Settings-based Behavior Change Interventions for Chronic Disease Risk Reduction and Health Promotion

Habilitationsschrift
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"Sei Du selbst. Alle anderen Möglichkeiten sind schon vergeben."

_Oscar Wilde_

"Ideen verwandeln die Menschen nicht. Es ist die Freiheit von Ideen, die Transformation bewirkt."

_Krishnamurti_
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Overview of the Habilitation

The body of work presented here focuses on various types of **settings-based interventions for chronic disease risk reduction and for health promotion**. Specifically, results of various studies examining the development, implementation and impact of behavior change interventions in various contexts (hospitals, schools, universities, churches, communities) and at various levels (individual, environment) ranging from tertiary to primary prevention of chronic diseases are included in this habilitation. Reflecting the spectrum of preventive interventions, outcomes assessed in these studies range from changes in clinical events to changes in non-communicable disease risk factors and in individual health behaviors and the environment. The publications included here are organized as follows: Firstly, two publications are presented that are based on two **hospital-based U.S. studies**, a multi-site controlled intervention study of persons with diagnosed coronary heart disease (CHD) participating in the **Multicenter Lifestyle Demonstration Project (MLDP)** and a prospective cohort study nested within a larger cohort of persons at risk for CHD and with CHD participating in the health-insurance-administered **Multisite Cardiac Lifestyle Intervention Program (MCLIP)**. These publications address how intensive lifestyle changes (i.e., low-fat, complex-carbohydrate diet, exercise, smoking cessation, stress reduction) can delay the need for surgical procedures (Pischke, Elliott-Eller, Li, Mendell, Ornish, & Weidner, 2010) and lead to changes in risk markers of CHD (Chainani-Wu et al., 2011).

The second part of the habilitation includes six articles revolving around formative work involved in the design process of behavior change interventions in various national and social contexts, settings (i.e., schools, churches, communities, daycare facilities), and populations. This work usually precedes studies (with rigorous study designs) testing the efficacy and effectiveness of an intervention. Papers included describe the **application of theory** to a step-wise design of an intervention (Nagler et al., 2013), **focus groups with the target population** to test how to best communicate health-related messages in a future intervention (Pischke et al., 2013), results of an **exploratory survey** to examine the role of specific factors in carrying out health behavior in a certain population (Allen et al., 2014), two **reviews of reviews** summarizing evidence on successful components of existing community- or daycare-based interventions (Brand et al., 2014; Steenbock, Pischke, Schönbach, Pöttgen, & Brand, 2015), and results of a **small pilot study** examining first steps in the implementation of an intervention for health promotion in the daycare setting (Steenbock, Zeeb, Liedtke, & Pischke, 2015). In the first article, the development of a theory-based intervention for smoking cessation among school personnel in Bihar, India, is described (Nagler et al., 2013). In the second article, perceptions of tobacco use among teachers in Bihar are qualitatively explored and various message formats to communicate risk information regarding tobacco use to be used in a
future intervention are tested (Pischke et al., 2013). Both articles are based on qualitative formative work for the *Bihar School Teacher’s Study (BSTS)*, a large-scale cluster-randomized trial implementing a tobacco use cessation intervention at 72 schools in Bihar, India. The third article is based on a small pilot study examining the role of churches as a promising setting for cancer control efforts among church-going Latinas in the U.S. (Allen et al., 2014). Specifically, religiousness and religious coping in cancer screening behaviors are examined in a survey with female Spanish-speaking members of a Baptist church in Boston. The following two articles included in this part of the habilitation are two review of reviews on successful components of existing interventions for the promotion of a physical activity and healthy eating among children, adolescents, and adults in communities (Brand et al., 2014) and among children in daycare facilities (Steenbock, Pischke, Schönbach, Pöttgen, & Brand, 2015). In the last article, included in this section, results of a small pilot study examining factors affecting implementation of a program for health promotion targeting preschoolers at selected daycare facilities are presented (Steenbock, Zeeb, Liedtke, & Pischke, 2015). Findings of the last three articles included in this section informed the development of multi-level interventions for the promotion of physical activity and healthy eating in these two settings in Germany.

The third part of the habilitation includes four articles on health promotion in the university setting and one review of reviews summarizing existing evidence on interventions for the prevention of substance use in the school setting. The intervention outlined in the first four articles goes beyond individual health behavior change and is aimed at environmental change. Specifically, existing social norms regarding substance use in the university setting are the focus of the intervention. The papers included in this part of the habilitation are based on the *Social Norms for the Prevention of PolyDrug Use study (SNIPE)*, a multi-site cluster controlled trial of a web-based social norms intervention aimed at reducing licit and preventing illicit substance use among European university and college students. In this study, prevalences of substance use were compared in seven European countries and perceptions of peer consumption rates and their influence on individual substance use behavior were assessed. A further aim of the study was to develop an online ‘social norms’ intervention and to examine the feasibility of this intervention in these countries. In the first article, the study design and the design process for the web-based ‘social norms’ intervention are described (Pischke et al., 2012). In the three subsequent articles, baseline results regarding students’ estimations of substance use in their peer group, personal rates of use, and cross-sectional associations of these two factors are described (alcohol: Stock et al., 2014; tobacco: Pischke et al., 2015; cannabis: Dempsey et al., under review). The fifth article is a review of review examining the nature, efficacy and effectiveness of existing interventions for the prevention and reduction of substance use in schools (Pöttgen, Brand, Samkange-Zeeb, Steenbock, & Pischke, 2015). This review of the existing literature will inform future
development of a multi-level intervention for the prevention of substance use among students in primary and secondary schools in Germany.

My contributions to the work presented in the three parts of this habilitation varied, depending on the time in the intervention development, implementation, or evaluation phases that I joined the respective research teams. In the MLDP and the MCLIP studies, my role in the two articles included here was to analyze the data and to write or contribute to writing up the results looking at intervention effects in various subgroups (Chainani-Wu et al., 2011; Pischke, Elliott-Eller, Li, Mendell, Ornish, & Weidner, 2010). At the Center for Community-based Research (Boston, MA), I was involved in the development of the intervention for smoking cessation targeting teachers in Bihar, India (Nagler et al., 2013) which was subsequently evaluated in the BSTS and I also analyzed the qualitative data from formative research preceding intervention development (Pischke et al., 2013). In addition, I contributed to the development of an analysis plan and the writing of the third article included in this section (Allen et al., 2014). In regard to the small pilot study examining first steps in the implementation of an intervention for health promotion in the daycare setting, I lead the research effort associated with this study (Steenbock, Zeeb, Liedtke, & Pischke, 2015). The intervention had been previously developed by the AOK health insurance in collaboration with researchers in the fields of diet, physical activity, and stress reduction.

The reviews of reviews included in both the second and third parts of the habilitation (Brand et al., 2014; Pöttgen et al., 2015; Steenbock, Pischke, Schönbach, Pöttgen, & Brand, 2015) were created by a team of researchers from my group and the “Social Epidemiology” group at the Leibniz-Institute for Prevention Research and Epidemiology (BIPS). I contributed to varying degrees to analysis and writing of these literature reviews. In the SNIPE study, I was involved in intervention development, implementation, data analysis, and evaluation, working closely together with my team (Dempsey et al., under review; Pischke et al., 2012; Pischke et al., 2015; Stock et al., 2014).
1 Introduction

Non-communicable diseases (NCDs), such as cardiovascular diseases (CVDs), type II diabetes, cancers, are the world’s leading causes for mortality. According to the World Health Organization (WHO), 36 million people died from NCDs worldwide in 2008 which represents 63% of all annual global deaths (WHO, 2010; WHO, 2013). Forty-eight percent of these deaths were due to cardiovascular diseases, 3.5% due to diabetes, 21% due to cancers, and 12% were caused by chronic respiratory diseases.

NCDs are largely preventable. Four main risk factors attribute to the etiology and prognosis of NCDs: Unhealthy diet, physical inactivity, tobacco use and harmful alcohol use (WHO, 2013). In an attempt to address these risk factors, the WHO recently proposed a global action plan to reach the following goals by 2025: a.) a reduction of harmful alcohol use by 10%, b.) a 10% relative reduction in rates of physical inactivity, c.) a 30% reduction in the prevalence of current tobacco use among people over the age of 15 years, and d.) a halt in the rise of diabetes and obesity. Additional targets to curb premature mortality include a 30% reduction in mean population intake of sodium, a 25% reduction of raised blood pressure, >50% of all eligible people receiving drug therapy and counselling to prevent heart attacks and strokes, and an 80% availability of drugs and technologies to treat those diseases. Taken together, these changes are expected to lead to an overall 25% relative reduction in risk of premature mortality from NCDs worldwide. Furthermore, a recently published article based on the data of the Global Burden of Diseases, Risk Factors and Injuries (GBD) 2013 Study which projected CVD mortality for 188 countries up to the year 2025 estimates a 5.7 million reduction of premature CVD deaths if these targets are met by 2025 (Roth, Nguyen, Forouzanfar, Mokdad, Naghavi, & Murray, 2015).

To achieve these targets, the WHO outlined six steps (WHO 2013):

1.) To raise the priority accorded to the prevention and control of NCDs in global, regional, and national agendas and internationally agreed development goals through strengthened international cooperation and advocacy.

2.) To strengthen national capacity, leadership, governance, multi-sectoral action and partnership to accelerate country response for the prevention and control of NCDs.

3.) To reduce modifiable risk factors for NCDs and underlying social determinants through creation of health promoting environments.
4) To strengthen and orient health systems to address the prevention and control of NCDs and the underlying social determinants through people-centered primary health care and universal health coverage.

5.) To promote and support national capacity for high-quality research and development for the prevention and control of NCDs.

6.) To monitor the trends and determinants of NCDs and evaluate progress in their prevention and control.

Two of these steps pertain, in part, to this body of work, namely steps 3 and 4. Because the habilitation is structured to firstly present the work on chronic disease risk reduction and secondly research regarding primary prevention and/or health promotion, step 4 is outlined first followed by step 3.

