AIDS.

2.2 Inclusion criteria

Studies were included if they met the following criteria:

1) Studies had to have been published in journals included on the Social Science Citation Index list.
2) Reviews had to have been published between 1995 and 2003.
3) Empirical studies had to have been published between 2000 and 2003.
4) Data collection had to have been carried out in Western countries (Western-Europe and USA).
5) Respondents had to be between 10 and 18 years.
6) Studies had to report on the relationship between the behavior and its determinants.

Because of the huge number of empirical studies on smoking and alcohol abuse, we included only longitudinal studies for these behaviors. The time window for reviews from 1995 to 2003 was chosen to make sure that reviews of all four behaviors could

be included. The time window for empirical studies was limited between 2000 and 2003 because we assumed that empirical studies published before 2000 were included in one of the included reviews. Because there are fewer studies on nutrition, we included empirical studies on nutrition published between 1995 and 2003.

On the basis of these inclusion criteria, 116 studies were included in the review: 23 on safe sex, 27 on smoking, 13 on alcohol abuse, 23 on nutrition, 10 on smoking and alcohol abuse, and 20 on multiple behaviors.

Of the 20 studies that examined multiple behaviors, five did not present results on the links between determinants and separate behaviors, but instead constructed a single index that included a number of health-related behaviors. In three of these studies, this index consisted of smoking, alcohol abuse, and sexual experience; in one study it consisted of smoking, alcohol abuse, and healthy nutrition; and in one it consisted of smoking and alcohol abuse. In all studies, the indexes also included other behaviors, for instance marijuana use or suicidal behavior. Table 1 shows the characteristics of the studies we included. Thirty-six reviews were included (including one meta-analysis) and 80 empirical studies. Most of the reviews are on smoking (53%) and only four reviews are on nutrition (11%). Empirical studies on smoking and alcohol abuse were longitudinal studies, whereas most empirical studies on safe sex and nutrition were cross-sectional studies (88% and 95%). Studies that addressed more than one behavior were mostly cross-sectional. Most studies (70%) were conducted in the USA, the remaining studies in Western Europe, Australia, New Zealand or Canada.

2.3 Coding

Three reviewers coded the studies, with one reviewer coding smoking and alcohol abuse studies, one coding safe sex and multiple-behavior studies, and one coding nutrition studies. To ensure that coding of the studies was carried out according to the protocol, coding was discussed in several meetings. For each study we coded the following: study design; the age; gender and ethnic group of respondents; the number of respondents; the country where data were collected, the method whereby behavior was measured; and relationships between behavior and determinants. Studies that measured multiple behaviors, but presented relationships between each separate behavior and determinants, were coded as separate behaviors, whereas studies that presented relationships between determinants and an index of multiple behaviors were analyzed separately

Determinants were categorized to meaningful categories, according to the model presented in figure 1. For example, we categorized “perceived personal risk of HIV” and “perceived personal risk of cancer” in the category “perceived personal health risk”. The only determinants included for further analysis were those measured for two or more behaviors. Behavior-specific proximal determinants that could not be categorized on a more conceptual level were not included in our study.

The terms ‘negative association’ and ‘positive association’ are used in this study. A negative association means that a determinant predicts unhealthy behavior, while a positive associations means that a determinant predicts healthy behavior.

3. RESULTS

3.1 Clustering of the four health-related behaviors

Most studies that investigated the links between health-related behaviors found significant relationships between the health compromising behaviors alcohol abuse and smoking. There was clear evidence that smoking and alcohol abuse cluster, with correlations varying from 0.43 to 0.60.

The relationship between safe sex and other behaviors is more complicated. Most studies did not measure the health enhancing behavior safe sex, but sexual experience, which some authors considered to be health compromising behavior. There is evidence that sexual experience clusters with smoking and alcohol abuse; correlations vary from 0.29 to 0.54.

We found only one study that investigated the relationship between nutrition and health compromising behaviors (Karvonen, Abel, Calmonte, & Rimpelä, 2000). This study identified three clusters: 1) adolescents who eat healthily, i.e., fruit and vegetables, and who do not smoke or drink alcohol (this cluster accounted for approximately half of the study population); 2) adolescents who eat unhealthily, i.e., who eat little fruit and vegetables, and who smoke and drink alcohol (20% of the study population); and 3) adolescents who eat unhealthily, but who do not smoke or drink alcohol (about 30% of the study population).

3.2 Correlation between determinants and health behaviors

Many determinants were studied for the four health-related behaviors. Most of these were studied for two or more behaviors, but, owing to their behavior-specific nature, some were studied for one behavior. For instance, “perceived healthfulness of the product” was studied only for nutrition, whereas “traditional attitude towards sex roles” was studied only for safe sex.

Several determinants were also measured for smoking and alcohol abuse, but not for safe sex and nutrition. These included the “belief that smoking and alcohol use reduce stress”, and “number of offers of unhealthy products”.

Table 2 presents the relationships between determinants and the four health-related behaviors (i.e., smoking, alcohol abuse, safe sex and healthy nutrition). The figures in table 2 refer to the studies with the same figure in table 1. We will elaborate on the results presented in table 2 in the following sections.

3.3 Studies examining determinants of one behavior

3.3.1 Ultimate determinants.

Ultimate determinants in the cultural environment stream were measured in only a few studies. While non-smoking and low alcohol consumption were positively associated with religiousness or frequent church attendance, there seemed to be no such correlation with safe sex. Exposure to commercials was negatively associated with a healthy diet, but findings concerning smoking were not uniform: while one study

found a negative relationship of commercials with non-smoking, another found no relationship.

In the social situation stream, four determinants were studied for more than one behavior. Life in a two-parent family was more positively associated with all four health-related behaviors than life in a one-parent family. However, family problems (e.g., illness, unemployment or remarrying) seemed to have no influence, with an exception for males, who had a higher risk of smoking. The influence of Social Economic Status (SES) was not clear: some studies found that a higher SES was protective, but other studies did not find a relationship.

Determinants in the biology/personality stream had frequently been studied for smoking and alcohol abuse. Positive traits such as reliability, sociability and intelligence generally had a positive association with health-related behavior, while negative traits, such as rebelliousness were negatively associated with it. Emotional distress was studied for all four behaviors: there is evidence that this had a negative association with all four health-related behaviors. Sensation-seeking was negatively associated with non-smoking, low alcohol consumption and safe sex. In general, risk-taking was negatively associated with non-smoking and safe sex.

3.3.2 Distal determinants.

In the cultural environment stream, knowledge of behavior risks was the only determinant measured for more than one behavior. The findings were not uniform: while most studies did not find any relationship between knowledge and behavior, some studies found a positive relationship and others a negative one.

On the distal level, determinants in the social situation stream were studied the most, principally 1) the perceived behavior of significant others and 2) the parent-child relationship. In general, the perceived healthy behavior of significant others (e.g., peers, friends, parents) was positively associated with the health-related behavior of adolescents. Only a small number of studies found no relationship. With regard to the parental-child relationship, in all four behaviors we found clear evidence that it was an important factor in adolescents' health-related behavior. Although different studies were carried out in different ways, one picture became clear: adolescents were more likely to behave healthily if they lived in a close family with supportive, involved parents who monitored them and communicated with them in a positive way.

In the biology/personality stream, self-esteem was the most studied determinant. There was evidence that safe sex, non-smoking and low alcohol consumption were positively associated with high self-esteem, although some studies found no relationship. Similarly, non-smoking and low alcohol consumption seemed to be positively associated with an internal locus of control.

3.3.3 Proximal determinants.

On the proximal level, determinants in the cultural environment stream were studied the most. A feature of proximal determinants is that they are specific to one behav-

ior. The studies in our review showed a great variety of beliefs concerning specific health behaviors, some of which were relevant to more than one behavior. The findings for perceived personal health risks of the specific behaviors all tended in the same direction, as most studies found that such perception was positively associated with safe sex and non-smoking, although some studies on safe sex reported a positive association for some groups in the study population but no association for other groups. In addition, a study on nutrition found a negative association for perceived personal health risk with healthy nutrition.

There was convincing evidence that for all four behaviors adolescents believe that immediate gratification will result from performing the unhealthy behavior.

While perceived subjective norms of peers seemed to have a positive association with safe sex, healthy nutrition and non-smoking, this was not the case with low alcohol consumption. Similarly, perceived subjective norms of parents were positively associated with healthy nutrition, non-smoking and low alcohol consumption. This had not been studied with regard to safe sex, however.

Finally, there is some evidence that all four behaviors are positively associated with perception of skill in refusing to engage in unhealthy behavior.

3.4 Studies examining determinants of more than one behavior

Studies that examined determinants of more than one behavior focused mainly on the social situation stream and the biology/personality stream, each at the ultimate and distal level; these studies hardly examined determinants at the proximal level. The results of these studies were consistent with the results of studies that examined one behavior. Studies that examined more than one behavior are marked bold in table 2.

3.5 Studies examining determinants of an index of multiple behaviors

Five studies used one measure for several health-related behaviors. Determinants on a distal or ultimate level were examined most.

The results of these studies confirmed the results described above regarding self-esteem, emotional distress, and parental monitoring/support. Besides, in one study a positive association with social, verbal and intellectual competence, and academic achievement was found and in an other study a negative association between healthy behavior and an extrinsic aspiration for wealth, fame, and image was found.

4. DISCUSSION

4.1 Clustering of the four health-related behaviors

The review of clustering of the behaviors smoking, alcohol abuse, safe sex, and healthy nutrition confirms our hypothesis that the health-compromising behaviors smoking and alcohol abuse indeed cluster. However, we could not clarify the clustering of health-enhancing behaviors such as safe sex and healthy nutrition, as this was not examined in the studies included in this review.

The confirmation of our hypothesis is consistent with Flay, who claims that although clustering certainly takes place between different adolescent problem-behaviors (including smoking and alcohol abuse), there is no evidence to support the idea of clustering of health-enhancing behaviors (Flay & Petraitis, 1994).

Although we found evidence that the health-compromising aspects of sexual behavior are moderately associated with other health-compromising behaviors, such as smoking and alcohol abuse, it should be stated that most studies in this review were carried out in the USA, where adolescent sex, especially sex with multiple partners, is considered as risky, health-compromising behavior. In the Netherlands, sexual experience is not generally considered as risky sexual behavior, whereas having sex without using a condom is.

No evidence was found for clustering of health-enhancing behaviors, such as safe sex and healthy nutrition; neither, however, was there any evidence that these behaviors do *not* cluster. Nor did we find evidence whether health-enhancing and health-compromising behaviors are negatively or positively associated, although one study reported a negative association for a large group of the study population and a positive association for a smaller group (Karvonen et al., 2000). This suggests that many adolescents do not have a lifestyle that can simply be labeled "healthy" or "unhealthy", but rather that some may have a lifestyle that is partly healthy and partly unhealthy.

As there are still many gaps in our knowledge of how health-related behaviors are associated, more studies are needed on the clustering of these behaviors.

4.2 Correlations between determinants and health-related behaviors

To date, correlational studies between determinants and health-related behavior have focused predominantly on 1) ultimate determinants in the personality/biology stream, 2) distal determinants in the social situation stream, and 3) proximal determinants in the cultural environment stream. The majority of these studies identified the relationships between determinants and health-related behavior which we expected to find, with the four health-related behaviors generally being predicted at a distal and ultimate level by the same determinants.

Because we categorized proximal determinants at a conceptual level, some of these determinants appear to be related to more than one health-related behavior. For example, perception of personal health risk, the belief that performing the behavior will bring immediate gratification, and normative beliefs of significant others were related to all four behaviors. While it is true that normative beliefs (to take just one example) are specific to one behavior, all behavior specific normative beliefs refer to the same idea: for adolescents it is important that a behavior be acceptable to their peers and/or parents, whether this behavior is safe sex, smoking, healthy nutrition or alcohol abuse. However, as we expected, all other proximal determinants were behavior-specific and could not be categorized on a more conceptual level and therefore were not included in our study.

4.3 Most relevant determinants of health-related behaviors

Although the results of the various studies differed with regard to the relationship between some determinants and the four behaviors, other determinants were studied for all four behaviors, with which they showed relatively consistent relationships. Several determinants seem to have a protective influence on adolescents: living with supportive parents, high self-esteem, high perceived personal health risk, perceived healthy behavior of peers and parents, and perceived acceptability of the healthy behavior by peers and parents. However, adolescents can be seduced into unhealthy behavior by the immediate gratification they anticipate.

4.4 Limitations

Before we focus on the implications of the present findings for research and intervention, we will first discuss some limitations of our study.

First, there was considerable variation in the design of the studies we selected: most of those on nutrition and safe sex were cross-sectional studies, and all of those on smoking and alcohol abuse were longitudinal studies. This implicates that the findings on smoking and alcohol abuse are more robust than the findings on safe sex and nutrition as far as causality is concerned. Cross-sectional studies only show that there is an association between determinants and behavior, whereas longitudinal studies also show that a determinant indeed is a predictor of a certain behavior.

Similarly, various statistical procedures had been used. Some studies conducted qualitative analyses, others carried out only univariate statistical analysis, and yet others multivariate analyses. Most of the reviews we included were narrative reviews and thus did not use any statistical procedures at all.

Across all studies, there was a great variation in the selection of outcome measures. For example, some studies measured condom use at first intercourse, while other studies assessed sexual experience. Most studies about alcohol assessed alcohol abuse, while some studies measured if the respondent had ever drank alcohol. In some cases, the reporting did not make it clear what exactly had been assessed. Some studies failed to report how outcome measures were coded or recoded. Definition of determinants was often unclear: terms such as antisocial behavior, sociable and social problems were used without a clear description of the measurements. However, studies that examined more than one behavior measured the determinants in the same way for each of the behaviors examined. In these studies, the results did not differ from studies that examined only one behavior. This indicates that in each of the studies we included the definitions of determinants were more or less the same. Despite differences in study design, statistical analysis and variability in outcome measures, the results for most determinants pointed in the same direction.

Because of the huge number of studies, we had to limit our search, and may thus have missed some relevant empirical studies. However, we assume that the reviews we included incorporated these empirical studies, and that we therefore included the relevant information they contained.

4.5 Implications for research and interventions

This review shows that while health-compromising behaviors have been studied extensively, far less attention has been devoted to health-enhancing behaviors. The emphasis on health-compromising behavior is understandable: after all, health promoters want to prevent adolescents from smoking, drinking alcohol, and from other health-compromising behaviors.

Nonetheless, greater understanding of the determinants of health-enhancing behavior may help identify options for developing interventions that simultaneously promote health-enhancing behavior and prevent health-compromising behavior. More studies about the determinants of health-enhancing behavior are thus highly relevant to health-promotion programs.

The determinants presented here do not cover the full possible range of determinants. Most of the studies we included concentrated on proximal determinants in the cultural environment stream, distal determinants in the social situation stream, and/or ultimate determinants in the personality/biology stream; other determinants were hardly examined. For instance, social competence, a distal determinant in the personality/biology stream, was examined in only one study, which found a relationship with an index of health-related behavior.

According to our theoretical framework, these kinds of distal determinants in the personality/biology stream might be important, as, unlike ultimate determinants in the personality/biology stream, they are potentially modifiable. Distal determinants, such as self-esteem, also underlie multiple behaviors and thus predict not only smoking but also other behaviors such as safe sex and alcohol abuse. More research should therefore be conducted on the impact of the distal determinants of health-related behaviors.

To conclude this review, we will briefly address its educational consequences. In recent years, various people have warned of the pressures imposed on schools and teachers by constantly changing learning-objectives and adding new ones. The introduction of social themes such as health education on top of those of multicultural education, environmental education, and so on means that the curriculum is in danger of becoming overfull (Ten Dam, Volman, & Vernooij, 2000).

Implementing such innovations makes constant demands on teachers' flexibility and ability; the problem is made worse by the accumulation of different intervention programs, each addressing a single behavioral domain. Bearing in mind the danger of an overloaded curriculum, it is thus important to question whether schools can work effectively on developing the knowledge, skills and attitudes that health education demands of students.

Our analysis of the clustering of health-related behaviors in terms of their predictors indicates the direction in which health educators should look for a more efficient instructional design. This review of the literature identifies potentially modifiable distal determinants (such as coping strategies), which are assumed to have more flexible properties than ultimate determinants (such as personality traits) and, therefore, to offer more clues for intervention aimed at various health-related behaviors simultaneously. In contrast, potential modifiable proximal determinants are more specifically linked to a single-behavior domain.

Determinants that are shared by several behaviors, distal as well as proximal determinants, should be taught in schools. However, the fact that health-related behaviors share some determinants does not necessarily mean that knowledge, attitudes, and skills can be learned independent of a specific behavioral context (e.g., smoking, alcohol abuse, safe sex, nutrition). This is borne out by research on learning and instruction (Brown, Collins, & Duguid, 1989). New knowledge, attitudes or skills can be learned only within the context of a specific behavior: coping strategies, self-efficacy, values, refusal skills, cannot be learnt in a vacuum. But, when several behaviors share the same determinant(s), a transfer-oriented learning process can provide students with skills to apply what they learned in other contexts. Transfer-oriented learning involves the alternate decontextualisation and contextualisation of the subject matter, in which, on the basis of a specific context, students are given insight into a general principle or concept, and are then asked to provide new specific examples of that principle. For example, if students learn how to resist the pressure of their peers when offered a cigarette, they can also use these skills when they are pressed to drink a lot of alcohol or to have sex without a condom, provided that a transfer-oriented learning process is used.

To summarize, in view of the risk of overloaded curriculums, the key is not to try to teach the competences that are important for general health-related behavior. Instead, the main challenge is to teach the domain-specific knowledge, skills and attitudes – regarding smoking, for example – in a transfer oriented way that, both in and out of school, students are also able and willing to apply the learned skills in other domains (e.g., alcohol abuse or safe sex) (Ten Dam, 2002). To study the possibilities of such an approach, we therefore recommend that a curriculum for the transfer-oriented learning of health-related behavior is developed and tested.

Table 1. Characteristics of studies included in the review

		Design	Dependent variable	Age	Gender	Ethnicity	*N*[b]	Country
1	Adalbjarnardottir (2001)	Longitudinal 3 years	Daily smoking, heavy alcohol use	14	M&F	White	347	Iceland
2	Amaro (2001)	Review	Smoking, drinking (substance abuse)	Mostly 12-18	M&F	Various ethnicities	219 ref	Mostly USA
3	Avenevoli (2003)	Review	Smoking	Mostly 11-17	M&F	Various ethnicities, mostly white	116 ref	USA and Western
4	Bachanas (2002)	Cross-sectional	% intercourse with condom	12-19	F	Afro-American	164	USA
5	Backman (2002)	Longitudinal	Intention healthy diet, calorie + F&V intake	14-19	M&F	Various ethnicities, 36% Hisp.	780	USA
6	Bauman (1996)	Review	Smoking, drinking (marijuana)	Adolescents	M&F	Not specified	116 ref	Mostly USA
7	Beal (2001)	Cross-sectional	Smoking, alcohol, sexual experience	12-13	M&F	Mostly black + Hispanic	208	USA
8	Beckman (1996)	Review	Condom use	Adolescents	M&F	Not specified	16	USA
9	Belcher (1998)	Review	Smoking, drinking (substance use)	Adolescents	M&F	Various ethnicities	113 ref	Mostly USA
10	Ben-Zur (2000)	Cross-sectional	Frequency condom use	14-18	M&F	60 % immigrants	1082	Israel
11a	Berg (2000)	Cross-sectional	Milk and bread choice	11-15	M&F	Not specified	1096	Sweden
11b	Berg (2002)	Cross-sectional	Breakfast food choice	11-15	M&F	Not specified	181	Sweden
12	Birch (1998)	Review	Eating behavior	Adolescents	M&F	Not specified	106 ref	Not specified
13	Blum (2000)	Cross-sectional	Smoking, alcohol, sexual experience	Grade 7-12	M&F	Various ethnicities, 70% white	10803	USA
14	Boyer (2000)	Cross-sectional	Susceptibility STD's	13-21	M&F	Afro-American	303	USA
15	Brooks (2002)	Cross-sectional	Smoking, alcohol, healthy diet, risky sexual behavior	Mean = 16	M&F	Not specified	2224	USA
16	Carvajal (2000)	Longitudinal 9m	Smoking	Grade 6-7	M&F	Various ethnicities, 60% white	736	USA
17	Chassin (2000)	Longitudinal 13y	Smoking trajectories	Grade 6-12	M&F	96% White	736	USA
18	Choi (2001)	Longitudinal, Sample 1: 4 yrs,	Established smoking (> 100 sig/life)	12-18	M&F	Sample 1: nationally repre-sentative	1: 7960 2: 3376	USA

		Design	Dependent variable	Age	Gender	Ethnicity	*N*[b]	Country
		Sample 2: 3 yrs				Sample 2: not specified		
19	Choi (2002)	Longitudinal 3y	Established smoking (> 100 sig/life)	12-17	M&F	Various ethnicities, 64% white	2965	USA
20	Coker (2001)	Longitudinal 2 yrs	Binge drinking (> 5 drinks)	Grade 8	M&F	Nationally representative	17424	USA
21	Colon (2000)	Cross-sectional	Intention condom use	14-19	M	Afro-American	229	USA
22	Contento (1995)	Cross-sectional	Quality of food intake	11-18	M&F	Various ethnicities, 47% white	411	USA
23	Cooper (2002)	Review	Condom use	12-24	M&F	Not specified	43	USA
24	Cooper (2003)[a]	Longitudinal 4y	Smoking, alcohol, risky sexual behavior	13-19	M&F	Black & white	1978	USA
25	Croll (2001)[a]	Focusgroup	Healthy food choice	Grade 7-12	M&F	Various ethnicities, 50% white	203	USA
26	Crosby (2000)	Cross-sectional	Frequency unsafe sex	14-18	F	Afro-American	522	USA
27	Crosby (2001)	Cross-sectional	Condom use	14-18	F	Afro-American	469	USA
28	Crosby (2002a,b)	Cross-sectional	Condom use	14-18	F	Afro-American	522	USA
29	Cullen (1999)	Cross-sectional	Fruit, vegetable and fat intake (i.o.)	14-21	M&F	Not specified	5881	USA
30	D'Amico (2001)	Longitudinal 6m	Binge drinking (> 5 drinks)	13-18	M&F	Various ethnicities, 70% white	621	USA
31	Darling (2003)	Review	Smoking	Adolescents	M&F	Not specified	96 ref	Not specified
32	De Bourdeaudhuij (1998)	Descriptive	Family members influence on decision making about food	Families with 2 adol. 12-18	M&F	Not specified	92 fam.	Belgium
33	Derzon (1999)	Meta-analysis	Smoking	Up to 18	M&F	Various ethnicities, mostly white	64	USA and Western
34	DiClemente (2001)	Cross-sectional	Alcohol, risky sexual behavior	14-18	F	Afro-American		USA
35	Dilorio (2001)	Cross-sectional	Condom use	13-15	M&F	Afro-American	405	USA
36	DuRant (1999)	Review	Smoking	Adolescents	M&F	Not specified	5	Not specified
37	Eertmans (2001)	Review	Eating behavior	Not specified	M&F	Not specified	124 ref	Not specified

		Design	Dependent variable	Age	Gender	Ethnicity	*N*[b]	Country
38	Eissenberg (2000)	Review	Initial smoking	Adolescents	M&F	Not specified	105 ref	Not specified
39	Ellickson (2001)	Longitudinal 5y	Smoking	13 and 18	M&F	Various ethnicities, 72% white	3056	USA
40	Ellickson (2001)	Longitudinal 2+5=7y	Alcohol misuse	Grade 7 and 10	M&F	Various ethnicities, 67% white	4200	USA
41	Epstein (2000)	Longitudinal 1+2y	Smoking	Grade 7 and 10	M&F	Various ethnicities, 54% Hispanic	1094	USA
42	Fahs (1999)	Review	Smoking, drinking	Adolescents	M&F	Various ethnicities	31	Mostly USA
43	Ferdinand (2001)	Longitudinal 4,6,8y	Heavy smoking	10-18	M&F	Not specified	487	The Nether-lands
44	Flay (1998)	Review	Smoking	Adolescents	M&F	Not specified	34	Not specified
45	Flisher (2000)	Cross-sectional	Score of 6 risk behaviors	9-17	M&F	Not specified	1285	USA
46	Gage (1998)	Review	Condom use	10-19	M&F	Not specified	10	Various
47	Gillman (2000)	Cross-sectional	Frequency of fruit and vegetables	9-14	M&F	Various ethnicities, 93% white	16202	USA
48	Goldberg (2002)	Longitudinal 6m	Alcohol use (smoking)	Grade 5, 7, 9	M&F	Various ethnicities, 80% white	395	USA
49	Greene (2000)	Cross-sectional	Smoking, alcohol, risky sexual be-havior	11-18	M&F	Various ethnicities, 82% white	381	USA
50	Griffin (2000)	Longitudinal 2y	Alcohol use	Grade 7	M&F	Various ethnicities, 40% Afro-Am	1950	USA
51	Gutierrez (2000)	Cross-sectional	Condom use	14-19	M&F	Afro- + European-American	333	USA
52	Halpern-Felsher (1996)	Review	Risky sexual behavior	13-20	M&F	Not specified	15	USA
53	Hanna (2001)	Cross-sectional	Smoking, alcohol	12-16	M&F	National representative	2001	USA
54	Henderson (2002)	Cross-sectional	Condom use 1e intercourse	13-14	M&F	Not specified	1220	Scotland
55	Hendrickx (2002)	Focusgroup	Condom use	15-21	M&F	Moroccan	55	Belgium
56	Hine (2002)	Longitudinal 3m	Smoking	12-19,	M&F	Not specified	361	Canada
57	Hoglund (1998)	Cross-sectional	Food-frequency of various products	14-15	M&F	Not specified	7605	Sweden

		Design	Dependent variable	Age	Gender	Ethnicity	*N*[b]	Country
58	Jemmott (2000)	Review	Condom use	11-21	M&F	Not specified	10	USA
59	Johnson (1999)	Review	Drinking	Adolescents	M&F	Afro-American, Hispanic	46 ref	Mostly USA
60	Kirby (2002)	Review	Use of contraception	< 19	M&F	Not specified	250	USA
61	Kobus (2003)	Review	Smoking	11-20	M&F	Not specified	125 ref	Not specified
62	Kodjo (2002)	Review	Drinking (substance use)	Adolescents	M&F	Various ethnicities	39 ref	Mostly USA
63	Koivisto Hursti (1999)	Review	Food choice	Not specified	M&F	Not specified	75 ref	Sweden
64	Kotchick (2001)	Review	Condom use	Adolescents	M&F	Not specified	121 ref	USA
65	Kremers (2003)	Cross-sectional	Fruit consumption and intention	16-17	M&F	Not specified	1771	The Nether-lands
66	Kumpulainen (2000)	Longitudinal 3y	Heavy alcohol use	12	M&F	Not specified	1111	Finland
67	La Greca (2001)[a]	Cross-sectional	Smoking, alcohol, risky sexual be-havior	Mean = 16,8	M&F	Mostly middle class	250	USA
68	Laukkanen (2002)	Cross-sectional	Smoking, alcohol	15	M&F	Not specified	171	Finland
69	Li (2000)	Cross-sectional	Alcohol, condom use	9-17	M&F	Afro-American	1000	USA
70	Lonczak (2001)	Longitudinal 1, 2 y	Alcohol misuse	14-15	M&F	Various ethnicities, 46% white	808	USA
71	Maes (2003)	Cross-sectional	Smoking, alcohol, healthy diet	High School	M&F	Not specified	3225	Belgium
72	Masu (2002)	Cross-sectional	Food intake	11-12	M&F	Not specified	238	USA
74	Maxwell (2002)	Longitudinal 1y	Smoking, alcohol, sexual experience	12-18	M&F	Various ethnicities, 49% white	1969	USA
75	Mayhew (2000)	Review	Stages in smoking	Adolescents	M&F	Not specified	86 ref	Not specified
76	McGee (2000)[a]	Longitudinal	Smoking, alcohol, sexual experience	9-15	M&F	Various ethnicities	1037	New-Zealand
77	Neumark-Sztainer (1996)	Cross-sectional	Vegetable and fruit(juice) consump-tion	12-20	M&F	Various ethnicities, 86% white	36284	USA
78	Neumark-Sztainer (1999)	Focusgroup	Food-choice	7^{th} + 10^{th} grade	M&F	Various ethnicities, 40% white	141	USA
79	Neumark-Sztainer	Cross-sectional	Nutrient intake	11-18	M&F	Various ethnicities, 48,5%	4746	USA

		Design	Dependent variable	Age	Gender	Ethnicity	*N*[b]	Country
	(2003)					white		
80	O'dea (2003)	Focusgroup	Benefits and barriers of healthy eating	7-17	M&F	Representative mix	213	Australia
81	Oman (2002)	Cross-sectional	Smoking, alcohol, sexual experience	13-19	M&F	Various ethnicities, 47% white	1350	USA
82	Orlando (2001)	Longitudinal 2+5=7y	Smoking	Grade 10 + 12	M&F	Various ethnicities, 67% white	2961	USA
83	Patton (1995)	Review	Drinking	Adolescents	M&F	Not specified	63 ref	Mostly USA
84	Pirouznia (2001)	Cross-sectional	Eating behavior	10-13	M&F	Not specified	532	USA
85	Pletcher (2000)	Review	Smoking	Adolescents	M&F	Various ethnicities	22 ref	Mostly USA
86	Poikolainen (2001)	Longitudinal 5y	Alcohol use, heavy drinking (> 13 drinks)	15-19	M&F	Not specified	611	Finland
87	Roos (2001)	Cross-sectional	Consumption of raw vegetables	Mean = 15,3	M&F	Not specified	65059	Finland
88	Rosengard (2001)	Cross-sectional	Intention condom use	14-19	M&F	Not specified	236	USA
89	Rotheram-Borus (1995)	Review	Condom use	Adolescents	M&F	Not specified	112 ref	USA
90	Sasco (1999)	Review	Smoking	Young people	M&F	Not specified	86 ref	Western
91	Scaramella (2001)	Review	Smoking, drinking	Adolescents	M&F	Various ethnicities	91 ref	USA
92	Scheier (2000)	Longitudinal 4y	Alcohol use	Grade 7-10	M&F	90% white	740	USA
93	Schor (1996)	Review	Drinking	Adolescents	M&F	Not specified	86 ref	Mostly USA
94	Simantov (2000)	Cross-sectional	Smoking, alcohol	Grade 7-12	M&F	Various ethnicities, 54% white	5513	USA
95	Soldz (2002)	Longitudinal 7x1y	Smoking trajectories	Grade 6-12	M&F	Various ethnicities, 87% white	852	USA
96	Story (2002)	Review	Eating behavior	Adolescents	M&F	Not specified	100 ref	Not specified
97	Swadi (1999)	Review	Smoking, drinking	Adolescents	M&F	Not specified	151 ref	USA and Western
98	Topolski (2001)	Cross-sectional	Smoking, alcohol, risky sexual behavior	High school	M&F	Various ethnicities, 71% white	2801	USA

		Design	Dependent variable	Age	Gender	Ethnicity	*N*[b]	Country
99	Tschann (2002)	Cross-sectional	Condom use	14-19	M&F	Not specified	228	USA
100	Tschann (2002) [a]	Cross-sectional	Substance use	12-15	M&F	Mexican-Americans	151	USA
101	Tucker (2002)	Longitudinal 5y	Daily smoking	Grade 7	M&F	Various ethnicities, 68% white	4165	USA
102	Tyas (1998)	Review	Smoking	Adolescents	M&F	Various ethnicities	226 ref	Mostly western
103	Wagner (2000)	Review	Smoking	Teenagers	F	Not specified		Mostly USA
104	Wang (2001)	Longitudinal 3y	Smoking (experimental and regular)	12-19	M&F	Nationally representative	4431	USA
105	Weber Cullen (1998)	Cross-sectional	Stages of change for F&V intake	9-12	F	Various ethnicities, 77% white	259	USA
106	Whaley (1999)	Review	Risky sexual behavior	Older than 13	M&F	Not specified	49 ref	USA
107	White (2002)	Longitudinal 18y	Smoking trajectories	12	M&F	92% White	374	USA
108	Wilcox (2003)	Review	Smoking	Adolescents	M&F	Not specified	146 ref	Mostly USA
109	Williams (2000) [a]	Cross-sectional	Score of 5 risk behaviors	Grade 9-12	M&F	Various ethnicities	271	USA
110	Wills (2002)	Longitudinal 4y	Smoking frequency, alcohol use	Grade 7-10	M&F	Various ethnicities, 37% white	1364	USA
111	Wingood (2002)	Cross-sectional	Condom use	14-18	F	Afro-American	522	USA
112	Woodruff (2003)	Longitudinal 1y	Ever smoking	12-15	M&F	Various ethnicities, 63% Hispanic	478	USA
113	Woodward (1996)	Cross-sectional	Intake of 22 selected food items	12-15	M&F	Not specified	2082	Australia
114	Yarcheski (2000)	Cross-sectional	Score of 6 risk behaviors	12-14	M&F	Various ethnicities, 77% white	148	USA
115	Young (2001)	Cross-sectional	Healthy breakfast + lunch and F&V intake	Grade 9-12	M&F	Various ethnicities, 80% white	3155	USA
116	Zweig (2002)	Cross-sectional	Four risk profiles	Grade 9-12	M&F	Various ethnicities	12955	USA

[a] *Studies included for clustering of health-related behaviors.*

[b] *In empirical studies* N=*number of respondents; in reviews* N=*number of included studies. Some reviews are not clear about the number of studies included: in these cases the total number of references is given.*

Table 2. Relations between determinants and behaviors[1]

Determinants	**Safe sex**			**Healthy nutrition**			**Non-smoking**			**Alcohol abuse**		
	+[2]	-	0/ un-clear	+	-	0/ un-clear	+	-	0 /unclear	+	-	0/ unclear
Ultimate determinants												
Cultural environment												
Religion/church visit	54	60	4, 10, 54, 64				19, 36, 44, 85, 95			91		
Media/commercials					12, 96			19	44			
Social situation												
Two parents	**13**[3], 60, 64, **81**			87, 96, 115			3, **13**, 31, 39, 61, **81, 94**, 95, 101, 102, **110**		**110**	**13**, 40, **81, 94**	59	
Family problems (e.g., divorce, remarried, lost job, hospitalized)								82	82			66
Socio-economic status	**81**		60, 64	77, 87, 96			31, 44, **94**, 102, 107, 110	39	**1**, 33, 36 **81**, 101, 107, 110	**94**		**1**, 40, 66, **81**
Life events			51					**94, 110**			86, **94, 110**	86
Biology/personality												

Determinants	**Safe sex**			**Healthy nutrition**			**Non-smoking**			**Alcohol abuse**		
	+[2]	-	0/ un-clear	+	-	0/ un-clear	+	-	0 /unclear	+	-	0/ unclear
General risk-taking		60						42, 102	44			
Sensation-seeking		**24, 49**, 60, 64						**49**, 107	**24**, 44		**24, 49**, 83, 97	
Feeling invulnerable			**49**					**49**			**49**	
Emotional distress (anxiety, depression)		**15**, 60, **98**	4, 10, **24**		**15**	**15**		2, **15, 24**, **43**, 44, **68**, 82, 85, **94, 98**, 100, 102, 103, **110**	**43, 53**, 107	30	2, **24**, 50, **53**, 66, **94, 98**, 100, **110**	**15**, 30, **43**, 66, **68**, 86
Impulsiveness, lack of behavioral control		**24**						**24**, 97	44		2, **24**, 50, 97	30
Sociability (not shy)							2, 97	2	44, **53**	97		**53**
Rebellious								82, 97			97	40
Reliable							97			97		
Intelligence							44			83		
Early onset of puberty								2			2	
Genetic influences								3	44		9, 62, 83, 97	
Age	8, 60	26, 58, 64, **74, 81**	**7**, 106		29, 77, 115	11a, 22, 47, 77, 115		**7**, 19, **43, 48, 53, 71, 74**, 75, **81, 94**, 95,	**74**		**7**, 9, 30, **48, 53, 71, 74, 81**, 92, **94**	30, **74**