Step 4 suggests a new orientation of primary health care towards the prevention and control of NCDs which is people-centered. Two articles based on two demonstration projects are included in this habilitation which focused on establishing lifestyle interventions for the modification of NCD risk factors in the U.S. health care system. These two demonstration projects were the Multicenter Lifestyle Demonstration Project (MLDP) targeting persons with established CHD (n=440) and the Multisite Cardiac Lifestyle Intervention Program (MCLIP) targeting patients with CHD (n=1152; Frattaroli, Weidner, Merritt-Worden, Frenda, & Ornish, 2008) and those at risk for CHD (n=997; Pischke, Frenda, Ornish, & Weidner, 2010). The aims of these demonstration projects were to evaluate whether persons with diagnosed CHD or with >3 coronary risk factors and/or type II diabetes were able to make intensive lifestyle changes, in the MLDP for one year (Pischke et al., 2006), and in the MCLIP for three months (Daubenmier et al., 2007; Frattaroli, Weidner, Merritt-Worden, Frenda, & Ornish, 2008), and whether these changes were associated with changes in clinical events or CHD risk factors (e.g., blood pressure, serum lipids, depression). In subgroup analyses, we looked at the associations of lifestyle changes with changes in clinical events among persons with a reduced left-ventricular ejection fraction in the MLDP ([LVEF], Pischke, Elliott-Eller, Li, Mendell, Ornish, & Weidner, 2010) and with changes in traditional and new biomarkers in persons with CHD and those at risk for CHD in the MCLIP (Chainani-Wu et al., 2011).

At the time these demonstration projects were conducted, it was unclear whether intensive lifestyle changes, meaning the consumption of a very low-fat, vegan diet, three hours of moderate exercise per week, one hour of stress management per day and the participation in group support sessions to help create a social network to address problems with adhering to this strict regimen, were feasible for patients with a severe chronic disease and/or multi-morbidity or for persons who
had multiple risk factors. In regard to lifestyle recommendations for persons at risk for heart failure (HF), the ACC/AHA staging system advised smoking cessation, regular exercise and a reduced alcohol intake in order to optimize systolic function, prevent acute incidence of HF, and reduce HF morbidity and mortality (Hunt et al., 2005; Starling, 2003; Yancy, 2005). However, previous research had only looked at the effects of exercise on exercise capacity, subjective health, and adverse events and death in patients with chronic HF (Flynn et al., 2009; Smart, & Marwick, 2004). Additional lifestyle behaviors had not been examined.

Furthermore, it was unclear whether intensive lifestyle changes would be accompanied by changes in not only traditional but also in emerging coronary heart disease biomarkers among persons with CHD and those at risk for CHD. Thus, in the MCLIP, emerging coronary risk factors, such as C-reactive protein and B-type natriuretic peptide, were assessed in a subsample and reported in a second article. The findings regarding all of the research questions outlined above and other findings from these two demonstration projects which were reported by myself and colleagues (e.g., Daubenmier et al., 2007; Frattaroli, Weidner, Merritt-Worden, Frenda, & Ornish, 2008; Pischke, Frenda, Ornish, & Weidner, 2010) led to a more wide-spread implementation of the ‘Lifestyle Change Program’ in hospitals in the U.S. and finally to coverage by Medicare and Medicaid. Hence, in both, the MLDP and the MCLIP, overall adherence to the lifestyle regimen was tracked for these subgroups to find out whether patients could follow lifestyle changes and benefit in terms of their cardiovascular risk factor profiles.

Step 3 in the WHO global action plan emphasizes the creation of health-promoting environments to reduce modifiable risk factors for NCDs. The WHO acknowledges that the social context, meaning where “people live and work and their lifestyles” (p.8, WHO 2013), impacts their overall health and quality of life. Health behaviors, health behavior change, health promotion, and health are all context-dependent (Fisher, 2008). Hence, activities or interventions for health promotion need to address the social context. The WHO defines the social context as a ‘setting for health’ or “the place or social context in which people engage in daily activities in which environmental, organizational, and personal factors interact to affect health and wellbeing” (p.19, WHO, Health Promotion Glossary, 1998). According to the WHO, “settings can normally be identified as having physical boundaries, a range of people with defined roles, and an organizational structure. Examples of settings include schools, work sites, hospitals, villages and cities” (p.19, WHO, Health Promotion Glossary, 1998). The settings approach was inspired by research of Aaron Antonovsky (1996) on salutogenesis (Kickbusch, 1996; Poland, Krupa, & McCall, 2009), as well as by ecological approaches to health promotion, such as the social-ecological model of health promotion, which, since its origins in the 1980s, was adapted in multiple ways and used as a basis for the development
of interventions for health promotion worldwide (also see figure 1; Hancock, 1985; McLeroy, Bibeau, Streckler, & Glanz, 1988; Richard, Potvin, Kischuk, Prlic, & Green, 1996). According to this approach, physical, organizational and social contexts are targets of interventions, as well as the people found in them (Poland, Krupa, & McCall, 2009).

Figure 1. The Social-Ecological Model of Health Promotion (McLeroy, Steckler, & Bibeau, 1988).

Various forms or models of settings-based activities exist (Whitelaw, Braxendale, Bryce, MacHardy, Young, & Whitney, 2001). Whitelaw and colleagues (2001) attempted to organize them into five groups of settings-based activities. Firstly, these forms will be outlined. Subsequently, the interventions and formative work in preparation of intervention development included in this habilitation will be classified into the respective models.

The ‘passive model’: According to this model (Whitelaw, Braxendale, Bryce, MacHardy, Young, & Whitney, 2001), the setting is simply regarded as an access point to populations and as a location to undertake health promotion activities. Solutions to health problems are solely within the voluntary scope of the individual. Examples include more traditional educational campaigns and health counselling. The two underlying disciplines providing the theoretical underpinnings are education and psychology which have a strong orientation toward the individual and cognition. The ‘active model’: Similar to the ‘passive model’, the solution to a health problem is still the responsibility of the individual but the nature of the solution also addresses characteristics of the environment or system in which the individual acts. According to this model, the environment or setting may contribute to shaping individual behavior or may restrict a person’s potential for change.
Hence, in this case, an intervention could be promoting a loosening of such restrictions. Examples include the establishment of regular hand washing by nurses at a health care facility where improved washing facilities are provided and staff receives training for behavior change.

According to the *vehicle model*, individual behavior change is secondary and “health promotion projects are used as a secondary vehicle towards the primary aim of wider development within the setting” (p.343, Whitelaw, Braxendale, Bryce, MacHardy, Young, & Whitney, 2001). Here, *demonstration* or *beacon* projects focusing on a certain issue, such as staff health at hospitals, are carried out with the ultimate aim of ‘horizontal impact’ meaning a change in organizational policy. In the *organic model*, the solution for the health problem is found in the “multitude of day-to-day processes and practices that constitute the whole” (p.344, Whitelaw, Braxendale, Bryce, MacHardy, Young, & Whitney, 2001) of a system. Health promoting activity is seen as the sum of communication within an organization or system, processes of representation and participation, and training and development of key players in a setting. The aim of an intervention is to change the culture, the ethos, or the values (e.g., regarding prevention) in a whole setting. The underlying assumption of the *comprehensive model* is that the setting is a superordinate of the individual suggesting that behavior can only be changed if broad setting policies and strategies are changed by actions of seniors in the organization.

Whitelaw and colleagues (2001) point out that overlap between the models occurs frequently. A health promotion project may start out within the passive model but may lead to work within the organic model meaning that the implementation of a certain intervention in a population may result in changes in the policy of an organization. Thus, the authors see the five types of settings activity as “loose representations rather than definite and discrete entities” (p.345). This habilitation includes intervention studies or formative work in preparation of intervention development in various settings including various populations [hospitals (Chainani-Wu et al., 2011; Pischke, Elliott-Eller, Li, Mendell, Ornish, & Weidner, 2010), schools (Nagler et al., 2013; Pischke et al., 2013; Pöttgen, Brand, Samkange-Zeeb, Steenbock, & Pischke, 2015), churches (Allen et al., 2014), communities (Brand et al., 2014), daycare facilities (Steenbock, Pischke, Schönbach, Pöttgen, & Brand, 2015; Steenbock, Zeeb, Liedtke, & Pischke, 2015), and universities (Pischke et al., 2012; Pischke et al., 2015; Dempsey et al., under review; Stock et al., 2014)] which can be classified into various models. Furthermore, interventions developed or examined here include *multi-component interventions*, meaning several health behaviors are targeted simultaneously (e.g., exercise and diet), and interventions with multiple intervention levels, so called *multi-level interventions*. In multi-level interventions, behavioral determinants are addressed at more than one intervention level (i.e., individual level and/or social environment and/or physical environment).
**Hospital Setting:** Two demonstration projects (MLDP, MCLIP) which were already described above were conducted in the hospital setting. Both can be regarded in the framework of the *vehicle model* because they were beacon projects that led to changes in health care policy.

**School Setting:** The aims of the *Bihar School Teacher’s Study* (BSTS), a large-scale cluster-randomized trial implementing a tobacco use cessation intervention at 72 schools in Bihar, India were to a.) increase tobacco use cessation among teachers and b.) promote the implementation of school tobacco control policies (Nagler et al., 2013; Pischke et al., 2013). The background of this study was that, even among teachers, a highly educated and respected group in Indian society with influence in setting norms around tobacco use in the younger generations, user rates were high (Sorensen et al, 2005). In the State of Bihar, 78% of teachers had reported tobacco use in the year 2000 (Sorensen et al, 2005). Despite a law, which had been passed in the state of Bihar in 2003 banning the sale of tobacco products within 100 meters of all educational institutions, access to tobacco products was still easy because this law was not enforced (Sinha, Gupta, Warren, & Asma, 2004). In addition, Bihar State government schools did little to regulate tobacco use on school premises neither for students nor for school personnel compared to federal schools (Sinha, Gupta, Warren, Asma, et al, 2004). This study can be situated somewhere between the *comprehensive* and the *active* model because an important part of the intervention was to get principals at the schools to implement and enforce a new tobacco-free policy (results not reported in this habilitation) which is in line with the assumption of the comprehensive model that behavior change of an individual is only possible if the *powerful levers within the system* promote change. Paralleling the changes in the school environment and school policy, teachers were educated about the harmful consequences of tobacco use and about ways to quit in group sessions (Nagler, Pednekar, Viswanath, Sinha, Aghi, Pischke et al., 2013; Pischke et al., 2013) which is the main characteristic of the *active model*. Ultimately, these changes in school policies and individual behavior at 72 schools (Sorensen et al., 2013) may influence social norms surrounding the use of smokeless tobacco among teachers in this part of India (*organic model*).

The review of reviews included at the end of the third part of the habilitation summarizes current evidence on the effectiveness of school-based interventions for the prevention and reduction of substance use among children and adolescents in primary and secondary schools. The literature suggests that interventions with a focus on strengthening individual skills, such as self-confidence and peer resistance (*active model*), are effective in preventing and/or reducing substance use (Pöttgen, Brand, Samkange-Zeeb, Steenbock, & Pischke, 2015). For certain substances, such as alcohol and cannabis, multi-component and multi-level interventions (i.e., organizational changes in the school environment, *comprehensive model*) appear more suitable and effective.
**Church Setting:** The formative work on the role of religiousness in communicating messages promoting cancer screening among churchgoers from Latin America was done to find out whether churches could be a promising setting for cancer control efforts or interventions that also include religious content (Allen et al., 2014). Churches play a vital role in the lives of Latin Americans and can influence how certain topics are perceived in church communities. This stands in contrast to the situation in the more secular Europe where church attendance is comparatively low and churches have little influence on shaping views on health-related topics in the general public. Previous research indicated that the incorporation of religious themes into health interventions may improve intervention update, participation, and efficacy in Latin Americans (e.g., Duan, Fox, Derose, & Carson, 2000; Fox, Stein, Gonzalez, Farrenkopf, & Dellinger, 1998; Lopez & Castro, 2006). However, none of these interventions had incorporated religious content into the health promotion messages. Religiousness and religious coping in cancer screening behaviors were examined among female Spanish-speaking members of a Baptist church in Boston with a survey. The formative work presented in this article may inform interventions in the ‘active model’ category. It is conceivable that the church setting and religious beliefs may contribute to shaping individual health behavior and that key church members may play a role in empowering potential for change.

**Community Setting:** The review of reviews included in this habilitation analysed successful components of existing community-based interventions for the promotion of a physical activity and healthy eating among children, adolescents, and adults (Brand et al., 2014). Communities were defined as geographic areas (e.g., neighbourhoods, villages, cities, or regions) or social groups with a common culture or community. Following the typology of McLeroy and colleagues (2003), community-based interventions were classified into three groups: a.) communities as a setting or communities as the locations where intervention participants are recruited but where the intervention efforts are focused on the individual, b.) multi-player/multi-level interventions including several components and addressing multiple social-ecological levels or multiple stakeholders, c.) environmental change interventions focussing on changes in the social and physical environment in the community. Because of the great heterogeneity in study designs and populations included in the existing reviews, the goal of this review of reviews was to find out which core intervention components need to be incorporated at which level to lead to significant changes in physical activity and diet. Most reviews included in this article fit into the ‘active model’ because in the majority of the primary studies included in the reviews, a community recruitment approach was followed, but intervention strategies were mainly focussed on individual behavior (e.g., provision of information material, individual or group counselling, pedometers for self-monitoring of physical activity). However, there was some indication that interventions that also incorporated environmental
changes (‘comprehensive model’) had a greater impact on physical activity and diet than those fitting the ‘active’ and ‘passive’ models.

**Daycare setting:** The review of reviews examined the evidence for effective interventions promoting healthy eating and physical activity in the daycare setting (Steenbock, Pischke, Schönbach, Pöttgen, & Brand, 2015). Results of a survey of 643 German daycare facilities preceding this review of reviews had indicated that 97% of these institutions engaged in activities for the promotion of physical activity (Kliche et al., 2008). However, these health promotion activities were very heterogeneous and there was a lack of systematic process and outcome evaluations in regard to changes in health behaviors and anthropometric outcomes, such as weight status (Pott, 2012; Strauss, Herbert, Mitschek, Duvinage, & Koletzko, 2011). Hence, the aim of this review of reviews was to give an overview of the current national and international evidence on effective measures to change diet and physical activity and anthropometric outcomes of children in this setting. Our results indicated that interventions which comprised (1) the development of skills and competencies (2) medium to high parental involvement, and (3) information for parents on the links of behavior change and health outcomes were most effective in facilitating changes in physical activity and diet among preschoolers (‘active model’) (compared to knowledge-based interventions). Furthermore, similar to the findings of the review of review on physical activity and diet interventions in the community setting, we also found that multi-level interventions (children, social environment – parents, ‘comprehensive model’) were more effective than those solely focussing on individual behavior change. In the second article included here, results of a small pilot study examining factors affecting implementation of a program for health promotion targeting preschoolers at selected daycare facilities were presented (Steenbock et al., 2015). This program consisted of multiple components (promotion of a healthy diet, physical activity, and psychological well-being), addressed various target groups (children, parents, daycare staff); however, changes in the daycare environment were only marginal. Thus, the ‘active’ and ‘passive’ models appear to best match the program objectives.

**University setting:** The last part of the habilitation includes four articles based on a study conducted in the university setting, the ‘Social Norms for the Prevention of PolyDrug Use’ (SNIPE) study. This study was based on the ‘social norms’ approach and can therefore be subsumed under the ‘organic model’. According to Berkowitz, “social norms theory describes situations in which individuals incorrectly perceive the attitudes and/or behaviors of peers and other community members to be different from their own when in fact they are not” (p.2, Berkowitz, 2005). The aim of the intervention developed and tested in this study was not only to change individual behavior but to change the social environment in regard to substance use meaning attitudes towards substance use
in this setting. Numerous studies found that students tend to overestimate consumption rates of licit (e.g., smoking: Cunningham, & Selby, 2007; Edwards et al., 2008; Falissard, & Reynaud, 2009; Riou França, Dautzenberg; Steyl, & Philips, 2011), as well as illicit substances (Helmer et al., 2014) in their peer group. It has also been shown that an overestimation of substance use in the peer group or a perception that the peer group approves of the use is associated with increases in personal use (tobacco: Arbour-Nicitopoulos, Kwan, Lowe, Taman, & Faulkner, 2010; Edwards et al., 2008; Riou França, Dautzenberg, Falissard, & Reynaud, 2009; alcohol: McAlaney et al., 2015; illicit substances: Helmer et al., 2014). The aim of a so called ‘social norms’ intervention is to change existing social norms on alcohol and tobacco use and on illicit substances among university and college students.

Previous research indicated that feedback including the actual norms regarding the behavior of the majority of the peer group appeared to result in reductions of rates of personal use. In regard to tobacco use, two U.S. studies found that on-campus ‘social norms’ interventions lead to more accurate perceptions of tobacco consumption patterns in the peer group and to adjustments in personal tobacco use (Berkowitz, 2005; Hancock, & Henry, 2003, Hancock, Abhold, Gascoigne, & Altekruse, 2002). For example, Hancock & Henry (2003) found that the overestimation decreased by 10% at an intervention campus compared to a control campus at the 10-week follow-up. Further, smoking rates appeared to stabilize among students receiving the intervention compared to increases in the number of cigarettes smoked per month at a control campus (Hancock, Abhold, Gascoigne, & Altekruse, 2002). At follow-up, students at the intervention campus smoked on average 1.7 cigarettes per months more compared to an increase of 30 cigarettes per month among students at the control campus. Hence, relatively small changes in perceptions of the behavior of the peer group can have an effect on smoking behavior among students. However, the majority of these studies were conducted in North America. It was still unclear whether misperceptions about peer consumption rates of substances could be replicated in Europe. Increasing evidence suggested that these misperceptions exist in regard to alcohol use and reductions in alcohol intake as a result of participation in ‘social norms’ interventions had also been demonstrated in Europe (Bewick et al., 2013; Bewick et al., 2010; Bewick, Trusler, Mulhern, Barkham, & Hill, 2008). But perceptions of peer use of tobacco and marihuana and their influence on personal substance use behavior in European students were not well understood. The articles included here are based on the first cross-national European study to investigate social norms regarding poly-drug use in seven European countries. The overarching goal of the SNIPE study was to change university culture and normative beliefs among university and college students (‘organic model’) regarding substance use by changing the social environment.
In the following section of the habilitation, study designs and study populations of the various articles are outlined. In section 3, the behavior change and ‘social norms’ interventions are described and in section 4, the methods for assessing various outcomes and for measuring changes in individual behavior, lifestyle, and the environment are outlined. This section is followed by section 5 which explains the analyses performed in the studies. Finally, the results of the articles included here are briefly summarized (section 6) and discussed (section 7). The habilitation ends with a conclusion and a perspective (section 8).

2 Study Designs and Study Populations

2.1 Chronic Disease Risk Reduction

Hospital Setting: The Multicenter Lifestyle Demonstration Project (MLDP) & The Multisite Cardiac Lifestyle Intervention Program (MCLIP)

The main aim of the MLDP was to examine whether patients can avoid revascularization by making comprehensive lifestyle changes without increasing cardiac events. Patients were classified into two intervention groups: group 1 and group 2. Those in group 1 had angiographically documented coronary artery disease (CAD) that was severe enough to warrant revascularization (by insurance coverage policy standards) at study entry but opted for lifestyle changes instead (deemed medically safe). Control group patients were historically matched to group 1 patients and were drawn from insurance records of Mutual of Omaha Insurance Company’s database (Omaha, Nebraska). They were matched by procedure eligibility, age, gender, left ventricular ejection fraction, and cardiac score. Intervention group 2 consisted of patients who had previous coronary artery bypass grafting or percutaneous transluminal coronary angioplasty and were in stable condition. The sample of the MLDP included 440 persons with CAD (347 men, 93 women) who participated in the intervention arms of the MLDP. Eligibility criteria for study participation have been reported elsewhere (Koertge et al, 2003). Briefly, patients did not smoke, had a diagnosis of CAD, and a history of coronary artery bypass surgery or percutaneous transluminal coronary angioplasty. In the first article included here, we compared clinical events in 27 (group 1) patients in the MLDP with left ventricular ejection fraction (LVEF) \( \leq 40\% \) who were eligible to receive revascularization but underwent lifestyle changes instead (intervention group, LVEF \( \leq 40\% \), see section 3 for further detail on the intervention) with those of a historically matched control group of patients with a LVEF of \( \leq 40\% \) receiving usual care who were planning to undergo revascularization within one month from study entry (Pischke, Elliott-Eller, Li, Mendell, Ornish, & Weidner, 2010). Changes in lifestyle and
clinical profile for this group have also been reported elsewhere (Pischke, Weidner, Elliott-Eller, & Ornish, 2007)

The MCLIP study was an on-going comprehensive lifestyle change program for the prevention of coronary heart disease (CHD) administered by insurance companies. The MLCIP study included two intervention groups (and no control group because it was an effectiveness trial): One arm included patients with CHD (Daubenmier et al., 2007; Frattaroli, Weidner, Merritt-Worden, Frenda, & Ornish, 2008; Govil, Weidner, Merritt-Worden, & Ornish, 2008), the second arm included persons at high risk for CHD (Pischke, Frenda, Ornish, & Weidner, 2010). One article based on the MCLIP study is included in this habilitation. In this article, results of a prospective cohort study nested within the larger cohort of the MCLIP study, including 131 participants (59.2% women and 27.3% diabetes mellitus), 56 with CHD and 75 at high risk with ≥3 CHD risk factors and/or diabetes mellitus are presented (Chainani-Wu et al., 2011). All participants engaged in a 3-months-lifestyle intervention. Changes in emerging biomarkers were measured at baseline and 3 months after the intervention.