Determinants	Safe sex			Healthy nutrition			Non-smoking			Alcohol abuse		
	+[2]	-	0/ un-clear	+	-	0/ un-clear	+	-	0 /unclear	+	-	0/ unclear
Female	**7**	64, 88	**74**	5, 29, 77, 96	29, 96, 115	11a, 22, 47, 115	9, 33, **74**, 102	102, 112 39, 101, 102, 107, 110	**1, 7**, 17, **43, 53, 74**, 75, 95	**1**, 9, 30, 40, 42, **43**, 50, 62, 86, 92, 97		2, **7**, 30, **53, 74**
Ethnicity white	**13**							**13**, 17, 33, 39, 44, **74**, 75, 85, 95, 101, 102, 108, 110	**7**		**13**, 40, 42, 50, 59, **74**, 83	**7**
Distal determinants												
Knowledge/values												
Knowledge of behavior risks	60, 64, 106, 14	10, 51, 64, 106	4, 14, 21, 51, 89			63, 96			102			
Tolerance for deviance								17, 75			70	
Social bonding/Others' behavior/attitudes												
General modeling / perceived behavior others				11a, 12, 63		72	19, 44, 97					
Perceived healthy-behavior peers	4, 14, 26, 64,		4, **7**, 26, 35	96, 113		96, 113	2, 3, 6, **7**, 16, 17,	39	**1**, 39, 101, 107	**1**, 2, 6, **7**, 30, 40,		30

Determinants	**Safe sex**			**Healthy nutrition**			**Non-smoking**			**Alcohol abuse**		
	+[2]	-	0/ un-clear	+	-	0/ un-clear	+	-	0 /unclear	+	-	0/ unclear
	67, 74						19, 33, 36, 42, 61, **67, 74**, 75, 85, 90, 102, 103, 104, 107			50, **67, 74**, 93, 97		
Actual healthy-behavior peers							6, 61, **74**		6	6, **74**		6
Perceived healthy-behavior parents	64		**7**	11a, 96, 113			**1**, 2, 3, **7**, 17, 19, 31, 33, 42, 61, **71**, 75, 85, 90, 97, 101, 102, 103, 104, 107	19	107	**7**, 9, 40, 59, 83, 93, 97		**1, 71**
Parental monitoring, control, strictness	**34**, 54, 60, 64, **69**		**7**	115			31, 61, 102		**7**, 17	**34**, 59, **69**, 83, 97		**7**, 20
Parental connectedness/support	60, 64, **98, 116**		64	77			17, 19, 31, 36, 61, **71, 94, 98**,	75		20, 59, **71**, 83, 91, **94, 98, 116**		59

Determinants	Safe sex			Healthy nutrition			Non-smoking			Alcohol abuse		
	+[2]	-	0/ unclear	+	-	0/ unclear	+	-	0 /unclear	+	-	0/ unclear
Authoritative parenting style (control, strictness & warmth, acceptance, involvement)				65			102, **116** 31, 44, 61, 91, 102		**1**	**1**, 59, 91		59
Hours home alone					115			9, 36			9	
Family communication				115			31, 101			93		
Socialize with deviant peers								91			91	
School acceptance of cigarettes and drugs								108			91	
Sense of self/social competence												
Self-esteem	21, 60, 64, **98, 116**		**76**				16, 44, 90, 95, **98**, 102, **116**		16, **76**, 107	2, 30, 62, 50, 83, 92, 97, **98, 116**	92	40, **76**, 86, 92
Defensive coping		**24**	4					**24**			**24**	
Coping (immature, mature, neurotic)									102		86	86
General social skills, social self-efficacy (interacting in social situations)			21				44	16	16	70, 83, 92		92

Determinants	**Safe sex**			**Healthy nutrition**			**Non-smoking**			**Alcohol abuse**		
	+[2]	-	0/ un-clear	+	-	0/ un-clear	+	-	0 /unclear	+	-	0/ unclear
Decision making skills (41, I can get info; acknowledge consequenc-es of decisions, etc)							41			50		
Problem-solving skills	60									92		
Personal effectiveness (I can accomplish something by working hard)							41			92		
Internal locus of control							17, 102		44	2, 62, 83		
Proximal determinants												
Attitude												
Positive attitude to healthy behavior (general, unspeci-fied or mixed beliefs)	10, 88		35	5, 11a			16, 33, 75, 95, 102, 104		56, 101	2, 48, 50		48
Health beliefs												
Perceived personal health risk	8, 14, 26, 46, 51, 55, 60, 64, 89	106	4, 8, 26, 51, 64;		96		75, 102					
Perceived general health risk							3, 17		56, 107			40
Importance of good health			88	11a								
Denial of health problems / still young		10			25							
Well-being (psychological)												
Immediate gratification		8, 14, 26,			5, 11a,	72		**48**			**48**	

Determinants	**Safe sex**			**Healthy nutrition**			**Non-smoking**			**Alcohol abuse**		
	+[2]	-	0/ unclear	+	-	0/ unclear	+	-	0 /unclear	+	-	0/ unclear
(e.g., reduction of pleasure, taste-preference unhealthy food, enjoy the moment)		46, 55, 58, 89			12, 25, 37, 63, 78, 80, 96, 105, 113							
Relaxation, reduction stress or negative affect (emotional control)								2, 17, 44, 56, 85, 90			83	
Anticipated regret (e.g., hangover, regret of drunken behavior)									42**, 48**	**48**		**48**
Appearance												
Lose or maintain weight				5		11a		42, 44, 56, 85, 90, 103				
Performance												
Mental / cognitive performance				80							83	
Athletic / physical / motor performance				80		5	90				83	
Social consequences												
Unhealthy behavior facilitates social interaction								61			83, 50	
Social advantages of un-		35						41, 56	56, 17			

Determinants	**Safe sex**			**Healthy nutrition**			**Non-smoking**			**Alcohol abuse**		
	+[2]	-	0/ un-clear	+	-	0/ un-clear	+	-	0 /unclear	+	-	0/ unclear
healthy behavior												
Social normative beliefs												
General Social / subjective norm	88	88		5, 11a, 12, 37, 105		72						
Healthy behavior acceptable to peers / peer norms	**7**, 8, 14, 46,			5, 80			**7**, 16, 33, 36, 44, 75, 102, 103		39, 101	**7**, 50		9, 40, 93
Healthy behavior acceptable to parents / parental norms			**7**	5, 80			2, 3, 16, 31, 33, 36, 61, 75, 90, 91, 101, 102, 103		**7**, 39, 44	**7**, 9, 50, 59, 93		40
Healthy behavior acceptable to partner	60, 64,				11a							
Healthy behavior acceptable to siblings				5			103					
Direct social pressure to engage in unhealthy behavior									6, 61			6
Rules set by parents about behavior				32, 37			90					

Determinants	Safe sex			Healthy nutrition			Non-smoking			Alcohol abuse		
	+[2]	-	0/ unclear	+	-	0/ unclear	+	-	0 /unclear	+	-	0/ unclear
Self-efficacy												
General self-efficacy / perceived behavioral control				5, 11a, 72, 96, 105			16					
Perception of skills to perform healthy behavior (e.g., using condoms, discuss condom use, prepare healthy food)	8, 35, 51, 58, 60, 64, 89		14, 51	5								
Perception of (refusal) skills to make healthy choices (e.g., refuse (unsafe) sex, cigarettes, etc.)	21, 35			96			36		40	40		

[1] *Studies can be scored in two columns for one behavior. For empirical studies this means that different relations were found for different groups of respondents. Reviews found different relationships in different studies, but did not draw clear conclusions. Besides, it can be that one study has several outcome measures, and that different results were found for different outcome measures.*

[2] *+ = determinant enhances healthy behavior; - = determinant impedes healthy behavior; 0 = no relationship with behavior.*

[3] *Studies that examined more than one behavior are marked bold.*

Chapter 3

A REVIEW OF SIMILARITIES BETWEEN DOMAIN-SPECIFIC DETERMINANTS OF FOUR HEALTH BEHAVIORS AMONG ADOLESCENTS[1]

Schools are overloaded with health promotion programs that, altogether, focus on a broad array of behavioral domains, including substance abuse, sexuality and nutrition. Although the specific content of programs varies according to the domain focus, programs usually address similar concepts: knowledge, attitudinal beliefs, social influences and skills. This apparent conceptual overlap between behaviors and programs provides opportunities for a transfer-oriented approach which will stimulate students to apply the knowledge and skills they have learned in one domain (e.g. skills for resisting tobacco use) to other domains (e.g. alcohol, sex). A requirement for such an approach is that behaviors share at least some determinants.

This review addresses this issue by examining similarities between domain-specific determinants of smoking, drinking, safe sex and healthy nutrition among adolescents.

Recent empirical studies and reviews were examined. The results show that the following determinants are relevant to all four behaviors: beliefs about immediate gratification and social advantages, peer norms, peer and parental modeling, and refusal self-efficacy. Several other determinants have been found to relate to at least two behaviors, e.g. health risk beliefs and parental norms. These results can be used for the development of a transfer-oriented school health promotion curriculum.

1. INTRODUCTION

Health-compromising lifestyles such as smoking, binge drinking, unsafe sex and insufficient intake of fruit and vegetables are widely prevalent among young people in western societies (Currie et al., 2006; Eaton et al., 2006). Numerous health education programs have been, and continue to be, developed to promote healthful behaviors among adolescents. The majority of adolescent health promotion programs are designed for use in schools and are often supplementary to the regular school curriculum. With a few exceptions, such as substance abuse programs, most projects focus

[1] *Peters, L. W. H., Wiefferink, C. H., Hoekstra, F., Buijs, G. J., Ten Dam, G. T. M., & Paulussen, T. G. W. M. (2009). A review of similarities between domain-specific determinants of four health behaviors among adolescents.* Health Education Research, 24, *198-223*.

on a single health-related behavior. Altogether, these single health promotion programs may overload the school curriculum and teaching staff (Lee, Keung, & Tsang, 2004; Leurs, Jansen, Schaalma, Mur-Veeman, & De Vries, 2005).

1.1 Transfer: looking for similarities

On a conceptual level, many classroom health education programs seem to 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). The specific content of these constructs varies with the specific behavioral focus of individual programs as consequences, meanings and contexts of behaviors differ. However, the apparent conceptual overlap between health education programs provides opportunities for more integrative approaches, such as one that is oriented towards promoting transfer (Ten Dam, 2002). In a transfer-oriented approach students are stimulated to apply the knowledge, attitudes and skills they have learned in one domain (e.g., refusal skills with respect to smoking) to other behavioral domains (e.g., refusing alcohol or unsafe sex). The teaching content thus focuses on building bridges between various behavioral domains, by identifying general principles and considering whether and how they can be applied in other domains. This does not mean that domain-specific issues are neglected. On the contrary, the transfer approach is about connecting domain-specific issues to general principles and vice versa. It requires alternate processes of contextualization (learning new skills in one context), decontextualization (deducing a general principle) and recontextualization (examining its application in other contexts) (Elshout-Mohr, Van Hout-Wolters, & Broekkamp, 1999). Thus, domain-specific issues may very well be addressed as contextualizations of general principles. Beliefs are most predictive of a given behavior when they specifically apply to that behavior (Ajzen, 1991), and new, meaningful knowledge can be attained only within the context of specific behavioral contexts.

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. Transfer effects have been reported in various subject domains in the education sector (Alexander, 2006; Mayer &Wittrock, 1996) but, to our knowledge, they have not yet been examined in health education. We aim to fill this gap by developing and empirically testing a transfer-oriented approach in classroom health education in secondary education. The present literature review is one of the first steps in our project and has been conducted to examine opportunities for a transfer-oriented approach and more specifically to identify determinants to be included in a transfer-oriented program. A transfer-oriented approach to different lifestyles is only possible if these lifestyles have at least some determinants in common. Therefore, the purpose of this review is to examine similarities between determinants across several lifestyles. Determinants of various individual health-related behaviors have been studied extensively but, until now, no review has systematically examined which determinants are shared by several behaviors.

Four target behaviors were selected beforehand for this review: smoking, alcohol abuse, safe sex and healthy nutrition. These behaviors were selected because a) they are among the ones most frequently addressed in Dutch secondary schools (Dafesh, 2006), and b) we expect there to be differences in the strength of relations between these behaviors, which may influence the occurrence or ease of transfer effects. We have reviewed studies of relations between the four behaviors elsewhere (Wiefferink et al., 2006) and will address this issue in our empirical study. It is sufficient to mention that the strong clustering relation between tobacco and alcohol use that has often been reported (Wiefferink et al., 2006) might lead to better transfer effects between these two behavioral domains than between domains that are not strongly related.

Since transfer-oriented learning is about discovering general issues in specific factors across domains, the focus of this review is on similarities between domain-specific determinants. The content of domain-specific factors varies with the behavioral domain in question. For instance, attitudinal beliefs about smoking are different from beliefs about condom use, because the behavioral consequences and circumstances of smoking and condom use differ. Domain-specific factors, such as attitudinal beliefs, are commonly addressed in categorical intervention programs. Despite their domain-specific content, such factors may share common ground on a more general level. For instance, the types of behavioral consequences may be similar for several behaviors: immediate physiological consequences, health consequences, and social consequences. This common ground creates opportunities for teaching for transfer.

The focus on domain-specific determinants in this review does not mean that general determinants are insignificant in affecting various behaviors simultaneously. On the contrary, general factors, such as demographic, personality or parenting factors or general social or cognitive skills, are also very important. However, they were not the focus of this review as they have been previously addressed elsewhere (Wiefferink et al., 2006).

1.2 Research question

Which domain-specific determinants correlate with two or more of the following behaviors: smoking, alcohol abuse, safe sex and healthy nutrition?

1.3 Theoretical model

Many theories have been formulated to predict health-related behaviors, which altogether have led to a broad array of determinants (see Petraitis, Flay, & Miller, 1995 for a comprehensive overview). We used the Theory of Triadic Influence (Flay & Petraitis, 1994), which integrates insights from many theories, as a framework for organizing determinants of health behaviors (Wiefferink et al., 2006). Figure 1 shows a simplified version of this theory and our framework. It categorizes determinants in three streams (intrapersonal, interpersonal and cultural) and at three levels of influence (proximal, distal and ultimate). The ultimate level of influence includes determinants that are thought to be predictive of multiple behaviors but are almost

unmodifiable, e.g. personality characteristics or the broader socio-cultural environment. Their influence is mainly indirect, via determinants at the distal and proximal levels. Distal and especially proximal-level determinants have better predictive value, but most are specific to one behavior. In addition, intentions and previous experiences with the behavior are assumed to have the most direct influence, whereas barriers with regard to accessibility and availability may undermine intentional behavior. Although the figure only indicates within-stream influences from the ultimate level to the proximal level, we and others (Flay & Petraitis, 1994) assume that there are also interstream influences. The model also includes feedback loops which are indicated in the figure by the broken lines: experiences from performing a behavior give people feedback regarding, for instance, some of its consequences (Flay & Petraitis, 1994).

Given our focus on domain-specific determinants, the determinants discussed in this review are, for the most part, but not exclusively, proximal determinants, such as attitudinal, social normative and self-efficacy beliefs.

2. METHOD

2.1 Sample of studies

The databases Medline and PsycINFO were used to generate the sample of studies. Searching this combination of databases meets criteria for a comprehensive search, as stated in a quality assessment tool for reviews (Thomas, Micucci, Ciliska, & Mirza, 2005) and is an efficient way for locating studies relevant to health promotion (Peersman, Harden, Oliver, & Oakley, 1999). We used the following keywords for determinants: risk-taking, risk factors, risk perception, psychosocial factors, psychology, intention, motivation, personality (characteristics), personality correlates, predisposition, knowledge, attitudes, and practice. We performed searches for every behavior and for multiple behaviors. For every search we added keywords specific to that behavior. For tobacco and alcohol: tobacco, smoking, cigarette, substance use, substance abuse, drug use, drug abuse, alcohol, alcoholic, drinking, binge drinking, alcohol drinking patterns, alcohol drinking attitudes. For safe sex: safe sex, contraception behavior, condoms, Acquired Immunodeficiency Syndrome/prevention and control, aids prevention, sexual risk taking, psychosexual-behavior, AIDS-attitudes. For nutrition: food preferences, diets, feeding practices, eating attitudes, food intake, fruit, fat, vegetables, adolescent nutrition, food habits. For multiple behaviors: generalization-learning, transfer-learning, health compromising behavior, lifestyle, health behavior, problem behavior, risk behavior, behavior problems. In addition, backward searches were conducted by scanning reference lists.

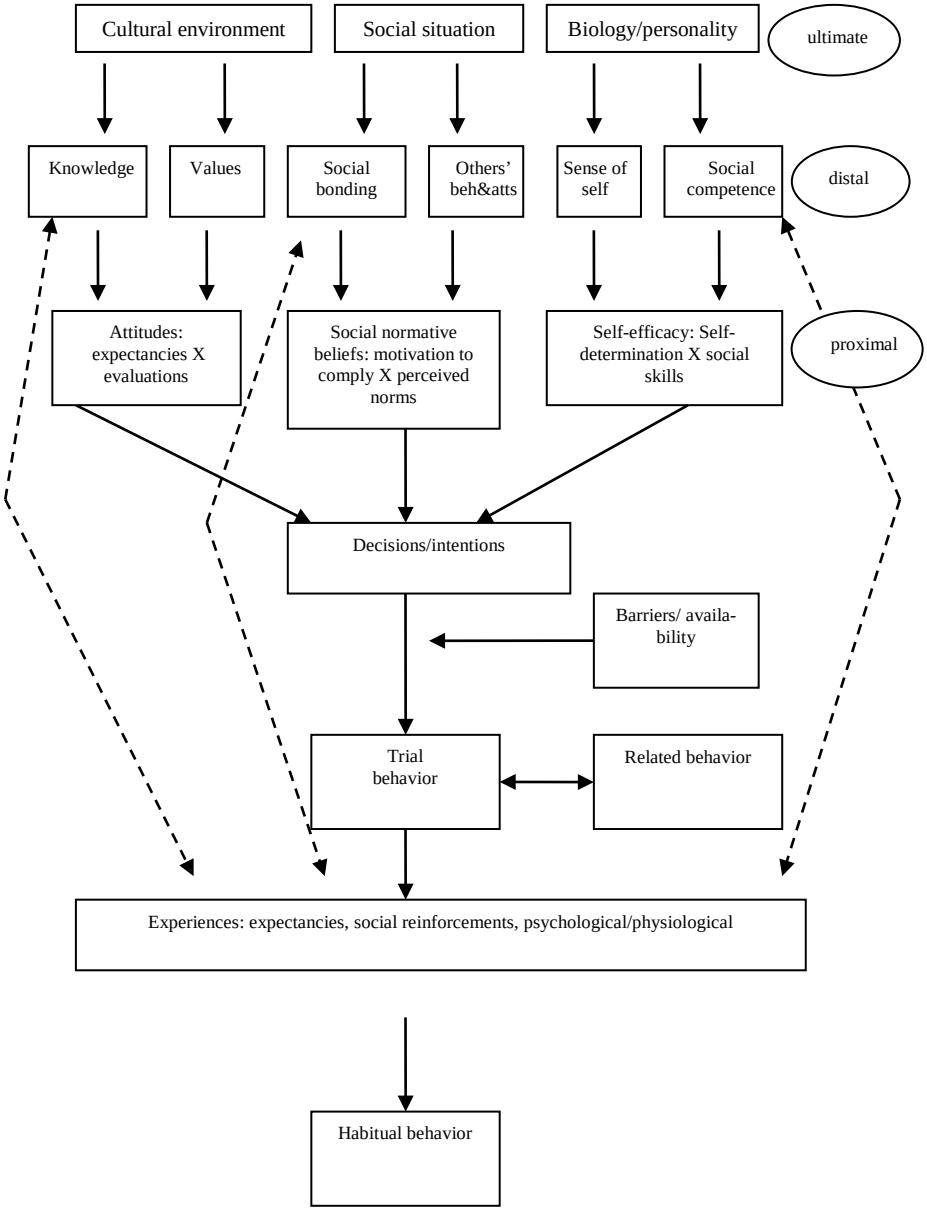

Figure 1. Theoretical framework for organizing determinants of health behaviors,

2.2 Inclusion criteria

Studies were included if they met the following criteria:

1) Studies on behavior-specific correlates of a measure of (self-reported) behavior or intention with respect to smoking, drinking, sexual behavior or healthy nutrition.
2) Correlates were measured at ages 10-18.
3) Data collection was carried out in western countries.
4) Publications were written in English and published in journals from the Social Science Citation Index list.
5) Empirical and review studies were considered. Reviews had to be published between 1995 and 2003 and empirical studies between 2000 and 2003. Because there were so few studies that addressed nutrition, we included empirical studies on nutrition from 1995 to 2003.
6) Because of the large numbers of longitudinal studies on tobacco and alcohol use we included only longitudinal studies for these behaviors.

The publication year criterion for empirical studies was strict because of the quantity of material on the four behavioral domains. Reviews were included to account for results of older studies.

Eighty-seven studies were found to satisfy the inclusion criteria: 14 were on multiple behaviors, 26 on smoking, 10 on alcohol use, 17 on safe sex and 20 on nutrition. Some of the studies also discussed other behaviors in addition to the ones of interest here, but results for these additional behaviors were not recorded.

2.3 Coding and synthesis

The studies were divided into three groups which were coded by three reviewers: smoking and alcohol use (LP), safe sex and multiple behaviors (CW) and nutrition (FH). Although each behavioral domain was assessed by one reviewer only, several procedures were used to ensure comparability of coding. Firstly, all reviewers were familiar with conducting literature reviews and with research in all four behavioral domains. Secondly, standardized assessment forms (available from the first author) were used for systematically recording study characteristics. Thirdly, coding of studies was discussed in several meetings and any doubts or problems with coding were resolved through discussion after all reviewers had read the relevant portions of the paper in question. For empirical studies the following aspects were recorded: study design (longitudinal, cross-sectional), sample size, participant characteristics (age or grade, gender, ethnicity, socio-economic status, country of residence), measurement of determinants (questionnaire, interview; specific measures recorded; yes/no validated), measurement of behavior or intention (questionnaire, interview, observation, biomedical, other; specific measure recorded; yes/no validated), theoretical basis, statistical analyses used (correlation, regression, other, none) and the relation between each determinant and behavior (positive, negative or null; for total sample or subgroup; strength of relationship in correlation, beta weight or odds ratio). Determinants recorded for focus group studies (only in the domains of safe sex and nutrition: study numbers 21, 42, 58 and 60 in Table 2) mostly pertained to aspects that,

according to the authors of the study, were mentioned frequently in discussion groups. A separate assessment form was used for review studies which contained information on: type of review (meta-analysis, narrative), characteristics of included studies (number of studies, study designs, sample sizes, participant characteristics), review authors' judgment of quality of study designs and instruments and conclusions about relations between determinants and behavior.

After initial data were extracted, determinants were further organized in several steps, which is explained in Table 1.

Table 1. Steps followed in the process of organizing and coding determinants

Steps in categorizing determinants	**Example**
1. Creating a template table with categories and subcategories, according to theoretical framework used	Category Proximal factors Subcategory Attitude Subcategory Health beliefs
2. Creating four behavior-specific tables from the template, with behavior-specific measures of determinants	Determinant 'Perceived personal risk of cancer' was entered in the subcategory 'Health beliefs' in the tobacco table
3. Combining the four behavior-specific tables into one table, with determinants categorized to a higher level (if possible)	'Perceived personal risk of cancer' (tobacco) and 'perceived personal risk of HIV' (safe sex) were categorized as 'perceived personal health risk'
General: we were conservative in combining determinants, both within and across behavioral domains (steps 2 and 3, respectively)	In step 2: 'Perceived personal risk of cancer from smoking' and 'perceived risk of cancer from smoking among people in general' were treated as separate determinants

Coding of study characteristics was descriptive and studies were not rated for overall methodological quality. However, in data synthesis the type of study was taken into consideration. Results of longitudinal studies were generally rated as being stronger than those of cross-sectional studies because a longitudinal design has better predictive value. Review studies were treated with more caution than empirical studies in our synthesis, especially when evidence was mainly from reviews or when evidence from reviews conflicted with that from empirical studies. This caution is warranted, as using review results may have some disadvantages. Because of their second-hand nature, review results may be less insightful than empirical results. Results of some empirical studies may be overrepresented, as they are perhaps discussed in several reviews. Also, reviews vary in the specificity of the outcome measure and in the number and quality of studies included and sometimes study design or quality is not addressed. Moreover, some reviews only discuss positive findings and do not mention null findings.

3. RESULTS

3.1 Study characteristics

Table 2 presents an overview of the characteristics of the studies included. Studies are grouped according to the criterion behavior(s) and according to study design.

The behavioral focus of both the empirical and review studies on multiple behavior, was mainly on alcohol and tobacco use. Sexual and nutrition behaviors were only addressed in some of these studies. Of the 8 empirical multiple behavior studies, 4 were longitudinal and 4 cross-sectional. As for studies that examined only one behavior, empirical studies on safe sex and nutrition were almost exclusively cross-sectional; only one longitudinal nutrition study was located. In the tobacco and alcohol domains, the longitudinal design was much more prevalent, which had led to the decision to include only longitudinal studies for these domains.

Most studies were conducted in the United States. The majority focused on both males and females and on samples with various ethnic composition, with some exceptions especially among safe-sex studies (e.g. black females). The age of the respondents in the empirical studies ranged from 7 to 21 years, with a bottom end mean of 12.7 and a top end mean of 16.6 years (overall mean age 14.7 years). Safe sex studies generally examined somewhat older samples, with a mean age range of 13.7 – 18.3 and an overall mean age of 16.0 years.

The operationalization of the behavioral criterion variables differed considerably. Tobacco use measures included long-term smoking trajectories (e.g., Chassin, Presson, & Sherman, 2000; White, Pandina, & Chen, 2002), established smoking (e.g., 100 cigarettes lifetime, Choi, Ahluwalia, Harris, & Okuyemi, 2002; Choi, Gilpin, Farkas, & Pierce, 2001), daily smoking (e.g., Tucker, Ellickson, & Klein, 2002), ever smoking (e.g., Wills, Sandy, & Yaeger, 2002), and both experimental and regular smoking (e.g., Wang, 2001). Alcohol studies generally examined heavy use or binge drinking. Studies of safe sex commonly addressed (intended) use of condoms or risky sexual behavior in general, but two multiple behavior studies focused on sexual experience. Studies of nutrition behavior showed the largest variation in behavioral outcomes. Some focused on more or less specific outcomes such as consumption of raw vegetables, of selected foods, or of fruit and vegetables in general, whereas others assessed nutrient or food intake or its quality, or even eating behavior in general (e.g., Pirouznia, 2001). Many studies used generally established outcome measures, but specific information about validity and reliability of measures was often not provided.

The operationalization of determinants also showed a high level of variation. Nearly every empirical study used its own measures and some did not give specific accounts of these. Most empirical studies reported on reliability (internal consistency), but information about validity was largely absent. Reviews generally did not go into details of the measures used.

3.2 Results of studies

The process of combining the domain-specific determinants into meaningful categories led to a total of 86 determinants. Of these 86 determinants, the majority (51) had been examined for only one behavior and a minority had been examined for two behaviors (25), three behaviors (4) or for all four behaviors (6). Table 3 presents the 35 determinants that were examined for more than one behavior. Since our interest is in discovering similar determinants across different behaviors, we will mainly focus on the results in this table. In line with our theoretical model (see Figure 1), the 35 determinants in Table 3 were categorized as: 4 behavioral factors, 1 barrier/availability factor, 23 proximal factors, 5 distal factors and 2 ultimate factors. The table indicates, for each study, the direction of the determinant-behavior relationship that was found (positive or negative influence or null findings). It does not provide information about the strength of the relationships. Unfortunately, such information was insufficient in many papers (e.g., only significance levels or group means reported) and totally absent in most reviews.

Table 4 displays the 51 determinants that have been measured in one domain only. This table is included to complete the overview of all determinants but will not be addressed frequently.

3.2.1 Behavioral and availability factors

As for behavioral factors, similarities between the tobacco and alcohol domains exist since these behaviors are predicted by positive experiences with the substance, previous use of the substance in general and early onset of use. The latter finding corresponds to the evidence in the sexuality domain that lower age of first intercourse correlates negatively with safe sex behavior. Behavioral factors that were only examined for one behavior (see Table 4) mainly pertained to situational characteristics in the nutrition domain and are not discussed here further.

Availability/accessibility factors have been examined recently only in the nutrition and tobacco domains. Evidence in the nutrition domain, mostly from focus group studies and reviews, consistently suggests that such factors impact nutrition behavior. Correspondingly, in the tobacco domain there is some evidence that accessibility of cigarettes is related to smoking.

3.2.2 Proximal factors

Attitudes. As expected, most domain-specific factors examined were proximal, consisting mainly of attitudinal and social normative beliefs. General, mixed or unspecified measures of attitudes have been found to relate positively to all four behaviors, although some studies reported null findings. The specific attitudinal beliefs examined pertained mainly to health, physiological and psychological gratification, appearance, performance and social contact. Health-related beliefs have been studied for all behaviors, although there is only one such study on alcohol. Positive associations with the health behaviors prevail, although many studies, including the alcohol study, reported null findings. Personal risk beliefs appear to be better predictors than

general risk beliefs, but correlations were predominantly weak and some studies reported negative associations. Therefore, health beliefs seem to be relevant, though minor, determinants of safe sex, healthy nutrition and non-smoking.

The evidence for the relevance of beliefs related to physiological and psychological gratification is more consistent. Beliefs that the unhealthy behavior contributes to an immediate positive sensation, or that the healthy behavior would obstruct this, are related to unhealthy lifestyles in each of the domains studied but especially in those of nutrition and safe sex. The belief that smoking relaxes or helps reduce negative feelings is a consistent predictor of tobacco use; such belief in the relaxing effects of alcohol has also been reported. Image-related beliefs have only been reported in reviews on tobacco (e.g., smoking makes you feel rebellious, see Table 4) and are therefore not discussed here further.

Whereas most beliefs about gratification were in favor of unhealthy behavior, anticipated regret about a hangover or drunken behavior had a negative association with binge drinking; this regret was not related to smoking.

Beliefs related to physical appearance have only been examined in the nutrition and tobacco domains. The belief that smoking has a favorable effect on weight management is negatively associated with non-smoking, as was reported consistently by one longitudinal study and five reviews, whereas the association between weight management beliefs and healthy nutrition behavior tends to be positive. The evidence in the nutrition domain is weaker than that found in the smoking domain since it is based on one longitudinal study with positive results and one cross-sectional study with null findings. Such contrasts have also been found for performance-related beliefs. The belief that healthy behavior promotes physical or athletic performance is associated positively with healthy nutrition and non-smoking. However, a review in the alcohol domain reported positive alcohol expectancies for mental and motor performance among children of alcoholics who are at risk of developing alcohol or drug problems.

There are relatively few studies on beliefs about social consequences which is surprising, given that social norms and especially modeling behavior have been studied extensively (see below). Nevertheless, beliefs that the unhealthy behavior has social advantages have been found for tobacco and alcohol use and safe sex, although for tobacco use also null findings were reported. A somewhat comparable finding in the nutrition domain was the belief that certain social situations such as parties are not conducive to making healthy food choices [see Table 4]. Only one finding in the category of social consequences was in the opposite direction: the belief that too much alcohol intake can lead to bad conduct [see Table 4].

*Social norms.*Social normative beliefs have been studied in relation to several reference groups but mostly peers and parents. Peer norms have been found to have an effect on all four behaviors. However, results in the alcohol domain are inconsistent, with one longitudinal and two review studies reporting the absence of an association and, in the tobacco domain, much of the evidence stems from reviews. The findings for parental norms are more consistent, at least in the domains of smoking and drinking. Social norms in the sex domain were only examined in one study (Beal, Ausiello, & Perrin, 2001). It has been found that use of tobacco and alcohol is stimu-

lated when these products are offered. However, adolescents do not feel overtly pressurized by others to engage in substance use. Rather, peer pressure is reported to be more internalized: adolescents want to do what (they see or think) others do (Bauman & Ennet, 1996; Kobus, 2003).

Self-efficacy. Self-efficacy has been studied less frequently than other proximal factors. General or unspecified measures, mainly used in the nutrition domain, have consistently shown positive correlations with healthy behavior. Refusal self-efficacy has been examined in only a few studies, but there are positive results for all four domains. Other self-efficacy beliefs have been studied, predominantly in the safe sex domain, with the main focus on skills for using and discussing condoms.

3.2.3 Distal factors

Distal domain-specific determinants generally pertain to knowledge and modeling behavior. Knowledge of behavior risks has mostly been studied in the safe sex domain, where results of cross-sectional studies and reviews are conflicting. Positive associations between knowledge and healthy behavior have been reported mainly in reviews, whereas cross-sectional studies have shown null findings or negative associations. Reviews in the domains of nutrition and tobacco indicate that knowledge of behavior risks does not seem to relate directly to behavior; in these reviews correct information is suggested to be a prerequisite for healthy behavior.

Modeling behavior has received much attention in determinant research, especially in the domain of smoking. Perceived health behavior of peers or friends seems to relate positively to adolescents' own health behavior in all four domains, although the absence of such a relation was also found for all behaviors. The influence of friends may be overrated in studies, especially cross-sectional ones, as selection and projection processes appear to account for at least a part of the correlation (Bauman & Ennet, 1996). Nevertheless, in the domain of substance use, not only perceived but also actual peer use relates to adolescents' own use of tobacco or alcohol, although correlations with actual use are generally lower than those with perceived use (Bauman & Ennet, 1996).

Perceived health behavior of parents has been related to adolescents' own behavior in all four domains, with the most and firmest evidence coming from the tobacco and alcohol domains and least evidence from the sex domain.

3.2.4 Ultimate factors

At the ultimate level, only two behavior-specific factors were identified: media influence and genetic factors. Two reviews on nutrition reported that the media had a negative influence on healthy nutrition. In the tobacco domain, evidence for negative media influence is very weak, although one longitudinal study found a negative influence of susceptibility to advertising for cigarettes. As for genetic factors, four reviews in the alcohol domain consistently reported that a genetic component to at least one type of problem drinking has been identified. In the tobacco domain, the evidence for genetic factors is less consistent. One review concluded that there is

only weak evidence for a genetic influence on smoking. Another review discussed studies that reported substantial heritability but was unclear about the strength of the evidence.

4. DISCUSSION

4.1 Similarities between behavior-specific determinants

This review has focused on similarities between behavior-specific determinants of four health-related behaviors: smoking, (binge) drinking, safe sex and healthy nutrition. To allow comparison across different behaviors, the determinants were carefully categorized, where possible, to a higher, non-behavior-specific level. Thirty-five determinants were identified that have been studied for more than one behavior.

Several determinants were found to be relevant for all four behaviors: beliefs that the unhealthy behavior will lead to immediate gratification and to social advantages, peer norms, peer and parental modeling behavior and refusal self-efficacy. Moreover, the direction of each determinant's relationship with behavior (i.e. as a risk or protective factor) was consistent across the four domains. These determinants appear to be the most relevant ones to include in a transfer-oriented program.

For the remaining determinants that have been examined for multiple behaviors, the direction of their influence is in most cases the same across behaviors. A negative influence on multiple behaviors was found for previous experience with the unhealthy behavior (tobacco and alcohol), early onset of unhealthy behavior (tobacco, alcohol and sex), availability or accessibility of unhealthy products (nutrition and tobacco), school acceptance of substances (tobacco and alcohol) and offers of unhealthy products (tobacco and alcohol). A protective influence on multiple behaviors was found for perceived personal health risk (sex, nutrition and tobacco), strict parental norms and rules (nutrition, tobacco and alcohol) and strict sibling norms (nutrition and tobacco). The influence of several factors was inconsistent across behaviors or was unclear for weight management beliefs (risk factor for smoking, inconsistent findings for nutrition), performance beliefs (protective factor for nutrition and smoking, risk factor for alcohol), knowledge of behavior risks (inconsistent findings for safe sex, unimportant for tobacco and nutrition) and media portrayals and commercials (risk factor for nutrition, very weak evidence for tobacco).

Out of a total of 86 determinants, 51 could not be classified meaningfully to a higher level or have only been studied for one behavior. This may be partly due to our conservative categorization process. For some determinants, their uniqueness may be due to their behavior-specific relevance. For instance, the perceived risk of pregnancy is only directly relevant for sexual behavior; we could not think of a meaningful category that would include similar beliefs for other behaviors. Other determinants, however, may be relevant for all domains but may not have been examined for them all. For instance, in the alcohol domain only one study had examined health-related beliefs.

In addition to this paper's main focus on overlap across domains, it presents a broad overview of research results in four domains. Researchers in a particular do-

main can use the results of this review to look beyond the boundaries of their own domain to generate ideas from results in other domains.

4.2 Implications for interventions

A prerequisite for developing interventions that are tailored to multiple behaviors is that these behaviors have some predictors in common. After all, if a factor is predictive of several behaviors, an intervention that can impact that factor may contribute to changes in all related behaviors. In a recent review we found evidence that several general, non-domain-specific factors (e.g., self-esteem, warm and strict parenting style) are predictive of all four behaviors that were also examined in the present review (Wiefferink et al., 2006). Interventions that affect such factors have thus the potential to lead to changes in all four behaviors. The Child Development Project and the Seattle Social Development Project are examples of such an approach in the primary school setting (Battistich, Schaps, Watson, Solomon, & Lewis, 2000; Hawkins, Catalano, Kosterman, Abbott, & Hill, 1999).

The present review concentrated on domain-specific predictors or correlates. These predictors are mostly proximal factors, comprising attitudinal, social normative and self-efficacy beliefs, and are the typical focus of educational interventions. Research in social psychology and health promotion has shown that such beliefs are most predictive of a specific behavior when they are formulated specifically in terms of that behavior (Ajzen, 1991). It is not likely that, without extra effort, changes in such factors in one domain will lead to changes in similar factors in other behavioral domains. Research in education has shown that transfer of learning – e.g., from the school context to the private or work setting, or from one situation or problem to another - does not happen by itself but must be actively promoted (Perkins & Salomon, 1996). The issue of transfer has been raised from different theoretical points of view, mainly from cognitive psychology and situated perspectives, which have different implications for promoting transfer (Tuomi-Gröhn & Engeström, 2003). Situated perspectives emphasize that abstract schooling does not make sense to young people (Säljö, 2003). Knowledge and skills should be meaningful in the context of the students' personal objectives in order for it to be carried over to a similar problem or behavior domain (Säljö, 2003). The perspective of cognitive educational psychology is relevant to the finding of this review that various behaviors have similar determinants. To achieve transfer, the teaching content should focus not only on domain-specific issues but should also invite students to decontextualize these issues into general principles and to examine and practise their application in various other behavioral domains (e.g., Elshout-Mohr et al., 1999). For instance, learning how to refuse a cigarette by understanding general refusal skills can help students to refuse alcohol use or unsafe sex. Application to other domains should be specific and should include relevant domain-specific knowledge, beliefs and circumstances as well as an assessment of the similarities and dissimilarities between domains. In the case of recontextualizing refusal skills from the tobacco to the alcohol domain, students could be invited to act out a situation involving alcohol. They would then assess what the situation entails, look at the ways it is comparable to or different from a tobacco situation, examine whether the response options are comparable and dis-

cuss which specific response could be used. By practising this in several domains, students may learn to use their knowledge and skills flexibly, thus increasing the chance that they will use them in domains they have not rehearsed.

Examples of other general principles that seem relevant in the light of the findings of this review are: understanding the mechanisms of social influences; exploring and questioning expected consequences of the target behavior; exploring alternative behaviors that have similar immediate gratification or social advantages but are less health-compromizing; and considering and weighing various behavioral options and their consequences (decision-making and problem-solving). However, since we do not know of any examples of explicit transfer-oriented learning in health promotion, it is not altogether clear what level of generalization would work best. Moreover, whatever level of generalization is chosen, domain-specific components will always be necessary. After all, young people will have to learn basic domain-specific knowledge and skills.

4.3 Limitations

This review fulfils generally acknowledged criteria for systematic reviews (Jackson, 2005): identification of the review question in advance, comprehensive literature search, use of explicit inclusion/exclusion criteria, application of established standards for appraising study quality, and explicit methods of extracting and synthesizing study findings. The following limitations should be discussed.

Because of our broad focus on four health-related behaviors we had to limit our search and may thus have missed relevant studies. Optimal use of restricted resources was made by searching a medical and a social science database (Peersman et al., 1999), by searching empirical as well as review studies and by backward search. Reviews were included to account for results of older studies but, as was mentioned above, this may have some disadvantages, such as the danger of overrepresentation of certain results.

There was considerable variation across the four behavioral domains in the design of the empirical studies. Whereas nearly all studies of safe sex and healthy nutrition had a cross-sectional design, all empirical studies of tobacco and alcohol use were longitudinal. In terms of causality, the findings on smoking and alcohol abuse are thus more robust than the findings on safe sex and nutrition. Although this may hamper comparison of results across different domains, the results in each behavioral domain can be considered to reflect available evidence and current study quality standards *within that domain*.

Within behavioral domains, and especially in the nutrition domain, there was great variation in outcome measures. We included all measures and thus looked at broad behavioral domains, since there is no consensus as to which specific outcome measures in these domains are most relevant.

Definition of determinants was in some cases unclear, as most reviews and some empirical studies did not give specifications of measures. Therefore, as stated earlier, we categorized the determinants conservatively. If we were not sure that determinants addressed the same content or concept, they were treated as separate determinants. Placement under the same heading indicates that there is at least some simi-

larity between determinants. In addition, studies that examined multiple behaviors measured the determinants for each of the behaviors in the same way. In these studies, the results did not differ from studies that examined only one behavior.

This review could even have been stronger if, in addition to type of study, we had included other methodological aspects for weighing study results. Such aspects may include validity and reliability of measures, level of respondent representation and appropriateness of statistical analyses.

Although use of stricter or alternative review methodology might have led to other specific results for some factors or behaviors, it is not likely that the main finding of this review would be different i.e. that there are similarities between domain-specific determinants across behavioral domains. Despite the inclusion of studies with a variety of designs, measures and analyses, the results for most of the determinants examined for multiple behaviors in this review point in the same direction: most determinants are either a risk factor or a protective factor across different behavioral domains. This main finding implies that an important precondition for a transfer-oriented approach to adolescent health promotion can be met. Such an approach is new to this field but seems promising. The determinants that were found to be relevant to all four behaviors are the primary candidates for consideration in a transfer-oriented program.

Table 2. Characteristics of studies included in the review

	Author (year)	Design	Dependent variable	Age	Gender	Ethnicity	N^2	Country
			Studies of multiple behaviors					
19	Adalbjarnardottir (2001)	Longitudinal 3 y	Daily smoking, heavy alcohol use	14	M&F	White	347	Iceland
20	Goldberg (2002)	Longitudinal 6m	Alcohol use (smoking)	Grade 5, 7, 9	M&F	Various, 80% White	395	USA
21	Maxwell (2002)	Longitudinal 1y	Smoking, alcohol, sexual experience	12-18	M&F	Various, 49% White	1969	USA
22	Wills (2002)	Longitudinal 4y	Smoking frequency, alcohol use	Grade 7-10	M&F	Various, 37% White	1364	USA
23	Beal (2001)	Cross-sectional	Smoking, alcohol, sexual experience	12-13	M&F	Mostly Black + Hispanic	208	USA
24	La Greca (2001)	Cross-sectional	Smoking, alcohol, risky sexual behavior	Mean = 16,8	M&F	Mostly middle class	250	USA
25	Maes (2003)	Cross-sectional	Smoking, alcohol, healthy diet	High School	M&F	Not specified	3225	Belgium
26	Topolski (2001)	Cross-sectional	Smoking, alcohol, risky sexual behavior	High school	M&F	Various, 71% White	2801	USA
27	Amaro (2001)	Review	Smoking, drinking (substance abuse)	Mostly 12-18	M&F	Various	219 ref	Mostly USA
28	Bauman (1996)	Review	Smoking, drinking (marijuana)	Adolescents	M&F	Not specified	116 ref	Mostly USA
29	Belcher (1998)	Review	Smoking, drinking (substance use)	Adolescents	M&F	Various	113 ref	Mostly USA
30	Fahs (1999)	Review	Smoking, drinking	Adolescents	M&F	Various	31	Mostly USA
31	Scaramella (2001)	Review	Smoking, drinking	Adolescents	M&F	Various	91 ref	USA
32	Swadi (1999)	Review	Smoking, drinking	Adolescents	M&F	Not specified	151 ref	USA and Western
			Studies of tobacco use					
33	Carvajal (2000)	Longitudinal 9m	Smoking	Grade 6-7	M&F	Various, 60%	736	USA

[1]

	Author (year)	Design	Dependent variable	Age	Gender	Ethnicity	*N*[2]	Country
						White		
34	Chassin (2000)	Longitudinal 13y	Smoking trajectories	Grade 6-12	M&F	96% White	736	USA
35	Choi (2001)	Longitudinal, Sample 1: 4 yrs, Sample 2: 3 yrs	Established smoking (> 100 sig/life)	12-18	M&F	Sample 1: nationally representative Sample 2: not specified	7960 3376	USA
36	Choi (2002)	Longitudinal 3y	Established smoking (> 100 sig/life)	12-17	M&F	Various, 64% White	2965	USA
37	Ellickson (2001)	Longitudinal 5y	Smoking	13 and 18	M&F	Various, 72% White	3056	USA
38	Epstein (2000)	Longitudinal 1+2y	Smoking	Grade 7 and 10	M&F	Various, 54% Hispanic	1094	USA
39	Hine (2002)	Longitudinal 3m	Smoking	12-19,	M&F	Not specified	361	Canada
40	Orlando (2001)	Longitudinal 2+5=7y	Smoking	Grade 10 + 12	M&F	Various, 67% White	2961	USA
41	Soldz (2002)	Longitudinal 7 x 1y	Smoking trajectories	Grade 6-12	M&F	Various, 87% White	852	USA
42	Tucker (2002)	Longitudinal 5y	Daily smoking	Grade 7	M&F	Various, 68% White	4165	USA
43	Wang (2001)	Longitudinal 3y	Smoking (experimental and regular)	12-19	M&F	Nationally representative	4431	USA
44	White (2002)	Longitudinal 18y	Smoking trajectories	12	M&F	92% White	374	USA
45	Woodruff (2003)	Longitudinal 1y	Ever smoking	12-15	M&F	Various, 63% Hispanic	478	USA
46	Avenevoli (2003)	Review	Smoking	Mostly 11-17	M&F	Various, mostly White	116 ref	USA and Western
47	Darling (2003)	Review	Smoking	Adolescents	M&F	Not specified	96 ref	Not specified
48	Derzon (1999)	*Meta-analysis*	Smoking	Up to 18	M&F	Various, mostly	64	USA and

	Author (year)	Design	Dependent variable	Age	Gender	Ethnicity	*N*[2]	Country
						White		Western
49	DuRant (1999)	Review	Smoking	Adolescents	M&F	Not specified	5	Not specified
50	Eissenberg (2000)	Review	Initial smoking	Adolescents	M&F	Not specified	105 ref	Not specified
51	Flay (1998)	Review	Smoking	Adolescents	M&F	Not specified	34	Not specified
52	Kobus (2003)	Review	Smoking	11-20	M&F	Not specified	125 ref	Not specified
53	Mayhew (2000)	Review	Stages in smoking	Adolescents	M&F	Not specified	86 ref	Not specified
54	Pletcher (2000)	Review	Smoking	Adolescents	M&F	Various	22 ref	Mostly USA
55	Sasco (1999)	Review	Smoking	Young people	M&F	Not specified	86 ref	Western
56	Tyas (1998)	Review	Smoking	Adolescents	M&F	Various	226 ref	Mostly western
57	Wagner (2000)	Review	Smoking	Teenagers	F	Not specified		Mostly USA
58	Wilcox (2003)	Review	Smoking	Adolescents	M&F	Not specified	146 ref	Mostly USA
			Studies of alcohol use					
59	D'Amico (2001)	Longitudinal 6m	Binge drinking (> 5 drinks)	13-18	M&F	Various, 70% White	621	USA
60	Ellickson (2001)	Longitudinal 2+5=7y	Alcohol misuse	Grade 7 and 10	M&F	Various, 67% White	4200	USA
61	Griffin (2000)	Longitudinal 2y	Alcohol use	Grade 7	M&F	Various, 40% Black	1950	USA
62	Lonczak (2001)	Longitudinal 1, 2 y	Alcohol misuse	14-15	M&F	Various, 46% White	808	USA
63	Poikolainen (2001)	Longitudinal 5y	Alcohol use, heavy drinking (> 13 drinks)	15-19	M&F	Not specified	611	Finland
64	Scheier (2000)	Longitudinal 4y	Alcohol use	Grade 7-10	M&F	90% White	740	USA
65	Johnson (1999)	Review	Drinking	Adolescents	M&F	Black, Hispanic	46 ref	Mostly USA
66	Kodjo (2002)	Review	Drinking (substance use)	Adolescents	M&F	Various	39 ref	Mostly USA
67	Patton (1995)	Review	Drinking	Adolescents	M&F	Not specified	63 ref	Mostly USA
68	Schor (1996)	Review	Drinking	Adolescents	M&F	Not specified	86 ref	Mostly USA
			Studies of safe sex					
69	Bachanas (2002)	Cross-sectional	% intercourse with condom	12-19	F	Black	164	USA

	Author (year)	Design	Dependent variable	Age	Gender	Ethnicity	N^2	Country
70	Ben-Zur (2000)	Cross-sectional	Frequency condom use	14-18	M&F	60 % immigrants	1082	Israel
71	Boyer (2000)	Cross-sectional	Susceptibility STD's	13-21	M&F	Black	303	USA
72	Colon (2000)	Cross-sectional	Intention condom use	14-19	M	Black	229	USA
73	Crosby (2000)	Cross-sectional	Frequency unsafe sex	14-18	F	Black	522	USA
74	Dilorio (2001)	Cross-sectional	Condom use	13-15	M&F	Black	405	USA
75	Gutierrez (2000)	Cross-sectional	Condom use	14-19	M&F	Black, White	333	USA
76	Henderson (2002)	Cross-sectional	Condom use 1st intercourse	13-14	M&F	Not specified	1220	Scotland
77	Hendrickx (2002)	Cross-sectional	Condom use	15-21	M&F	Moroccan	55	Belgium
78	Rosengard (2001)	Cross-sectional	Intention condom use	14-19	M&F	Not specified	236	USA
79	Beckman (1996)	Review	Condom use	Adolescents	M&F	Not specified	16	USA
80	Gage (1998)	Review	Condom use	10-19	M&F	Not specified	10	Various
81	Jemmott (2000)	Review	Condom use	11-21	M&F	Not specified	10	USA
82	Kirby (2002)	Review	Use of contraception	< 19	M&F	Not specified	250	USA
83	Kotchick (2001)	Review	Condom use	Adolescents	M&F	Not specified	121 ref	USA
84	Rotheram-Borus (1995)	Review	Condom use	Adolescents	M&F	Not specified	112 ref	USA
85	Whaley (1999)	Review	Risky sexual behavior	Older than 13	M&F	Not specified	49 ref	USA
			Studies of nutrition behavior					
86	Backman (2002)	Longitudinal	Intention healthy diet, calory + F&V intake	14-19	M&F	Various, 36% Hispanic	780	USA
87	Berg (2000)	Cross-sectional	Milk and bread choice	11-15	M&F	Not specified	1096	Sweden
88	Berg (2002)	Cross-sectional	Breakfast food choice fat fiber	11-15	M&F	Not specified	181	Sweden
89	Contento (1995)	Cross-sectional	Quality of food intake	11-18	M&F	Various, 47% White	411	USA
90	Croll (2001)	Cross-sectional	Healthy food choice	Grade 7-12	M&F	Various, 50% White	203	USA
91	De Bourdeaudhuij (1998)	Cross-sectional	Family members influence on decision making about food	Families with 2 adol. 12-18	M&F	Not specified	92 fam.	Belgium

[1]

	Author (year)	Design	Dependent variable	Age	Gender	Ethnicity	*N*[2]	Country
92	Gillman (2000)	Cross-sectional	Frequency of fruit and vegetables	9-14	M&F	Various, 93% White	16202	USA
93	Masu (2002)	Cross-sectional	Food intake	11-12	M&F	Not specified	238	USA
94	Neumark-Sztainer (1996)	Cross-sectional	Vegetable and fruit(juice) consumption	12-20	M&F	Various, 86% White	36284	USA
95	Neumark-Sztainer (1999)	Cross-sectional	Food-choice	Grade 7 and 10	M&F	Various, 40% White	141	USA
96	Neumark-Sztainer (2003)	Cross-sectional	Nutrient intake	11-18	M&F	Various, 49%White	4746	USA
97	O'dea (2003)	Cross-sectional	Benefits and barriers of healthy eating	7-17	M&F	Representative mix	213	Australia
98	Pirouznia (2001)	Cross-sectional	Eating behavior	10-13	M&F	Not specified	532	USA
99	Roos (2001)	Cross-sectional	Consumption of raw vegetables	Mean = 15,3	M&F	Not specified	65059	Finland
100	Weber Cullen (1998)	Cross-sectional	Stages of change for F&V intake	9-12	F	Various, 77% White	259	USA
101	Woodward (1996)	Cross-sectional	Intake of 22 selected food items	12-15	M&F	Not specified	2082	Australia
102	Birch (1998)	Review	Eating behavior	Adolescents	M&F	Not specified	106 ref	Not specified
103	Eertmans (2001)	Review	Eating behavior	Not specified	M&F	Not specified	124 ref	Not specified
104	Koivisto Hursti (1999)	Review	Food choice	Not specified	M&F	Not specified	75 ref	Sweden
105	Story (2002)	Review	Eating behavior	Adolescents	M&F	Not specified	100 ref	Not specified

[1] Reference numbers are copied from published paper Peters et al. (2009)

[2] *In empirical studies* N=*number of respondents; in reviews* N=*number of included studies. Some reviews were not clear about the number of studies included: in these cases the total number of references is given.*

Table 3. Domain-specific determinants studied for two or more behaviors

Determinants	**Safe sex**			**Healthy nutrition**			**Non-smoking**			**Low alcohol consumption**		
	+	-	0/ unclear	+	-	0/ unclear	+	-	0/ unclear	+	-	0/ unclear
Behavioral factors												
Previous experience with the behavior												
Previous experience with the unhealthy behavior								19L, 35L, 37L, 38L, 51R, 21L, 53R, 40L, 42L		64L	19L, 59L, 60L, 20L, 62L, 21L	22L
Positive experiences with trial behavior								50R			20L	
Early onset of unhealthy behavior								30R, 53R, 56R			59L, 63L	59L
Lower age at first intercourse		75C, 76C, 81R, 82R, 83R	75C			25C						
Barriers/availability factors												
Availability / accessibility of unhealthy products					90C, 103R, 104R,			45L, 49R, 58R	45L, 56R			

Determinants	Safe sex			Healthy nutrition			Non-smoking			Low alcohol consumption		
	+	-	0/ unclear	+	-	0/ unclear	+	-	0/ unclear	+	-	0/ unclear
					105R							
Proximal factors												
Attitude												
General, unspecified or mixed beliefs	70C, 78C		74C	86L, 87C, 88C			33L, 48R, 53R, 41L, 56R, 43L		39L, 42L	27R, 20L, 61L		20L
Health beliefs												
Perceived personal health risk	79R, 71C, 73C, 80R, 75C, 77C, 82R, 83R, 84R	85R	69C, 79R, 73C, 75C, 83R		105R		53R, 56R	49R				
Perceived general health risk							46R, 34L		39L, 44L			60L
Denial of health problems in young people		70C			90C							
Physiological and psychological gratification												
Unhealthy behavior gives immediate gratification (e.g.		79R, 71C, 73C,			86L, 87C, 102R,	93C		20L			20L	

Determinants	**Safe sex**			**Healthy nutrition**			**Non-smoking**			**Low alcohol consumption**		
	+	-	0/ unclear	+	-	0/ unclear	+	-	0/ unclear	+	-	0/ unclear
condom reduces pleasure, unhealthy food tastes better)		80R, 77C, 81R, 84R			90C, 103R, 104R, 95C, 97C, 105R, 100C, 101C							
Unhealthy behavior helps relax, reduce stress and negative affect								27R, 34L, 51R, 39L, 54R, 55R			67R	
Anticipated regret (e.g. hangover)									20L	20L		20L
Appearance												
Behavior helps lose or maintain weight				86L		87C		30R, 51R, 39L, 54R, 55R, 57R				
Performance												
Mental / cognitive performance				97C							67R	
Athletic / physical / motor performance				97C		86L	55R				67R	
Social consequences												
Unhealthy behavior		74C						38L,	39L, 34L		67R, 61L	

Determinants	Safe sex			Healthy nutrition			Non-smoking			Low alcohol consumption		
	+	-	0/ unclear	+	-	0/ unclear	+	-	0/ unclear	+	-	0/ unclear
has social advantages								39L, 52R				
Social normative beliefs												
General social norm	78C		78C	86L, 87C, 102R, 103R, 100C		93C						
Healthy behavior acceptable to peers / peer norms	23C, 79R, 71C, 80R			86L, 97C			23C, 33L, 48R, 49R, 51R, 53R, 56R, 57R		37L, 42L	61L, 23C		29R, 60L, 68R
Healthy behavior acceptable to parents / parental norms			23C	86L, 97C			27R, 46R, 33L, 47R, 48R, 49R, 52R, 53R, 55R, 31R, 42L, 56R, 57R		23C, 37L, 51R	23C, 29R, 61L, 65R, 68R		60L
Rules set by parents about behavior				91C, 103R			55R					

Determinants	Safe sex			Healthy nutrition			Non-smoking			Low alcohol consumption		
	+	-	0/ unclear	+	-	0/ unclear	+	-	0/ unclear	+	-	0/ unclear
Healthy behavior acceptable to partner	82R, 83R				87C							
Healthy behavior acceptable to siblings				86L			57R					
School acceptance of cigarettes and drugs								58R			31R	
Offers of unhealthy products								53R, 42L, 45L	45L		60L	
Direct social pressure to engage in unhealthy behavior									28R, 52R			28R
Self-efficacy												
General self-efficacy to perform healthy behavior				86L, 87C, 93C, 105R, 100C			33L					
Perception of skills to perform healthy behavior (e.g. use condoms, prepare healthy food)	79R, 74C, 75C, 81R, 82R, 83R, 84R		71C, 75C	86L								
Refusal self-efficacy	72C, 74C			105R			49R		60L	60L		
Distal factors												
Knowledge/values												
Knowledge of behavior risks	82R, 83R,	70C, 75C,	69C, 71C,			104R, 105R			56R			

Determinants	Safe sex			Healthy nutrition			Non-smoking			Low alcohol consumption		
	+	-	0/ unclear	+	-	0/ unclear	+	-	0/ unclear	+	-	0/ unclear
	85R, 71C	83R, 85R	72C, 75C, 84R									
Social bonding/Others' behavior												
Perceived healthy behavior general				87C, 102R, 104R		93C	36L, 51R, 32R					
Perceived healthy behavior peers/friends	69C, 71C, 73C, 83R, 24C, 21L		69C, 23C, 73C, 74C	105R, 101C		105R, 101C	27R, 46R, 28R, 23C, 33L, 34L, 36L, 48R, 49R, 30R, 52R, 24C, 21L, 53R, 54R, 55R, 56R, 57R, 43L, 44L	37L	19L, 37L, 42L, 44L	19L, 27R, 28R, 23C, 59L, 60L, 61L, 24C, 21L, 68R, 32R		59L
Actual healthy behavior peers/friends							28R, 52R, 21L		28R	28R, 21L		28R

Determinants	**Safe sex**			**Healthy nutrition**			**Non-smoking**			**Low alcohol consumption**		
	+	-	0/ unclear	+	-	0/ unclear	+	-	0/ unclear	+	-	0/ unclear
Perceived healthy behavior parents	83R		23C	87C, 105R, 101C			19L, 27R, 46R, 23C, 34L, 36L, 47R, 48R, 30R, 52R, 25C, 53R, 54R, 55R, 32R, 42L, 56R, 57R, 43L, 44L		36L, 44L	23C, 29R, 60L, 65R, 67R, 68R, 32R		19L, 25C
Ultimate factors												
Cultural environment												
Media/commercials					102R, 105R			36L	51R			
Biology												
Genetic influences								46R	51R		29R, 66R, 67R, 32R	
	+	-	0	+	-	0	+	-	0	+	-	0

Studies can be in two columns of one behavior. For empirical studies this means that different relations were found for different groups of respondents or for different outcome measures. For reviews, it means that different relations were found in different studies and no overall conclusion was formulated. Study design is indicated by a letter: L=longitudinal, C=cross-sectional, R=review. + = determinant enhances healthy behavior; - = determinant impedes healthy behavior; 0 = no relationship with behavior.

Table 4. Domain-specific determinants studied for only one behavior

Determinant	Behavior	+	-	0
Behavioral factors				
Previous experience with the behavior				
Previous behavior to relieve tension	Low alcohol consumption		63L	
Behavior-related health consequences in the past (STD, pregnancy)	Safe sex		73C, 82R, 78C, 85R	78C
Nicotine dependence	Non-smoking		30R	
Behavior specifics				
Eating dinner with family members	Healthy nutrition	92C, 96C, 99C, 105R		
Eating outside the house (e.g. school, restaurants, fast-food)	Healthy nutrition		105R	
Member of school lunch program	Healthy nutrition	99C		
Eating snacks during school hours	Healthy nutrition		99C	
Binge eating	Healthy nutrition		94C	
Dieting	Healthy nutrition	89C	94C	94C
Number of sex partners	Safe sex		84R	
Barriers/availability factors				
Availability and accessibility of healthy products	Healthy nutrition	86L, 105R, 103R, 95C, 97C		
Proximal factors				
Attitude				
Health beliefs				
Perceived protection against health risks	Healthy nutrition	87C, 90C, 101C		101C
Define healthy breakfast as low in fat	Healthy nutrition			88C
Define healthy breakfast as high in fiber	Healthy nutrition	88C		
Feel healthy when acting healthy	Healthy nutrition	97C		86L
Perceived risk of pregnancy	Safe sex	79R, 73C, 80R, 77C, 82R		73C
Other contraception than condoms protects against HIV/STD	Safe sex		73C	
Physiological and psychological gratification				
Unhealthy behavior (UB) enhances mood	Healthy nutrition		97C	
UB Helps feel confident	Non-smoking		27R	
UB Helps feel rebellious	Non-smoking		27R, 55R	

Determinant	Behavior	+	-	0
UB Helps feel independent, autonomous	Non-smoking		51R, 52R	
UB Helps feel unique	Non-smoking		55R	
UB Helps feel sexually active	Non-smoking		27R	
Image/stereotype of smokers more positive than self-image	Non-smoking		52R, 55R, 57R	
Feeling good when acting healthy	Healthy nutrition	86L, 97C		
Energy level increases when acting healthy	Healthy nutrition	90C, 97C		86L
Feeling comfortable with own sexuality	Safe sex	79R		
Appearance				
Look good when acting healthy	Healthy nutrition	90C		86L
Social consequences				
UB helps cope with social insecurity	Non-smoking		27R	
Behavior does not fit social situation	Healthy nutrition		90C	
Belief alcohol influences conduct negatively	Low alcohol consumption	30R		
Other				
Costs of behavior	Healthy nutrition		86L, 95C	
Efforts / time needed to perform the behaviour	Healthy nutrition		90C, 95C, 97C	86L
Social normative beliefs				
Congruence between parental norms and behavior (parents do not drink)	Low alcohol consumption	65R		
Healthy behavior acceptable to teacher, coach	Healthy nutrition			86L
Self-efficacy				
Self-efficacy in risky situations (e.g. drunk, holiday, party, etc.)	Safe sex	78C		75C
Self-efficacy to quit unhealthy behavior	Non-smoking		36L	
Distal factors				
Knowledge/values				
Knowledge about the food content	Healthy nutrition	88C, 93C, 98C		88C, 98C
Knowledge of symbol for healthy food	Healthy nutrition			88C
Received education about health behavior	Safe sex	82R		
Traditional attitude toward sex roles	Safe sex		80R, 82R, 84R	
Permissive attitude toward (premarital) sex	Safe sex		82R, 83R	83R

Determinant	Behavior	+	-	0
Social bonding/Others' behavior				
Parents have alcohol problem	Low alcohol consumption		67R, 32R	63L
Perceived healthy behavior siblings	Non-smoking	46R, 47R, 52R, 53R, 55R, 42L, 56R, 43L		44L
Perceived healthy behavior partner	Non-smoking	52R		
Perceived healthy behavior in family/ household	Non-smoking	49R, 50R, 57R		36L, 37L
Perceived healthy behavior adults	Low alcohol consumption	61L		
Perceived healthy behavior teachers	Non-smoking			43L
Perceived healthy behavior of others	Non-smoking	36L, 51R, 32R		
Communication with parents about health behavior	Safe sex	82R, 83R		82R
Ultimate factors				
Cultural environment				
Culture/traditions food	Healthy nutrition	103R, 104R	103R, 104R	

Studies can be in two columns of one behavior. For empirical studies this means that different relations were found for different groups of respondents or for different outcome measures. For reviews, it means that different relations were found in different studies and no overall conclusion was formulated. Study design is indicated by a letter: L=longitudinal, C=cross-sectional, R=review. + = determinant enhances healthy behavior; - = determinant impedes healthy behavior; 0 = no relationship with behavior; STD=sexually transmitted disease; UB=unhealthy behavior.

Chapter 4

EFFECTIVE ELEMENTS OF SCHOOL HEALTH PROMOTION ACROSS BEHAVIORAL DOMAINS: A SYSTEMATIC REVIEW OF REVIEWS[1]

Most school health education programs focus on a single behavioral domain. Integrative programs that address multiple behaviors may be more efficient, but only if the elements of change are similar for these behaviors. The objective of this study was to examine which effective elements of school health education are similar across three particular behavioral domains.

A systematic review of reviews of the effectiveness of school-based health promotion programs was conducted for the domains of substance abuse, sexual behavior, and nutrition. The literature search spanned the time period between 1995 and October 2006 and included three databases, websites of review centers and backward search. Fifty-five reviews and meta-analyses met predetermined relevance and publication criteria and were included. Data was extracted by one reviewer and checked by a second reviewer. A standardized data extraction form was used, with detailed attention to effective elements pertaining to program goals, development, content, methods, facilitator, components and intensity. Two assessors rated the quality of reviews as strong, moderate or weak. We included only strong and moderate reviews in two types of analysis: one based on interpretation of conflicting results, the other on a specific vote-counting rule.

Thirty six reviews were rated strong, 6 moderate, and 13 weak. A multitude of effective elements was identified in the included reviews and many elements were similar for two or more domains. In both types of analysis, five elements with evidence from strong reviews were found to be similar for all three domains: use of theory; addressing social influences, especially social norms; addressing cognitive-behavioral skills; training of facilitators; and multiple components. Two additional elements had positive results in all domains with the rule-based method of analysis, but had inconclusive results in at least one domain with the interpretion-based method of analysis: parent involvement and a larger number of sessions.

Five effective elements of school health promotion were found to be similar across the three behavioral domains examined (substance abuse, sexual behavior, nutrition). An integrative program that addresses the three domains seems feasible. The five elements are primary candidates to include in programs targeting these behaviors.

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[1] *Peters, L. W. H., Kok, G., Ten Dam, G. T. M., Buijs, G. J., & Paulussen, T. G. W. M. (2009). Effective elements of school health promotion across behavioral domains: a systematic review of reviews.* BMC Public Health, 9, *182*.

1. BACKGROUND

Adolescents are a popular target group for health education and promotion programs because many health-risk behaviors, which contribute to the leading causes of morbidity and mortality among youth and adults, develop or augment during adolescence (Currie et al., 2006; Eaton et al., 2006). These behaviors include use of tobacco, alcohol and other substances, unprotected sexual activity, poor dietary habits, physical inactivity, and behaviors that contribute to unintentional injuries and violence. More and more evidence shows that several of these behaviors tend to co-occur (Basen-Engquist, Edmundson, & Parcel, 1996; Donovan, Jessor, & Costa, 1991; Driskell, Dyment, Mauriello, Castle, & Sherman, 2008; DuRant, Smith, Kreiter, & Krowchuk, 1999; Prochaska, Spring, & Nigg, 2008; Sallis, Prochaska, & Taylor, 2000; Wiefferink et al., 2006) and have similar determinants (Peters, Wiefferink, et al., 2009; Wiefferink et al., 2006), which opens up opportunities for integrative programs that address multiple behaviors (Prochaska, 2008). Yet, most adolescent health promotion programs continue to address only one behavioral domain.

The majority of adolescent health promotion programs are intended for use in schools, often as a supplement to the regular curriculum. In many countries school staff feel overwhelmed by the ever-increasing supply of prevention programs, especially since they are faced with overcrowded curricula and limited opportunities for implementing prevention programs (Lee, Keung, & Tsang, 2004; Leurs, Jansen, Schaalma, Mur-Veeman, & De Vries, 2005). Integrative programs that address multiple risk behaviors effectively and efficiently may reduce the burden on schools and teachers (Ten Dam, 2002). Several authors have suggested that integrative programs can be efficient if the change processes or effective elements for different health behaviors are similar (Paulussen, Panis, Peters, Buijs, & Wijnsma, 1998; Prochaska et al., 2008).

The observation that most programs focus on a single behavior also holds for the review literature that discusses effectiveness and effective elements of school-based health promotion. As Prochaska (2008, p. 283) argues, “science tends to value specificity, and specialists are trained to know what is specific to their disciplines rather than what is common across disciplines”. Although many authors have observed that elements of effective programs appear to be similar across different behaviors (Nation et al., 2003; Schaalma, Abraham, Gillmore, & Kok, 2004; Summerfield, 2002; Thomas, Micucci, Ciliska, & Mirza, 2005), only a few authors have yet examined these commonalities systematically (Nation et al., 2003). Knowledge of the similarities and dissimilarities of effective programs across behavioral domains may not only contribute to the development or elaboration of integrative programs. It may also deepen our understanding of what does and does not work in school health promotion and may contribute to transfer of knowledge and ideas from one domain to another.

The present review focuses on similarities between effective elements of school health education programs across three behavioral domains: substance abuse, sexual behavior and healthy nutrition. It was conducted to inform development of an inte-

grative educational program that addresses all three domains. These domains were selected because they are among the ones most frequently addressed in Dutch secondary schools (Dafesh, 2006).

In light of the task of assessing three domains and the extensive body of literature on effectiveness that already exists in these domains, we opted for a review-of-reviews approach. As Nation and colleagues (2003) stated, prevention now has a sufficient knowledge base to begin a meta-assessment of the characteristics of effective prevention programming. More and more, reviews draw on previous reviews for making statements about effectiveness (e.g., Ellis & Grey, 2004; Micucci, Thomas, & Vohra, 2002; Mulvihill & Quigley, 2003; Nation et al., 2003; Poobalan, Taylor, Clar, Helms, & Smith, 2008; Thomas et al., 2005).

2. METHODS

2.1 Literature searches and inclusion/exclusion criteria

Three internet databases (Pubmed, PsycINFO, ERIC) were searched for relevant reviews published between January 1995 and October 2006 by combining groups of keywords pertaining to school health promotion, effectiveness and the three health behavior domains (see Table 1), generating over 1600 papers. The number and types of databases searched can be considered comprehensive (Thomas et al., 2005) and efficient for locating literature about effectiveness of health promotion (Peersman, Harden, Oliver, & Oakley, 1999). Also, the internet sites of six international review initiatives were searched for relevant reviews (see Table 1) and reference lists of already retrieved publications were scanned for additional reviews.

Titles and abstracts of publications were screened for relevance, and in case of doubt, entire publications were checked. Reviews were deemed relevant if they: a) included a review of primary effect studies (reviews of reviews were excluded); b) focused on one or more of the targeted risk behaviors (substance abuse, early or unprotected sexual behavior, dietary behavior); c) focused on regular, secondary-school-age youth or adolescents (12-18 years); d) included school-based programs with an educational approach; and e) discussed programs implemented in western countries. Furthermore, reviews had to be written in English, be published in a peer-reviewed journal listed on the Thomson Scientific master journal list or by an international review initiative, and be available over the Internet or from university libraries in The Netherlands.

Fifty five reviews met these criteria and were included: 5 about multiple domains of our interest (mostly about substance abuse and sexual behavior, see references 26-30 in Table S1 at the end of this chapter), 24 about substance abuse (references 31-54 in Table S1), 17 about sexual behavior (references 55-71 in Table S1) and 9 about nutrition (references 72-80 in Table S1).

Table 1. Databases and keywords used in search strategies

Databases			
Pubmed keywords	**PsycINFO keywords**	**ERIC keywords**	**Review initiatives websites**
School health promotion: Curriculum Health-education Health-promotion School-health-services Health-plan-implementation **Effectiveness:** Program-evaluation Evaluation-studies Risk-reduction-behavior **Behavior focus:** Smoking Alcohol-drinking Sex-education Diet Food-habits	**School health promotion:** Curriculum Curriculum-development Educational-programs Schools School-environment Health-education Health-promotion **Effectiveness:** Effectiveness Educational-program-evaluation Treatment-effectiveness-evaluation Health-attitudes Health-behavior Health-knowledge **Behavior focus:** Tobacco-smoking Alcohol-abuse Safe-sex Sex-education Sexuality Sexually-transmitted-diseases Food-intake Nutrition Health-behavior Lifestyle	**School health promotion:** Curriculum School-health-services Health-programs Health-education Comprehensive-school-health-education Intervention Instruction **Effectiveness:** Program-effectiveness Program-evaluation Program-implementation Outcomes-of-education Knowledge-level Feedback Learning **Behavior focus:** Tobacco Smoking Alcohol-education Drinking Substance-abuse Sex-education Sexuality Nutrition Nutrition-instruction Eating-habits	Campbell Collaboration Centre for Reviews and Dissemination, York UK Cochrane Collaboration Effective Public Health Practice Project, Hamilton Canada EPPI-Centre, London UK Guide to Community Preventive Services

Publication year: January 1995 – October 2006. Language: English.
Note: The keywords within one group of keywords (e.g., school health promotion) were combined with 'OR', the groups were combined with 'AND'.