2.2 Primary Prevention of Chronic Diseases & Health Promotion in Different Settings

School setting: The ‘Bihar School Teacher’s Study’ (BSTS)

In the BSTS, a cluster randomized-controlled design was used to assess the extent to which a comprehensive tobacco control intervention resulted in a.) tobacco-use cessation among teachers and b.) the implementation of school tobacco control policies. The intervention was conducted in two waves over two consecutive academic years. Seventy-two rural and urban schools representing grade levels 8–10 were randomly selected from a total of 6900 schools governed by the Bihar state government. To be eligible for the study, schools had to have eight or more teachers and not be located in flood zones. Thirty-six schools were randomly assigned to the intervention group and the remaining 36 were assigned to the delayed intervention control group. Message testing was performed in focus groups with 44 teachers to better understand the social context of tobacco use from their perspective (results reported in the habilitation). Focus group participants taught grade levels 8-10 at two rural and two urban Bihar government schools and were not part of the subsequent BSTS.
Church setting: A Pilot Study

A small pilot study was conducted regarding the role of religiousness among churchgoers from Latin America to find out whether churches could be a promising setting for cancer control efforts or programs that include religious content in addition to information regarding cancer screening. This pilot study included a survey; no rigorous study design was employed. The results of this pilot study informed a church-based educational program to promote breast, cervical, and colorectal cancer screening among Latinas (> 18 years) which was implemented in the year 2014 (Allen, Pérez, Tom, Leyva, Diaz, & Idali Torres, 2014).

Community Setting: A Review of Reviews

In this article, a systematic literature search to assess the effectiveness of community-based interventions to promote physical activity and healthy eating among children, adolescents, and adults was conducted (Brand et al., 2014). This part of the habilitation was not a primary study.

Daycare Setting: A Review of Reviews / A Pilot Study

In this systematic literature review, evidence from existing reviews of effective interventions promoting healthy eating and physical activity among preschoolers in the daycare setting was summarized (Steenbock, Pischke, Schönbach, Pöttgen, & Brand, 2015). This part of the habilitation did not involve primary data collection from study subjects. Furthermore, a small pilot study was conducted in this setting examining the implementation status of “JolinchenKids – Fit and Healthy in Daycare”, a program for health promotion among preschoolers which had been previously developed by the German health insurance AOK. In this study, we also examined program acceptance among various stakeholders in this setting and previous health promoting activities which had been implemented before the start of the program. Overall, fifty daycare facilities in three regions of Germany participated in this pilot study.

University setting: The ‘Social Norms for the Prevention of PolyDrug Use’ (SNIPE) Study

The SNIPE study was a multi-site cluster controlled intervention trial conducted in seven European countries. Each country aimed to recruit 2000 students at two or more different universities or colleges: n=1000 at the university serving as the intervention site, n=1000 at a second
university serving as the control site. Study participation rates (both at baseline and follow-up) were lower than the initial targets chosen for recruitment. For the final n recruited, see section 6.2.2. Issues surrounding loss to follow-up are discussed in further detail in the discussion section.

Both intervention and control sites were chosen by convenience. In each country, the intervention site was the university that the local principal investigator was affiliated with. Baseline data on social norms and substance use at both intervention and control universities were used as the basis for the online intervention. Briefly, the online intervention was comprised of personalized feedback in which the perceived peer substance use was contrasted with the assessed peer substance use among students of the same gender and university. Data were derived from the baseline questionnaire and highlighted discrepancies in the perceptions and the actual substance use behavior in the peer group (for further detail on the intervention, see section 3.2). A second period of data collection (T1) took place towards the end of the spring semester of the same academic year at both intervention and control sites. At the end of the study, students at the control sites were given access to the web-based intervention.

3 Description of Behavior and Environmental Change Interventions

3.1 Chronic Disease Risk Reduction

The Lifestyle Change Program (MLDP & MCLIP): Promotion of a low-fat, complex-carbohydrate Diet, Physical Activity, Social Support, and Stress Reduction

Primary Outcomes: Changes in Clinical Events (among Patients with CHD at risk for Heart Failure), Changes in Biomarkers (among Patients at risk for or with CHD)

All participants were encouraged to eat a very low-fat, plant-based diet (10% daily calories from fat, 15% from protein, and 75% from complex carbohydrates), engage in moderate aerobic exercise for a minimum of three hours per week (with a minimum of 30 minutes per session exercising within their target heart rates) and strength training activities at least twice per week, practice stress management for one hour per day, and attend group support sessions for two hours each week for 12 weeks. In the MLDP, the program began with a 12-hour orientation seminar that was offered over two to three days and consisted of scientific lectures and demonstrations (e.g., cooking). Patients then attended sessions in groups three times per week for 12 weeks. Two of the three weekly sessions focused on the program components in 1-hour blocks. The third weekly session consisted of a 1-hour aerobic exercise session (e.g., on treadmills) and 1-hour lectures that
were designed to facilitate long-term adherence to the program. Patients continued to meet in groups weekly for the following 40 weeks. In addition, they were instructed to exercise and practice stress management on their own (also see Billings, 2000; Koertge et al., 2003; Ornish, 1998). The same program was employed in the MCLIP but with shorter length. Participants attended the program onsite in groups (supervised by site personnel) twice a week for three months for a total of 104 hours (Daubenmier et al., 2007).

3.2 Primary Prevention of Chronic Diseases & Health Promotion in Different Settings

Tobacco Cessation Intervention: Promotion of Tobacco Cessation

Primary Outcomes: Changes in Tobacco Cessation among Teachers and Changes in the School Environment

This 6-months intervention included one theme per month and was developed based on the ‘Social-contextual Model of Behavior Change’ (Sorensen et al., 2003; Sorensen et al., 2007, see figure 2). This framework includes psychosocial factors implicated in behavior change, such as self-efficacy, attitudes and beliefs, and describes pathways through which population characteristics (e.g., socio-economic status, education) influence behavior. Interventions developed according to this framework differentiate the role of social context as “a set of modifying conditions, that is, factors that independently impact on outcomes but which are not influenced by the intervention, and mediating mechanisms, defined as variables along the pathway between the intervention and the outcomes” (p.190, Sorensen et al., 2003). These variables are amenable to change and can be modified by an intervention.
The following intervention themes and activities were included in the intervention for the **Bihar School Teacher Study**: a.) teachers as role models, b.) risks associated with tobacco use, c.) motivation to quit, d.) skills to quit, e.) withdrawal, f.) promotion of skills for maintenance, g.) creation of a supportive normative climate for not using tobacco. Messages were developed for different parts of the intervention. To ensure that these messages fit the socio-cultural context of teachers, two rounds of focus groups were conducted with teachers in which general themes that, according to teachers, ought to be addressed in a tobacco cessation intervention were identified (first round) and in which the content and cultural appropriateness of tobacco cessation messages were discussed (second round). Taking the results of the focus groups into account, intervention themes, materials, and messages were subsequently adapted. For example, to change risk perceptions, intervention materials were designed to portray the harmful effects of tobacco. Teachers had recommended to use pictures showing harmful effects of tobacco (e.g., a cancerous jaw). They also thought an intervention should include written information materials emphasizing harmful effects of tobacco use. As a result, and in addition to other information material provided, a list of carcinogenic effects of tobacco use was given to teachers in the intervention. Teachers in the focus groups had also recommended to encourage intervention participants to discuss how tobacco
harms the whole family at intervention meetings and other teacher gatherings. Hence, the final intervention included monthly meetings where teachers met in groups and discussed the topics which had been brought up by teachers in the focus groups, using discussion points developed by the researchers in the U.S..

**Intervention for Health Promotion among Children**

**Primary Outcomes: Changes in Diet, Physical Activity and Psychological Well-being among Preschoolers**

The 3-year intervention ‘JolinchenKids - Fit and Healthy in Daycare’ was comprised of five modules, three focusing on children, one on parental participation in the program, and one on promoting health among kindergarten teachers. Daycare facilities were free to choose from these modules and had no fixed time schedule to follow in regard to the implementation of these modules. The three modules focusing on children’s health were designed to affect dietary behavior and physical activity levels among 3-6 year-olds and to improve their psychological well-being. Activities of the diet module included small changes in the daycare environment. For example, un-sweetened beverages and plates with fruits and vegetables were made available throughout the day in the kindergarten groups and a breakfast buffet was offered once every week. Examples for intervention activities in the physical activity module included the provision of a box with cards for kindergarten teachers that included instructions for physical activity games with children. Also, intervention efforts were put into providing areas with sufficient space at daycare facilities where children could involve in “active play”. The module focusing on psychological well-being included, among other materials, the provision of a card box with techniques for stress management to be implemented by kindergarten teachers. The module focusing on parental participation in program activities included several actions to convince parents to support the implementation of the program, such as including parent representatives in small implementation teams or an invitation to a parent-kindergarten teacher conference. The module targeting kindergarten teachers’ health included information materials and one workshop on how to live a healthier lifestyle.
Web-based ‘Social Norms’ Intervention: Prevention and Reduction of Substance Use

Primary Outcomes: Changes in Social Norms regarding Substance Use and Changes in Rates of Substance Use among University and College Students

The ‘social norms’ intervention was an instantaneous personalized feedback which took the following form: The perceived peer substance use (e.g., “Fourty percent of the male/female students at your university use marijuana at least once a month.”) was contrasted with the assessed peer substance use among students of the same gender from the baseline questionnaire (e.g., “Four percent of the male/female students at your university use marihuana.”) to highlight discrepancies. Additionally, the personal substance use pattern (e.g., “I have five alcoholic drinks during a typical drinking session.”) was put into relation to the substance use in the peer group [same-gender, same university, e.g., “Actually, most male students of my university (68%) drink no more than four alcoholic drinks during a typical drinking session!”]. These two comparisons formed the descriptive norms feedback. In addition, information on injunctive norms (i.e., general perceptions about whether substance use is accepted in the peer group) was provided in some of the feedback messages (e.g., “Did you know that 91% of male students at Bradford think it is never okay to use ecstasy?”).