Of the substance abuse reviews, 5 focused specifically on tobacco, 4 on alcohol and the remaining 15 addressed tobacco and/or alcohol, possibly in combination with other substances. All reviews about multiple domains addressed substance abuse and sexuality programs and two also included nutrition programs. As some of these reviews focused on specific types of programs (e.g. peer programs) and not so much on specific behavioral domains, the results were usually not discussed for each specific domain. Some reviews in the multiple behavior and nutrition categories also addressed behaviors outside our focus (e.g. exercise), but results for these additional behaviors were not recorded.

2.2 Data extraction

A standardized form (available from the first author) containing 27 categories was used for recording information about the characteristics and results of the 55 included reviews. This form was developed ad hoc for this review, but was based on tools previously used by others. Nine categories, derived from other reviews of reviews (Micucci et al., 2002; Thomas et al., 2005), pertained to characteristics of the focus and methods of each review: general and specific behavior focus, target population, intervention setting, type of review, time span, number of studies included, criteria for study design and outcome measures. One category was used for recording general results with respect to effectiveness, such as overall effect sizes or general statements. The other 17 categories addressed results with respect to effective elements of programs, participants or studies. This level of specificity was chosen to maximize learning about characteristics associated with effectiveness. Seven of these categories, which are all discussed in this review, pertained to elements of programs: focus/goal, development, content, methods, facilitator, components, and intensity. The remaining 10 categories pertained to elements of participants (e.g. gender, pre-test risk behavior) or studies (e.g., type of study design, length of follow-up). The three main categories of effective elements (programs, participants and studies) and specific elements within these categories (e.g., for program characteristics: goal, development, et cetera) are commonly used in data extraction forms of systematic reviews (e.g., see Ammerman, Lindquist, Lohr, & Hersey, 2002; Tobler et al., 2000). Due to the length of this paper we will not discuss the results for elements of participants or studies in full but will only address them when they are relevant to results for program elements.

Results and statements about effectiveness and effective elements were recorded in the appropriate categories as specifically as possible, often by literally quoting the review author. In addition, the results of each review were summarized using the symbols +, -, 0 and ? for respectively a positive, negative, null or unclear contribution of the element to effectiveness. This 'shorthand notation' facilitated tabulation, whereas the underlying extensive information warranted preservation of details. This process resulted in a 195-page summary document and an 80-page document with tables.

The first author extracted all data and conferred with the third author in case of doubt about interpretation or recording of a specific result; this was the case with 20

reviews. The third author also read six reviews (11%) and checked all data extracted from these reviews; only a few disagreements were found and these were discussed until a unanimous decision was reached.

2.3 Quality rating

The included reviews were rated for methodological quality using the Quality Assessment Tool for Reviews. This tool was developed by the Effective Public Health Practice Project and has been used in several reviews of reviews (Micucci et al., 2002; Poobalan et al., 2008; Thomas et al., 2005). It comprises the following seven criteria, which are all awarded one point, with a maximum score of 0 to 7: a) statement of the search strategy; b) comprehensiveness of the search; c) description of relevance criteria; d) some quality assessment of primary studies; e) comprehensive quality assessment of primary studies; f) integration of findings; and g) adequacy of the reported data to support the review's conclusions. Quality was rated by two raters in a staged manner. First, the independent ratings of 13 reviews were compared (inter-rater reliability overall: kappa=0.639, $p<.001$), and disagreements were discussed and resolved. Then, the remaining reviews were rated independently, and compared, and any disagreements were discussed until all scores were unanimous. Reviews were rated strong if they met six or seven of the criteria, moderate if they met four or five, and weak if they scored three or less. Strong reviews tend to be systematic, and weak reviews tend to be traditional narrative reviews. In addition to quality criteria d and e, which are quite general and only ask whether reviews assessed the quality of primary studies, we recorded which specific methodological inclusion criteria were applied in reviews (see Table S1].

2.4 Analysis

For each program element, the results of included reviews were compared, first within each domain, then across domains. Following procedures used in other reviews of reviews (Ellis & Grey, 2004; Micucci et al., 2002; Poobalan et al., 2008), only the results of strong and moderate reviews were considered for statements about effective elements. We considered a program element to be effective in a particular domain if it was labeled as such in at least one strong or moderate review from that domain and, in case of multiple reviews, if the overall conclusion was positive. If strong and/or moderate reviews in one domain had conflicting results (e.g., positive versus null results), we attempted to reach an overall conclusion by examining the methodology of the reviews (e.g., did follow-up periods or criteria for effectiveness differ between reviews?) and giving the highest weight to the review with the highest quality score, the strictest methodological criteria, and the clearest and most narrowly defined operationalizations; if no overall conclusion could be drawn the evidence was considered to be inconclusive.

Additionally, it was examined whether the results would be the same when using an alternative analytical approach, which was derived from others (Ellis & Grey, 2004). In this second type of analysis, the strength of evidence is rated as sufficient,

tentative or insufficient based on explicit rules. The evidence is sufficient if it is based on conclusions in at least one strong review from that domain and if there are no conflicting conclusions between strong reviews. The evidence is tentative if it is based on at least one moderate review or if the conclusions of strong reviews conflict (e.g., positive versus null results). If moderate reviews have conflicting conclusions, the evidence is considered to be insufficient. The main differences between the two types of analysis are that the second type strictly distinguishes between strong and moderate reviews and relies on a strict rule for handling conflicting results, whereas the first type relies more on interpretation of conflicting results. Hence, the first type is called interpretation-based and the second is called rule-based.

The results of weak reviews were deemed to be too questionable for conclusions about effective elements. However, in light of the focus of this review on similarities across domains, they were included in a supplementary way. Specifically, if a particular element had evidence from strong or moderate reviews in at least one domain, the results of weak reviews in other domains were explored and treated as a suggestion that the element might be effective in these other domains.

3. RESULTS

The results of the literature review are displayed in Tables S1 to S8 at the end of this chapter. In Table S1, references are identified by a reference number, in Tables S2 to S9 only the reference numbers are displayed. In order to facilitate the combined reading of the text and the results tables, we refer to publications in the text of the Results section by means of their reference number.

3.1 Characteristics, relevance and quality rating of included reviews

Table S1 gives an overview of characteristics of the 55 reviews. The reviews are categorized by behavior focus, and within these categories, by quality rating and publication year.

In addition to - or instead of - a preset focus on one or more behaviors, some reviews focused on specific populations (e.g., young adolescent girls [39]), intervention types (e.g., peer education [26,37,69]) or even specific programs (e.g., Life Skills Training [47]). Such specific foci are reported in Table S1.

All reviews included school-based programs (not reported in Table S1), and 23 of them entirely focused on programs in this setting, among which 15 in the substance abuse domain. Substance abuse prevention and sex education are usually implemented in secondary schools (junior high and/or senior high) and may also include the upper elementary grades 5-6. This corresponds with the age range most frequently stated in reviews: 11-18 years. Many nutrition reviews also included younger elementary-aged children.

The number of included studies differs widely across the reviews (3-144 studies) and appears to be largely due to differences in review focus (e.g., specific program

type) and strictness of methodological inclusion criteria. For reviews that provided sufficient information about studies, we recorded in Table S1 how many of the included primary studies met our relevance criteria (targeted behaviors, secondary-school-age, school-based educational intervention). In the nutrition domain, some reviews included only one relevant study, as most nutrition programs target elementary students. For these reviews, only the results of this one study were recorded. In the other domains, the number of relevant studies was much larger, and often all studies were relevant.

Except for a review about sexual knowledge [67], all reviews applied behavioral criteria to determine program effectiveness. Many reviews also addressed effects on psychosocial determinants, and in the sexuality domain one third of reviews examined results for biological outcomes such as pregnancy.

As for the quality rating, 36 reviews (65%) were rated strong, 6 moderate (11%), and 13 weak (24%). Weak reviews generally did not report methodological inclusion criteria, whereas strong reviews did. Criteria used most frequently pertained to study design and outcome measure; other criteria were much less frequently applied, e.g. for equivalence of groups, minimal follow-up period, or reporting of all outcomes. The inclusion criteria differed markedly, even between strong reviews. Many strong reviews subjected the included studies to additional quality rating. Fifteen reviews applied meta-analytic techniques (mostly in the substance abuse and sexuality domains, not reported in Table S1) and nearly all of them had a quality score of 7.

3.2 Effect sizes and general statements about effectiveness

Qualitative statements about the occurrence or magnitude of behavioral effects were cautiously positive in most reviews. Only very few reviews reported overall absence of effects and none reported overall negative effects. There do not appear to be clear relationships between type of statement and behavioral domain or review quality. The quantitative results of meta-analyses and reviews, expressed in effect sizes (ES), odds ratios (*OR*) or percentage reductions, are in line with the above mentioned qualitative statements in the reviews: in light of Cohen's [81] classification of ES as small (.20), medium (.50) or large (.80), many ESs reported in reviews were statistically significantly different from zero, explaining positive statements, but most can be considered small, explaining reservations.

In the *substance abuse* domain, average ESs reported for tobacco use ranged from -.02 [41: for the total set of non-interactive programs] to .29 [32: for life skills programs evaluated within 12 months after end of the program], with most meta-analyses reporting ESs between .10 and .18 [32,40,41,43,45]. Botvin and colleagues [29,47,53] reported typical reductions of 30-50% for social influence programs and 40-80% for life skills programs. A review of long term (> 2 years) tobacco outcomes reported a mean reduction of 11.4% in the percentage of baseline nonusers who initiated smoking [44]. For alcohol use, meta-analyses [40,41] and reviews [29,44,47,53] have reported ESs and percentage reductions of the same magnitude as for tobacco use.

In the *sexuality* domain the results vary per outcome measure examined and per review. Statistically significant positive effects have been reported for condom use (ES=.07 [56]; *OR*=.66 [58]). For birth control, one meta-analysis that included non-controlled studies found statistically significant positive effects (ES=.27 [61]) but a meta-analysis with stricter study design criteria did not [57]. Of five reviews that examined sexual activity, frequency or number of partners, two reported statistically significant positive effects (both ES=.05 [56,59]), whereas the other three did not [57,58,61]. No effects were found on diagnosis with STD [56,58]. As for pregnancy, the meta-analysis that included non-controlled studies reported a positive effect (ES=.15 [61]), whereas one with stricter criteria found no effect for females and a negative effect for males (*OR*=1.54 [57]).

In the *nutrition* domain, statistically significant positive effects have been reported for intake of fat (*OR*=2.19 [75]) and fruit and vegetables (increase of .30 to .99 servings per day [72]). One intensive high school intervention even increased daily servings of fruit and vegetables by over 2.5 [74,76].

ESs reported for psychosocial determinants are usually larger than those for behavior. In the substance use domain, a meta-analysis [41] reported an average ES of .38 for knowledge, .26 for attitude and .24 for skills for programs with much peer interaction. A tobacco-specific meta-analysis [32] reported comparable ESs for knowledge (.53 to .19, depending on the follow-up interval), attitude (.22 to .10), and skills (.22 to .09). In the sexuality domain, the following ESs have been reported: .41 for knowledge [67], .30 for condom use skills and .50 for condom negotiation skills [56].

3.3 Effective elements of programs

The results for the various categories of program elements are presented in Tables S2-S8 and are discussed in separate paragraphs below. As stated in the Methods section, the analysis focused on results of strong and moderate reviews; weak reviews were only used for supplementary purposes in the absence of stronger reviews. The elements are italicized in the text below to enhance combined reading of text and tables, and elements that are considered effective in all three domains are marked bold in the text and tables. In light of the large number of elements that have been examined in the reviews and our focus on similarities across domains, the tables only include aspects that have been examined in at least two domains.

3.4 Program focus or goal

As shown in Table S2, several strong reviews in the nutrition and sexuality domains concluded that programs with a *specific behavioral focus* (e.g., fruit consumption, condom use) are more effective than programs that discuss general nutritional or sexuality issues; supplementary, a comparable statement in one weak substance abuse review was that programs should be tailored to specific substances [52].

The issue of *abstinence goals* has been addressed by strong reviews in the sexuality and substance abuse domains. Not one sexuality review stated positive conclusions about the effectiveness of abstinence-only programs, which portray abstinence from sex as the only or very best prevention option and usually do not discuss contraception, and one even reported negative effects [63]. In contrast, one strong sexuality review [61] reported positive effects of programs that do discuss contraception (abstinence-plus or safer sex programs). Comparatively, in the substance abuse domain, one strong review cautioned that the goal of harm reduction or prevention of abuse may be more effective than a goal of abstinence or delayed use, at least for youth who already use [35].

3.5 Program development

In the substance abuse, sexuality and nutrition domains there is broad consensus among strong reviews that ***theory-based*** programs produce better effects than non-theory-based programs [see Table S3], although some reviews did not find obvious differences [42], only found a contribution of theory in univariate and not multivariate analysis [56] or stated that the exact contribution of using theory is unclear [26]. With respect to specific theories, strong reviews in the substance abuse [36,40] and nutrition [77] domains made special reference to Bandura's *social cognitive theory*; supplementary, a weak review in the sexuality domain stated that the evidence for using this theory is tentative but not yet convincing [70].

Addressing behavioral determinants was reported to be an effective element by a strong nutrition review [77] and a moderate sexuality review [66]; supplementary, weak reviews in the substance abuse domain had the same conclusion [52-54]. Three other characteristics of program development were stated to be important for enhancing effects, but each only in one or two domains: *needs assessment* among the target group, *participant involvement* in program planning and implementation, and *pretesting*. The evidence for the second element involved only a supplementary weak review in the substance abuse domain [54], and the evidence for the third was mixed, as a meta-analysis in the sexuality domain reported that stated use of pretesting was not related to the effect size for condom use [56].

The issue of *tailoring interventions to the culture* of the target group was addressed by several strong or moderate reviews in the substance abuse domain and a moderate review in the sexuality domain. The sexuality review had positive conclusions [66], as did most substance abuse reviews [33,41,47]. However, the substance abuse review with the strictest criteria reported this issue to be unclear because no high-quality study had compared culture-specific interventions with standardized interventions [31]. In the nutrition domain, this issue was only addressed by a supplementary weak review, which stated the issue to be unclear and in need of further research [79]. *Tailoring to cognitive ability or age* has been examined by three strong reviews, which cover all three domains. The sexuality [65] and nutrition [77] reviews reported favorable results, but again, the review in the substance abuse domain applied the strictest criteria and reported inconclusive results because of a lack of high-quality comparison studies [31].

3.6 Program content

Table S4 presents the results for elements of program content. Since many elements were mentioned in the reviews, we included headings to indicate that there may be some similarity between elements.

3.6.1 Knowledge, risk, attitude.

Health education programs in all domains usually include information about health consequences and prevention methods. In all domains a *knowledge-only approach* was reported to have no effect on behavior, but in the sexuality domain this involved only a supplementary weak review [29]. Some authors commented that this approach has hardly been tested rigorously [31] or only with traditional, non-engaging methods [51]. In the sexuality domain, a strong and a moderate review stated that accurate, *factual information* is an element of effective interventions [60,66]; supplementary, this was also reported in a weak substance abuse review [54]. The results of two strong sexuality reviews for *enhancing perceived risk* were mixed [58,65]; in the substance abuse domain, the related issue of fear arousal was reported to be ineffective by a moderate review [47]. Several other elements were each addressed in only one domain and are therefore not included in Table S4 nor further discussed here.

3.6.2 Social influences.

Social influences have been addressed in all domains, especially in the substance abuse domain where the social influences approach has been widely prevalent for decades. In all domains, strong reviews stated that this approach is effective, although reservations were reported in one tobacco review [31] as the largest and most rigorous study found no evidence of a sustained effect on smoking prevalence. While the social influence approach entails several components [see 51], two components have received most attention in the review literature: reinforcing or changing social norms (e.g., correcting overestimations of peer smoking) and training in recognizing and resisting peer, media and other influences (e.g., learning to negotiate safer sex). In all domains, strong reviews reported the first component, addressing ***social norms***, as an effective element. In the nutrition domain attention to norms does not seem to take the form of normative feedback but rather of building normative support for desired changes and for creating a more supportive school or community environment [77]. The second component, *resistance skills training*, was not addressed in nutrition reviews and had inconsistent results in other domains. There is some evidence that this element may only be effective in conjunction with normative education or with a rationale or motivation for refusal and may even be counterproductive when used alone [28]. This latter review [28] reported that resistance skills training is only effective if it is behavior-specific.

3.6.3 Skills

In all domains, training of *skills* was generally reported to be effective. Although the types of skills were not always specified or seemed to vary, the following similarities were observed. In the nutrition and sexuality domains, some strong reviews mentioned *domain-bound practical skills*, such as food preparation or condom use skills.

In each domain, ***cognitive-behavioral programs*** have been found effective in one or two strong reviews. Although not all authors used the same terms or were clear about what this approach entails exactly, we included this element to refer to statements about the importance of addressing both motivations and cognitive and behavioral skills. In the nutrition domain, one strong review stated that effective behaviorally focused curricula address cognitive, affective and behavioral aspects [77]. In their meta-analysis of tobacco outcomes of psychosocial programs, Hwang and colleagues [32] used a narrower definition of cognitive-behavioral programs. They distinguished social influence, cognitive behavioral, and life skills modalities. Cognitive-behavioral programs were those that included the social influence approach "plus at least two cognitive skills such as problem solving, decision making, assertiveness, self-control, and/or other coping skills. Life skills programs included the defined aspects of the social influence and cognitive-behavioral modality programs plus at least one affective skill such as self-confidence, values clarification, and/or generic social skills".

Life skills training can be regarded as a specific type of cognitive-behavioral program, one that addresses self-management and social skills (decision-making, anxiety management, communication, assertiveness). Strong reviews in the substance abuse domain reported that this training enhances the effects of a social influence approach on tobacco and alcohol use. Life skills training has only been tested in the substance use domain, and only in combination with a social influence approach. However, in the sexuality domain some strong and moderate reviews seem to refer to similar skills when stating the importance of coping, communication, and negotiation skills [58,60,62,65,66, not reported in Table S4].

3.7 Program methods

Statements about effective methods were relatively scarce in the reviews [see Table S5]. In the substance abuse domain four strong reviews consistently reported *interactive methods* to be effective; supplementary, weak reviews in the sexuality and nutrition domains mentioned specific examples of interactive methods (discussion and role-play). Tobler and colleagues [40,41], who provided the strongest evidence for interactive methods in large meta-analyses in the substance abuse domain, stated that interaction should be between students, not so much between student and teacher.

In both the nutrition and sexuality domains, *having students personalize information* was identified as an effective element in one strong or moderate review. Four other elements of program methods had evidence from one or two strong reviews in one domain, but had been examined by only weak reviews in another domain. The re-

sults for these elements were consistent across these domains (the domain named first in parentheses had evidence from a strong review): a *traditional, didactic style* ('lecture') is reported to be ineffective (nutrition, substance abuse), whereas it is effective to use *multiple channels* (sexuality, multiple behaviors), *active, experiential methods* such as experiments and taste testing (nutrition, substance abuse), and *cognitive-behavioral skills training* (sexuality, substance abuse). According to one review [47], the latter training consists of: instruction and demonstration, behavioral rehearsal with role play, feedback on each student's performance, social reinforcement, and extended practice through behavioral 'homework' assignments. Several other methods have only been reported in a single domain and are thus not included in Table S5 nor discussed here (e.g., modeling, goal-setting).

3.8 Program facilitator

The impact of the type of program facilitator on program effectiveness has had most attention in the domains of substance abuse and sexuality [see Table S6]. Especially in the substance abuse domain, many types of facilitators have been examined (not shown in Table S6).

Only *peer leaders* and *teachers* have been examined in more than one domain. The evidence conflicted between the nutrition and sexuality domains, as a strong nutrition review reported favorable results for the use of peer leaders [72], whereas three strong sexuality reviews did not find evidence for a differential impact of the type of facilitator [55,56,59]. In the substance abuse domain, the results of strong and moderate reviews were mixed. Both peer leaders [45,47] and teachers [47] have been involved in effective programs and several meta-analyses and reviews that analyzed the contribution of the type of facilitator to ES did not find overall significant differences between these facilitator types [34,35,41]; however, some reported results favoring peers over teachers, either overall [43] or for a particular intervention type [34,40] or measurement period [36]. A meta-analysis of studies comparing implementation of the same program by *peers versus teachers* reported that peers have shown better effects, but only in the short term and not at 1- or 2-year follow-up [37]. However, in light of variations in effects and lack of high-quality studies, this review did not conclude that implementation by peers is better. Also, a recent tobacco review [31] stated that not one comparison study was of high quality. Our overall conclusion for the substance abuse domain is that there are some indications that peers may have better effects than teachers, but the evidence is yet inconclusive and not one type of facilitator has generally proven to be more effective than another. There was one element of the facilitator that was consistently reported by strong reviews in all domains to have a positive contribution to effectiveness*:* ***facilitator training***.

3.9 Program components

Table S7 presents the results of reviews with respect to program components. The term 'component' is used here to refer to different approaches to behavior change (education, environmental change) or the inclusion of different settings (school, family, community). We paid extra attention to reviews with a specific focus on schools, and we were especially interested in the added value of school-wide, family and community components in addition to the usual classroom education approach.

Strong reviews in all domains were consistently positive about the effectiveness of ***programs with multiple components***, except for one sexuality review with null results but unclear operationalization [57] and one tobacco review that reported positive effects only for the long term [32]. The element of multiple components includes statements about the (better) effects of multi-component programs in general, about specific multi-component programs and about combinations of specific components.

Drawing overall conclusions about specific components is more difficult because reviews varied as to the specificity of their statement, the operationalization of components, and the criteria for assessing effectiveness (e.g., are direct comparisons necessary?). For instance, several reviews distinguished family from community components, whereas others included all family, media and community mobilization activities under the heading of community components. In light of these differences between reviews, the conclusions below about specific components should be regarded as tentative.

Programs with *school-wide change and family or community components* have been reported by strong reviews to be effective, but have only been examined in the substance abuse and nutrition domains. Strong reviews in the substance abuse and sexuality domains made positive statements about *community interventions*, and these were supplemented by a weak review in the nutrition domain; however, the strong alcohol review by Foxcroft and colleagues [33] referred more to hypotheses about cost-effectiveness than to actual evidence. The added value of *community adjuncts to classroom interventions* is convincing in the nutrition domain but was not examined in the sexuality domain. In the substance domain, several strong reviews and meta-analyses had positive conclusions, but their operationalizations or statements were general and included also family activities [32,36] or life skills modalities [31].

The evidence for *school-wide activities* is consistently positive in the nutrition domain (foodservice); supplementary weak reviews in the sexuality domain were also consistently positive (school health clinic with family planning services), but weak reviews in the substance abuse domain were not (school drug policies).

There is some evidence from strong reviews in all domains that including *parents or families* is effective; however, in the substance abuse domain this may apply only to high-risk youth, and in the nutrition domain only to elementary-aged children [77].

In the nutrition domain one strong review examined policies that impact on accessibility of products. *Price regulation* has been found effective in this domain

[78]; this was also reported for tobacco and alcohol by two weak substance abuse reviews [52,54].

All in all, there is some evidence in all domains that multi-component programs with school-wide, community and/or family components can be effective or can be more effective than curricular interventions, but the added value of such components is unclear.

3.10 Program intensity

Table S8 lists the review results with respect to program intensity and duration. It should be noted that it is not always clear what authors mean when using these terms. The more narrowly defined term of *number of sessions/hours* was addressed by strong reviews in all domains. Only reviews in the nutrition domain consistently reported a positive association with outcomes ('more is better') [74,76,77]. In the sexuality domain, the results appear to differ per type of review: three narrative reviews reported such an association [55,60,62], whereas two meta-analyses did not [58,59]. In the substance abuse domain, one review and one meta-analysis did not find clear evidence that more is better [35,41], whereas another meta-analysis did, but only for interactive programs and not for non-interactive programs [40].

Several strong or moderate reviews identified a specific minimum number of sessions/hours required for producing effects, and the numbers were comparable across domains: 8 hours for sexuality programs [60] and 10 sessions for substance abuse [48] and nutrition programs [74], although one nutrition review considered 10-15 sessions insufficient [77]. These numbers are in accordance with effects reported in one strong and one moderate substance abuse review about specific programs [38,47], but another review stated that recent substance abuse studies tend to recommend fewer sessions, specifically 4, 5 or 8 [35]. However, in light of the results already discussed, the evidence that a larger number of sessions enhances effects is only consistent in the nutrition domain. The same conclusion can be reached for the less well-described terms of *intensity* and *duration*.

The issue of *booster sessions* has mainly been examined in the substance abuse domain, except for one strong sexuality review with positive results [65]. In the substance abuse domain, the results of strong reviews were mixed. Of two strong tobacco-specific reviews, one concluded that boosters enhance long-term effects [44], but our recalculations of the presented data led us to question this conclusion; the second review had unclear results [43]. One broader substance abuse review reported benefits of boosters for behavior maintenance [35], while another did not find conclusive evidence and stated that boosters may increase effects for some programs but not for others [36]. All in all, this issue remains inconclusive.

4. DISCUSSION

4.1 Similarities across domains

This review of reviews examined effective elements of adolescent health promotion programs in three behavioral domains – substance abuse, sexual behavior and nutrition. We specifically focused on similarities across these domains, and indeed, we identified many similarities. The results are discussed here in light of the two types of analysis that have been explained in the Methods section: an interpretation-based method and a rule-based method. Based on our interpretation-based examination of the evidence that is currently available from strong and moderate reviews, five elements were identified to be effective in all domains. These five elements have evidence from at least one strong review in each domain:

a) use of theory, with specific reference to social cognitive theory
b) addressing social influences, especially social norms
c) addressing cognitive-behavioral skills
d) training of facilitators
e) including multiple components.

When using the rule-based method of analysis, the results are similar: all five elements have at least tentative evidence in all domains. Elements b, c and d even have sufficient evidence in all domains; elements a and e have tentative evidence in one or two domains due to conflicting results between strong reviews in these domains (positive versus null or unclear results). Using the rule-based method, no other elements were identified as having sufficient evidence in all three domains, but two additional elements had at least tentative evidence for a positive contribution to effectiveness in each domain:

f) parent involvement
g) a larger number of sessions.

These two elements were not identified as similar across domains with the interpretation-based method of analysis, since we found the evidence in at least one domain to be inconclusive due to conflicting results between strong reviews; in the rule-based method such conflict leads to the conclusion that the evidence is tentative. The different results of the two methods of analysis for these two elements can thus be explained by the different approaches to handling conflicting results.

In addition to the above elements, which had evidence from strong or moderate reviews in each of the three domains, several other elements also tended to have similar results across the three domains, but their evidence involved only weak reviews in one or two domains. Although weak reviews were not included in the analysis, they were used for exploring whether there is any indication that a particular element might be effective in a particular domain. The following elements had similar results across all domains; domains with strong or moderate reviews are given between parentheses:

h) a focus on specific behavior (sexuality, nutrition)
i) addressing behavioral determinants (sexuality, nutrition)
j) a knowledge-only approach (ineffective element; substance abuse, nutrition)
k) use of interactive methods (substance abuse).

In addition to the above elements, the results for many other elements were comparable across at least two of the three domains. We did not find one element for which the results indicated opposing directions of influence between domains (e.g., a positive contribution to effectiveness in one domain and a negative contribution in another domain). In cases where the results were not similar across domains, this was usually because results in one or more domains were unclear or indicated null findings, whereas those in other domains indicated a positive contribution to effectiveness.

The results of the present review are fairly similar to those of other systematic reviews of reviews that examined the domains of substance abuse and sexuality separately and that included only high-quality reviews (Lister-Sharp, Chapman, Stewart-Brown, & Sowden, 1999; Thomas et al., 2005), suggesting that the results for these domains are robust. This review adds rigor and specificity to the general observation in several reviews that effective elements in the domains of substance abuse and sexuality appear to be similar (e.g. Botvin et al., 1995; Kirby, 2002b; Schaalma et al., 2004; Summerfield, 2002; Thomas et al., 2005) and extends this observation to also include the nutrition domain. In contrast to the present review, these reviews did not examine the issue of similarity systematically or in detail.

Perhaps more importantly, our results are largely comparable to, and in some cases more specific than, those of a review of reviews that specifically focused on similarities across multiple domains (Nation et al., 2003). That review examined partly different domains (substance abuse, risky sexual behavior, school failure, and juvenile delinquency and violence), included a smaller and different set of reviews (35 narrative reviews that explicitly discussed common features of effective programs) and used a somewhat different review methodology (determining the percentage of reviews that mentioned an element as consistently effective). In that review (Nation et al., 2003), nine elements of effective programs were identified, which were claimed to reflect general principles that transcend specific content areas. Seven of these elements coincide with the ones identified by us, although some tend to be formulated in more general terms than ours. These seven elements and, between brackets, the corresponding letters from our list, are: theory-driven [a]; socio-culturally relevant (address cultural norms and beliefs) [b,i]; varying teaching methods (skills-based component, active and interactive format) [c,k]; providing opportunities for positive relationships (parent-child communication, peer influences) [b,f]; well-trained staff [d]; comprehensive (multi-modal, multiple settings) [e]; and sufficient dosage [g]. Two of the elements they identified are not represented in our own set of eleven elements: appropriate timing and inclusion of outcome evaluation. The issue of outcome evaluation was not considered relevant for the present review, as it is an aspect of studies rather than programs. The issue of appropriate timing has to do with tuning interventions to student characteristics such as age, cognitive and social development and experience with the risk behavior. This issue is generally recommended in health promotion theory (Bartholomew, Parcel, Kok, & Gottlieb, 2006; Green & Kreuter, 1999), and indeed, tailoring to age was reported to be effective by strong sexuality and nutrition reviews in this paper (Contento et al., 1995; Pedlow & Carey, 2004). However, we did not include it in our empirical-

ly-based list of effective elements because in the substance abuse domain it was reported to be unclear due to absence of high-quality comparison studies (Thomas & Perera, 2006). One element from our own list, a focus on specific behavior, is not represented in the list from the other review (Nation et al., 2003). Unfortunately, due to the limited reporting of results in the Nation et al. review, we cannot examine the causes for this difference. Possibly, the issue of behavioral focus may only be relevant for certain domains or may have been overlooked in certain domains.

4.2 Implications for practice

Researchers and practitioners in the three domains can use the effective elements identified in this review, and especially the ones that are similar across domains, as guidelines for developing and improving their adolescent health promotion programs. They can also look beyond the boundaries of their own domain to generate ideas for programs or research from results in other domains.

The fact that another multiple-domain review (Nation et al., 2003) found comparable effective elements while examining partly different domains (also school failure, juvenile delinquency and violence) suggests that the effective elements may transcend broadly to other content areas. In fact, the effective elements pertaining to program development (use of theory, addressing determinants) appear to be applicable universally, as they are general recommendations from health promotion planning models and quality assurance procedures such as PRECEDE-PROCEED (Green & Kreuter, 1999), intervention mapping (Bartholomew et al., 2006) and Preffi (Molleman, Peters, Hosman, Kok, & Oosterveld, 2006).

The finding that several effective elements are comparable across the three targeted domains indicates that integrative programs can address these domains with the same program characteristics. This is important in light of the recent interest in multiple health behavior research and its potential implications for integrative interventions (Noar, Chabot, & Zimmerman, 2008; J. O. Prochaska, 2008; J. J. Prochaska et al., 2008). The results will be used for guiding the development of our own integrative program. The effective elements pertaining to program content - address not only information, but also social influences and cognitive-behavioral skills – fit well with those of a previous review that assessed similarities between behavioral determinants across the same three domains (Peters, Wiefferink, et al., 2009). In that review the following determinants were found to be important for all domains: attitudinal beliefs about immediate gratification and social advantages, social norms, modeling behavior and resistance skills. Together, both that review and the present one provide sufficiently valid input for the development of an integrative program that addresses all three domains.

4.3 Limitations

Given our broad focus on several health-related behaviors and the already extensive body of knowledge in each domain, we applied a review-of-reviews approach, an approach that has gained acceptance in recent years (e.g., Cuijpers, 2002a; Ellis &

Grey, 2004; Lister-Sharp et al., 1999; McBride, 2003; Micucci et al., 2002; Mulvihill & Quigley, 2003; Nation et al., 2003; Poobalan et al., 2008; Thomas et al., 2005). Although the search strategy was comprehensive, it is possible that we may have missed relevant reviews. However, it is not very likely that these reviews would have discussed different sets of primary studies and would have led to different conclusions.

A limitation of the review-of-reviews approach is that it relies on 'second-hand' information and is potentially vulnerable to the interpretive and conceptual biases of previous reviewers (Nation et al., 2003). We attempted to limit these biases as much as possible by using a systematic review methodology, by assessing the quality and relevance of each review and relying on reviews of high to moderate quality, by carefully categorizing the results without generalizing too much, and, in case reviews had differential results, by attempting to examine the causes of the differences. We also attempted to check the results of reviews if sufficient information was provided.

Perhaps we would have identified more similarities across domains if we had combined aspects and findings into broader categories. We used a conservative categorization process and were reluctant to generalize findings, because the operationalization, interpretation or analysis of aspects seemed to differ between reviews or were sometimes unclear.

Two-thirds of the included reviews had a high quality score of 6 or 7. In line with other reviews of reviews (Ellis & Grey, 2004; Micucci et al., 2002; Poobalan et al., 2008) we included only strong and moderate reviews in the analysis. Furthermore, we used two methods for analyzing the results and especially for dealing with conflicting results between reviews: one method focused on interpretation of differences and the other set a strict rule. The conclusions based on these two methods were fairly similar. Weak reviews were excluded from the analysis but were used in a speculative way: for elements that had evidence from strong or moderate reviews in at least one domain, the results of weak reviews in the other domains were used to give any indication or suggestion of effectiveness in these other domains.

The methodological aspects assessed in reviews most often pertained to study design, appropriateness of allocation procedures, comparability of groups, validity of assessment and attrition, but only a few reviewers examined additional aspects such as quality of implementation. The strictness of inclusion criteria and assessment of methodological quality varied widely, even among high-quality reviews. Although meta-analyses in several domains reported that effect sizes did not vary with the design or quality of studies (DiCenso, Guyatt, Willan, & Griffith, 2002; Gottfredson & Wilson, 2003; Johnson, Carey, Marsh, Levin, & Scott-Sheldon, 2003; Knai, Pomerleau, Lock, & McKee, 2006; Mullen, Ramírez, Strouse, Hedges, & Sogolow, 2002; Tobler et al., 2000), reviews with the strictest methodological criteria (e.g., accepting only high-quality comparison studies) generally appeared to have more cautious conclusions than reviews with less strict criteria. Reporting the specific criteria applied by reviewers appears to be a valuable addition to the Quality Assessment Tool for Reviews. For reviews of primary studies, the Cochrane Collaboration Handbook (Higgins & Green, 2008) and others (Jackson & Waters, 2005) rec-

ommend using the Quality Assessment Tool for Quantitative Studies, which is also developed by the Effective Public Health Practice Project, Canada.

5. CONCLUSIONS

A multitude of effective elements of school health promotion programs has been identified in literature reviews in the domains of substance abuse, sexuality and nutrition. Many effective elements are similar across at least two domains. Based on strong reviews in all three domains, five elements were found to be similar across the three domains: use of theory; addressing social influences, especially social norms; addressing cognitive-behavioral skills; training of facilitators; and including multiple components. Two additional elements had at least tentative evidence of effectiveness in all domains when using a rule-based method of analysis but had inconclusive evidence in at least one domain when using an interpretion-based method of analysis: parent involvement and a larger number of sessions. For four additional elements, the results were comparable across the three domains but they are more speculative, as in one or two domains these elements had only been examined by weak reviews. Three of these elements have a positive contribution to effectiveness (specific behavioral focus; addressing determinants; interactive methods), whereas the fourth (knowledge-only approach) was considered ineffective. The results suggest that an integrative program that addresses the three domains seems feasible and could be efficient. The five elements with evidence from strong reviews in each domain are likely candidates to include in such a program.