Study participants from the intervention sites were invited to access the feedback approximately two weeks after the baseline assessment and they were informed that they would have the opportunity to access the intervention multiple times during the following five months. Every time a student wished to receive feedback using the intervention he/she had to first provide an update on the information about their own substance use behavior and perceptions. The content of the website was developed in English and translated into the languages of the respective participating countries.

4 Methods

4.1 Methods of Assessing Changes in Cardiovascular Outcomes

Cardiovascular Risk Factors: In the MLDP, the following risk factors were assessed at baseline, after three and 12 months: History of smoking, type II diabetes, hypertension, hyperlipidemia, family history of CHD, myocardial infarction (MI), and cerebrovascular accident (CVA) were assessed in questionnaires. In the subsample that was analysed for the first article included in the habilitation (Pischke, Elliott-Eller, Li, Mendell, Ornish, & Weidner, 2010), data on these risk
factors, as well as clinical events were extracted from medical charts for the historically matched control group. Clinical event data of the intervention group had been documented at baseline and during the follow-up by physicians involved in the study and were available in the MLDP database. In both, intervention and usual care groups, ejection fraction had been determined by left ventricular contrast angiography with direct left ventriculography in all patients. In the MCLIP, cardiovascular risk factors were assessed at baseline and 3-months follow-up. Risk factors included biomarkers of the lipid metabolism [e.g., total cholesterol, high-density lipoprotein cholesterol (HDL-C), low-density lipoprotein cholesterol (LDL-C)] which were determined via blood tests and emerging cardiac biomarkers (for further detail, see below), as well as psychological risk factors for CHD, such as depression, which were assessed with questionnaires [e.g., the Center for Epidemiologic Studies Depression Scale (CES-D), Radloff, 1977].

Clinical Events: In the MLDP, cardiac events over the course of three years were defined as nonfatal MI, cardiac death, heart failure, CVA, and revascularization procedures (coronary artery bypass graft, percutaneous transluminal coronary angioplasty). Non-cardiac events and deaths from all other causes were also tracked. In both, intervention and matched usual care control groups, all events had been documented in patients’ medical records.

Cardiovascular Biomarkers/Other Variables: In the MCLIP, a fasting blood sample was drawn for laboratory analyses including total cholesterol, HDL cholesterol, triglycerides, LDL cholesterol, high-sensitivity C-reactive protein, fibrinogen, lipoprotein(a), homocysteine, oxidized LDL, insulin, B-type natriuretic peptide (BNP), and nuclear magnetic resonance lipoprotein assays for LDL, very-low-density lipoprotein (VLDL), and HDL particle concentrations and particle size. A baseline physical assessment (anthropometrics) was completed during the interview. A second interview was scheduled with the hospital team after the intake interview and records review; this included administration of psychosocial and behavioral questionnaires, instructions for completion of a 3-day diet diary, a blood draw for a baseline lipid profile, and a treadmill exercise stress test. Medical, behavioral and psychosocial variables and quality of life were reassessed at three and 12 months.

Psychosocial Variables: Hostility (Cook-Medley Hostility Scale; Barefoot, Dodge, Peterson, Dahlstrom, & Williams, 1989), psychological stress (Perceived Stress Scale; Cohen, Camarck, & Mermelstein, 1983), quality of life (SF-36; Ware, Snow, Kosinski, & Gandek, 1993), and depression (see above) were assessed in the MLDP and MCLIP studies. Religiousness variables were only assessed in the pilot study conducted in Boston, MA. Positive religious support from other church members was assessed with two items (Krause, 1999). Two components of spiritual locus of control (Holt, Clark, & Klem, 2007) were assessed: a.) active (god plays a collaborative role in one’s health), b.) passive (participants do not take preventive actions because of a belief that God is the sole
Religious coping (Pargament, 1999) was assessed to evaluate how participants use religion to cope with problems. This measure includes two scales: a.) positive religious coping: Three items on religious ways to manage stressors and b.) negative religious coping: Three items on religious struggle in coping.

**Drop-out analysis:** Details on characteristics of persons dropping out of the intervention studies represented in this habilitation or analyses of missing data are reported in the individual articles.

### 4.2 Methods of assessing Changes in Lifestyle

**Diet:** In both, MLDP and MCLIP, diet was measured as percent of calories from fat (goal: 10%). A registered dietitian instructed participants on how to complete 3-day food diaries and verified dietary data entry, as a measure of quality assurance. Data were analyzed using nutrition data system for research software (NDS-R) (versions 4.01_29, 1999 and 4.02_30, 2000, Nutrition Coordinating Center, University of Minnesota, Minneapolis).

**Exercise/Physical Activity:** Exercise was measured as hours per week (goal: 3 h per week). In both, MLDP and MCLIP, exercise tolerance was assessed with a symptom-limited treadmill test. Metabolic equivalents (METs) were automatically calculated by the testing device during the exercise testing.

**Stress Management:** Stress management was measured as self-reported hours per week of yoga/meditation (goal: 1 hour per day) in the MLDP and MCLIP studies.

**Substance Use:** In regard to tobacco use, in both, the MLDP and MCLIP studies, patients were required to have quit smoking before entering the study. Therefore, only a history of smoking was assessed in the behavioral questionnaire. In the BSTS study, tobacco use was assessed pre- and post-intervention (not reported in the habilitation). In the SNIPE study, the use of several tobacco products (i.e., cigarettes, chewing tobacco, cigars, etc.) was assessed in an online questionnaire. The survey also included the use of cannabis (marijuana, pot, grass, hash, etc.). Other substances were assessed with an adapted version of the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST; Humeniuk, Henry-Edwards, Ali, Poznyak, & Monteiro, 2010).
In both, MLDP and MCLIP, participants adhered to the program if they consumed less than 10% fat in their diets, exercised three hours per week, and practiced stress management for one hour every day. In the MLDP and the MCLIP, a lifestyle index, based on a formula validated in previous research (Daubenmier et al., 2007; Ornish et al., 1998; Pischke, Scherwitz, Weidner, & Ornish, 2008), measured overall adherence to intervention guidelines and was calculated as the mean percentage of adherence to each lifestyle behavior. Zero equalled no compliance and one equalled 100% compliance.

Assessment of adherence to the recommendation to quit tobacco was performed with cotinine testing in the BSTS study but is not the subject of this habilitation. In the SNIPE study, tobacco cessation was assessed in the online survey.

Adherence to cancer screening recommendations (current at the time of data collection) are outlined below and were assessed via a questionnaire. Breast cancer screening: Women aged 40-49: Having had a mammogram within the prior 2 years and a clinical breast examination (CBE) within the prior year. Women >50: Having had a mammogram and CBE within the prior year. Cervical cancer screening: Compliance of women >18: Having had a Pap test within the prior 3 years. Women >50: Having had an annual fecal occult blood test (FOBT), sigmoidoscopy within prior 5 years, colonoscopy within prior 10 years. All-age appropriate screening: Women who met the criteria for all screening tests (see above) appropriate for their age were deemed compliant. In the analyses for the paper, compliance with the individual screenings was computed, as well as compliance with all screenings required for a person’s age. Categories for colorectal cancer screening (age 50+) were ‘compliant’ vs. ‘not compliant with recommendations’; for mammography screening (age 40-49) categories included ‘within past 2 years’ vs. ‘more than 2 years ago’ vs. never; for mammography screening (age 50+) ‘within past year’, ‘within past 2 years’, ‘more than 2 years ago’, ‘never’; for clinical breast examination (40+) ‘within past year’, ‘more than 1 year ago’, ‘never’, ‘don’t know/not sure’; for all breast cancer screening recommended for age ‘yes’ vs. ‘no’; for cervical cancer screening (age 18+) ‘within past year’, ‘within past 3 years’, ‘more than 3 years ago’, ‘never’; and for adherence to all screening tests recommended for a given age ‘yes’ vs. ‘no’. The proportion of the sample compliant with more than one test but fewer than all which were required in a person’s age group was not reported.

In the small pilot study, examining the state of implementation of a program for health promotion among preschoolers two months post-baseline, the current state of implementation in regard to the five modules of the program (diet, physical activity, stress reduction, parental...
involvement, kindergarten teachers’ health promotion) was assessed in telephone interviews with the heads of the daycare facilities or kindergarten teachers responsible for program implementation at their institution.

4.4 Methods of Assessing Changes in the Physical or Social Environment

Physical Environment: Signs of Tobacco Use at Schools

In the BSTS study, environmental changes were assessed via observations of changes in the school environment in terms of signs of tobacco use. The results are not part of this habilitation as they were part of a later publication which was not co-authored by CP. However, they will be discussed in section 7.

Social Environment: Social Norms regarding Substance Use at Universities

Descriptive Norms: Perceptions of rates of peer substance use were assessed in a web-based survey using items based on the corresponding personal substance use items. Perception items were similarly worded as personal use items and were similar to those used in previous social norms surveys (Bewick et al., 2010; McAlaney, & McMahon, 2007).

Injunctive Norms: Personal and perceived social norms regarding attitudes towards substance use were assessed. The items used were based on existing surveys which were adapted for use in the intervention (Core Institute, 2008).

5 Analyses

5.1 Quantitative Analyses

Cardiovascular Outcomes in the MLDP and MCLIP Studies

In the paper included here based on the MLDP study, differences in numbers of cardiac events between intervention and usual care group patients during the 3-year follow-up were analyzed using Fisher’s exact test. Odds ratios and relative risk ratios were estimated by dividing the number of events by the number of patient-years for the particular time period. In the article included here based on the MCLIP study, changes in lifestyle and biomarkers from baseline to 3-
months follow-up were tested for significance using paired t-tests (continuous data) and the Wilcoxon signed rank test (for categorical data). Cardiac biomarker distributions were not normal and log-transformed values were used for parametric tests. The association between the continuous variables was evaluated using linear regression analysis. Pearson’s r and associated 2-sided p values were computed for bivariate correlations.

Substance Use in the SNIPE Study

Tobacco & Cannabis Use

Firstly, estimates for personal and perceived tobacco/cannabis use were generated. Secondly, the percentages of respondents who perceived the tobacco/cannabis use of the majority of students of their own sex and university as higher/as identical/as lower as the report of the corresponding own behavior estimate were calculated. Subsequently, binary logistic regression analyses were performed to examine associations between perceived and personal tobacco/cannabis use and attitudes towards tobacco/cannabis use. Sex, age, year of study, living situation, and perceived substance use/attitude towards tobacco/cannabis use were included as independent variables in the models. In the model with the outcome variable attitude towards tobacco/cannabis use, personal tobacco/cannabis use was also added as an independent covariate. For these analyses, age was used as a continuous variable and all other variables as categorical variables. To investigate whether sex or country moderates the association between perception and personal behavior/attitude, the two relevant interaction terms were added to the regression models. Additionally, stratified analyses by variables were performed for those interactions that were significant at the p<0.05 level.

Alcohol Use

Wilcoxon signed rank tests were employed to test for differences between personal drinking and perceived peer drinking. Binary logistic regression was used to determine odds ratios (OR) and 95% confidence intervals (95% CI) for factors associated with accurate estimation of peer drinking. Students were classified as accurate estimators if they estimated the number of drinks per day among peers of their sex up to the 75% percentile of the actual number of drinks consumed per day in this group. The 75% percentile was used as cut-off because it represents data from the majority of students. Personal number of alcoholic drinks per day was entered as an independent variable into the regression model. Gender, age, country of origin, born outside the country of current residence,
typicality as student from low to high (i.e., whether a student perceived him or herself to be a “typical” student) were included for adjustment in the regression models. In addition, medicine/health as study subject was added to the model as an independent variable. This was based on the assumption that students studying medicine and other health-related subjects are more likely to estimate the alcohol consumption among peers accurately.

**Cancer Screening**

Logistic regression was employed to examine bivariate and multivariate relationships between cancer screening adherence (yes/no), demographic variables, and dimensions of religiousness. Only those variables were included in the multivariate models that showed bivariate associations ($p<.10$) with cancer screening adherence.

**Implementation Status**

In the evaluation of the implementation status of the different modules of the health promotion program for preschoolers, only descriptives on the implementation of the various modules and specific intervention activities of each module were analysed.

5.2 Qualitative Analyses and Reviews

**Message Testing in the BSTS Study:** The transcribed and translated focus group data were analyzed by trained staff using a two-stage coding process using NVivo, an ethnographic data management software program. Structural coding followed the structure of the focus group guide. Thematic coding and analysis was based on major themes that arose from structural coding of the transcripts and was applied in a second pass analysis.

**Pilot Study conducted at Daycare Facilities:** The transcribed focus group data were analysed according to Mayring (2010) using MaxQDA. Two researchers paraphrased and reduced the data, according to the categories of the focus group guide. Differences in results between researchers were discussed until consensus was reached.
**Reviews of Reviews: a.) Health Promotion in Communities:** Results of 18 systematic reviews of primary studies on community-based interventions to promote physical activity and healthy eating were extracted and categorized into articles examining: a.) *community-based interventions:* This also included studies in which the recruitment was performed in the community, but where the intervention efforts were focused on the individual, b.) *multi-player/multi-level interventions* meaning that the intervention addressed multiple social-ecological levels or multiple stakeholders, and c.) *environmental change interventions* focusing on changes in the social and physical environment in the community. The evidence of the reviews included was subsequently appraised using the following criteria: Adequate sample size in the underlying studies, inclusion of randomized trials, use of objective or validated outcome measures, and inclusion of community-based interventions type 2 or 3 (for further detail on this categorization, see the article).  

**b.) Health Promotion in Daycare Facilities:** Systematic reviews and meta-analyses published between 2007 and 2014 that also met the AMSTAR criteria were included in this review of reviews (n=13). The evidence was then sorted into four categories: “not effective” (i.e., intervention studies did not indicate significant effects), “inconsistent” (i.e., some intervention studies demonstrated significant effects but the majority showed no effects), “some indication of effectiveness” (i.e., majority of intervention studies demonstrated effects), “clear evidence” [i.e., majority of high quality intervention studies (with appropriate sample size, valid outcome parameters, process evaluation of intervention implementation) demonstrated effects]. Finally, reviews were analyzed as to whether they included information on differential intervention effects. Specifically, differences were analysed by a.) *target group,* b.) *intervention component* (nutrition, physical activity, sedentary behavior), c.) *intervention level* (individual, environment, combination of levels), d.) *strategy employed for behavior change* (knowledge-based, skills training or both), e.) *dose/intensity,* and f.) *parental involvement.*  

**c.) Health Promotion in Schools:** Two reviewers assessed the quality of the identified review articles (both systematic reviews and meta-analyses published between 2007 and 2013) and extracted the data using AMSTAR criteria. Fourteen review articles of moderate to good quality fulfilled the a-priori defined inclusion criteria (for further detail, see the article). After that, the included studies were grouped into studies examining the efficacy and effectiveness of a.) *smoke-free class competitions,* b.) *knowledge-based interventions,* c.) *capacity-promoting interventions,* and d.) *multi-level interventions.*
6 Results

6.1 Chronic Disease Risk Reduction – Individual Behavior Change

6.1.1 Comprehensive Lifestyle Changes for the Prevention of Heart Failure (MLDP Study)


The aim of this study was to examine whether lifestyle changes can delay the need for surgical procedures in CHD patients with asymptomatic reduced left ventricular ejection fraction. 3-year clinical events were compared in 27 CHD patients eligible to receive revascularization (by insurance standards), but underwent lifestyle changes (low-fat diet, exercise, stress management) instead (intervention group [IG], LVEF < or =40%), with those of a historically matched (age, gender, LVEF, and stenosis of the 3 major coronary arteries) control group receiving usual care (UCG; n = 13) who had undergone revascularization at study entry. Both IG and UCG patients were enrolled in the health insurance companies participating in the MLDP (for further detail, see section 3.1). At three months, there were more cardiac events in the UCG (6 events) than in the IG (1 event; P < .006; odds ratio = 13.27; 95% confidence interval = 1.57-111.94). This difference was attenuated but maintained over three years (P < .06; odds ratio = 2.75; 95% confidence interval = 1.05-7.19). More detailed findings can be found in Table 1. For further detail on number of events for each year, see the full table in the article.
Table 1. Cardiac Events for Intervention (n=27) and Usual Care Matched Control (n=13) Groups.*

<table>
<thead>
<tr>
<th></th>
<th>12 Weeks</th>
<th>Sum over 3 yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cardiac Death</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention Group</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Control Group</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td><strong>Non-fatal MI</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention Group</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Control Group</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Primary PTCA</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention Group</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Control Group</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>CABG surgery</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention Group</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Control Group</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>HF</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention Group</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Control Group</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>CVA</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention Group</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Control Group</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total # of cardiac events initiating hospitalization (Deaths, MI, HF, CABG, Primary PTCA** & Other ¥)
- Intervention Group: 1 8
- Control Group: 6 9
- Odds ratio: 13.27 2.75
- Significance (P): 0.005 0.055
- 95% Confidence Interval: 1.57-111.94 1.05-7.19

**Total # of patients having at least one primary cardiac event at each time point
- Intervention Group: 1 6
- Control Group: 4 5
- Rate ratio: 8.64 1.99
- Significance (P): 0.04 0.318
- 95% Confidence Interval: 0.95-78.48 0.60-6.58

*Not shown in table: 8/13 control patients had CABG surgery and 5/13 had primary PTCA within 4 months of study entry
**Primary PTCA excludes restenosis within 6 months
¥ One patient in the usual care group was hospitalized with recurrent supraventricular tachycardia (SVT), treated with myocardial ablation (3Y)
^ Two intervention group patients had 2 events (each) over 3 years
~ One usual care patient had 2 events, and one usual care patient had 4 events over 3 years.

6.1.2 Comprehensive Lifestyle Changes for the Prevention of CHD & the Role of new Biomarkers (MCLIP study)


In this article, we evaluated the changes in emerging cardiac biomarkers, cognitive function, and social support measures after participation in a comprehensive lifestyle change intervention (for further detail on the intervention, see section 3.1). A prospective cohort study of 131 participants (59.2% women and 43.1% with diabetes mellitus), 56 with CHD (37.5% women and 27.3% diabetes mellitus), and 75 at high risk with ≥3 CHD risk factors and/or diabetes mellitus (76% women and 54.7% diabetes mellitus) was conducted. The measurements were taken at baseline and three
months after the intervention. Improvement in all targeted health behaviors was seen in both high-risk and CHD groups (all p <0.001) at three months. Further, reductions in body mass index, systolic and diastolic blood pressure, waist/hip ratio, C-reactive protein, insulin, low-density lipoprotein, high-density and total cholesterol, apolipoproteins A1 and B (all p <0.009) were observed.

Nuclear magnetic resonance spectroscopy analysis of lipoprotein subclass particle concentrations and diameters showed a reduction in large very-low-density lipoprotein particles, size of the very-low-density lipoprotein particles, total low-density lipoprotein particles; total, large, and small high-density lipoprotein particles (all p <0.009), and small very-low-density lipoprotein particles (p <0.02). Increases in fibrinogen (p <0.03) and B-type natriuretic peptide (p <0.001) were seen, and these changes correlated inversely with the changes in body mass index. The observed increase in B-type natriuretic peptide can be explained by the metabolic changes related to adipose tissue lipolysis. The quality of life, cognitive functioning, and social support measures significantly improved. For further detail on changes in biomarker levels from baseline to 3-months follow-up, see Table 2.
Table 2. Biomarker Level at Baseline and 3 months after Comprehensive Lifestyle Intervention.