Table S1. Characteristics of included reviews, categorized by behavior focus

Reference[a] (quality)	Behavior focus[b]	Time span[c]	# Studies (# relevant)[d]	Age range[e]	Methodological inclusion criteria[f]
Multiple domains					
26 Harden 1999 (7)	Peer programs. Tob, Sex, other	Up to 1998	49, 12 sound (5)	11-24 yrs	Prospective controlled design, equivalent groups, reporting of all data for all groups.
27 Lister-Sharp 1999 (7)	Health promoting school approach. Tob, Sex, Nut, other	No limits (incl =1979-1998)	12 (6)	5-16 yrs	One-group pre-post or controlled design, health-related outcomes
28 Herrmann 1997 (6)	Refusal programs. Tob, Alc, drugs, Sex	1974-1994	33	Child, Adol	None stated
29 Botvin 1995 (2)	Tob, Alc, drugs, Sex (aids, std, pregnancy)	NR	141 r	Child, Adol	None stated
30 Jason 2002 (1)	Tob, Alc, drugs, Sex, Nut, other	NR	50 r	Child, Adol	None stated
Substance abuse					
31 Thomas 2006 (7)	Tob	1966-2005	94 (54 in analysis, 23 high-quality)	Child (5-12 yrs), Adol (13-18 yrs)	RCT, tobacco use measure for baseline nonusers, minimal follow-up of 6 months after program end. Additional quality rating.
32 Hwang 2004 (7)	Psychosocial programs. Tob	1978-1997	75	Grade 6-12	Control group had no psychosocial program, pre-post measures
33 Foxcroft 2003 (7)	Alc	Up to 2001	56	< 25 yrs	RCT, matched pre-post or interrupted time series design; measures of alcohol use or related problems. Additional quality rating.
34 Gottfredson 2003 (7)	Alc, drugs (not Tob-only)	NR	94	School-age	Control group with no or minimal intervention, behavioral outcome

Reference[a] (quality)	Behavior focus[b]	Time span[c]	# Studies (# relevant)[d]	Age range[e]	Methodological inclusion criteria[f]
35 McBride 2003 (7)	Tob, Alc, drugs	1997-2001. Reviews 1990-2001	5 primary studies, 11 reviews	School-age	Primary studies: (quasi-) experimental design, pre-post measures of behavior, positive effects, discussed methodological issues. Reviews: systematic, applied methodological inclusion criteria
36 Cuijpers 2002 (7)	Tob, Alc, drugs	NR, incl = mostly 1990s	27 (27)	School-age	Meta-analyses comparing program types. Mediator studies. Studies comparing program components.
37 Cuijpers 2002 (7)	Peer-led vs adult-led. Tob, Alc, drugs	NR, incl = 1981-1995	12 (12)	School-age 11-18 yrs	Prospective studies comparing peer- and adult-led program.
38 Sussman 2002 (7)	Towards No Drug Abuse. Tob, Alc, drugs, violence	1994-1998	3 (3)	Grade 10-11	None stated, all studies were RCT
39 Blake 2001 (7)	Tob, Alc, drugs	1980-2000	32 (11)	Adol girls (primary & secondary age)	Female-specific results, no design criteria
40 Tobler 2000 (7)	Tob, Alc, drugs	1978-1998	144, 93 high-quality	School-age	Controlled design, pre-post drug-use measures. Additional criteria for high quality subsample.
41 Tobler 1997 (7)	Tob, Alc, drugs	1978-1990	90, 56 high-quality	Grade 5-12	Controlled study with pre-post drug-use measures. Additional criteria for high quality subsample.
42 Foxcroft 1997 (7)	Alc	1966-1995	33	8-25 yrs	(Quasi-)experimental, pre-post measures of alcohol use or related incidents. Additional quality rating.
43 Rooney 1996 (7)	Social or peer-type programs. Tob	1974-1991	90	Grade 6-12	Control group, measure of tobacco use
44 Skara 2003 (6)	Tob, Alc, drugs	1966-2002	25 (25)	< 21 yrs	(Quasi-)experimental design; at least 2-yr follow-up; measure of tobacco use incidence or prevalence

Reference[a] (quality)	Behavior focus[b]	Time span[c]	# Studies (# relevant)[d]	Age range[e]	Methodological inclusion criteria[f]
45 Posovac 1999 (6)	Peer-based programs. Tob, other	1978-1997	22 Tob programs	Average age 12.5 yrs	Control group, enough information to calculate effect sizes
46 Werch 2001 (5)	Stage-based programs. Alc	About 1990-2000	5 (3)	NR. Included = Grades 5-9	None stated, all studies were RCT
47 Botvin 2000 (5)	Life Skills Training. Tob, Alc, drugs	About 1980-2000	About 9 (about 9)	Middle/junior high school	None stated
48 Dusenbury 1997 (5)	Alc, drugs (incl Tob but not Tob-only)	NR	23 (21)	Primary and secondary age	Pre-post control group design, substance use outcome measure, peer reviewed
49 Hittner 1998 (4)	Alc	1980-1996	36 (31)	Child, Young Adol	Alcohol misuse outcome
50 Flay 2000 (3)	Classroom plus additional component. Tob, Alc, drugs	NR, incl = 1980s and 90s	18 (13)	Primary and secondary age	None stated.
51 Donaldson 1996 (3)	Tob, Alc, drugs	About 1976-1996	78 r	School-age	None stated
52 Montoya 2003 (2)	Tob, Alc, marijuana	About 1980-2003	81 r	Adol	None stated
53 Botvin 2000 (2)	Tob, Alc, drugs	About 1980-2000	70 r	Primary & secondary age	None stated
54 Paglia 1997 (2)	Tob, Alc, illicit drugs	NR	176 r	Youth	None stated
Sexuality					
55 Robin 2004 (7)	Sex: hiv, std, pregnancy	1990-1999	20 (about 13)	Youth and Adol	RCT or quasi-experimental; control for pretest differences; cell size at least 16; follow-up of at least 4 weeks; attrition less than 40%; behavioral or biological outcome
56 Johnson 2003 (7)	Programs with HIV content. Sex: hiv	Up to 2000	44	Adol 11-18 yrs	RCT or quasi-experimental with rigorous controls; outcome measures relevant to sexual risk behavior; sufficient information to calculate effect sizes.

Reference[a] (quality)	Behavior focus[b]	Time span[c]	# Studies (# relevant)[d]	Age range[e]	Methodological inclusion criteria[f]
57 DiCenso 2002 (7)	Sex: pregnancy	1970-2000	26 (13)	Adol 11-18 yrs	RCT; measured initiation of intercourse, use of birth control or pregnancy. Additional quality rating.
58 Mullen 2002 (7)	Sex: hiv	1992-1998	20 (6)	Adol 13-19 yrs	RCT or controlled design with pretest inequivalence controlled; measure behavior or biologic indicator
59 Silva 2002 (7)	Sex	1985-2000	12 (12)	Adol	RCT or quasi-experimental; equivalent no-intervention control group; measure of abstinent behavior; peer-reviewed
60 Yamada 1999 (7)	Sex: std	Up to Sep 1998 (incl= 1992-1998)	24 (about 10)	10-19 yrs	RCT or controlled; sample representative of general population; behavioral outcome. Additional quality rating
61 Franklin 1997 (7)	Sex: pregnancy	Up to 1995	32 (about 14)	Adol 11-20 yrs	Behavioral measure, peer-reviewed. No design criteria for inclusion. Additional quality rating.
62 Kim 1997 (7)	Sex: hiv	1983-1995	40, 4 in meta (19)	Adol 10-18 yrs	No design criteria for inclusion in review. Additional quality rating. RCT criterion for inclusion in meta-analysis.
63 Oakley 1995 (7)	Sex: sexual health	1982-1994	12 sound-65	0-19 yrs	Sound study: RCT or equivalent control group; pre- and post data; reporting of all outcomes
64 Bennett 2005 (6)	Sex: pregnancy	1980-2002	16 (16)	Secondary school	RCT; outcomes sexual behavior, contraceptive knowledge or use, or pregnancy
65 Pedlow 2004 (6)	Sex	Up to Feb 2003	24 (10)	11-18 yrs	RCT; behavioral outcome measure
66 Kirby 2002 (5)	Sex: hiv, std, pregnancy, abstinence	1980 – 2001	73	12-18 yrs	(Quasi-)experimental; sample size at least 100 in groups combined; measure of behavior or behavioral outcome.
67 Song 2000 (5)	Sex	1960-1997	67 (67)	Adol Grade 5-12	Outcome measure of knowledge about sexuality

Reference[a] (quality)	Behavior focus[b]	Time span[c]	# Studies (# relevant)[d]	Age range[e]	Methodological inclusion criteria[f]
68 Thomas 2000 (3)	Programs with focus on abstinence. Sex: std, pregnancy	NR, incl = 1990-1995	9 (8)	Adol	None stated
69 Milburn 1995 (3)	Peer education programs. Sex.	NR	51 r	Young people	None stated
70 Christopher 1995 (2)	Sex: pregnancy	NR, incl = 1981-1994	About 13	Adol	None stated.
71 Jacobs 1995 (2)	Sex: pregnancy, std	NR, incl = 1982-1991	6 (5)	Adol	None stated.
Nutrition					
72 Knai 2006 (7)	Nut: fruit, vegetables	Up to Apr 2004	15 (4)	Child, Adol 5-18 yrs	Controlled; follow-up at least 3 months; behavioral outcome. Additional quality rating.
73 Shilts 2004 (7)	Programs including goal-setting. Nut, exercise	1977- Dec 2003	28 (1)	All ages; sub sample Adol 12-19 yrs	Experimental, quasi-experimental or pre-experimental (no cross-sectional); cell size greater than 5. Additional quality rating.
74 Thomas 2004 (7)	Nut, exercise. Subset of dietary programs.	1985-Aug 2003	57 (4)	6-18 yrs	Prospective controlled studies; behavioral outcome. Additional quality rating.
75 Ammerman 2002 (7)	Nut: fat, fruit, vegetables	1975-Aug 1999	92 (1)	All ages; sub sample school-based	RCT or quasi-experimental; behavioral outcome; sample size at least 40; diet freely chosen by participants. Additional quality rating.
76 Ciliska 1999 (7)	Nut: fruit, vegetables	Up to Aug 1998	15 (1)	> 4 yrs	Prospective study with comparison group; information on process or outcome evaluation. Additional quality rating.

Reference[a] (quality)	Behavior focus[b]	Time span[c]	# Studies (# relevant)[d]	Age range[e]	Methodological inclusion criteria[f]
77 Contento 1995 (7)	Nut	1980-1995	43 (about 20)	School-age	Random or quasi-experimental design; evidence of instrument reliability and validity
78 French 2003 (6)	Environmental programs. Nut: fruit, vegetables	NR, incl = 1993-2003	11 (2)	Primary and secondary age	No criteria stated. All included studies are controlled, about half randomized
79 Hoelscher 2002 (3)	Nut	1994-2000	17 (about 5)	Adol 11-18 yrs	No criteria stated
80 Lytle 1995 (3)	Nut	1980-1995?	85 r	Child, Adol	Controlled; behavioral outcome; peer-reviewed

Note. Within behavior categories, reviews are ordered by quality rating and publication year.
[a] Reference number, first author, publication year, quality score in parentheses (0-3=weak, 4-5=moderate, 6-7=strong). [b] Behavior focus: Alc=alcohol, Nut=nutrition, Sex=sexuality, Tob=tobacco, std=sexually transmitted disease. If applicable, a more specific focus is recorded for sexuality and nutrition reviews (e.g., pregnancy, fat consumption). [c] Time span used in search strategy. NR=not reported, Incl=actual time span of included studies, recorded for reviews that did not report time span of search strategy. [d] For reviews that did not report the number of included primary studies the total number of references is given, indicated by r. Numbers between parentheses indicate the number of primary studies meeting relevance criteria of the present review (target behaviors, secondary school-age, school-based educational intervention). This number was only examined for reviews that provided sufficient information about primary studies. [e] Child=children, Adol=adolescents, yrs=years. [f] RCT=randomized controlled trial.

Table S2. Elements of program focus related to program effectiveness: results of reviews by domain

Element	Multiple domains	Substance abuse	Sexuality	Nutrition
Focus on specific behavior		52 (2): +.	56 (7): +. 66 (5): +.	72 (7): +. 74 (7): +. 76 (7): +. 77 (7): +. 79 (3): +.
Abstinence-plus (AP) vs abstinence-only (AO)		35 (7): +/?. 54 (2): +.	59 (7): AP vs AO 0. 61 (7): AP +. 63 (7): AO -. 64 (6): AP vs AO ?. 66 (5): AO ?. 68 (3): AO 0, AP +. 70 (2): AO 0.	

Note. Reviews are indicated by the reference number and, between parentheses, the quality rating (0-3=weak, 4-5=moderate, 6-7=strong). Results are indicated by the following characters: +=positive, -=negative, 0=null, ?=unclear contribution to program effectiveness

Table S3. Elements of program development related to program effectiveness: results of reviews by domain

Element[a]	Multiple domains	Substance abuse	Sexuality	Nutrition
Use of theory	26 (7): ?. 29 (2): +.	36 (7): +. 38 (7): +. 40 (7): +. 42 (7): 0. 47 (5): +. 53 (2): +.	56 (7): +/0. 60 (7): +. 62 (7): +. 66 (5): +. 68 (3): +. 70 (2): +.	76 (7): +. 77 (7): +. 79 (3): +. 80 (3): +.
Social cognitive theory	29 (2): +.	36 (7): +. 40 (7): +. 47 (5): +. 53 (2): +.	70 (2): +/?.	77 (7): +. 79 (3): +. 80 (3): +.
Addressing determinants	29 (2): +.	52 (2): +. 53 (2): +. 54 (2): +.	66 (5): +.	77 (7): +.
Conducting needs assessment	26 (7): +	35 (7): +.		
Students involved in planning, implementation	26 (7): +.	54 (2): +.		
Formative phase, interviews, pretesting		35 (7): +.	56 (7): 0.	
Tailoring to culture, ethnicity		31 (7): ?. 33 (7): +. 41 (7): +. 47 (5): +. 53 (2): +.	66 (5): +. 29 (2): +.	79 (3): ?.
Tailoring to cognitive ability or age		31 (7): ?.	65 (6): +.	77 (7): +. 79 (3): +.

Note. Reviews are indicated by the reference number and, between parentheses, the quality rating (0-3=weak, 4-5=moderate, 6-7=strong). Results are indicated by the following characters: +=positive, -=negative, 0=null, ?=unclear contribution to program effectiveness .[a] Elements marked bold are considered by us to have similar results in the domains of substance abuse, sexuality and nutrition.

Table S4. Elements of program content related to program effectiveness: results of reviews by domain

Element[a]	Multiple domains	Substance abuse	Sexuality	Nutrition
Knowledge, risk, attitudes				
Knowledge only approach	26 (7): 0. 29 (2): 0.	31 (7): 0. 40 (7): 0. 41 (7): 0. 47 (5): 0. 50 (3): 0. 51 (3): 0. 53 (2): 0. 54 (2): 0.	29 (2): 0.	74 (7): 0. 76 (7): 0. 77 (7): 0.
Factual information		54 (2): +.	60 (7): +. 66 (5): +. 70 (2): +.	
Short-term consequences	29 (2): +.	54 (2): +.		
Enhancing perceived risk		Fear arousal: 47 (5): 0. 51 (3): 0. 54 (2): 0.	58 (7): 0. 65 (6): +.	
Social influences				
Social influences	29 (2): +.	31 (7): 0/+. 32 (7): +. 35 (7): +. 39 (7): + especially for girls. 40 (7): +. 41 (7): +. 43 (7): +. 50 (3): +. 51 (3): +. 52 (2): +. 53 (2): +.	65 (6): +. 66 (5): +. 68 (3): +.	77 (7): +. 79 (3): + with younger adolescents.
Social norms	29 (2): +.	35 (7): +. 36 (7): +. 50 (3): +. 51 (3): +. 52 (2): +. 54 (2): +.	65 (6): +. 68 (3): +.	77 (7): +.
Resistance skills	26 (7): +. 28 (6): behavior specific +, general 0. 29 (2): +.	35 (7): ?. 36 (7): 0. 38 (7): not suited for alternative high school students. 28 (6): for tob + when embedded, for alc 0/+ when embedded. 47 (5): +. 51 (3): 0/+. 50 (3): 0/+. 52 (2): +.54 (2): 0.	28 (6): 0/-. 66 (5): +. 68 (3): +.	
Skills				
Skills (unspecified)			61 (7): ?.	77 (7): +. 79 (3): +. 80 (2): +.
Practical domain-bound skills (condom use, food preparation)			55 (7): +. 56 (7): +. 65 (6): ?.	72 (7): + food preparation skills.
Cognitive-behavioral program / skills training		32 (7): +. 38 (7): TND program +. 53 (2): +.	65 (6): +.	77 (7): +. 79 (3): +.

Element[a]	Multiple domains	Substance abuse	Sexuality	Nutrition
Life skills (self-management, decision-making, social and assertive skills, anxiety manag)	29 (2): +.	31 (7): 0/+. 32 (7): +. 33 (7): 0/+. 36 (7): +. 40 (7): +. 41 (7): +. 47 (5): +. 51 (3): +. 52 (2): +. 53 (2): +, without drug focus 0. 54 (2): +.		

Note. Reviews are indicated by the reference number and, between parentheses, the quality rating (0-3=weak, 4-5=moderate, 6-7=strong). Results are indicated by the following characters: +=positive, -=negative, 0=null, ?=unclear contribution to program effectiveness.

[a] *Elements marked bold are considered by us to have similar results in the domains of substance abuse, sexuality and nutrition.*

Table S5. Elements of program methods related to program effectiveness: results of reviews by domain

Element	Multiple domains	Substance abuse	Sexuality	Nutrition
Multiple channels or strategies	29 (2): +.		65 (6): +. 66 (5): +.	
Didactic style (lecture)		54 (2): 0.		72 (7): 0.
Interactive (incl. discussion, role play)	28 (6): + discussion. 29 (2): + discussion, role play.	35 (7): +. 36 (7): +. 40 (7): +. 41 (7): +. 51 (3): +. 54 (2): +.	68 (3): + role play.	79 (3): + discussion.
(Cognitive)behavioral skills training		53 (2): +.	65 (6): +.	
Active, experiential learning		54 (2): +.		72 (7): +. 77 (7): +. 80 (3): +.
Having students personalize info (e.g., diet self-assessment)			66 (5): +.	77 (7): +. 79 (3): +. 80 (3): +.

Note. Reviews are indicated by the reference number and, between parentheses, the quality rating (0-3=weak, 4-5=moderate, 6-7=strong). Results are indicated by the following characters: +=positive, -=negative, 0=null, ?=unclear contribution to program effectiveness.

Table S6. Elements of program facilitator related to program effectiveness: results of reviews by domain

Element[a]	**Multiple domains**	**Substance abuse**	**Sexuality**	**Nutrition**
Peer leader	26 (7): +/?. 28 (6): +. 29 (2): +.	34 (7): +/0. 35 (7): 0. 36 (7): +/0. 40 (7): +/0. 41 (7): 0. 43 (7): +. 45: (6) +/0. 47 (5): +.	56 (7): 0. 59 (7): 0. 68 (3): +. 69 (3): ?.	72 (7): +.
Teacher	28 (6): +.	34 (7): 0. 35 (7): 0. 41 (7): 0. 47 (5): +.	59 (7): 0.	
Peer vs teacher same program	26 (7): +/0.	31 (7): ?. 37 (7): +/0.	55 (7): 0/?.	
Trained facilitator		35 (7): +. 47 (5): +.	55 (7): +. 60 (7): +. 66 (5): +.	72 (7): +. 77 (7): +.

Note. Reviews are indicated by the reference number and, between parentheses, the quality rating (0-3=weak, 4-5=moderate, 6-7=strong). Results are indicated by the following characters: +=positive, -=negative, 0=null, ?=unclear contribution to program effectiveness.

[a] *Elements marked bold are considered by us to have similar results in the domains of substance abuse, sexuality and nutrition.*

Table S7. Elements of program components related to program effectiveness: results of reviews by domain

Element[a]	**Multiple domains**	**Substance abuse**	**Sexuality**	**Nutrition**
Multi-component programs	27 (7 S): +. 29 (2 S): +.	31 (7 S): 0/+. 32 (7 S): ?. 36 (7 S): +. 40 (7 S): +. 50 (3 S): 0/?. 51 (3): +. 54 (2): +.	56 (7): +. 57 (7): 0. 59 (7 S): +. 61 (7): +. 65 (6): +. 66 (5): +. 68 (3): +. 70 (2): +/?. 71 (2 S): +.	72 (7): +. 74 (7): +. 76 (7): +. 77 (7): +. 78 (6 S): +/0. 79 (3): +. 80 (3): +.
School wide change and family or community component		40 (7 S): +.		77 (7): +. 78 (6 S): +/0. 79 (3): +. 80 (3): +.
Community interventions		33 (7): +/?. 54 (2): +.	61 (7): +. 66 (5): +.	80 (3): +.
Community component additional to school	29 (2 S): +.	31 (7 S): 0/+. 32 (7 S): ?. 36 (7 S): +. 50 (3 S): 0/?. 51 (3): +. 54 (2): +.		72 (7): +. 77 (7): +.
School-wide activities		50 (3 S): 0/?. 52 (2): +. 54 (2): ?.	70 (2): +/0. 71 (2 S): +.	72 (7): +. 74 (7): +. 78 (6 S): +/0. 79 (3): +. 80 (3): +.
Parent / family involvement		31 (7 S): 0/+. 33 (7): high-risk +. 36 (7 S): +. 40 (7 S): +. 50 (3 S): general population 0/?, high-risk +. 52 (2): +. 54 (2): general population 0, high-risk 0/+.	59 (7 S): +. 65 (6): +. 68 (3): +.	72 (7): +. 76 (7): +. 74 (7): +. 77 (7): elementary school +, middle/high school 0. 78 (6 S): +/0. 79 (3): +. 80 (3): elementary age +.
Policy: price regulation		52 (2): +. 54 (2): +.		78 (6 S): +.

Note. Reviews are indicated by the reference number and, between parentheses, the quality rating (0-3=weak, 4-5=moderate, 6-7=strong); reviews with a specific focus on schools are indicated by S between parentheses. Results are indicated by the following characters: +=positive, -=negative, 0=null, ?=unclear contribution to program effectiveness.

[a] *Elements marked bold are considered by us to have similar results in the domains of substance abuse, sexuality and nutrition.*

Table S8. Elements of program intensity related to program effectiveness: results of reviews by domain

Element	Multiple domains	Substance abuse	Sexuality	Nutrition
Intensity		31 (7): ?. 36 (7): ?.	55 (7): +/?.	
Duration		34 (7): 0. 54 (2): ?/+.	55 (7): +/?. 66 (5): +.	72 (7): + (at least 12 months).
Number of sessions or hours		35 (7): ?. 38 (7): TND 9 sessions 0 for tob and + for alc (only baseline nonusers alc); 12 sessions + for tob and alc (only baseline nonusers alc). 40 (7): +/0. 41 (7): 0. 47 (5): LST 15 sessions +. 48 (5): 10 sessions in first yr and 5 sessions in second yr +.	58 (7): 0. 59 (7): 0. 60 (7): minimum of 8 hours +. 62 (7): +. 55 (7): +/?.	74 (7): + (at least 10 sessions). 76 (7): +. 77 (7): + (10-15 hrs is too little). 79 (3): +. 80 (3): +.
Boosters, continued education	29 (2): +.	35 (7): +. 36 (7): ?. 43 (7): ?. 44 (6): +/0. 47 (5): 15 booster sessions +. 48 (5): +. 51 (3): +. 53 (2): +. 54 (2): +.	65 (6): +.	

Note. Reviews are indicated by the reference number and, between parentheses, the quality rating (0-3=weak, 4-5=moderate, 6-7=strong). Results are indicated by the following characters: +=positive, -=negative, 0=null, ?=unclear contribution to program effectiveness.

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;

[1] *Peters, L. W. H., ten Dam, G. T. M., Kocken, P. L., Buijs, G. J., Dusseldorp, E., & Paulussen, T. G. W. M. (2011).* Broadening the scope of health education: Effects of a transfer-oriented curriculum about smoking and safe sex on multiple health behavior domains. *Manuscript submitted for publication.*

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.*

Chapter 6

PROMOTING CURRICULUM EFFECTS IN MULTIPLE HEALTH BEHAVIOR DOMAINS: A MEDIATION TEST OF TRANSFER[1]

In a recent, quasi-experimental intervention study of transfer-oriented learning (1107 students, grades 7 and 8) we observed transfer effects in three health behavior domains (alcohol, fruit, breakfast consumption) that were not addressed by our experimental transfer-oriented curriculum about smoking and safe sex. Transfer was hypothesized to occur by teaching general cognitive-behavioral skills relevant to multiple domains. In this paper we examined: a) to what extent the intervention had effects on students' learning experiences regarding general cognitive-behavioral skills, b) to what extent these learning experiences mediated the intervention effects in the three untaught domains. Learning experiences were measured by using an open-ended learner report (OLR) and a closed learner report (CLR). The intervention had significant effects on both OLR and CLR measures. Regression analyses (N=541) revealed no evidence of mediation for CLR learning experiences. For OLR learning experiences, a mediation effect occurred on some outcome measures in the fruit and breakfast domains, but not in the alcohol domain, although more intervention effects occurred in this domain. The results suggest that the effects in the alcohol versus nutrition domains were brought about by distinct transfer mechanisms and have implications for designing interventions to promote transferable learning results in multiple health behavior domains.

1. INTRODUCTION

Within the school health promotion sector there are increasing calls for integrative approaches that target multiple behavioral domains simultaneously (Flay, 2002; Greenberg et al., 2003; Prochaska, 2008). These calls are mostly instigated by the limited capacity in schools to implement a variety of health promotion programs (Greenberg et al., 2003) and the growing evidence that various health behaviors are associated (Basen-Engquist, Edmundson, & Parcel, 1996; Donovan, Jessor, & Costa, 1991; Prochaska, Spring, & Nigg, 2008; Wiefferink et al., 2006). Also, various health behaviors appear to be grounded in similar psychosocial determinants, such as outcome expectancies, social influences and skills (Flay & Petraitis, 1994; Peters, Wiefferink, et al., 2009; Wiefferink et al., 2006). This is in line with the observation that, across behavioral domains, effective programs share a number of characteristics (Nation et al., 2003; Peters, Kok, et al., 2009).

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[1] *Peters, L. W. H., Paulussen, T. G. W. M., Zijlstra, B. J. H., Kocken, P. L., Buijs, G. J., & Ten Dam, G. T. M.* Promoting curriculum effects in multiple health behavior domains: A mediation test of transfer. *Manuscript submitted for publication*.

In response to these observations we recently tested – and found evidence for - the effectiveness of a particular integrative approach based on transfer-oriented learning (Peters et al., 2011). Transfer refers to a process when knowledge and skills learned in one context (e.g., refusal skills with respect to smoking) are applied to another context (e.g., refusing alcohol) (Barnett & Ceci, 2002; Perkins & Salomon, 1996). Our study tested whether an experimental transfer-oriented curriculum that focused on the prevention of smoking and unsafe sex, was able to also produce effects on three other behavioral domains that were not explicitly taught: consumption of alcohol, fruit and breakfast. The analyses showed significant positive effects in the tobacco domain - but hardly in the safe sex domain. In the three untaught domains, positive effects were observed on several psychosocial determinants, as well as a positive effect on behavior in the alcohol domain (Peters et al., 2011). In the present paper we seek to further understand and explain the observed transfer effects in these untaught domains by focusing on the potential mediation effects of students' self-reported learning experiences.

1.1 Transfer-oriented learning

Transfer can be said to be 'near' or 'far', depending on the degree of apparent similarity between contexts. The notions of near and far, however, are intuitive and do not have strictly defined boundaries (Perkins & Salomon, 1996; Barnett & Ceci, 2002). These two types of transfer are hypothesized to involve two distinct mechanisms of transfer. Transfer to rather similar contexts (near transfer) often involves triggering of semi-automatic responses which have been extensively practiced, the so-called low road transfer. Transfer between contexts that seem remote and alien to another (far transfer), often requires mindful abstraction from the context and a deliberate search for connections. This so-called high road transfer involves applying a general principle to a very different context.

Research has shown that transfer, especially far transfer, very often does not happen by itself (Perkins & Salomon, 1996). However, research has also shown that transfer is more likely to occur under certain conditions (Tuomi-Gröhn & Engeström, 2003), which have implications for the design of teaching-learning processes that aim to promote transfer (Campione, Shapiro, & Brown, 1995; Elshout-Mohr, Van Hout-Wolters, & Broekkamp, 1999): alternating explicit abstraction (learning general skills) with application in various contexts (Wang, Haertel, & Walburg, 1993); meta-cognitive reflection on one's thinking processes (Volman & Ten Dam, 2000); learning content that is personally meaningful to students (Boersma, Ten Dam, Volman, & Wardekker, 2010; Saljö, 2003); and self-confidence in one's ability to bridge different settings and apply knowledge and skills in new situations (cf. Beach, 1999).

We incorporated these transfer-promoting conditions into our experimental curriculum on smoking and safe sex. One particular aspect was that - in addition to domain-specific learning content about smoking and safe sex – the curriculum explicitly addressed general cognitive and behavioral skills. The general skills pertained to decision-making, problem-solving, and refusal and negotiation skills.

We hypothesize that the observed transfer effects in the domains of alcohol, fruit and breakfast consumption in our study (see Peters et al., 2011) were the result of high-road transfer to these domains, in that experimental students, compared to con-

trol students, learned general cognitive-behavioral skills and perceived them as important or useful. This hypothesis is examined in this paper by focusing on the extent to which students, in their response to learner report questions ("What have you learned in the lessons?") (Antonenko, 2010; Janssen & Rijlaarsdam, 1990; Marum, 1996), reported learning general, non-domain-specific skills. These learning experiences were measured in two ways: by means of an open-ended (OLR) and a closed learner report (CLR).

The research questions were:

1) Do experimental students report more learning experiences with respect to general cognitive-behavioral skills than control students?
2) Do these learning experiences (measured at post-test) mediate intervention effects in three untaught domains (measured at follow-up)?

2. METHOD

For this paper, data from an intervention study were used, which is described more in detail elsewhere (Peters et al., 2011). The study was conducted according to the declaration of Helsinki and passed the internal TNO Ethical Review Board.

2.1 Study design

The intervention study featured a quasi-experimental design, with 15 teachers assigned to the experimental condition (Exp) and 18 teachers assigned to a usual care 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. Student data were collected in three waves of self-report questionnaires (baseline between September and December 2006, 1-month post-test, 4-month follow-up) to examine intervention effects on outcomes in the taught domains (smoking, safe sex) and in three untaught 'transfer' domains (alcohol, fruit, and breakfast consumption). The selection of these domains was primarily based on evidence for differential clustering of behaviors and concurrent expectations of transfer effects (Wiefferink et al., 2006). Smoking and precocious sex correlate fairly strongly with alcohol use, and correlate much less with nutrition behaviors (fruit and breakfast). Given these associations, we expected more and larger transfer effects to the relatively 'near' domain of alcohol than to the 'far' nutrition domains. This expectation was confirmed in our effect study (Peters et al., 2011).

2.2 Intervention

The experimental curriculum 'Multiple Choice 4 U' was designed as a 10-session curriculum. 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 proximal behavioral determinants which are featured in various theories: attitudes, social influences and self-efficacy (Ajzen, 1991; Bandura, 1986; Flay & Petraitis, 1994). The domain-specific content of the

curriculum was partly adapted from existing Dutch interventions on smoking and safe sex. In line with the transfer-promoting conditions described earlier, the transfer-oriented learning activities provided students opportunities for: a) reflection on the learning content and its personal relevance, b) exploring personal beliefs and making their own choices in assignments in order to strengthen personal meaning in learning, c) addressing general (decontextualized) cognitive-behavioral skills pertaining to processes of decision-making, problem-solving, refusal and negotiation, and d) applying these general skills to other self-chosen behavioral domains in so-called 'excursion assignments' (recontextualization).

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.

2.3 Data collection

Students. Teachers administered the self-report student surveys during regular class periods. To ensure validity, the student instruction explained the confidential processing of data. The student survey was practically identical at each measurement point and included items about the five behavioral domains of interest (smoking, safe sex, alcohol, fruit, and breakfast). Table 1 displays information about all outcome measures reported in this paper. Most items were based on existing Dutch questionnaires about alcohol (Cuijpers, Jonkers, De Weerdt, & De Jong, 2002; De Graaff & Poort, 2004; Van Dorsselaer, Zeijl, Van den Eeckhout, Ter Bogt, & Vollebergh, 2007), and fruit and breakfast consumption (Martens, Van Assema, & Brug, 2005; www.monitorgezondheid.nl). Constructs that were only measured at baseline were ethnic background, Rosenberg's (Rosenberg, 1965) Self-Esteem scale, and a self-developed scale of attitude towards school.

In addition, the post-test survey also included an open learner report and a closed learner report for assessing students' learning experiences. The closed learner report asked students to choose (to a maximum of four) the most important things they had learned in the lessons from ten pre-determined statements: five statements pertained to a general skill (see Table 1 for item wordings), two were tobacco-specific and three were safe-sex-specific. Scores for each category (general skill, tobacco, safe sex) were summed. The measure analyzed for this paper is the total score for general skills (range 0-4). Prior to the closed learner report, the open learner report asked students the same question in an open-ended format, again to a maximum of four. Each entry was coded into one or more of four categories (general skill, tobacco, safe sex, other). If an entry mentioned a combination of a general skill with one or more behavior-specific examples, it was coded for all relevant categories. General skills were only coded as such if they were framed in a general way (e.g., "say no") or were combined with a behavior-specific example (e.g., "say no, for instance to cigarettes"), not if they were totally framed in a behavior-specific way (e.g., "say no to cigarettes"). Scores were summed for each category (range of 0-4), except the 'other' category. The first author coded all entries and discussed all doubtful entries with the last author, after entries of 200 students had been coded independently by the first author and a master's level researcher, with satisfactory inter rater reliability

(kappa for the general skills variable=.87, $p<.001$). For this paper, only the score for the general skill category was used; this variable was later dichotomized due to an uneven distribution of scores across experimental conditions.

We expect the evidence for intervention effects and mediation to be stronger for OLR learning experiences compared to CLR learning experiences, since the OLR format is likely to require more metacognitive reflection from students on personal lessons learned than the CLR format. In the CLR format, students can just tick a box. For both the OLR and CLR, students without any entry were coded as missing.

Teachers. Teachers were asked to record the number of any lessons taught about alcohol and nutrition between measurement waves. Instruction time for alcohol (0=0 lessons, 1=1-2.5 lessons, 2=3 or more lessons) or nutrition (0=no, 1=yes) between baseline and follow-up was used as a covariate in mediation analyses for the alcohol or nutrition domains.

2.4 Participants

At baseline, participating students (568 Exp, 539 Con) were in grade 7 (16%) or 8 (84%) of secondary schools which prepare for higher vocational education or university. They were on average 13.50 years old, 48.3% were female, and 12.6% had at least one parent who was born in a non-western country.

Dropout at post-test (n=134, 12.1%) and follow-up (n=365, 33.0%) did not differ between conditions. Additional loss of data from mediation analyses occurred because of missing values for the learner reports and missing information about instruction time for alcohol and nutrition (see also Data analysis and the flow diagram in Figure 1). This additional dropout from mediation analyses led to differential total dropout rates for the experimental and control group (Exp n=240, 42.3% vs. Con n=314, 58.3%, χ^2=28.33, $p<.001$). For the sample used in mediation analyses, some baseline differences were observed between the two conditions and between participants who were retained versus dropped out. These differences pertained mainly to demographic factors and to some domain-specific variables (see Supplemental Table at the end of this chapter). For these reasons, demographic factors and baseline scores were controlled for in mediation analyses.

2.5 Data analysis

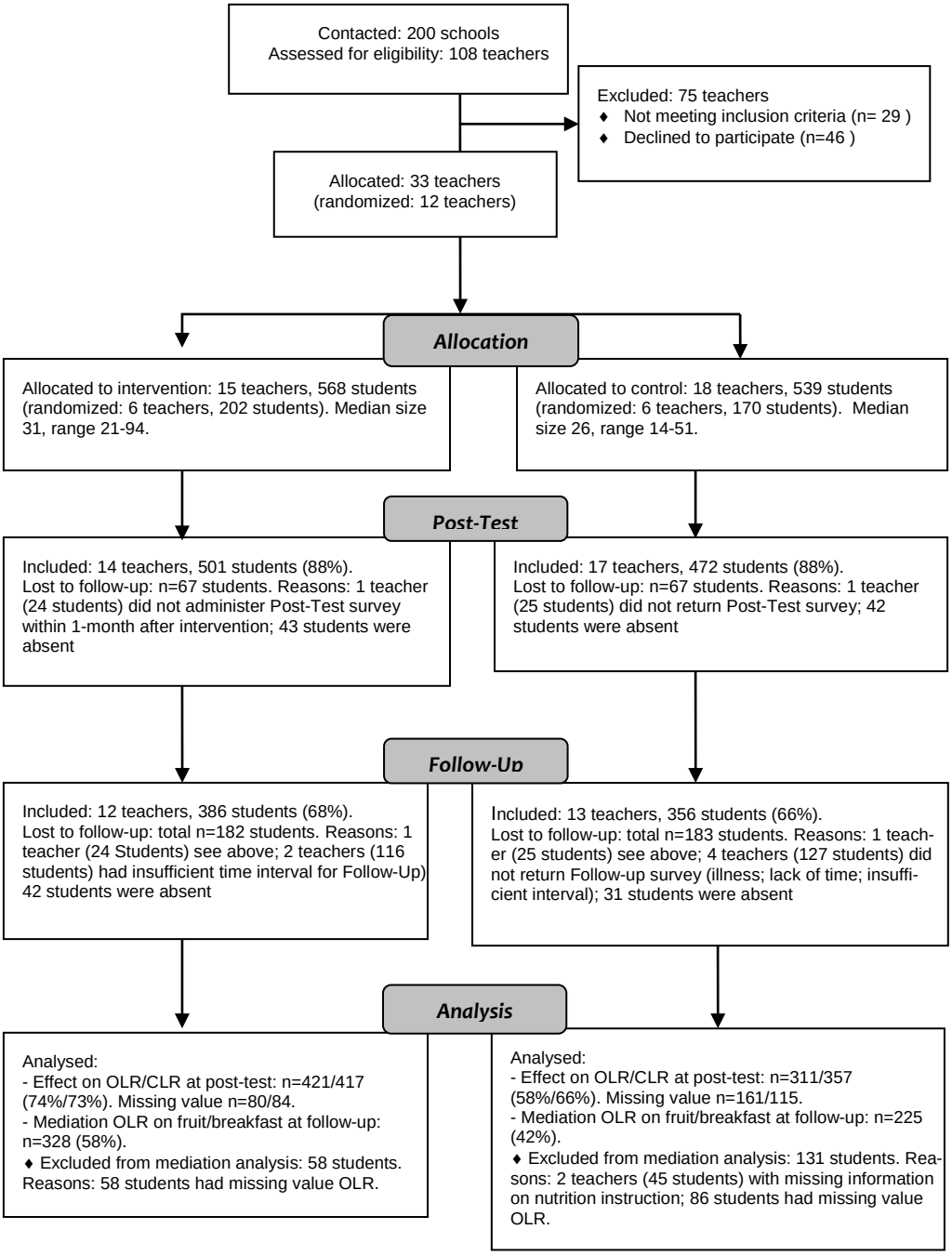
Preliminary analyses. Because of the large number of psychosocial determinants per domain, and the concurrent risk of capitalizing on chance, a composite score of all determinants was calculated for each domain by averaging the standardized scores

Table 1. Information on Measures of Psychosocial Determinants, Behavior, Generic Constructs, and Learning Experiences (n items and Cronbach's alpha)

Psychosocial determinants (measured at all waves)						
	Alcohol		**Fruit**		**Breakfast**	
Variable. *Sample item for alcohol (range)*	***n***	**α**	***n***	**α**	***n***	**α**
General attitude. *Drinking alcohol is bad for me (1=certainly not, 5=certainly yes)*	3	.94	4	.88	4	.86
Outcome expectancies. *If I (would) drink alcohol, I think I (would) feel (-3) much more, (+3) much less at ease with others*	7	.87	4	.68	4	.71
Risk expectancy. *If I (would) drink alcohol, my chance of getting a disease later will be (1) much larger, (4) equal to if I don't drink alcohol*	1	-	1	-	1	-
Anticipated regret. *If I (would) drink alcohol, I will have (1) much, (4) no regret later*	1	-	1	-	1	-
Self-efficacy. *Imagine you've planned to drink no alcohol. Now, you're at a party where people drink a lot of alcohol. Will you be able not to drink alcohol? (1=certainly not, 5=certainly yes)*	3	.87	1	-	2	.75
Social norm parents and friends. (Fruit and breakfast: separate variables for parents and friends). *How would your parents or caretakers think about you drinking alcohol? (1=very good, 5=very bad)*	2	.77	2	-	2	-
Intention. *Do you intend to start or keep drinking alcohol at least once a week in the next six months? (1=certainly not, 5=certainly yes)*	1	-	1	-	2	.61
Composite measure of determinants. Mean of Z-scores on all above determinants	7	.85	8	.80	8	.80
Behavior items (measured at all waves)						
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 (measured at baseline)						
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=.83. *I am glad I am at this school (1=is not correct, 5=is totally correct)*						
Learning experiences with respect to general skills (measured at post-test)						
General skills reported in open learner report: 4 items. *Please write down below what you have learned in the lessons of Multiple Choice 4 U (Con: in the lessons about smoking and safe sex). Finish as many sentences as possible. I have learned/discovered/noticed that … [4x]. [Responses that reflect a general skill were summed (0-4). This variable was later dichotomized into no-yes (0-1) general skill reported.]*						
General skills chosen in closed learner report: 10 items. *What do you personally think is the most important you learned from the lessons of MC4U/lessons about smoking and safe sex? To help you, we have selected some statements. Choose a maximum of 4 statements from the 10 statements below. [Scores for general skills were summed (0-4). Five statements/items reflected a general skill: Item 2: That the things you learned with respect to one behavior, e.g. smoking, can also be used for other behaviors. Item 3: How other people may influence what you think and do. Item 5: That you have to weigh all pros and cons before deciding whether or not to do something. Item 7: That, before doing something, you have to think about whether you may have regrets later. Item 10: How to stick to your opinion and do nothing against your will.]*						

Notes: - = not applicable.

Figure 1. Flow Diagram



on psychosocial determinants (see Table 1). These composite measures were used as a proxy for multivariate analyses of psychosocial determinants.

Covariates. Based on analyses of attrition and baseline equivalence, the following covariates were included in the analyses: socio-demographic variables (gender, ethnicity, grade, school level), the baseline score of the outcome variable, the baseline score of the relevant behavior, self-esteem, and attitude to school. In addition, the mediation analyses also controlled for instruction time for alcohol or nutrition between baseline and follow-up, since otherwise the effects in these domains cannot be interpreted as true transfer effects.

Level of analysis. Analyses were conducted at the student level, because the proportion of variance attributed to the teacher level was not significant for the model including covariates (Snijders & Bosker, 1999). The intra class correlation for all variables was below 0.035.

Analyses of intervention effects on learning experiences. The intervention effect on the OLR and CLR measures at post-test were analyzed with logistic and linear regression, respectively, which controlled for covariates (gender, ethnicity, grade, school level, self-esteem, school attitude).

Analyses of mediation. The CLR total score and the OLR variable were considered as hypothesized mediators. Following Baron and Kenny (1986), mediation was said to occur if three conditions were met: 1) the intervention has an effect on the outcome variable, 2) the intervention has an effect on the hypothesized mediator, and 3) the hypothesized mediator is associated with the outcome variable after controlling for the intervention variable. These mediation conditions were tested with linear and logistic regression, respectively, for dichotomous and interval level criterion variables. All analyses were performed on single outcome variables measured at follow-up and adjusted for the common set of covariates listed in the above paragraph about covariates, which was entered first into analyses. The significance level for all analyses was set at $p<.05$. However, because of the exploratory nature of this study, associations that approached significance ($p<.10$) were included as well. If mediation condition 1 was not met at $p<.10$ for an outcome variable, further analyses on the outcome variable were not conducted.

As the sample size in the analyses varied with the type of learner report (open vs. closed), domain (alcohol vs. fruit and breakfast) and specific outcome variable examined, the sample size is reported for each analysis.

3. RESULTS

3.1 Intervention effects on learning experiences

At post-test, experimental students reported significantly more learning experiences with respect to general cognitive-behavioral skills than control students. This effect was found for both the OLR variable [29.2% vs. 3.9%, *OR*(CI)=16.10 (8.43-30.76), $p<.001$] and the CLR variable (2.22 vs. 1.87, beta=.24, $p<.001$).

Table 2. Results of mediation analyses in the alcohol domain

	Hypothesized mediator: Open learner report (OLR)				**Hypothesized mediator: Closed learner report (CLR)**			
Variable[a]	***N***[b] **E - C**	**Condition 1**[c] **A → C** *B* (*SE*), ***p***	**Condition 2**[c] **A → B** *B* (*SE*), ***p***	**Condition 3**[c] **B → C** *B* (*SE*), ***p***	***N***[b] **E - C**	**Condition 1**[c] **A → C** *B* (*SE*), ***p***	**Condition 2**[c] **A → B** *B* (*SE*), ***p***	**Condition 3**[c] **B → C** *B* (*SE*), ***p***
Behavior: frequency [t]	295-192	-0.059 (0.022), **.006**	3.281 (0.471), **.000**	0.006 (0.023), **.776**	295-207	-0.073 (0.021), **.001**	0.466 (0.111), **.000**	-0.014 (0.009), **102**
Behavior: % binge	296-192	0.833 (0.395), **.035**	3.260 (0.471), **.000**	0.134 (0.478), **.780**	296-207	1.090 (0.422), **.010**	0.452 (0.111), **.000**	0.267 (0.167), **.110**
Composite of determinants	299-192	0.167 (0.055), **.003**	3.293 (0.471), **.000**	0.076 (0.058), **.189**	299-207	0.205 (0.052), **000**	0.467 (0.112), **.000**	-0.025 (0.021), **.245**
General attitude	299-192	0.118 (0.101), **.243**			299-207	0.163 (0.099), **.100**	0.469 (0.112), **.000**	-0.018 (0.040), **.651**
Outcome expectancies	298-192	0.145 (0.068), **.032**	3.273 (0.470), **.000**	0.042 (0.071), **.554**	298-207	0.162 (0.065), **.014**	0.468 (0.112), **.000**	-0.004 (0.026), **.871**
Risk expectancy	298-191	0.145 (0.091), **.109**			298-206	0.180 (0.089), **.044**	0.475 (0.112), **.000**	0.023 (0.036), **.526**
Regret [t]	298-192	0.068 (0.021), **.001**	3.341 (0.473), **.000**	0.009 (0.022), **.669**	298-207	0.071 (0.020), **001**	0.478 (0.112), **.000**	0.000 (0.008), **.944**
Self-efficacy	299-192	0.245 (0.098), **.013**	3.283 (0.472), **.000**	0.022 (0.102), **.830**	299-207	0.241 (0.093), **.010**	0.482 (0.112), **.000**	-0.039 (0.037), **.300**
Social norm	299-192	0.101 (0.069), **.144**			299-207	0.156 (0.067), **.020**	0.468 (0.112), **.000**	-0.034 (0.027), **.201**
Intention [t]	298-191	0.051 (0.023), **.026**	3.269 (0.470), **.000**	0.040 (0.024), **.095**	298-206	0.070 (0.023), **.002**	0.464 (0.112), **.000**	-0.013 (0.009), **.174**

Notes:[a] Variables indicated by superscript [t] were logtransformed. [b] E=experimental group, C=control group. [c] A=experimental condition, B=hypothesized mediator C=outcome variable.

Table 3. Results of mediation analyses in the fruit domain

	Hypothesized mediator: Open learner report (OLR)				Hypothesized mediator: Closed learner report (CLR)			
Variable[a]	***N***[b] **E - C**	**Condition 1**[c] **A → C** *B* (*SE*), ***p***	**Condition 2**[c] **A → B** *B* (*SE*), ***p***	**Condition 3**[c] **B → C** *B* (*SE*), ***p***	***N***[b] **E – C**	**Condition 1**[c] **A → C** *B* (*SE*), ***p***	**Condition 2**[c] **A → B** *B* (*SE*), ***p***	**Condition 3**[c] **B → C** *B* (*SE*), ***p***
Composite of determinants	321-220	0.096 (0.047), **.040**	3.204 (0.451), **.000**	0.113 (0.056), **.043**	323-242	0.093 (0.044), **.038**	0.444 (0.093), **.000**	-0.009 (0.020), **.658**
General attitude [t]	320-220	0.023 (0.014), **.114**			322-242	0.030 (0.014), **.029**	0.439 (0.093), **.000**	-0.005 (0.006), **.404**
Regret	318-218	0.031 (0.016), **.055**	3.182 (0.452), **.000**	-0.017 (0.019), **.394**	320-240	0.017 (0.015), **.251**		
Self-efficacy [t]	319-218	0.047 (0.018), **.011**	3.206 (0.452), **.000**	0.017 (0.022), **.441**	321-240	0.042 (0.018), **.018**	0.459 (0.094), **.000**	-0.009 (0.008), **.275**

Notes:[a] Variables indicated by superscript [t] were logtransformed. [b] E=experimental group, C=control group. [c] A=experimental condition, B=hypothesized mediator C=outcome variable.

Table 4. Results of mediation analyses in the breakfast domain

	Hypothesized mediator: Open learner report (OLR)				**Hypothesized mediator: Closed learner report (CLR)**			
Variable[a]	***N***[b] **E - C**	**Condition 1**[c] **A → C** *B* (*SE*), ***p***	**Condition 2**[c] **A → B** *B* (*SE*), ***p***	**Condition 3**[c] **B → C** *B* (*SE*), ***p***	***N***[b] **E - C**	**Condition 1**[c] **A → C** *B* (*SE*), ***p***	**Condition 2**[c] **A → B** *B* (*SE*), ***p***	**Condition 3**[c] **B → C** *B* (*SE*), ***p***
Composite of determinants	319-220	0.091 (0.048), **.060**	3.146 (0.452), **.000**	0.151 (0.058), **.009**	321-242	0.085 (0.045), **.061**	0.440 (0.094), **.000**	-0.022 (0.021), **.288**
General attitude [t]	318-220	0.043 (0.016), **.007**	3.165 (0.451), **.000**	0.020 (0.019), **.299**	320-242	0.042 (0.015), **.004**	0.453 (0.094), **.000**	.00(0.007), **.923**
Outcome expectancies [t]	317-220	0.033 (0.015), **.027**	3.157 (0.452), **.000**	0.060 (0.018), **.001**	320-242	0.031 (0.014), **.031**	0.439 (0.094), **.000**	-0.004 (0.006),**.519**
Self-efficacy [t]	317-218	0.044 (0.017), **.010**	3.154 (0.452), **.000**	0.034 (0.020), **.091**	319-240	0.042 (0.016), **.008**	0.459 (0.095), **.000**	-0.009 (0.007),**.192**

Notes:[a] Variables indicated by superscript [t] were logtransformed. [b] E=experimental group, C=control group. [c] A=experimental condition, B=hypothesized mediator C=outcome variable

3.2 Did learning experiences mediate transfer effects?

Table 2 (alcohol), Table 3 (fruit) and Table 4 (breakfast) present the results of mediation analyses with the OLR measure (left-hand part of tables) and the CLR measure (right-hand part). Results are only presented for outcome variables on which the intervention had at least a marginally significant effect ($p<.10$ for mediation condition 1) at follow-up. An intervention effect on the hypothesized mediator (mediation condition 2) was observed for all these outcome variables. Therefore, only results for mediation conditions 1 and 3 are discussed below.

3.2.1 Results for the OLR measure of general skills

In the alcohol domain, a significant intervention effect on the outcome variable (mediation condition 1) was found for the two measures of behavior, and for the composite measure of determinants, outcome expectancies, anticipated regret, self-efficacy, and intention. However, none of these outcome variables had a statistically significant association with the OLR measure, which means that mediation condition 3 was not met. To some extent, the results for alcohol intention might hint in the direction of a potential mediation effect, as condition 3 approached significance for this outcome variable ($p=.095$).

In the fruit domain, a significant intervention effect on the outcome variable (mediation condition 1) was found for the composite measure of determinants and for self-efficacy; an effect on anticipated regret approached significance ($p=.055$). As for mediation condition 3, a statistically significant association between the OLR measure and the outcome variable was found for the composite measure of determinants. This means that there is evidence of a mediating effect on the composite determinant measure, but not on self-efficacy or anticipated regret.

In the breakfast domain, significant intervention effects (mediation condition 1) were found for attitude, outcome expectancies, and self-efficacy, and the effect on the composite measure of determinants was marginally significant ($p=.06$). A statistically significant association with the OLR measure (mediation condition 3) was found for the composite measure of determinants and for outcome expectancies, and a marginally significant association for self-efficacy ($p=.091$). The results in the breakfast domain thus indicate that there is clear evidence for a mediating influence of the OLR measure on outcome expectancies, some evidence for such an influence on the composite measure of determinants, and a slight indication that there might be such an influence on self-efficacy.

3.2.2 Results for the CLR measure of general skills

The right-hand parts of Tables 2 to 4 show the results of mediation analyses with the CLR measure as the hypothesized mediator. Although mediation condition 1 was met for various outcome measures in all three domains, no mediation was found because condition 3 was not met: none of the outcome measures was significantly, or even marginally significantly, associated with the CLR measure of general skills.

4. DISCUSSION

This study was conducted within the framework of an effect study of a transfer-oriented curriculum. The curriculum about smoking and safe sex was designed to also promote transfer to untaught health behavior domains, among other things by explicitly addressing general cognitive-behavioral skills which are relevant for many domains (i.e., decision-making, problem solving, and refusal skills). As the effect study (Peters et al., 2011) had indeed shown effects in all three untaught domains measured (alcohol, fruit and breakfast consumption), the present paper addressed two research questions to shed further light on these effects. The first research question was whether experimental students reported more learning experiences regarding general cognitive-behavioral skills, as measured with an open-ended learner report (OLR) and a closed-ended learner report (CLR). The answer is clearly affirmative for both measures. The second research question was whether these learning experiences mediated the intervention effects in the three untaught domains. For the CLR measure, there were no indications of mediation, mainly because this measure was not significantly associated with any of the outcome variables. For the OLR measure, evidence was found of a mediation effect on some outcome variables in the fruit and breakfast domains. As we expected, the OLR measure thus appears to be a better indicator of personal lessons learned by students than the CLR measure.

Although there were more intervention effects in the alcohol domain than in the two nutrition domains, we found evidence of mediation via the OLR measure only in the two nutrition domains. These results suggest that intervention effects in the alcohol versus the nutrition domains may be brought about by different mechanisms. Possibly, intervention effects in the alcohol domain may have occurred in a less cognitively aware and more automatic way. The alcohol context may have been sufficiently similar to the contexts explicitly addressed in the curriculum (smoking and safe sex) for students to apply the learned knowledge and skills to the alcohol domain without consciously generalizing the information first. This explanation would suggest that intervention effects in the alcohol domain were the result of low-road transfer, whereas those in the nutrition domain – at least for some outcome variables – occurred through high-road transfer, requiring mindful abstraction and a deliberate search for connections. This explanation fits in well with results of studies of behavioral clustering, which have consistently shown that alcohol use is strongly associated with the behaviors addressed in our curriculum, more so than nutrition behavior (Basen-Engquist et al., 1996; Donovan et al., 1991; Van Nieuwenhuijzen et al., 2009; Wiefferink et al., 2006).

Although this study may not provide definite answers, the results do lead to intriguing speculations about potential implications. The above explanation of the results may implicate that even a domain-specific intervention may have transfer effects in nearby domains –even though such transfer effects were not strived for-, whereas for effects in farther domains an explicit transfer approach may be required. Various studies of alcohol- or tobacco-specific interventions have reported effects on substances not addressed by the intervention (Grossbard et al., 2010; Magill, Barnett, Apodaca, Rohsenow, & Monti, 2009; Myers & Prochaska, 2008), although a review of alcohol-specific interventions did not find evidence for an effect on to-

bacco use (McCambridge & Jenkins, 2008). To examine this intriguing implication, more intervention research is needed with respect to transfer-oriented as well as domain-specific interventions and potential mediating mechanisms. Such research would lead to valuable insights into the breadth or narrowness of effects of domain-specific and transfer-oriented interventions, and to better or more differentiated views on how transfer to nearby and far domains can be promoted.

The hypothesized mediating construct examined in this study - self-reported learning experiences regarding general cognitive-behavioral skills – was geared well towards the aims of this study, as it reflects aspects of several transfer-promoting conditions. The focus on general skills bears in it the aspect of decontextualization. Furthermore, it is a measure of metacognitive reflection, and, being about personal learning experiences, it also has an element of meaningfulness. The learner report has been shown to be a useful and robust tool for analyzing educational objectives that are difficult to measure straightforwardly (Janssen & Rijlaarsdam 1990; Marum, 1996). Especially the latter two aspects mentioned with regard to our measure – metacognitive reflection and meaningfulness – set it apart from other potential measures, such as 'knowledge of general skills'. However, such alternative measures may also be worth investigating. Recently, knowledge of general life skills was found to mediate intervention effects on tobacco and alcohol outcome measures (Bühler, Schröder, & Silbereisen, 2009). Unfortunately, that study did not examine intervention effects in untaught domains, so it cannot clarify a potentially mediating role of life skills knowledge in this respect. Botvin's Life Skills Training program for substance use prevention has had preventive effects on the untaught domains of risky driving and HIV risk behavior, which the authors attributed to the program focus on generic self-management and social skills (Griffin, Botvin, & Nichols, 2004; 2006). However, as mediation mechanisms were not examined in these studies, it remains unclear whether these effects can indeed be attributed to the program focus on generic skills, which might indicate high-road transfer, or to more automated, low-road transfer processes to closely related contexts. These are interesting issues for further research. Also other factors may be examined as potential mediators for transfer effects. The factors of meaningfulness and reflection are eligible candidates, as they are thought to be important for producing transfer.

4.1.1 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 controlling for important implementation variables in analyses. The study also had some limitations. One limitation is that the planned random assignment to conditions was only partly implemented with success. Another limitation is that attrition was substantial and differed between the conditions. Attrition had a negative impact on the power of the analyses, which may have affected the results. Also, baseline differences were observed between conditions and between attrition groups. In response, we controlled for these differences in analyses. Attrition was partly due to missing data on the learner report variables and on measures of instruction time for nutrition and alcohol. Controlling for instruction time on alcohol and

nutrition was necessary for interpreting the transfer effects as true transfer effects. As for the missing values on the learner reports, all students without any entry were coded as missing. Among this group, we were unable to distinguish students who skipped the learner report (truly missing) from students who felt they had not learned anything (unjustified missing), but this group did not include students who explicitly indicated they had learned nothing (they were scored 0). A different coding decision, i.e. giving all students without any entry a score of 0, would have reduced the number of missing values and could have produced different results, but would have been less valid in our opinion then the present coding decision.

Another issue with respect to coding the open learner report is that many student responses were brief (e.g., "say no"), which made it difficult sometimes to interpret and correctly classify the responses. However, the inter-rater reliability was satisfactory and all doubtful responses were discussed and agreed upon by the first and last author.

The significance level for each mediation condition was set at .05, mediation conditions that approached significance ($p<.10$) were also explored. This was done to explore potentially relevant relationships because attrition may have led to loss of power, and because, to our knowledge, this project was the first ever to explicitly promote and test transfer to untaught domains in health education. The results provide valuable insights into the potential mediation processes operating, which may be relevant to researchers, intervention designers and practitioners. The results suggest that transfer of learned knowledge or skills to relatively far domains can be stimulated – at least in part – by teaching general skills; transfer to closely related domains may occur more easily and more in an automated way.

Supplemental Table: Baseline equivalence of students in mediation analyses: comparison of experimental conditions and dropout groups

Dropout from mediation analyses varied with the type of learner report (open vs closed), domain (alcohol vs fruit and breakfast) and specific outcome variable examined. For clarity of reporting about dropout analyses, the decision was made to consider as dropouts those students who had not completed the follow-up survey, had a missing score on the open learner report or had missing teacher information about nutrition instruction between baseline and follow-up.

Variable *=logtransformed	**Range or no. of levels**	**Experimental conditions in mediation analyses** **Exp** ***N*=328** ***M* (%)**	**Con** ***N*=225** ***M*(%)**	***p*[a]**	**Dropout from mediation analyses** **Non-dropout** ***N*=553** ***M* (%)**	**Dropout** ***N*=554** ***M* (%)**	***p*[a]**
Demograhics							
Grade	2 levels			***			***
7		48 (14.6%)	9 (4.0%)		57 (10.3%)	124 (22.4%)	
8		280 (85.4%)	216 (96.0%)		496 (89.7%)	430 (77.6%)	
Age at baseline	11.83-16.08	13.47 (.529)	13.66 (.512)	***	13.55 (.530)	13.46 (.697)	*
Gender (% female)	2 levels	159 (48.5%)	130 (57.8%)	*	289 (52.3%)	246 (44.5%)	**
Ethnicity	3 levels						
Dutch		255 (78.9%)	188 (84.3%)		443 (81.1%)	438 (81.6%)	
Other western		19 (5.9%)	14 (6.3%)		33 (6.0%)	30 (5.6%)	
Non-western		49 (15.2%)	21 (9.4%)		70 (12.8%)	69 (12.8%)	
School level	4 levels			***			***
Vmbo-havo (low)		47 (14.3%)	0		47 (8.5%)	98 (17.7%)	
Havo		97 (29.6%)	97 (43.1%)		194 (35.1%)	156 (28.2%)	
Havo-vwo		121 (36.9%)	35 (15.6%)		156 (28.2%)	160 (28.9%)	
Vwo (high)		63 (19.2%)	93 (41.3%)		156 (28.2%)	140 (25.3%)	
Non-behavior-specific attitudes							
Self esteem*	1-4	.3.13 (.561)	3.22 (.487)		3.17 (.534)	3.18 (.541)	
Attitude towards school	1-5	3.04 (.649)	3.09 (.566)		3.06 (.617)	3.10 (.648)	

Variable *=logtransformed	Range or no. of levels	Experimental conditions in mediation analyses Exp *N*=328 *M* (%)	 Con *N*=225 *M*(%)	 *p*[a]	Dropout from mediation analyses Non-dropout *N*=553 *M* (%)	 Dropout *N*=554 *M* (%)	 *p*[a]
Alcohol use							
Behavior Freq. drinking occasions past mnth*	1-7	1.62 (1.076)	1.49 (.770)		1.57 (.964)	1.59 (.956)	
Behavior % Binge (>=5 drinks) past 2 wks	Yes-no	15 (4.6%)	13 (5.8%)	***	28 (5.1%)	46 (8.3%)	*
Composite determinants	Mean of Z-scores	.08 (.745)	-.05 (.662)	*	.03 (.713)	.04 (.699)	
Attitude	1-5	3.51 (.970)	3.35 (.928)		3.44 (.956)	3.52 (.919)	
Outcome expectancies	-3.429 – + 1.714	-.74 (.795)	-.85 (.713)		-0.78 (.764)	-0.79 (.790)	
Risk expectancy	1-4	2.49 (1.017)	2.34 (.849)		2.43 (.954)	2.39 (.884)	
Anticipated regret*	1-4	2.04 (1.105)	1.83 (1.000)	*	1.95 (1.068)	1.94 (1.063)	
Self-efficacy	1-5	3.78 (.981)	3.70 (.925)		3.75 (.958)	3.83 (.958)	
Social norm	1-5	3.45 (.747)	3.33 (.648)		3.40 (.711)	3.42 (.709)	
Intention*	1-5	4.10 (1.106)	4.12 (1.052)		4.11 (1.083)	4.04 (1.153)	
Fruit consumption							
Behavior No. portions per wk*	0-21	5.83 (4.646)	5.61 (4.401)		5.74 (4.545)	6.12 (4.958)	
Composite determinants	Mean of Z-scores	.03 (.652)	-.01 (.608)		.01 (.633)	-.02 (.622)	
Attitude*	1-5	4.07 (.736)	4.06 (.676)		4.07 (.711)	4.03 (.691)	
Outcome expectancies	1-5	3.32 (.734)	3.36 (.685)		3.34 (.714)	3.30 (.720)	
Risk expectancy*	1-4	2.16 (.890)	2.09 (.793)		2.13 (.851)	2.05 (.903)	
Anticipated regret	1-4	1.35 (.684)	1.26 (.595)		1.31 (.650)	1.32 (.675)	
Self-efficacy*	1-5	4.22 (1.062)	4.33 (.932)		4.27 (1.012)	4.33 (1.002)	
Social norm parents*	1-5	4.18 (.980)	4.19 (.925)		4.18 (.957)	4.13 (.997)	
Social norm peers	1-5	3.11 (1.013)	3.02 (1.088)		3.07 (1.045)	2.93 (1.065)	*
Intention	1-5	3.80 (1.160)	3.67 (1.139)		3.75 (1.152)	3.79 (1.136)	
Breakfast							
Behavior No. days per week	0-7	6.21 (1.828)	6.42 (1.554)		6.29 (1.723)	6.25 (1.784)	
Composite determinants	Mean of Z-scores	.06 (.689)	.00 (.612)		.04 (.657)	-.02 (.644)	
Attitude*	1-5	4.25 (.685)	4.32 (.667)		4.28 (.678)	4.16 (.715)	**

Variable *=logtransformed	Range or no. of levels	Experimental conditions in mediation analyses Exp *N*=328 *M* (%)	 Con *N*=225 *M*(%)	 *p*[a]	Dropout from mediation analyses Non-dropout *N*=553 *M* (%)	 Dropout *N*=554 *M* (%)	 *p*[a]
Outcome expectancies*	1-5	4.20 (.692)	4.19 (.613)		4.20 (.660)	4.07 (.731)	**
Risk expectancy	1-4	2.40 (.963)	2.32 (.866)		2.37 (.925)	2.40 (.945)	
Anticipated regret	1-4	1.96 (1.010)	1.89 (.948)		1.93 (.985)	1.91 (1.022)	
Self-efficacy*	1-5	4.38 (.837)	4.41 (.755)		4.39 (.804)	4.43 (.797)	
Social norm parents*	1-5	4.71 (.621)	4.66 (.644)		4.69 (.631)	4.68 (.663)	
Social norm peers	1-5	3.78 (.998)	3.66 (.982)		3.73 (.993)	3.61 (1.077)	
Intention*	1-5	4.20 (.821)	4.07 (.830)	*	4.15 (.826)	4.14 (.824)	

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

Chapter 7

SUMMARY AND GENERAL DISCUSSION

Health-compromizing lifestyles such as smoking, binge drinking, unsafe sex and insufficient intake of fruit and vegetables are widely prevalent among young people. Numerous health education programs have been, and continue to be, developed to promote healthful behaviors among adolescents. The majority of adolescent health promotion programs are designed for use in schools and are often supplementary to the regular school curriculum. Most programs focus on a single health-related behavior. Altogether, these single health education programs may overload the school curriculum and teaching staff. It would be more efficient if a single intervention could produce effects in multiple domains. A transfer-oriented approach may offer possibilities for such an intervention.

This thesis focuses on the feasibility and effectiveness of a transfer-oriented approach to health education in secondary schools. The term transfer refers to a process in which knowledge and skills learned in one context (e.g., a particular health behavior domain) are applied to another context (e.g., a different health behavior domain). If an intervention is to produce effects in several domains at the same time, this presupposes that the knowledge and skills relevant to the various domains have a common core, and that the intervention can be designed in such a way that students can actually carry over the knowledge and skills from one domain to another.

In this thesis, the main research question is:
Is it possible, with a specially designed transfer-oriented intervention about smoking and safe sex, to achieve effects on behavior and determinants not only in the domains of smoking and safe sex, but also in the closely related domain of alcohol and the less closely related domain of healthy nutrition?

The data presented in this thesis suggests the answer to this question is 'yes, to a large extent'.

The main research question was partitioned into four research questions that were examined in various substudies. In this general discussion, we will first summarize the results of these substudies and the answers to the research questions. Additionally, we will reflect on the strengths and limitations of the studies, followed by

reflections on the potential significance of the results for theory and practice. Lastly, recommendations are made for further research.

1. SUMMARY OF THE PROJECT AND ITS RESULTS

The transfer oriented curriculum we developed and tested focused on two behavioral domains: smoking and safe sex. In the studies, two other behavior domains were examined as transfer domains: alcohol and healthy nutrition. The choice for these four domains was based on two reasons: a) these domains are addressed relatively frequently in health education classes at secondary schools in The Netherlands (Dafesh, 2006), and b) according to available literature at the time we developed our research plan, we expected that the strength of associations between these domains would differ. The latter is relevant from the viewpoint of transfer, as transfer literature indicates that transfer to closely related domains (i.e. alcohol) is easier to produce than transfer to less closely related domains (i.e. nutrition).

Since transfer requires some type of similarity or association between domains, the first phase in the project was to examine similarities and associations between the four domains of smoking, safe sex, alcohol, and healthy nutrition. The first phase was thus preparatory in nature, designed to examine the feasibility of a transfer-oriented approach.

1.1 Phase 1: Examining associations and similarities between domains

Phase 1 comprised two research questions, which are addressed in chapters 2 to 4 of this thesis. Chapters 2 and 3 are relevant for the first research question.

Research question 1: To what extent are the domains of smoking, alcohol abuse, safe sex and healthy nutrition associated at the level of behavior, and which similarities exist between these domains at the level of behavioral determinants?

This research question was examined by means of a literature review. Chapter 2 describes the full review of 116 publications, and goes into the extent to which the domains are associated at the level of behavior, and which determinants are similar across the four domains. Regarding associations at the behavioral level, the review revealed that tobacco and alcohol use are strongly associated, and are also associated with precocious sex. However, behavioral associations involving safe sex and healthy nutrition had hardly been studied and the review results involving these domains were thus not clear.

Regarding similarities between determinants, the review identified several determinants to have a positive, health-promoting influence in all four domains (living in a two-parent family, parental support, and parental monitoring) and one determinant to have a negative, health-compromizing influence in all domains (emotional distress). In addition, the review identified several other determinants that were similar across all domains; these are discussed in chapter 3.

In addition to the determinants indicated above, which were measured in a non-domain-specific way, in chapter 3 we zoomed in on domain-specific determinants,

making use of 87 publications from the above-mentioned review sample that examined such determinants. Domain-specific determinants are determinants which are framed in terms of a particular domain or whose content varies with the domain in question, such as outcome expectancies. Despite their domain-specific content, these determinants may share common ground on a more general level (e.g., regarding the type of outcome expectancies: physical consequences, social consequences, et cetera). This may be relevant for teaching for transfer, since transfer-oriented learning is about discovering and applying general issues in specific factors across domains.

In our review, we identified the following domain-specific determinants to be similar across all four domains: 1) beliefs that the unhealthy behavior will lead to immediate gratification and to social advantages had a negative association with healthy behavior; 2) peer norms, peer and parental modeling behavior and refusal self-efficacy had a positive association with healthy behavior. We considered these determinants to be the most relevant ones to address in our transfer-oriented intervention, for several reasons: a) these determinants show similarity across the behavioral domains of interest, and b) these determinants are frequently addressed in school health education interventions and they can be more easily modified by interventions than the general, non-domain-specific determinants discussed in chapter 2 (living in a two-parent family, etc.)

With regard to chapters 2 and 3, it is worth mentioning that a relatively small number of determinants had been studied in all four domains. This limits the number of determinants for which similarities across all four domains could be found. However, the results for determinants that had been studied in only two or three domains, also indicated that many determinants were similar across several domains. Moreover, in most cases their influence was consistently either health-promoting or health-compromizing across domains.

As part of the preparatory phase of examining the feasibility of a transfer-oriented approach, we believed it to be important that the four domains not only share similar determinants, but also share similar effective intervention methods with which the determinants can best be targeted. Hence, in chapter 4 we addressed the following research question.

Research question 2: Which effective elements of school health promotion are similar across the domains of smoking, alcohol abuse, safe sex and healthy nutrition?

This research question was, again, examined by means of a literature review, a review of 55 reviews to be more precise. Since the number of reviews explicitly focusing on either tobacco or alcohol use was small, and a large number of reviews had a broader focus on substance use, we collapsed the tobacco and alcohol domains into the broader domain of substance abuse. In the review, we focused on the following elements of the educational interventions: goals, process of development, content, methods, facilitator, components, and intensity. Eleven elements were found to be similar across the substance abuse, sexuality, and nutrition domains, but the strength of evidence in all domains differed per element. Five elements had evidence from strong reviews in all domains: use of theory, particularly social-cognitive theory;

addressing social influences, especially social norms; addressing cognitive-behavioral skills; training of facilitators; and multiple components (e.g., school plus community involvement). Somewhat less consistent evidence across domains was found for two additional elements: parent involvement and a larger number of sessions. Lastly, for four additional elements, the results were more speculative, as in one or two domains these elements had only been examined by weak reviews: specific behavioral focus; addressing determinants; interactive methods; knowledge-only approach (this was an ineffective element).

The results of the preparatory phase showed a sufficient degree of similarity or association across the four domains – in terms of behavior, determinants, and effective elements of interventions– for us to conclude that a transfer-oriented approach would be feasible.

1.2 Phase 2: Development of the transfer-oriented curriculum

The next phase in our project was the development of a curriculum about smoking and safe sex, which would specifically aim to promote transfer of learning to other health behavior domains. The development was based on various sources of information and expertise, including the results of the preliminary literature reviews (cf. chapters 2, 3 and 4), existing Dutch evidence-based school programs about smoking and safe sex, various social psychological theories for explaining and changing behavior, evidence and theory from educational psychology about conditions for promoting transfer, and expert and creative input from various professionals who are familiar with designing school health promotion interventions and educational materials for the selected target group of students and teachers.