<table>
<thead>
<tr>
<th>Variable</th>
<th>CHD (n=54*)</th>
<th>High Risk (n=71*)</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>3 mo</td>
<td>p Value**</td>
<td>Baseline</td>
<td>3 mo</td>
</tr>
<tr>
<td>Biomarkers of lipid metabolism</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total cholesterol (mg/dl)</td>
<td>165 (136-190)</td>
<td>143 (109-174)</td>
<td>&lt;0.001</td>
<td>185 (164-224)</td>
<td>176 (147-198)</td>
</tr>
<tr>
<td>Low-density lipoprotein cholesterol (mg/dl)</td>
<td>89 (68-109)</td>
<td>68 (49-100)</td>
<td>&lt;0.001</td>
<td>109 (88-133)</td>
<td>104 (72-117)</td>
</tr>
<tr>
<td>High-density lipoprotein cholesterol (mg/dl)</td>
<td>42.0 (35.8-50.0)</td>
<td>37.0 (32.0-44.5)</td>
<td>&lt;0.001</td>
<td>44.5 (38.5-50.0)</td>
<td>38.0 (33.5-43.5)</td>
</tr>
<tr>
<td>Triglycerides (mg/dl)</td>
<td>113 (80-162)</td>
<td>113 (65-174)</td>
<td>0.8</td>
<td>135 (100-212)</td>
<td>142 (89-187)</td>
</tr>
<tr>
<td>Very-low density lipoprotein triglycerides (mg/dl)</td>
<td>89 (49-126)</td>
<td>81 (41-138)</td>
<td>0.96</td>
<td>102 (63-170)</td>
<td>104 (53-155)</td>
</tr>
<tr>
<td>Lipoprotein (a) (nmol/L)</td>
<td>48.0 (15.5-163.5)</td>
<td>56.5 (13.3-185.8)</td>
<td>0.7</td>
<td>18.5 (6.0-67.3)</td>
<td>56.5 (13.3-185.8)</td>
</tr>
<tr>
<td>Oxidized low-density lipoprotein (U/L)</td>
<td>54 (41-80)</td>
<td>50 (35-63)</td>
<td>0.17</td>
<td>54 (41-80)</td>
<td>61 (47-83)</td>
</tr>
<tr>
<td>Apolipoprotein A1 (mg/dl)</td>
<td>133 (117-148)</td>
<td>118 (107-134)</td>
<td>0.002</td>
<td>147 (131-162)</td>
<td>127 (115-140)</td>
</tr>
<tr>
<td>Apolipoprotein B (mg/dl)</td>
<td>78 (66-97)</td>
<td>82 (54-93)</td>
<td>0.09</td>
<td>94 (82-112)</td>
<td>87 (71-106)</td>
</tr>
<tr>
<td>Apolipoprotein B/ apolipoprotein A1</td>
<td>0.6 (0.5-0.8)</td>
<td>0.5 (0.6-0.8)</td>
<td>0.30</td>
<td>0.7 (0.6-0.8)</td>
<td>0.7 (0.6-0.8)</td>
</tr>
<tr>
<td>Other biomarkers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C-reactive protein (mg/L)</td>
<td>1.2 (0.5-3.8)</td>
<td>1.0 (0.4-2.6)</td>
<td>0.06</td>
<td>2.8 (1.4-6.0)</td>
<td>2.0 (0.8-4.3)</td>
</tr>
<tr>
<td>Fibrinogen (mg/dl)</td>
<td>322 (283-380)</td>
<td>356 (298-402)</td>
<td>0.554</td>
<td>330 (276-377)</td>
<td>357 (311-402)</td>
</tr>
<tr>
<td>Homocysteine (μmol/L)</td>
<td>8.7 (6.6-10.1)</td>
<td>8.5 (6.4-11.0)</td>
<td>0.614</td>
<td>7.5 (6.0-8.8)</td>
<td>7.9 (6.2-9.6)</td>
</tr>
<tr>
<td>B-type natriuretic peptide (pg/ml)</td>
<td>28.0 (15.5-64.0)</td>
<td>37.0 (20.5-97.5)</td>
<td>0.002</td>
<td>15.5 (9.0-25.3)</td>
<td>22.0 (12.0-41.0)</td>
</tr>
<tr>
<td>Insulin (IU/L)</td>
<td>13.0 (9.0-24.5)</td>
<td>12.0 (8.5-17.0)</td>
<td>0.021</td>
<td>17.0 (10.5-27.0)</td>
<td>13.0 (9.0-19.5)</td>
</tr>
<tr>
<td>Fasting glucose (diabetics)**</td>
<td>118 (103-152)</td>
<td>104 (99-146)</td>
<td>0.20</td>
<td>118 (102-149)</td>
<td>102 (94-120)</td>
</tr>
<tr>
<td>Hemoglobin A1c (diabetics)**</td>
<td>6.9 (6.4-8.9)</td>
<td>6.7 (6.4-8.3)</td>
<td>0.05</td>
<td>6.4 (6.1-7.5)</td>
<td>6.0 (5.8-6.5)</td>
</tr>
</tbody>
</table>

Data are presented as median (interquartile range).

* Because of missing data, number of patients for individual variables ranged from 114-122.

** Diabetics only: hemoglobin A1c, n=53; fasting glucose, n=52.
6.2 Primary Prevention of Chronic Diseases & Health Promotion

6.2.1 Individual Behavior Change

Formative Research

Tobacco Cessation - Schools

Theory-based Intervention Development & Message Testing (The Bihar School Teachers Study)


This article describes a theory-based, step-by-step approach to the development of an intervention to promote tobacco use cessation among school personnel in Bihar (for further detail on the intervention, see section 3.2). A five-step approach was used to develop the intervention using the ‘Social-Contextual Model of Health Behavior Change’ (for a description of the model, see section 3) in Bihar, which involved conducting formative research, classifying factors in the social environment as mediating mechanisms and modifying conditions, developing a creative brief, designing an intervention, and refining the intervention based on pilot test results. The intervention targeted users and non-users of tobacco, involved teachers in implementing and monitoring school tobacco control policies, and maximized teachers’ role as change agents in schools and communities. Intervention components included health educator visits, discussions led by lead teachers, cessation assistance, posters and other educational materials and was implemented over the entire academic year. The intervention was subsequently tested in Bihar government schools as part of a randomized-controlled trial (results not included here).


The aim of this article was to qualitatively explore perceptions about tobacco use among teachers in Bihar and to examine how risk information may be communicated through a variety of message formats. Twelve messages on tobacco health risks varying in formats (see Table 3) were tested in focus groups with teachers from Bihar. Messages #1-4 were aimed at increasing the risk perception of the audience and at eliciting negative emotions associated with tobacco-related morbidity and mortality. Messages #5-8 were narratives focusing on the benefits of teachers as role
models for quitting tobacco. These messages emphasized that teachers are powerful role models in society, especially if they choose to commit themselves to this role. The gain of quitting for the teacher is to feel respected and to contribute to his or her students' health by being a strong role model. Messages #9-12 dealt with skills necessary for quitting, such as willpower and a plan to quit, and how to handle triggers for tobacco use and manage relapse. Different message formats were applied in each set of messages. The first set used fear or guilt appeals, in the the second set narratives with gain-frames were employed in messages, and the third set included messages with narratives and exemplars. A summary of the results is shown in Table 3. Further detail on the improvements of the messages which were suggested by teachers can be found in the attached article.

In sum, participants stated that teachers were already aware of tobacco-related health risks. However, teachers recommended including evidence-based facts in messages to further increase awareness of these risks. Communicating risk information using negative emotions had a great appeal to teachers and was deemed most effective for increasing risk perception. Messages using narratives of teachers' personal accounts of quitting tobacco were deemed effective for increasing knowledge about the benefits of quitting.
Table 3. Main Results of Message Testing.

<table>
<thead>
<tr>
<th>Format</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fear Appeal</td>
<td></td>
</tr>
</tbody>
</table>

MESSAGE 1. You know that tobacco may hurt you in the future. But do you know how it’s hurting you and your family now? She worries about her dad chewing tobacco. She saw what happened to her grandfather, and she is scared. He loves his dad, but he hates the way he smells. Yuck! A visitor came to the school today and explained that tobacco is bad for health. Does his dad know, he wonders? She wishes she had more money to fix some things around the house. She could do those things if he didn’t buy tobacco every day. Learn to quit tobacco with our program.

- Picture showing a man in an armchair lighting up a cigar and a little girl next to the armchair holding her nose

MESSAGE 2. You know that tobacco is bad for your health. But we would like to tell you something else about tobacco. Using tobacco is an addiction, not a habit. This means that your body feels like it needs tobacco, not just wants it. It is the reason why people say they can’t stop, even when they know it’s bad for them. It’s why it can be hard for some people to quit. When you use tobacco, it hurts your body, even though you can’t see it. It increases your heart rate and your blood pressure. It gives you bad breath and puts you at risk for mouth sores. When you are addicted to tobacco long enough, the increased heart rate and blood pressure can lead to heart attack and stroke. The mouth sores can develop into oral cancer. Learn how to quit tobacco with our program.

- Picture showing a person with a mouth ulcer

MESSAGE 3. If it can happen to him, it can happen to you. Tobacco can hurt anyone. It doesn’t matter who you are, what you do, or where you live. Tobacco doesn’t care if you have a family to support, or if you have lots of friends. It only wants to hurt you. You would never guess it, but Mahesh is already developing ulcers and sores in his mouth. He looks fine. He feels fine. He doesn’t even know they are there yet. But he is addicted to tobacco, and they will get worse. Learn to quit tobacco with our program.

MESSAGE 4. Sometimes things aren’t what they seem. If you use tobacco, everything may look fine from the outside. But everything is not fine on the inside. Even if you only use tobacco a few times a week, you are still taking a risk. You are putting dangerous chemicals into your body. And you make it more likely that you will become addicted in the future. Learn to quit tobacco with our program.