The target group comprised students and teachers in the second year (Grade 8) of schools which prepare for higher vocational education or university (havo-vwo). The curriculum, by the name of 'Multiple Choice 4 U', consisted of a teacher manual, a student book, a video, and a teacher training session. It was designed as a 10-session curriculum and was divided into five chapters. After an introductory chapter (chapter 1, session 1), it focused sequentially on the domains of smoking (chapters 2 and 3, sessions 2-5) and safe sex (chapters 4 and 5, sessions 6-10).

The curriculum focused mainly on three psychosocial constructs: attitudes (short-term physical, social and other consequences, health risks, anticipated regret), social influences (prevalence estimates, social norms, peer pressure) and self-efficacy (risky situations, refusal and negotiation skills, condom use skills). These were addressed both in a domain-specific way for smoking and safe sex and in a general way.

Throughout the curriculum, texts and assignments to stimulate transfer to other health behavior domains were included. The transfer-oriented approach was operationalized mainly by addressing the following transfer-promoting conditions: a) decontextualization, b) recontextualization, c) meaningfulness and d) reflection. This is explained below.

(a) Decontextualization means that the learning content is addressed in a general, non-domain-specific way. The transfer message that the curriculum is not only about

smoking and safe sex, but is also relevant for all kinds of health behaviors, was stressed from the first session. Throughout the curriculum, texts and assignments explicitly addressed general cognitive and behavioral skills pertaining to decision-making, problem-solving, refusal and negotiation skills. The general skills are presented in Box 1. The introduction of specific general skills was carefully tuned to domain-specific learning content about smoking and safe sex to which they are relevant. General skills were thus interwoven in a natural way with domain-specific texts and assignments, while color was used to indicate their general nature.

Box 1. General cognitive-behavioral skills in the curriculum

The theme of 'making choices' was chosen as the central theme that connected all general skills. It was partitioned into three sub themes, which correspond to the main determinants addressed: making your own choices (attitude), other people's choices (social influences), and implementing your choices (self-efficacy).

Making your own choices (~attitude)
Behavior can have positive and negative consequences, e.g. for your health. It is wise to correctly know all short- and long-term consequences and think them over; it can help you prevent future regret. People make excuses for behaviors they know are unwise. Decision-making action plan: define the problem or situation; think out possible solutions/actions; consider the pros and cons of each solution; make sure your information is correct and distinguish opinion from fact; think about possible regret; choose the solution that offers you the most pros and the least cons and regret.

Other people's choices (~social influences)
People can value consequences differently and act differently. Don't just do what others do: follow your own judgment. Consider that all opinions are justified as long as they don't conflict with relevant facts. You may not know what people think or do; best ask instead of assume. Other people may try to influence your choices, e.g. help or obstruct you. Think for yourself and determine how much you care about the opinion of others. It takes some confidence to express your opinion.

Implementing your choices (~self-efficacy)
Attaining a certain goal may require knowledge, skill and courage. Practice helps you gain experience, don't give up on your first attempt. Chunk your goal into little steps, anticipate possible difficulties and try to find solutions. If you anticipate peer pressure, think about what you can do or say (avoid situations, say no, use counterarguments, walk away).

(b) Recontextualization means that the learning content is applied to a new context. Throughout the curriculum, so-called 'excursion assignments' prompted students to think about if and how the general skills can be applied to other behaviors than smoking and safe sex. In many cases, the excursion assignment elaborated on a prior domain-specific assignment about smoking or safe sex, by asking students to think of examples for other health behaviors. In some cases, the excursion assignment was more extensive and free-standing, e.g. an assignment to draw a cartoon or write a

film scenario portraying how at least one general skill is applied to a health behavior of their choice.

(c) *Personal meaningfulness* of learning was stimulated in a number of ways. Students were given the opportunity to make their own choices in curriculum assignments. For instance, in the cartoon/film scenario assignment students were given the freedom to choose the format (cartoon or scenario), the general skill and the behavior. Also, many assignments asked about students' personal beliefs and examples from their own lives. Moreover, many assignments set out to confront students with real-life dilemma situations, to which they were asked to come up with their own solutions. Discussion and collaboration between students were stimulated as they can lead to co-creation of shared meanings.

(d) Reflection on the learning content and its personal relevance was also stimulated in various ways. The 'excursion assignments' can be regarded as reflective assignments. Also, many assignments asked students to first give their personal beliefs or to think of solutions to a posited problem, and then to discuss their beliefs or solutions with other students. Such assignments stimulate reflection in a discussion format. Moreover, each chapter in the student book concluded with some logbook questions, in which students could indicate what they thought of the learning content in terms of usefulness for their life, and unanswered questions they might have.

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, 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.

The teacher manual included some background information about transfer-promoting conditions, and mainly consisted of instructions about assignments. Instructions relevant to transfer (e.g., about 'excursion assignments') were color-highlighted to indicate their significance. The teacher training session was minimal and lasted three hours. It focused on information and discussion about the conditions for transfer and about the importance of adhering to critical learning activities and to the study design.

The above-described curriculum was completed after a previous prototype version of the curriculum had been pilot-tested. The pilot-test took place among the original target group selected for the study: students and teachers in preparatory vocational education (vmbo). This target group was originally selected because health-risk behaviors are more prevalent among these students than among students in higher school levels. Six teachers from five schools agreed to implement the full prototype curriculum in eleven Grade 8 classes.

The pilot study was designed to serve several aims: a) to examine teachers' and students' perceptions of attractiveness, practicability and feasibility of the curriculum (formative evaluation), b) to test the psychometric qualities of a draft version of

the student questionnaire later to be used in the effectiveness study, and c) to analyze the results of the baseline and post-test administration of the draft student questionnaire as an indication of pre-to-post changes in student learning outcomes.

The results of the pilot study called for improvements with regard to the attractiveness and practicability of the curriculum and the likelihood to produce transfer. Therefore, the results led to profound modifications to the prototype curriculum. As for the likelihood to produce transfer, decontextualization was addressed in a too implicit way in the prototype and was made more explicit in the final curriculum. Also, reflective and excursion assignments were integrated better into the curriculum and were given a more attractive format; in the prototype they were addressed at the end of a lesson as a paper-and-pencil assignment, and they were sometimes skipped because of time limitations. Teacher comments on their students' cognitive and reflective abilities led us to select a different target group for the effect study: a school level which prepares for at least higher vocational education (havo-vwo). Furthermore, many changes were made to improve attractiveness and practicability of the curriculum.

1.3 Phase 3: Assessment of curriculum effectiveness

In chapter 5 we described the effectiveness study of the transfer-oriented curriculum, which gave us the answer to the third research question.

Research question 3: To what extent is a transfer-oriented curriculum about smoking and safe sex effective in changing behavior and behavioral determinants in the domains of smoking and safe sex, and in the closely related domain of alcohol and the less closely related domains of fruit and breakfast consumption?

This research question was examined in an effectiveness study among 1107 students in grades 7 and 8 of 23 schools which prepare for at least higher vocational education (havo-vwo). In a quasi-experimental design, 33 teachers were assigned to the experimental condition (Exp) – teaching the transfer-oriented curriculum – or to a control condition (Con), which involved teaching their regular lessons about smoking and safe sex. Student data were collected in three waves of self-report 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. The post-test was administered within 1 month after intervention ending, and the follow-up on average 4 months after intervention ending. Attrition at post-test (12.1%) and follow-up (33.0%) did not differ between conditions.

At each measurement point, the student questionnaire asked about behavior and psychosocial determinants for all five behavioral domains under study (smoking, safe sex, alcohol, fruit, and breakfast). The psychosocial determinants measured were: 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. Because of the large number of psychosocial determinants per domain, we also calculated a composite measure of determinants for

each domain by averaging the standardized scores on the psychosocial determinants. This measure included all determinants, except the knowledge measure in the domains of smoking and safe sex, and was used in analysis as a proxy for multivariate testing of effects on psychosocial determinants. Teachers were asked to record the number of lessons on each of the domains.

The analyses of effects were multilevel and controlled for various student factors (among other things demographics and baseline measure). Analyses in the alcohol and nutrition domains also controlled for instruction time on these domains.

In the tobacco domain, analyses of effects revealed a statistically significant positive intervention effect on behavior at post-test and follow-up. 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).

Results in the safe sex domain showed that fewer experimental students than controls had recent experience with intercourse at post-test. There were no other effects on sexual behavior items or on the composite measure of determinants, neither at post-test nor follow-up.

As for behavioral effects in the alcohol domain, an effect that approached significance was observed for frequency of consumption at post-test. At follow-up, significant effects were found for both frequency of consumption and binge drinking. At the level of determinants, significant effects on the composite measure of determinants were observed at both measurement points. Regarding individual determinants, significant positive intervention effects were observed for two determinants at post-test (anticipated regret and self-efficacy) and at follow-up (anticipated regret, intention). In addition, various marginally significant intervention effects occurred (on outcome expectancies at post-test, and on social norm and self-efficacy at follow-up).

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 the fruit domain there were favorable intervention effects on two to three psychosocial predictors at each measurement point: on outcome expectancies and anticipated regret at post-test, and on attitude and self-efficacy at follow-up. Significant effects on individual determinants in the breakfast domain were found for attitude, perceived risk and self-efficacy at post-test, and for attitude, outcome expectancies and self-efficacy at follow-up.

The results for the alcohol and nutrition domains clearly indicate that transfer effects occurred. The effects in the alcohol domain are stronger than those in the nutrition domains, judging from the effects on alcohol behavior and a larger effect size for the composite measure of determinants. This is in line with our expectation that transfer is more likely to occur to domains that are closely related to the taught domain(s) than for domains that are less closely related.

The relative absence of effects in the safe sex domain was surprising. Possibly, the safe sex component of our experimental curriculum was not stronger than the safe sex lessons in the control group. Another explanation may be that the quality of im-

plementation of the safe sex component was lower than that of the tobacco component. Indeed, teachers reported a lower degree of implementation of the safe sex component, mainly because most teachers needed more lessons to complete the total curriculum than the ten lessons that were planned; the mean number of lessons was 14.

Since we observed transfer effects in the domains of alcohol, fruit and breakfast consumption in the effect study, we additionally examined mediation mechanisms which may explain how the transfer effects were produced. This mediation study, addressing research question 4, is reported in chapter 6.

Research question 4: To what extent are transfer effects in the closely related domain of alcohol and in the less closely related domains of fruit and breakfast consumption mediated by students' learning experiences with respect to general cognitive-behavioral skills?

The mediation study was conducted with the data of the effectiveness study. Specifically, it was examined to what extent students at post-test reported learning a general cognitive-behavioral skill, and to what extent these learning experiences mediated the intervention effects in the untaught domains at follow-up.

The post-test student questionnaire included two types of learner report questions ("What have you learned in the lessons?") for measuring learning experiences. One type, the so-called closed learner report (CLR), asked students to choose (to a maximum of four) the most important things they had learned in the lessons from ten pre-determined statement: five statements pertained to a general skill, two were tobacco-specific and three were safe-sex-specific. The variable used in the analyses was the number of general skills chosen by the student (0-4). The second type of learner report, the so-called open learner report (OLR), asked students the same question in an open-ended format, again to a maximum of four. The answers to this question were coded qualitatively as yes-no reflecting a general skill, and then summed. Because of an uneven distribution of scores across the experimental conditions, this variable was later dichotomized (yes-no a general skill mentioned in any of the four student responses). Thus, two variables were examined as hypothesized mediators: the CLR total number of general skills chosen and the OLR dichotomous measure.

A mediation effect is said to occur if three conditions are met: 1) the intervention has a statistically significant effect on the outcome variable, 2) the intervention has a statistically significant effect on the hypothesized mediator, 3) the hypothesized mediator is statistically significantly associated with the outcome variable after controlling for the intervention variable.

The mediation analyses, which controlled for the same covariates as the effect analyses reported above, showed that there was no indication of mediation for the CLR variable. Although intervention effects were observed for various outcome variables in all domains (mediation condition 1), and there was a significant intervention effect on the CLR variable for all these outcome variables (mediation condition 2), none of the outcome variables were significantly related to the CLR variable (mediation condition 3 was not met). For the OLR measure, the results were more

complex, as they depended on the domain and the specific outcome variable. For all outcome variables, mediation condition 2 was met. In the alcohol domain, there were significant intervention effects on seven of the ten outcome variables (mediation condition 1), but there was no indication of mediation, as none of these variables was significantly related to the OLR variable (mediation condition 3 was not met). In the fruit domain, a significant intervention effect was found on the composite measure of determinants and on self-efficacy (mediation condition 1), and the composite measure of determinants also had a significant association with the OLR variable (condition 3), indicating mediation. In the breakfast domain, a significant intervention effect was found on three outcome variables (attitude, outcome expectancies, self-efficacy), and a marginally significant effect on one (composite measure of determinants). Two of these variables (composite measure, outcome expectancies) were also significantly related to the OLR measure, indicating mediation.

These results indicate two major findings. The first is that in this study the OLR variable appeared to be a stronger indicator of personal lessons learned than the CLR variable. The second is that intervention effects in the alcohol versus the nutrition domains appeared to be brought about by different mechanisms. Personal lessons about general cognitive-behavioral skills contributed to changes in at least some nutrition outcomes, whereas intervention effects in the alcohol domain, though more frequent and substantial, appeared to occur in a less cognitively aware and more automatic way. Possibly, the alcohol context is sufficiently similar to the contexts explicitly addressed in the curriculum (smoking and safe sex) for students to apply the newly acquired knowledge and skills to the alcohol domain without consciously generalizing the information first. This explanation fits in well with results of studies of behavioral clustering, which have consistently shown that alcohol use is strongly associated with the behaviors addressed in our curriculum, more so than nutrition behavior.

This explanation may implicate that an intervention, even a domain-specific intervention, may have transfer effects in nearby domains –even though such transfer effects are not strived for-, whereas for effects in farther domains an explicit transfer approach may be required, one that explicitly addresses general skills. More intervention research is needed, both with respect to transfer-oriented as well as domain-specific interventions, to further examine this intriguing implication.

2. STRENGTHS AND LIMITATIONS

2.1 Strengths of the project and the studies

A strong point of the project as a whole is its explicit focus on examining transfer in the field of health education, which, to our knowledge, is new to this field. Moreover, it combined contemporary theory and empirical research from the fields of health promotion, social psychology and educational sciences.

The project as a whole, and consequently this thesis, was built up logically and coherently. First, feasibility of a transfer-oriented approach was checked by examining, in a series of systematic reviews, similarities between four selected behavioral domains in terms of behavior, behavioral determinants and effective elements of

interventions. After sufficient similarities were uncovered, a prototype transfer-oriented curriculum was developed, pilot-tested, and revised. Then, the curriculum was tested for effectiveness in a carefully designed controlled experiment. Lastly, as transfer effects were observed in the effect study, we also invested in gaining insight into the mechanisms that might explain the observed transfer effects.

In addition to the coherent, systematic approach that characterized the project as a whole, the individual studies that comprise the project were of high quality. The reviews in chapters 2, 3, and 4 had a systematic methodology and were comprehensive in their scope. As for the empirical studies described in chapters 5 and 6, the research design was well-constructed and the selection of the behavioral domains was based on current theory and empirical data from educational science and school-based health education. Another strong point was that analyses of effects and mediation with respect to the alcohol and nutrition domains controlled for the possible impact of lessons taught about these domains ("time on task"), which otherwise might have biased our attribution of the observed effects to the transfer-oriented curriculum.

2.2 Limitations of the studies

All of the chapters in this thesis that describe a particular sub study (chapters 2-6), include a comprehensive paragraph that discusses the potential limitations of the sub study, as well as our efforts to reduce possible bias. We will recapitulate these limitations here.

As for the systematic reviews of determinants discussed in chapters 2 and 3, the most important limitation is that the included studies showed variation in various aspects: type of research (empirical study, review study), research design (cross-sectional, longitudinal), statistical procedures (quantitative multivariate, quantitative univariate, qualitative), criterion behavior (e.g., alcohol abuse versus ever drinking alcohol), and operationalization of determinants. We have tried to give due consideration to this limitation by being aware of these variations in the first place, by including some of these aspects in our analysis (type of research, research design), and by categorizing determinants conservatively to make sure we were not comparing apples to oranges. Further refinement of inclusion criteria and/or analyses would have reduced the number of available studies considerably. Furthermore, we believe that some extent of variation between studies is inevitable, especially if the aim, as in our case, is to focus broadly on four behavioral domains and, within each of these domains, on all types op determinants (proximal, distal, ultimate).

Variation between studies may also have biased the review of effective intervention elements discussed in chapter 4. Here, comparable considerations as above are valid. An additional limitation may be that the review-of-reviews approach we used, relies on 'second-hand' information and is vulnerable to potential interpretive or conceptual biases of previous reviewers. We have attempted to limit such biases as much as possible by using a systematic review methodology, by assessing the quality and relevance of each review and relying on reviews of high to moderate quality, by carefully categorizing the results without generalizing too much, and, in case reviews had differential results, by attempting to examine the causes of the differ-

ences. We also attempted to check the results of reviews if sufficient information was provided. We do not believe the results would have been very different if an alternative review methodology was used, especially not with respect to the main finding that there are many similarities in effective intervention elements across domains.

With respect to the effect study discussed in chapter 5, several potential limitations should be mentioned, which also apply to the mediation study in chapter 6. One limitation is that the planned randomized assignment to conditions was only partly implemented with success. This may have led to the baseline differences we observed in demographics and some psychosocial factors, which we therefore controlled for in analyses of effects, and possibly to differences in other factors we did not measure.

Another limitation may be the risk of contamination of experimental conditions, in that in some schools both conditions were represented: experimental and control teachers and students within these schools may have influenced each other. However, we expect this type of bias to be limited, given that this situation only existed in 3 of the 23 participating schools (involving 6 of the 33 teachers).

A third limitation concerns the attrition at follow-up. Attrition had a negative impact on the power of the analyses, which may have affected the follow-up results. The observed attrition did not appear to be selective, as it did not differ between the experimental and control group. Also, dropouts did not differ from students retained to the study on any of the baseline behavioral measures, suggesting that there was no selective attrition of high-risk students.

Unfortunately, controlling for instruction time in analyzing the transfer effects to the alcohol or nutrition domains, led to additional drop-out of teachers and students at post-test and follow-up. This was because some teachers had failed to report their instruction time for these subjects. However, most of the observed effects were also found in analyses that did not control for instruction time.

In the mediation study discussed in chapter 6, additional dropout occurred because of missing values on the learner reports. In this study, total dropout rates differed between the conditions. Also, differences in various baseline scores were observed between dropouts and non-dropouts and between experimental and control students. Therefore, baseline scores were included as covariates in analyses.

The participating teachers were instructed to take ten sessions to complete the curriculum. However, in practice many teachers needed more sessions (the mean number of sessions taught was 14), and teachers who did not have sufficient time available skipped some of the lessons or assignments. Since smoking and safe sex were addressed sequentially in the curriculum, time constraints became more urgent during the sessions on safe sex, and implementation data indicated these sessions were implemented to a lesser extent than sessions about smoking. This might explain the absence of effects in the safe sex domain.

In the domains where effects on determinants were observed – tobacco, alcohol, fruit and breakfast – the effect sizes were small. This is not an uncommon result in school health promotion research (see chapter 4). Furthermore, in the tobacco and alcohol domains, also effects on measures of behavior were found: from baseline to follow-up, experimental students had a smaller increase than control students in cur-

rent smoking, frequency of alcohol consumption, and binge drinking. If the increases are interpreted in terms of reduction in percentages, the reduction was 57% for current smoking and 62% for binge drinking. These reductions are comparable to those reported for Botvin's (2000) Life Skills Training (LST) intervention (40-80%; see chapter 4). In a meta-analysis of various types of psychosocial smoking prevention programs, life skills interventions were found to have the highest effect size of all types of interventions (Hwang et al., 2004; see also chapter 4). Given these results, it is fair to say that our curriculum did quite well with respect to preventing tobacco and alcohol use, especially if one considers that the LST program spans three years and takes far more sessions than ours – 15 in the first year, 10 in the second year, and 5 in the third year.

However, it must be said that our effect study had a limited time span, with follow-up measurement only four months after intervention ending. Given the common finding in school health promotion research that effects tend to erode after some time, and that a one-year interval is generally considered a minimum to speak of 'long-term' results, our study would have been stronger if it had included additional measurements in the following year or years. This effect study was the first to test a transfer approach in health education. In light of its positive results, it is advisable to repeat an effect study of such an approach with a longer-term interval, and it is preferable that the intervention would include a booster to strengthen long-term effects. In the substance use domain, the 3-year LST program has been shown to be effective three years after intervention ending (six years after baseline measurement) (Botvin et al., 1995). Moreover, the LST program has also been shown to have long-term effects on outcomes not addressed in the program: effects on risky driving three years after intervention ending (Griffin et al., 2004) and on HIV risk behavior about ten years after intervention ending (Griffin et al., 2006). Since the content of our curriculum appears to be somewhat related to that of LST, as both address general skills and the effect sizes for substance use are comparable, these LST results may suggest that our curriculum, if extended with boosters in later years, might have chances to produce long-term results in substance use domains and nearby domains.

3. RELEVANCE FOR PRACTICE

Although the transfer-oriented curriculum we have developed and tested was effective to a large extent, it does not appear to be eligible for broad-scale implementation in The Netherlands. This was also not intended in the first place. The curriculum was mainly designed from the perspective of addressing scientific questions about the promotion of transfer in health education. The choice of the behavioral domains it explicitly focuses on – smoking and safe sex –, as well as the choice of the transfer domains alcohol and nutrition, was mainly based on insights into behavioral clustering and related hypotheses about the ease with which transfer could be produced in nearby and farther domains. A barrier to large-scale implementation is that many teachers in our effect study perceived the combination of the domains smoking and safe sex to be odd; a combination of smoking and alcohol would have made more sense in their opinion. Also, student evaluations of the curriculum were somewhat less positive than those of the teaching materials used in the control

group. For the record, most teachers in the control group used regular textbooks in Biology or Care (especially the highly popular textbooks Biology/Care for You) for their lessons about smoking and safe sex. These textbooks have been in circulation for years and are updated regularly. In terms of attractiveness and practicability, our newly developed curriculum cannot compete with such institutionalized textbooks. However, in terms of effectiveness, our curriculum shows a surplus value, not only with respect to the taught domain of smoking, but more importantly, also with respect to the promotion of transfer to untaught domains.

A transfer-oriented approach to health education is very relevant to practice, as it may be more efficient than an approach involving multiple single-domain interventions. After all, a transfer-oriented approach may contribute to producing effects in multiple health-behavior domains, while reducing the burden on schools.

A transfer approach fits in well with Dutch national policy in the field of health promotion, as health promotion institutions, which are largely health-domain-specific, are more and more stimulated, or forced, to work together. Health promotion institutions, indeed, seem to be interested in a transfer approach.

The curriculum and the research described in this thesis provide valuable leads for how transfer can be promoted. These leads can be used by curriculum developers to incorporate a transfer-oriented approach into existing or new health education curricula. In our opinion, many current Dutch domain-specific school health promotion interventions, at least the ones developed in university-based research studies, have already incorporated two transfer-promoting conditions to a large extent: reflection and meaningfulness. These interventions already utilize active and interactive teaching methods, address and probe for personal beliefs and experiences, present students with real-life problems to which they are asked to come up with solutions, and stimulate discussion among students. These interventions are designed to stimulate students to transfer the learned knowledge and skills from the classroom setting to the real-life, out-of-school setting where health-related behaviors occur. In our view, the main difference between our curriculum and these domain-specific interventions lies in decontextualization and recontextualization of the content. Whereas some current domain-specific interventions address comparable cognitive-behavioral skills as in our curriculum, they do so in an implicit manner, and solely with respect to their own health behavior domain. In contrast, our curriculum explicitly abstracted the cognitive-behavioral skills, while still grounding them in domain-specific examples for the sake of meaningfulness and comprehension, and stimulated students to apply the general skills to other health behavior domains. Given that most current domain-specific interventions focus on the same behavioral determinants as in our curriculum – knowledge, attitudes, social influences and self-efficacy – and their already implicit use of cognitive-behavioral skills that address these determinants, we believe it would require relatively little effort to integrate the contextualization/recontextualization condition into these domain-specific interventions and thus transform them into a transfer-oriented intervention. A question that remains open is: if one wishes to stimulate transfer to a particular health domain, to what extent is it necessary to include domain-specific content about that domain? To put it differently: if the intervention is to stimulate transfer to a whole range of spe-

cific domains, to what extent does domain-specific content about all these domains have to be integrated into the curriculum, and how could this be organized best?

The minimal scale of the teacher instruction session – three hours - may indicate that a transfer approach does not require much training from teachers in secondary schools, if the instructions in the teacher manual are clear. Classroom observations and teacher interviews in the pilot study, however, indicated that teachers struggled with getting their students to reflect on the learning process and to come up with real-life examples from other domains. This difficulty may also be partly attributed to other factors, especially: to the cognitive and reflective abilities of the students in the pilot study (pre-vocational education), to students' feelings of insecurity in the classroom climate which may inhibit them from sharing personal information about their lives, to the implicit way in which decontextualization was operationalized in the pilot curriculum, and to the not so attractive format of reflective and excursion assignments in the pilot curriculum. These are important considerations for educational practice. We considered the incorporation of reflective, decontextualized and excursion elements in the teaching-learning process as an important condition for transfer-oriented learning. Therefore, in the final curriculum we paid more attention to stimulating feelings of security, and paid extra attention to integrating decontextualization, reflection and excursion assignments into the lessons. Whereas in the pilot curriculum these assignments were mostly placed at the end of each chapter, in the final curriculum they were more interwoven into the lessons, while their special significance for transfer was highlighted by using a background color in the student book. Also, we selected students with a higher school level as the target group for the effect study. This decision was made because we wished to examine the occurrence of transfer under optimal conditions. This does not mean that we believe transfer effects are impossible to attain with students in pre-vocational education. Rather, it means that, in our search for how to operationalize the teaching-learning process in such a way that it promotes transfer, the instructional strategies we designed were deemed to be more suitable for students in a school level that prepares for higher vocational education or university. We believe that promoting transfer among students in pre-vocational education is possible but may require different instructional strategies, for instance assignments of a more practical nature (Volman & Ten Dam, 2000).

4. RELEVANCE FOR THEORY AND RESEARCH

The literature reviews in chapter 2 to 4 of this thesis have provided a comprehensive overview of research into determinants and effective intervention elements in four health-behavior domains: smoking, safe sex, alcohol, and healthy nutrition. The results may be valuable to researchers in each of these domains. Furthermore, the reviews may stimulate researchers in a particular domain to look beyond the boundaries of their own domain to generate research ideas from results in other domains, and may perhaps even stimulate collaborative efforts across domains.

The many similarities and associations we identified across domains, and the positive effects of our transfer-oriented intervention, suggest that such a broad focus may be fruitful.

To our knowledge, our project is the first to explicitly target and examine a transfer approach in the field of health education. To this end, theory and research from health education and social psychology were combined with theory and research from the educational sciences. The effect and mediation studies in chapters 5 and 6 have given insight into the extent of transfer effects in nearby (alcohol) and farther (nutrition) domains, and some insight into the mechanisms by which transfer effects in these domains may occur. These insights may be valuable to advance theorizing, development and implementation of integrative approaches in the field of health promotion and education.

This study was an applied study in its nature, not a conceptual one. However, as an exemplary study of transfer, it might be used by theorists to contribute to a more conceptual discussion in psychology and the educational sciences about definition and operationalization of the notions of near and far transfer. As Barnett and Ceci (2002, p. 619) point out, "defining the terms *near* and *far* is no simple matter, as they are usually based on the intuitive notion of *similarity*, which is itself ill defined". In a noteworthy effort to further the discussion and shed some conceptual light on the near-far distinction, they have proposed six dimensions of context on which distance between the learning context and the transfer context could be judged. The proposed context dimensions are: knowledge domain; physical context; temporal context; functional context; social context; and modality. Out of interest, we have tried to position our effect study on these dimensions. However, our experience was that some dimensions could be interpreted in different ways, which led to rather different positions on these dimensions. Furthermore, with respect to the context dimension of knowledge domain, Barnett and Ceci (2002) and others (e.g., Marini & Genereux, 1995) posit that the notion of domain itself is ill defined: what constitutes a domain? Indeed, we ourselves have used the term domain in several broader or narrower ways. For instance, in chapter 4, we collapsed the tobacco and alcohol domains into the substance use domain, and in our effect study we divided the nutrition domain into the fruit and breakfast domains. These experiences may indicate the difficulty of conceptualizing and operationalizing the concept of transfer and related concepts, such as 'domain'. The debate about transfer, and about the extent to which near and far transfer occur, has gone on for over a hundred years (Barnett & Ceci, 2002). Conceptualization and operationalization are needed to further this debate, the identification of transfer-promoting conditions and their application in education.

5. RECOMMENDATIONS FOR FURTHER RESEARCH

Given that an explicit transfer approach in health education has not yet been tested before, there are many avenues for further research.

First of all: in light of the positive results of this study, it is advisable to conduct more effect studies of transfer-oriented approaches in health education. Such effect studies are preferably conducted with a larger range of transfer domains, a longer-term interval, and among various groups of students – for instance, student groups which differ with respect to cognitive abilities, socio-cultural background and extent of domain knowledge.

With respect to our own data, an interesting question for further analysis is to what extent the various observed effects in our effect study are related: do the effects cluster with respect to the type of outcome measure (e.g., are effects on tobacco attitude related to effects on alcohol attitude?) and with respect to the type of domain (are effects in the tobacco domain related or do some students show progress in attitude and others in self-efficacy?). Results of such analyses would probably lead to further hypotheses or speculations about how transfer effects come about.

This study showed that the occurrence or strength of effects in transfer domains may differ according to the relative closeness between the transfer domain and the domain that is explicitly addressed. Future studies may therefore want to incorporate results for behavioral associations in their research design. In recent years, many studies have examined associations between various health behaviors. Although the results so far appear to be reasonably comparable – at least with respect to associations between traditional problem behaviors (e.g. smoking, drug use) which tend to be strong – the specific results of studies may differ. These differences may be attributed to variation across various aspects, such as: the number and nature of behavioral domains examined, the operationalization of behavioral measures, the type of analysis (e.g., bivariate associations versus cluster analysis), and the population under study (e.g., in terms of country, age, sex, ethnicity, socio-economic status). For instance, a recent study showed results for behavioral clustering to differ by age group (Van Nieuwenhuijzen et al., 2009). It would be helpful to have a thorough overview of the literature about behavioral associations for a broad range of health behaviors, preferably also including other behaviors which may be of interest to schools or other institutions (e.g., truancy, academic grades, conduct, bullying). The above-mentioned study aspects should be considered in such an overview.

The results of our mediation study suggest that transfer effects to relatively nearby domains (in our case the alcohol domain) are not mediated by learning experiences with respect to general principles. Possibly, effects in nearby domains might come about in a more automatic way, in that the contexts are sufficiently similar for students to apply what they learned without consciously generalizing the information first. If this is indeed so, it may mean that domain-specific interventions may have 'unintended' transfer effects in nearby domains. To examine this, we recommend that effect studies of domain-specific interventions examine such transfer effects in nearby domains. The above-mentioned overview of behavioral associations would be very helpful in identifying and selecting nearby domains. Such effect studies would lead to valuable insights into the breadth or narrowness of effects of domain-specific interventions, and to better or more differentiated views on how transfer to nearby and far domains can be promoted.

In our mediation study, we examined the potential mediating role of 'learning experiences with respect to general cognitive-behavioral principles'. Indeed, in the fruit and breakfast domains we found some evidence for this mediator. We did not measure 'knowledge of general principles', but this may very well be a potential mediator. Recently, Bühler and colleagues (2009) conducted an effect study of a life skills training curriculum (addressing communication, interpersonal relationships, critical thinking, self-awareness, problem solving, coping with stress and emotions) that also focused on substance use. They found evidence for a mediating role of

'knowledge of general life skills' in affecting tobacco use and a critical attitude towards tobacco and alcohol use. Unfortunately, the study did not examine effects in untaught domains, so it cannot clarify the potentially mediating role of life skills knowledge in this respect. This is an interesting issue for further research. In addition to these two factors – learning experiences and life skills knowledge – other factors may be examined as a potential mediator for transfer effects. The factors of meaningfulness and reflection are eligible candidates, as they are thought to be important for producing transfer.

An interesting issue is to what extent domain knowledge is necessary for transfer. The transfer literature indicates that the extent of domain knowledge, or the extent to which the knowledge is organized, may influence transfer (Barnett & Ceci, 2002). In the health promotion field, the importance of domain knowledge is unclear, as correct knowledge is considered to be both a prerequisite for healthy behavior and a minor determinant of health behavior, and the extent or nature of the 'necessary' knowledge is unclear. Our curriculum included one 'excursion assignment' that aimed to promote some knowledge of behaviors other than smoking and safe sex. Students were asked to create a poster that would give examples of health behaviors of their choice and would answer the questions: what is healthy or unhealthy about the behavior? why do people (don't) do it (pros and cons)? how many people do it? Due to constraints of questionnaire length, we were unable to measure knowledge in the transfer domains of alcohol, fruit, and breakfast. This issue remains for further research.

In the section on Relevance for theory and research, we raised the conceptual issue 'what constitutes a domain?'. Here, we go on to raise the more practical issue how to deal with 'domain' when trying to teach health education or to promote transfer in health education. Does it work best to focus on a narrowly defined domain, such as tobacco or alcohol, and try to promote transfer from there to other narrowly defined domains? Or is it possible to focus broadly on something like a 'health domain'? Although this specific question, to our knowledge, has not been examined in research and thus remains open for further research, we believe the first approach works best, for several reasons. Firstly, research on learning and instruction has shown that learning works best in a well-defined context (e.g., Brown et al., 1989). Students have to perceive the 'domain' as meaningful in order for them to be able to relate to it. We believe that students can relate better to a narrowly defined domain than to a broad, vague domain. On the other hand, if students are given options to choose, a broad domain may present the student with more options to choose their own behavior of interest. Secondly, various theories and constructs from social psychology (theory of planned behavior, goal setting, implementation intentions) posit that a particular health behavior or action is predicted better as it is defined more narrowly. Thirdly, systematic reviews in the domains of nutrition and sexuality (see chapter 4) have concluded that programs with a specific behavioral focus (e.g., fruit consumption, condom use) are more effective than programs that discuss general nutritional or sexuality issues.

In this thesis we have postulated that transfer-oriented interventions, if effective, are likely to be more efficient than a series of domain-specific interventions. This is because they may produce effects on multiple domains while needing less instruc-

tion time to produce these effects. Further research is needed to examine efficiency and cost-effectiveness from a health promotion perspective, and to examine aspects of feasibility and relieving the burden on schools from the school perspective.

In addition to the proximal determinants targeted by our curriculum, various distal determinants appear to be relevant to multiple behaviors, such as self-esteem and social competence. Indeed, some integrative programs focus on such determinants. Transfer-oriented interventions could be expanded with such determinants, and it would be worthwhile to examine the surplus value and potentially mediating role of these determinants. As such hypothesized underlying determinants may take more time and effort to modify, however, the intervention may require more sessions and a larger number of years. Here, too, issues of efficiency and cost-effectiveness are relevant.

Finally, the study presented in this thesis has focused on the promotion of transfer by designing the teaching-learning process in a certain way. The transfer literature indicates there are large individual differences in the extent or occurrence of transfer (Barnett & Ceci, 2002). Individual characteristics important for transfer include the level and organization of domain knowledge, cognitive abilities or general intelligence, motivation and self-efficacy to learn and apply knowledge and skills, and perhaps even the 'big five' personality traits of conscientiousness, openness to experience, extraversion, emotional stability, and agreeableness (Barnett & Ceci, 2002; Merriam & Leahy, 2005). Student characteristics are thus important to take into account when examining transfer. While some individual characteristics, such as motivation and self-efficacy, may be enhanced by designing the intervention in a specific way, others, such as intelligence, may be less modifiable but still important for selecting the target group.

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References marked with ~ indicate studies included in the review in chapter 3.
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INDEX

SAMENVATTING

Ongezonde gedragingen -zoals roken, overmatig alcoholgebruik, onveilig seksueel gedrag en onvoldoende fruit- en groenteconsumptie- komen veel voor onder jongeren. Voor het bevorderen van gezonde gedragingen zijn talloze interventies beschikbaar, de meeste daarvan zijn gedragsspecifiek. De meeste interventies die zich op jongeren richten zijn bedoeld voor uitvoering op scholen, als een aanvulling op het bestaande curriculum. Scholen worden overladen met verzoeken om zulke interventies uit te voeren, maar zij hebben slechts beperkte capaciteit hiervoor. Het zou efficiënter zijn als één interventie met beperkte onderwijstijd effecten op meerdere gedragsdomeinen tegelijk zou hebben. Hiervoor zou transfergerichte educatie mogelijkheden kunnen bieden.

In dit proefschrift is nagegaan in hoeverre er mogelijkheden zijn voor een transfergerichte benadering van gezondheidseducatie op scholen voor voortgezet onderwijs. De term transfer verwijst naar het toepassen van kennis of vaardigheden in een andere context (bv. op een ander gedragsdomein) dan de context waarbinnen de kennis of vaardigheden werden verworven. Wil een educatieve interventie effecten op meerdere gedragsdomeinen tegelijk bewerkstelligen, dan veronderstelt dit evenwel dat relevante kennis en vaardigheden voor de verschillende gedragsdomeinen een gemeenschappelijke kern bezitten en dat het programma zo kan worden ingericht dat leerlingen de geleerde kennis en vaardigheden ook daadwerkelijk met zich meenemen van het ene gedragsdomein naar het andere.

In dit proefschrift staat de volgende hoofdonderzoeksvraag centraal:

Is het mogelijk om, met een speciaal ontwikkelde transfergerichte interventie over roken en veilig vrijen, effecten op gedrag en gedragsdeterminanten te bewerkstelligen niet alleen in de domeinen roken en veilig vrijen, maar ook in het sterk gerelateerde alcoholdomein en in het minder sterk gerelateerde voedingsdomein?

Deze hoofdonderzoeksvraag werd verdeeld in vier onderzoeksvragen die in diverse deelstudies zijn onderzocht. Hieronder geven we een samenvatting van de resultaten van de diverse studies en de antwoorden op de onderzoeksvragen.

Het transfergerichte curriculum dat we ontwikkelden en evalueerden, bevatte leerinhouden en -activiteiten gericht op twee gedragsdomeinen: roken en veilig vrijen. In de studies werd nagegaan in hoeverre leereffecten optraden binnen de onderwezen domeinen roken en veilig vrijen, en binnen twee gedragsdomeinen die niet expliciet werden onderwezen: alcoholgebruik en gezonde voeding (de zogenaamde

transferdomeinen). De keuze van deze vier domeinen was gebaseerd op twee overwegingen: a) over deze domeinen wordt relatief vaak educatie gegeven op middelbare scholen in Nederland (Dafesh, 2006), en b) op basis van de literatuur die beschikbaar was in de periode dat het onderzoeksplan werd ontwikkeld, mocht worden verwacht dat de sterkte van de associatie tussen deze domeinen zou verschillen. Dit laatste is relevant vanuit het gezichtspunt van transfer, aangezien de transferliteratuur aangeeft dat transfer naar sterk gerelateerde domeinen (in dit geval alcohol) gemakkelijker is te bewerkstelligen dan transfer naar minder sterk gerelateerde domeinen (in dit geval voeding).

Aangezien het voor transfer nodig is dat er enige gelijkenis of associatie bestaat tussen de domeinen, is de eerste fase van het project besteed aan het verkennen van de onderzoeksliteratuur die nader inzicht kon bieden in de mogelijke overeenkomsten en associaties tussen de vier domeinen roken, veilig vrijen, alcoholgebruik en gezonde voeding.

FASE 1: ONDERZOEK NAAR OVEREENKOMSTEN EN ASSOCIATIES TUSSEN DOMEINEN

In fase 1 werden twee onderzoeksvragen onderzocht, die in hoofdstuk 2 tot en met 4 van dit proefschrift worden behandeld. Hoofdstuk 2 en 3 zijn relevant voor de eerste onderzoeksvraag.

Onderzoeksvraag 1: In hoeverre zijn de domeinen roken, veilig vrijen, alcoholgebruik en gezonde voeding geassocieerd op het niveau van gedrag, en welke overeenkomsten tussen deze domeinen zijn er op het niveau van gedragsdeterminanten?

Deze onderzoeksvraag werd onderzocht middels een literatuurreview. Hoofdstuk 2 beschrijft de volledige review van 116 publicaties en gaat in op de mate waarin de domeinen geassocieerd zijn op het niveau van gedrag en op overeenkomsten tussen gedragsdeterminanten. Met betrekking tot associaties op het gedragsniveau bleek uit de reviewresultaten dat roken en alcoholgebruik sterk geassocieerd zijn, en ook geassocieerd zijn met vroegtijdige seks. Echter, gedragsassociaties met veilig vrijen en gezonde voeding waren nauwelijks onderzocht en de reviewresultaten over deze domeinen waren dus onduidelijk.

Met betrekking tot overeenkomsten tussen determinanten bleek uit de review dat meerdere determinanten een positieve, gezondheidsbevorderende invloed hadden in alle vier de domeinen (leven in een twee-oudergezin, steun van ouders, monitoring van gedrag door ouders) en dat één determinant een negatieve, gezondheidsondermijnende invloed had in alle vier de domeinen (emotionele stress). Ook werden enkele andere determinanten geïdentificeerd die vergelijkbaar waren tussen de domeinen; hierop wordt nader ingegaan in hoofdstuk 3.

De bovengenoemde determinanten waren gemeten op een algemene, niet-domeinspecifieke wijze. In hoofdstuk 3 gaan we nader in op overeenkomsten tussen domeinspecifieke determinanten, waarbij we gebruik hebben gemaakt van 87 publicaties uit de bovengenoemde review die zulke determinanten onderzochten. Met domeinspecifieke determinanten bedoelen we determinanten die zijn geoperationali-

seerd in relatie tot een specifiek domein of waarvan de inhoud varieert al naar gelang het domein in kwestie, zoals uitkomstverwachtingen met betrekking tot roken of alcoholgebruik. Ondanks hun domeinspecifieke inhoud kunnen deze determinanten overeenkomst vertonen op een meer algemeen, theoretisch niveau, bijvoorbeeld wat betreft het type uitkomstverwachtingen (verwachtingen met betrekking tot fysieke gevolgen, sociale gevolgen, et cetera). Dit kan relevant zijn voor het bevorderen van transfer, aangezien transferbevorderend leren gaat over het ontdekken en toepassen van generieke aspecten bij het maken van specifieke gedragskeuzes binnen meerdere domeinen.

In de review in hoofdstuk 3 werden diverse domeinspecifieke determinanten geidentificeerd die relevant zijn in alle vier de domeinen. Een negatieve associatie met gezond gedrag werd gevonden voor de overtuiging dat het ongezonde gedrag leidt tot onmiddellijke bevrediging en tot sociale voordelen, terwijl een positieve associatie met gezond gedrag werd gevonden voor waargenomen sociale normen van leeftijdgenoten, waargenomen voorbeeldgedrag van leeftijdgenoten en ouders en eigen effectiviteit ten aanzien van weigervaardigheden. Deze determinanten werden het meest relevant geacht om aandacht aan te besteden in een transfergerichte interventie, om de volgende redenen: a) de determinanten vertoonden overeenkomst tussen de gedragsdomeinen, en b) op deze determinanten is de voorlichting op school al vaak gericht en ze zijn makkelijker veranderbaar dan de algemene, niet-domeinspecifieke determinanten die in hoofdstuk 2 zijn besproken (zoals leven in een twee-oudergezin, etc.).

Naast inzicht in de associaties tussen de gedragingen en de mogelijke overlap in de determinanten ervan, is het voor de uitwerking van een transfergerichte interventie ook behulpzaam inzicht te verwerven in methodieken en mogelijke toepassingen ervan die effectief aangrijpen op de betreffende determinanten. In hoofdstuk 4 stond daarom de volgende onderzoeksvraag centraal:

Onderzoeksvraag 2: Welke effectieve elementen van gezondheidseducatie op school zijn vergelijkbaar tussen de domeinen roken, veilig vrijen, alcoholgebruik en gezonde voeding?

Deze onderzoeksvraag werd beantwoord op basis van een review van 55 reviews. Aangezien het aantal reviews dat zich expliciet richtte op ofwel roken ofwel alcoholgebruik klein was en een groter aantal reviews een bredere focus had op genotmiddelgebruik, zijn de domeinen roken en alcoholgebruik samengevoegd tot het bredere domein van genotmiddelen. In de review werden interventieaspecten onderzocht met betrekking tot: doelen, ontwikkeling, inhoud, methoden, uitvoerder, componenten en intensiteit. Elf elementen bleken toepasbaar binnen alle drie de domeinen genotmiddelen, veilig vrijen en gezonde voeding. Echter, de sterkte van de bewijslast verschilde per element. Voor vijf elementen werd de bewijslast geleverd door sterke reviews: gebruik van theorie, met name de sociaal-cognitieve theorie; aandacht voor cognitieve en gedragsvaardigheden; aandacht voor sociale invloeden, met name sociale normen; training van uitvoerders; en gebruik van meerdere componenten (bv. naast school ook betrokkenheid vanuit de gemeenschap). Ietwat minder consistente bewijslast was er voor twee aanvullende elementen: betrokkenheid

van ouders en een groter aantal lessen. Ten slotte werden voor vier aanvullende elementen ook overeenkomsten tussen de domeinen gevonden, maar de resultaten waren meer speculatief omdat de bewijslast in sommige domeinen berustte op minder robuust uitgevoerde reviews: een focus op specifiek gedrag; aandacht voor determinanten; interactieve methoden; een benadering die alleen ingaat op kennis (dit laatste was een ineffectief element).

De resultaten van de voorbereidende literatuurverkenningen leidden tot de conclusie dat er voldoende overeenkomsten bestonden tussen de vier domeinen -zowel wat betreft gedrag, determinanten als interventiemethoden en –toepassingen-, om een proef te starten met de ontwikkeling van een transfergerichte interventie.

FASE 2: ONTWIKKELING VAN HET TRANSFERGERICHTE CURRICULUM

De volgende fase in het project was het ontwikkelen van een curriculum over roken en veilig vrijen dat specifiek tot doel had om ook transfer naar andere gedragsdomeinen te bevorderen. Bij het ontwikkelen van het curriculum werd geput uit meerdere bronnen van informatie en expertise: de resultaten van de literatuurreviews (hoofdstuk 2, 3 en 4), bestaande Nederlandse evidence-based schoolinterventies over roken en veilig vrijen, psychologische theorieën over het verklaren en veranderen van gedrag, resultaten en theorieën uit de leerpsychologie over condities die transfer bevorderen, en expertise van methodiek- en materiaalontwikkelaars die ervaring hadden met de doelgroep.

De doelgroep waarvoor uiteindelijk is gekozen, waren leerlingen en docenten in klas 2 van havo-vwo. Het curriculum, genaamd ‘Multiple Choice 4 U’, bevatte een docentenhandleiding, een leerlingenboek, een video en een docententraining. Het was opgezet als een curriculum van 10 lessen. Na een inleidende les (les 1), richtte het zich achtereenvolgens op de preventie van roken (les 2-5) en onveilig vrijen (les 6-10). De lessen waren interactief, er werd grotendeels gewerkt in tweetallen of kleine groepen, en meerdere methodieken werden gebruikt.

Het curriculum richtte zich hoofdzakelijk op drie psychosociale constructen: attitude (korte-termijn lichamelijke, sociale en andere gevolgen, gezondheidsrisico’s en geanticipeerde spijt), sociale invloeden (waargenomen gedrag van anderen, sociale normen, sociale druk van leeftijdgenoten) en eigen effectiviteit (risicovolle situaties, weiger- en onderhandelvaardigheden, vaardigheden om condooms te gebruiken). Hieraan werd aandacht besteed op zowel een domeinspecifieke manier met betrekking tot roken en veilig vrijen als op een algemene manier.

In het curriculum zaten meerdere teksten en opdrachten die bedoeld waren om transfer naar andere gedragsdomeinen te bevorderen. Hieraan lagen de volgende effectcondities voor transferbevordernd leren ten grondslag: a) decontextualisatie, b) recontextualisatie, c) betekenisvolheid, en d) reflectie.

Decontextualisatie betekent dat de leerinhoud op een algemene, niet-domeinspecifeke manier wordt aangeboden. Vanaf de eerste les werd de transferboodschap benadrukt dat het curriculum niet alleen gaat over roken en veilig vrijen, maar ook relevant is voor allerlei andere gezondheidsgedragingen. Door het hele curriculum heen waren er teksten en opdrachten die specifiek ingingen op algemene cognitieve en gedragsmatige vaardigheden met betrekking tot besluitvorming, pro-

bleem oplossen en weigeren en onderhandelen. Het moment waarop elke algemene vaardigheid werd geïntroduceerd, was zorgvuldig afgestemd op de domeinspecifieke inhoud over roken en seks waarvoor de vaardigheid relevant was. De algemene vaardigheden werden zo op een natuurlijke manier vervlochten met domeinspecifieke teksten en opdrachten, terwijl met een achtergrondkleur hun algemene karakter visueel werd aangegeven.

Recontextualisatie betekent dat de leerinhoud wordt toegepast op een nieuwe gedragscontext. Door het hele curriculum heen waren er zogenoemde 'uitstapjes'-opdrachten, die leerlingen aanzetten tot nadenken over of en hoe de algemene vaardigheden ook kunnen worden toegepast op andere gedragingen dan roken en veilig vrijen. In veel gevallen bouwden de uitstapjesopdrachten voort op eerdere domeinspecifieke opdrachten over roken of veilig vrijen.

Persoonlijke betekenisvolheid van het geleerde werd gestimuleerd door leerlingen eigen keuzes te laten maken bij opdrachtuitvoering, door te vragen naar hun eigen mening en voorbeelden uit hun eigen leven, door leerlingen eigen oplossingen te laten bedenken voor dilemmasituaties, en door discussie en samenwerking tussen leerlingen te stimuleren.

Reflectie op de leerinhoud en op persoonlijke relevantie werd op diverse manieren gestimuleerd, onder andere via discussie, uitstapjesopdrachten en logboekvragen over de bruikbaarheid van de leerinhoud voor het eigen leven.

De docentenhandleiding bevatte achtergrondinformatie over condities voor transferbevorderend leren en handelingsvoorschriften voor de uitvoering van de opdrachten. Instructies die relevant waren voor transfer (bv. over uitstapjesopdrachten) werden benadrukt met behulp van een achtergrondkleur. De docententraining, die drie uur duurde, was vooral gericht op informatie en discussie over de condities voor transfer, over kritieke leeractiviteiten in het curriculum en over benodigde handelingen voor het onderzoek.

Het bovenbeschreven curriculum werd ontwikkeld nadat een eerder ontwikkeld prototype van het curriculum in een pilotonderzoek was uitgetest onder zes docenten van vijf vmbo-scholen in 11 tweede klassen.
Het pilotonderzoek diende meerdere doelen: a) om de mening van docenten en leerlingen te achterhalen over aantrekkelijkheid en praktische uitvoerbaarheid van het curriculum (formatieve evaluatie), b) om de psychometrische eigenschappen te onderzoeken van een concept vragenlijst voor leerlingen die later in de effectstudie zou worden gebruikt, en c) om de resultaten op de voor- en nameting van de conceptvragenlijst te analyseren, hetgeen een indicatie zou geven van de potentiële effectiviteit. Op basis van de uitkomsten van deze pilot werd een grondige herziening van het curriculum overwogen en doorgezet. Dit leidde tot de keuze van leerlingen van havo-vwo als primaire doelgroep van het curriculum, en tot verbeteringen met betrekking tot praktische uitvoerbaarheid voor docenten en operationalisatie van de transferbevorderende condities.

FASE 3: ONDERZOEK NAAR DE EFFECTIVITEIT VAN HET CURRICULUM

In hoofdstuk 5 is de effectstudie van het transfergerichte curriculum beschreven, die antwoord geeft op de derde onderzoeksvraag.

Onderzoeksvraag 3: In welke mate is een transfergericht curriculum over roken en veilig vrijen effectief in het veranderen van gedrag en gedragsdeterminanten in de domeinen van roken en veilig vrijen, en in het sterk gerelateerde domein van alcoholgebruik en de minder sterk gerelateerde domeinen van fruit- en ontbijtconsumptie?

Dit werd onderzocht in een grootschalige effectstudie onder 1107 leerlingen in klas 1 en 2 van 23 scholen voor havo-vwo. In een quasi-experimentele onderzoeksopzet werden 33 docenten toegewezen aan een experimentele conditie (Exp) –het transfergerichte curriculum- of aan een controleconditie (Con) waarin docenten hun reguliere lessen over roken en veilig vrijen gaven. Leerlingendata werden verzameld in drie metingen met behulp van zelfrapportage vragenlijsten (voormeting, eerste nameting, tweede nameting). De docenten kregen de instructie om tussen de voormeting en de eerste nameting het experimentele curriculum te onderwijzen (Exp) of hun eigen lessen over roken en veilig vrijen (Con); zij mochten in die periode geen lessen geven over alcohol of voeding. De eerste nameting werd afgenomen binnen één maand na het eind van de lessen, de tweede nameting gemiddeld vier maanden na het eind van de lessen. De uitval van leerlingen op de eerste en tweede nameting (respectievelijk 12% en 33%) verschilde niet tussen de condities.

Bij elke meting werd gevraagd naar gedrag en psychosociale determinanten voor elk van de vijf onderzochte gedragsdomeinen (roken, veilig vrijen, alcohol-, fruit- en ontbijtconsumptie). De psychosociale determinanten waren: kennis (alleen gemeten voor de domeinen roken en veilig vrijen), attitude, uitkomstverwachtingen, risicoverwachting, geanticipeerde spijt, eigen effectiviteit, prescriptieve sociale normen van ouders en vrienden en intentie. Vanwege het grote aantal psychosociale determinanten is voor elk domein één composietmaat van determinanten berekend door de standaardscores van de psychosociale determinanten per domein te middelen. Deze composietmaat bestond uit alle determinanten, behalve de kennismaat in de domeinen roken en veilig vrijen, en werd in analyses gebruikt als een benadering van multivariate toetsing van effecten op het niveau van determinanten. Docenten werd gevraagd het aantal gegeven lessen voor elk van de domeinen te noteren.

De eindresultaten zijn multilevel getoetst (leerlingen genest binnen docenten) en gecontroleerd voor diverse factoren op leerlingniveau (onder andere demografische factoren en voormetingscores). In analyses over de alcohol- en voedingsdomeinen werd ook gecontroleerd voor instructietijd voor deze domeinen.

In het rokendomein werden statistisch significante positieve interventie-effecten gevonden op gedrag bij zowel de eerste als de tweede nameting. Op beide meetmomenten werden ook significante effecten gevonden op de composietmaat van determinanten. Wat betreft de afzonderlijke determinanten werden bij de eerste nameting significante effecten gevonden op drie factoren (uitkomstverwachtingen, geanticipeerde spijt, intentie) en bij de tweede nameting op vier factoren (kennis, uitkomstverwachtingen, risicoverwachting en eigen effectiviteit).
In het veilig vrijendomein toonden de resultaten op de eerste nameting dat minder leerlingen in de experimentele groep recente ervaring hadden met geslachtsgemeenschap dan de leerlingen in de controlegroep. Op geen van beide nametingen werden

andere effecten gevonden op seksueel gedrag of op de composietmaat van determinanten.

Wat betreft gedragseffecten in het alcoholdomein werd op de eerste nameting een bij benadering statistisch significant effect gevonden op de frequentie van alcoholgebruik. Bij de tweede nameting werden significante effecten gevonden voor zowel frequentie van alcoholgebruik als overmatig drinken (binge drinking). Op beide nametingen werd een statistisch significant effect gevonden op de composietmaat van determinanten van alcoholgebruik. Effecten op de afzonderlijke gedragsdeterminanten werden geobserveerd voor twee determinanten bij de eerste nameting (geanticipeerde spijt, eigen effectiviteit) en bij de tweede nameting (geanticipeerde spijt, intentie). Voorts werden enkele marginaal significante effecten gevonden (op uitkomstverwachtingen op de eerste nameting, en op sociale norm en eigen effectiviteit op de tweede nameting).

Voor fruitconsumptie en ontbijtgedrag werden op de nametingen geen gedragseffecten gevonden. Wel waren er significante effecten op de composietmaat in beide domeinen op beide meetmomenten. In het fruitdomein waren er gewenste interventie-effecten op twee tot drie determinanten bij elke nameting: op uitkomstverwachtingen en geanticipeerde spijt bij de eerste nameting, en op attitude en eigen effectiviteit bij de tweede nameting. Significante effecten op determinanten in het ontbijtdomein werden gevonden voor attitude, risicoverwachting en eigen effectiviteit bij de eerste nameting, en voor attitude, uitkomstverwachtingen en eigen effectiviteit bij de tweede nameting.

De resultaten in de alcohol- en voedingsdomeinen geven duidelijk aan dat beoogde transfereffecten zijn opgetreden. De effecten in het alcoholdomein zijn sterker dan die in de voedingsdomeinen: dit blijkt uit de gevonden gedragseffecten en een grotere effectgrootte op de composietmaat van determinanten in het alcoholdomein in vergelijking met de voedingsdomeinen. Dit resultaat is in overeenstemming met onze verwachting dat transfer meer waarschijnlijk is naar domeinen die sterk gerelateerd zijn aan het oorspronkelijke leerdomein dan naar domeinen die daarmee minder sterk geassocieerd zijn.

De relatieve afwezigheid van effecten in het veilig vrijendomein was verrassend. Mogelijk waren de lessen over veilig vrijen in ons curriculum minder sterk dan de lessen over veilig vrijen in de controlegroep, maar daarover bestaan geen gegevens. Een andere verklaring kan zijn dat de kwaliteit van de implementatie van de experimentele lessen over veilig vrijen lager was dan die van de lessen over roken. Sommige docenten rapporteerden namelijk een lagere graad van implementatie van de veilig vrijenlessen. Dit kwam vooral doordat het curriculum in de praktijk meer tijd bleek te vergen dan de vooraf geplande tien lessen. Hierdoor zijn meerdere docenten in tijdnood gekomen bij de uitvoering van de latere lessen over veilig vrijen. Gemiddeld hebben de docenten in de experimentele groep in totaal 14 lessen aan het curriculum besteed.

Aangezien we in de effectstudie transfereffecten vonden in de alcohol- en voedingsdomeinen, hebben we vervolgens mediatiemechanismen onderzocht die mogelijk kunnen verklaren hoe de transfereffecten tot stand zijn gekomen. De mediatiestudie gaat in op onderzoeksvraag 4 en is beschreven in hoofdstuk 6.

Onderzoeksvraag 4: In hoeverre zijn transfereffecten in het sterk gerelateerde alcoholdomein en in de minder sterk gerelateerde domeinen van fruit- en ontbijtconsumptie gemedieerd door leerervaringen van leerlingen met betrekking tot cognitief-gedragsmatige vaardigheden?

De mediatiestudie werd uitgevoerd met de data van de effectstudie. In de studie werd onderzocht in welke mate leerlingen op de eerste nameting een leerervaring met betrekking tot een algemene cognitief-gedragsmatige vaardigheid hadden gerapporteerd, en in welke mate deze leerervaringen de interventie-effecten op de tweede nameting in de alcohol- en voedingsdomeinen medieerden.

In de vragenlijst op de eerste nameting werden zulke leerervaringen gemeten met twee typen *learner reports* ("Wat heb je in de lessen geleerd?"). In één type, het zogenoemde gesloten learner report (GLR), werd leerlingen gevraagd om de meest belangrijke dingen (maximaal vier) die ze in de lessen hadden geleerd aan te kruisen in een lijst van tien stellingen: vijf stellingen gingen over een algemene vaardigheid, twee stellingen gingen specifiek over roken en drie gingen specifiek over veilig vrijen. Het aantal stellingen over algemene vaardigheden dat de leerling had aangekruist (0-4) werd als variabele gebruikt in de analyses. In het tweede type learner report, het zogenoemde open learner report (OLR), werd dezelfde vraag gesteld maar dan in een open format; ook nu mochten leerlingen weer maximaal 4 dingen noemen die zij geleerd hadden. De antwoorden op deze vraag werden kwalitatief gecodeerd als zijnde wel/niet een weerspiegeling van een algemene vaardigheid en deze scores werden vervolgens gesommeerd. Omdat de gesommeerde scores ongelijk waren verdeeld over de experimentele en controlegroep, werd deze variabele later gedichotomiseerd (wel/niet een algemene vaardigheid genoemd in minstens één van de antwoorden). Als mogelijke mediatoren werden aldus twee variabelen onderzocht: de totale score van algemene principes in het GLR (0-4) en de dichotome maat voor algemene principes in het OLR (0-1).

Er wordt gesproken van een mediatie-effect als aan drie condities is voldaan: 1) de interventie heeft een statistisch significant effect op de uitkomstvariabele, 2) de interventie heeft een significant effect op de veronderstelde mediator, 3) de veronderstelde mediator is statistisch significant geassocieerd met de uitkomstvariabele na correctie voor de interventieconditie.

De mediatieanalyses, waarin gecontroleerd werd voor dezelfde covariaten als in de effectanalyses in de effectstudie, lieten zien dat er geen indicatie was voor mediatie door de GLR variabele. Hoewel aan mediatie-condities 1 en 2 werd voldaan voor diverse uitkomstvariabelen, bleek geen van de uitkomstvariabelen significant geassocieerd met de GLR-variabele (aan mediatie-conditie 3 werd dus niet voldaan).

Voor de OLR variabele waren de resultaten meer complex, aangezien ze afhingen van het domein en van de specifieke uitkomstvariabele. In het alcoholdomein was er geen indicatie van mediatie door de OLR variabele: hoewel aan mediatie-condities 1 en 2 werd voldaan, was geen van de uitkomstvariabelen significant geassocieerd met de OLR variabele (aan mediatie-conditie 3 was niet voldaan). In het fruitdomein werd wel een mediatie-effect gevonden voor de composietmaat van determinanten. In het ontbijtdomein werd een mediatie-effect gevonden voor de

uitkomstmaat uitkomstverwachtingen, en een marginaal significant mediatie-effect voor de composietmaat van determinanten.

Deze resultaten wijzen op twee belangrijke bevindingen. De eerste bevinding is dat de OLR variabele een sterkere indicator lijkt te zijn van persoonlijke leerervaringen dan de GLR variabele. De tweede bevinding is dat interventie-effecten in het alcoholdomein versus de voedingsdomeinen lijken te zijn bewerkstelligd door verschillende mechanismen. Persoonlijke leerervaringen met betrekking tot cognitief-gedragsmatige vaardigheden hebben bijgedragen aan veranderingen in tenminste sommige voedingsuitkomstmaten, terwijl interventie-effecten in het alcoholdomein, hoewel frequenter en groter, op een minder cognitief bewuste en meer automatische wijze lijken te zijn bewerkstelligd.

Mogelijk was de alcoholcontext voor de leerlingen voldoende vergelijkbaar met de expliciet onderwezen contexten (roken en veilig vrijen) om de geleerde kennis en vaardigheden te kunnen toepassen op de alcoholcontext zonder deze eerst bewust te generaliseren. Dit indiceert mogelijk dat zelfs domeinspecifieke interventies transfereffecten kunnen bewerkstelligen op nabije gedragdomeinen –zelfs als zulke transfereffecten niet expliciet zijn nagestreefd. Een expliciete transfergerichte aanpak zal daarentegen wel nodig zijn indien men daarnaast ook effecten wil bewerkstelligen in verder weg gelegen gedragsdomeinen Meer interventieonderzoek, met betrekking tot zowel transfergerichte als domeinspecifieke interventies, is nodig om deze intrigerende, maar vooralsnog tentatieve conclusie te staven.

DISCUSSIE

In het laatste hoofdstuk van dit proefschrift is ingegaan op de relevantie van de bevindingen voor praktijk, onderzoek en theorievorming en zijn aanbevelingen voor verder onderzoek gegeven.

Relevantie voor de praktijk

Een transfergerichte benadering van gezondheidseducatie op school is zeer relevant voor de onderwijspraktijk omdat deze in potentie efficiënter en kosteneffectiever is dan het aanbieden van meerdere, domeinspecifieke interventies. Immers, met een enkele interventie kunnen effecten op meerdere gedragsdomeinen worden bereikt. Vanuit dit oogpunt past een transfergerichte benadering goed in het overheidsbeleid ten aanzien van gezondheidsbevordering en onderwijs. Gezondheidsbevorderende instellingen, die in Nederland domeinspecifiek georganiseerd zijn, zijn ook geïnteresseerd in deze benadering, niet in het minst daar zij door de overheid meer en meer worden aangezet tot onderlinge samenwerking.

De door ons ontwikkelde transfergerichte interventie diende vooral een onderzoeksdoel en was niet bij voorbaat bedoeld voor grootschalige implementatie in de praktijk. Grootschalige implementatie van de interventie lijkt ook niet mogelijk, enerzijds door de grote concurrentie van bestaande interventies en anderzijds omdat docenten in onze studie aangaven dat zij de combinatie van de onderwerpen roken en veilig vrijen vreemd vonden; een combinatie van roken en alcohol lag voor hen meer voor de hand. De interventie en de studie geven wel aanwijzingen voor de wij-

ze waarop transfer kan worden bevorderd in bestaande of nieuw te ontwikkelen interventies. In onze ogen zijn twee transferbevorderende condities tot op zekere hoogte al verwerkt in sommige bestaande domeinspecifieke interventies: betekenisvolheid en reflectie. Zo worden in deze interventies interactieve methodieken gebruikt en wordt ingegaan op persoonlijke meningen en ervaringen van leerlingen en bruikbaarheid van de lesstof voor het eigen leven. Deze interventies proberen bij de leerlingen transfer van kennis en vaardigheden te stimuleren van de klascontext naar de buitenschoolse context waar het gedrag in kwestie zich afspeelt. Het belangrijkste verschil met onze interventie is dat deze interventies enkel domeinspecifiek gericht zijn en niet aanzetten tot het decontextualiseren en recontextualiseren van de lesstof. Deze interventies richtten zich wel veelal op dezelfde gedragsdeterminanten als in onze interventie –attitude, sociale invloed en eigen effectiviteit- en gaan soms ook in op vergelijkbare cognitief-gedragsmatige vaardigheden, maar dan enkel op een impliciete en een domeinspecifieke manier. Om deze reden verwachten wij dat het relatief weinig moeite zou kosten om decontextualiseren en recontextualiseren expliciet in te bouwen in deze interventies. De minimale omvang van de docententraining in onze studie (3 uur) wijst erop dat een transferbenadering niet veel extra training van docenten vereist.

Relevantie voor theorievorming en onderzoek

De reviews in hoofdstuk 2-4 geven een uitgebreid overzicht van gedragsdeterminanten en effectieve interventie-elementen in de vier onderzochte gedragsdomeinen: roken, veilig vrijen, alcoholgebruik en gezonde voeding. De resultaten van de reviews zijn bruikbaar voor onderzoekers en interventie-ontwikkelaars in al deze domeinen en kunnen hen mogelijk stimuleren om breder te kijken dan hun eigen domein.

In deze studie zijn theorie en onderzoek op de terreinen van gezondheidsbevordering en sociale psychologie gecombineerd met theorie en onderzoek op het terrein van onderwijswetenschappen. De effect- en mediatiestudie in hoofdstuk 5 en 6 geven inzicht in de mate waarin en de mechanismen waarmee transfereffecten kunnen worden gerealiseerd in nabije en verder weg gelegen domeinen. Deze inzichten kunnen mogelijk bijdragen aan theorievorming en onderzoek met betrekking tot integratieve benaderingen op het terrein van gezondheidsbevordering.

Deze studie was toegepast van aard, niet conceptueel. Desalniettemin zou de studie, als een voorbeeldstudie van transfer, door theoretici mogelijk gebruikt kunnen worden om bij te dragen aan een conceptuele discussie over definitie en operationalisatie van de begrippen nabije en verre transfer. De discussie over het onderscheid tussen nabije en verre transfer en de mate waarin nabije en verre transfer optreden, is al meer dan honderd jaar gaande (Barnet & Ceci, 2002). Deze discussie wordt bemoeilijkt doordat deze begrippen, alsook relevante begrippen zoals ‘overeenkomst’, ‘vergelijkbaarheid’ en ‘domein’, moeilijk te definiëren zijn. Conceptualisatie en operationalisatie van deze begrippen is nodig om de discussie over nabije en verre transfer verder te helpen.

Aanbevelingen voor verder onderzoek

Aangezien deze studie, voor zover wij weten, de eerste was waarin een transferbenadering op het terrein van gezondheidsbevordering expliciet is onderzocht, zijn er veel mogelijkheden voor nader onderzoek.

Een nader uit te werken onderzoeksvraag luidt in hoeverre de gevonden effecten clusteren per type uitkomstmaat en per domein. Een eerste aanzet daartoe kan al gemaakt worden op basis van de data die dit project voortbracht.

Gezien de positieve resultaten van deze studie is het wenselijk dat meer effectstudies worden uitgevoerd naar transfergerichte benaderingen op het terrein van gezondheidsbevordering. Bij voorkeur zouden dergelijke studies zich moeten richten op een groter aantal domeinen, een langere termijn en diverse groepen leerlingen.

Wat betreft de inhoud van de interventie zou ook aandacht kunnen worden besteed aan distale determinanten (bijvoorbeeld zelfwaardering of sociale vaardigheden) die relevant zijn voor meerdere gezondheidsgedragingen, al zal er mogelijk meer onderwijstijd geïnvesteerd moeten worden om die determinanten te veranderen.

Met betrekking tot transfergerichte interventies verdient het aanbeveling om te onderzoeken in hoeverre zij daadwerkelijk efficiënter en kosteneffectiever zijn dan het uitvoeren van meerdere domeinspecifieke interventies.

De resultaten van de mediatiestudie lijken te suggereren dat transfereffecten in zeer nabije gedragsdomeinen misschien zelfs mogelijk zijn bij domeinspecifieke interventies. Het zou dan ook wenselijk zijn om in effectstudies van domeinspecifieke interventies zulke potentiële transfereffecten naar nabije domeinen te onderzoeken. Voor een onderbouwde keuze van de te onderzoeken domeinen in zowel transfergerichte als domeinspecifieke interventiestudies is het aanbevelenswaardig dat er een overzicht komt van de mate van onderlinge associatie tussen een hele range aan gezondheidsgedragingen. Hierbij zouden ook andere gedragingen kunnen worden onderzocht die relevant zijn voor het onderwijs, zoals spijbelen.

Met het oog op het begrijpen van mechanismen van transfer is onderzoek gewenst naar mediatoren van transfereffecten. Als potentiële mediator kan gedacht worden aan kennis van algemene vaardigheden –als een aanvulling op de door ons onderzochte leerervaringen met betrekking tot algemene vaardigheden-, alsmede aan betekenisvolheid en reflectie.

In dit proefschrift ging de aandacht met betrekking tot transfer uit naar de wijze waarop transfer kan worden bevorderd door het onderwijsleerproces op een bepaalde manier in te richten. De literatuur over transfer geeft aan dat er grote individuele verschillen zijn in de mate waarin transfer optreedt. Het verdient dan ook aanbeveling om in onderzoek naar transfer aandacht te besteden aan het belang van individuele verschillen in leerlingkenmerken, zoals de mate van domeinkennis, intelligentie en motivatie.

CURRICULUM VITAE

Louk Peters (1964, Heerlen, The Netherlands) graduated from high school at the St. Bernardinuscollege in Heerlen in 1983. From 1983 to 1989 he studied Psychology at the Catholic University Nijmegen, from which he received his master's degree in Social Psychology in 1989. Since then he has been working in the field of health promotion. From 1990 to 1995 he worked as a research assistant at the Maastricht University Department of Health Education on projects about Aids education and tobacco prevention in schools. In 1996 he started working as a researcher at the Netherlands Institute for Health Promotion and Disease Prevention (NIGZ) in Woerden. In that position, he conducted review studies on many health promotion topics (tobacco, alcohol, sexual health, obesity, nutrition, physical activity, safety, skin cancer, diabetes management) for various sponsoring organizations and was involved in the development of quality assurance instruments for health promotion (Preffi 2.0, Empowerment Quality Instrument, schoolBeat checklist). From March 2003 to September 2007, he worked part-time as a PhD-student at the Graduate School of Teaching and Learning of the University of Amsterdam, while continuing his work at NIGZ. His PhD project pertained to the development and evaluation of transfer-oriented learning in health education at secondary schools. Since May 2007, he is employed by TNO (Netherlands Organisation for Applied Scientific Research) in Leiden, where he has been involved in various research projects in the field of health promotion (obesity prevention in primary schools, life skills training in secondary schools, self-management among adolescents with diabetes or muscular disease, safe sex promotion among young men who have sex with men). Also, he is continuing his work on transfer-oriented learning in health education. In January 2012, he started a project comprising the development and evaluation of a transfer-oriented version of the Healthy School and Drugs program.

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