Narrative with Social Modeling Theme

MESSAGE 5. Lessons don’t only come from books. Your students don’t learn from your lessons alone. They learn from your words and actions. Show them that good health is important by quitting tobacco. Let them see that you take good care of yourself, so they learn to take good care of themselves. Aren’t you worth it? Aren’t they worth it? Learn to quit tobacco with our program.

- First picture in the Indian context: Female teacher teaching a group of students (4th graders) sitting on the floor
- Second picture in the American context: American teacher teaching a group of students

MESSAGE 6. Lessons don’t only come from books. Your students learn from your actions – the good ones and the bad ones. If you use tobacco, they will think that tobacco is OK. You have so much power to influence your students. Send a positive message instead. Quit tobacco – show them that you take good care of yourself, so they learn to take good care of themselves. Aren’t you worth it? Aren’t they worth it? Learn to quit tobacco with our program.

- Picture showing Indian teacher smoking a cigarette

MESSAGE 7. “We talk about a lot of things in the common room at school, like what we did over the weekend. Since I’m quitting tobacco, I had a chance to tell everyone what happened to me at a function on Saturday. A lot of people at the gathering were using

1. Reactions to tobacco health risks communicated in the message
   The general opinion voiced in the focus groups was that teachers were already educated about the harmful effects of tobacco and were aware of the risks of using it.

2. Reactions to message format:
   Was deemed effective in making both teachers and students want to quit.

1. Reactions to benefits of quitting tobacco communicated in the message:
   Participants felt that messages based on social modeling communicated the benefits of quitting tobacco, and subsequent decreases in disease risk, well.

2. Reactions to message format:
   Format worked for teachers as they pointed out that it was important for teachers (“as highly dignified persons in society”) to lead by demonstration.
tobacco, of course. In the past I might have felt strange saying no, but this time I said, “No thanks, I’m quitting tobacco.” I had to say it a lot! Suneeta was in the common room, too, and she said, “I know how hard that is to do! My husband had to say ‘no’ many times when he was quitting.” It made me feel better to know that others went through the same thing. Before I could answer her, Rajeev added, “It’s good to hear these stories. I think about quitting sometimes, and this makes me feel more like I can do it. Also, the more people say ‘No, thanks!’ at gatherings, the less I’ll feel like I have to use it to fit in.” Learn to quit tobacco with our program.

MESSAGE 8. Be a leader. Don’t use tobacco. “Over the years, I have known many teachers who use tobacco. I always wish they wouldn’t, for a lot of reasons. I worry about my best teachers getting sick and suffering from the health problems that we know tobacco can cause. I knew one who did have problems, and I saw how hard it was on his students. Just as importantly, I worry about the example the teachers are setting. I see the students watch their teachers and pay attention to what they do – both inside and outside the classroom. We teachers know that kids don’t miss a thing! As a teacher, you are in a position of respect and prestige – kids look up to you and listen to you. Teach your students about tobacco with your words and actions. Quit tobacco, and show that good health is important. Be the role model they expect you to be.” Learn to quit tobacco with our program.

MESSAGE 9. “I needed to learn a new equation to quit tobacco. I thought I knew everything I needed to teach math to my students. But I needed to learn a new equation to quit tobacco: Willpower + Skills = Success. Willpower can help you quit, but it isn’t the only thing you need. Wanting to quit isn’t always enough. To be successful, you also need skills and a plan for quitting. When I was quitting tobacco, there were challenges every day. But I had ways to beat them. You can learn them, too.” Learn to quit tobacco with our program.

MESSAGE 10. Everyone believes in you! [child one] “I really want my mother to quit tobacco – and I know she has the willpower to do it.” [father] “She has something more than willpower: She also has a plan. Now that she knows what triggers her to use tobacco, it will be easier for her to quit.” [child two] “I’m so proud of my mom! I know she can do it!” Learn to quit tobacco with our program.

MESSAGE 11. “I don’t treat a patient without a plan. You don’t teach your students without a plan. So why try to quit tobacco without a plan?” “Many people tell me that they want to quit tobacco. But wanting to quit isn’t always enough. You need a plan. Researchers and doctors have learned a lot about ‘triggers’. These are the things that make you want to use tobacco. We’ve studied how to beat these triggers. If you have a plan for dealing with them ahead of time, you will be able to beat tobacco.” Learn to quit tobacco with our program.

MESSAGE 12. I started using tobacco when I was at university – when I was with friends or out at gatherings. Soon I was using it a lot more; it just seemed to fit into my life. By the time I graduated, it had become a habit I couldn’t break. When I started teaching, it was really stressful – so many things to do during the day, so many tasks to get used to. Tobacco helped me deal with those feelings. But eventually, I really didn’t like what tobacco was doing to me. I hated having bad breath, and I had mouth sores. I wanted to stop, but I didn’t know how. The habit just seemed too much to deal with. Luckily, I learned about triggers. A trigger is something that makes you want to use tobacco. I had a lot of different triggers. For example, I always used tobacco for my morning bowel motion. Now I take churan when I go to bed instead. My tea breaks were also triggers. Now that I don’t use tobacco while I drink my tea, it tastes so much better! My biggest trigger was stress. I would use tobacco to unwind and calm down during the day. Now that I’m quitting, I take walks instead. When I walk, I have time to think. I don’t miss the tobacco very much now – and walking is much healthier for me.” Learn to quit tobacco with our program.
Cancer Screening - Churches

Pilot Testing of Messages for an Intervention promoting Cancer Screening


In this article, we explored relationships between dimensions of religiousness with adherence to cancer screening recommendations among church-going Latinas. Female Spanish-speaking members, aged 18 and older from a Baptist church in Boston, Massachusetts (n = 78), were interviewed about cancer screening behaviors and dimensions of religiousness. We examined adherence to individual cancer screening tests (mammography, Pap test, and colonoscopy), as well as adherence to all screening tests for which participants were age-eligible. Dimensions of religiousness assessed included church participation, religious support, active and passive spiritual health locus of control, and positive and negative religious coping. Results showed that roughly half (46%) of the sample had not received all of the cancer screening tests for which they were age-eligible. In multivariate analyses, positive religious coping was significantly associated with adherence to all age-appropriate screening (OR = 5.30, 95% CI: 1.18-23.71). For the main findings of this article, please see Table 4.

Table 4. Multivariate Results for Adherence to Cancer Screening Recommendations.

<table>
<thead>
<tr>
<th>Correlates</th>
<th>All Cancer Screening (N = 78)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR</td>
</tr>
<tr>
<td>Model 1 (Nagelkerke $R^2 = .40; %$ correctly classified = 72%)</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>0.91</td>
</tr>
<tr>
<td>Spiritual Health Locus of Control (passive)</td>
<td>0.48</td>
</tr>
<tr>
<td>Religious Coping (positive)</td>
<td>5.51</td>
</tr>
<tr>
<td>English Language Proficiency</td>
<td>0.69</td>
</tr>
<tr>
<td>Final Model (Nagelkerke $R^2 = .40; %$ correctly classified = 73%)</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>0.92</td>
</tr>
<tr>
<td>Spiritual Health Locus of Control (passive)</td>
<td>0.50</td>
</tr>
<tr>
<td>Religious Coping (positive)</td>
<td>5.30</td>
</tr>
</tbody>
</table>

Note. All logistic regressions were conducted using enter method. Variables selected for inclusion in multivariate models were those that demonstrated significant bivariate associations ($p < .10$) with adherence to screening recommendations. Results are not presented for breast, cervical cancer or colorectal cancer screening individually due to small cell sizes.
Promotion of Physical Activity and a Healthy Diet – Communities / Daycare Facilities

Review of Reviews: Evidence Summaries on Efficacy & Effectiveness of Diet and Physical Activity Interventions in Communities and Daycare Facilities


The goal of the first review of reviews was to identify promising intervention strategies in communities. The search strategy is described in the methods section of the habilitation and more detail on the included reviews can be found in the article. In terms of effectiveness of interventions promoting a healthy diet, the meta-analysis by Michie and colleagues (2009) provided moderate evidence for the effectiveness of community-based interventions on healthy eating (Michie, Abraham, Whittington, McAteer, & Gupta, 2009). They reported a positive combined effect for healthy eating derived from various food frequency questionnaires across all studies [standardized mean difference (SMD) = 0.31, 95% CI: 0.23, 0.39, I² = 73%] with no significant difference between community-based studies and studies in other settings (workplace, healthcare settings). Evidence regarding the effects of multi-level or environmental change interventions on diet included in this meta-analysis was not sufficient to draw any conclusions. Results of the meta-regression suggested that among the 26 potential behavior change strategies (e.g., providing general information, modeling behavior, setting graded tasks, feedback on performance), a combination of self-monitoring with one or more self-regulatory techniques improved the effects on healthy eating (SMD = 0.54 vs. SMD = 0.24). Michie and colleagues (2009) also reported a pooled beneficial effect of community-based interventions on physical activity (PA) derived from questionnaire and objective PA data (SMD = 0.32, 95% CI: 0.26, 0.38, I² = 58%). Once again, the evidence was limited by the lack of multi-level or environmental change interventions and the pooling of studies of differing quality. According to the meta-regressive results, combining self-monitoring with one or more self-regulatory technique improved the effects on PA (SMD = 0.38 vs. SMD = 0.28).

The narrative systematic review by Baker and colleagues (2015) focused on community-wide interventions and incorporated a large proportion of multi-level and environmental change interventions with moderate to large sample sizes (Baker, Francis, Soares, Weightman, & Foster, 2015). The authors assessed a variety of self-reported PA outcome measures; however, they did not
find sufficient evidence for the effectiveness of community-based interventions. A further review from Ogilvie and colleagues (2007) focused on interventions to promote walking (Ogilvie et al., 2007). The review comprised three multi-level interventions and environmental change interventions, including mass media campaigns, walking groups, community events, and park modifications. Of the five studies, two showed a significant net increase in self-reported time spent walking at 12 months follow-up. The authors concluded that the evidence was still insufficient as the review included only a small number of community-based studies.

A recent meta-analysis by Bock and colleagues (2014) included 55 intervention studies (seven multi-level or environmental change interventions) (Bock, Jarczok, & Litaker, 2014). The authors found a significant net percent change (NPC) in physical activity [(PA) both self-report and objective measures] of 16% (95% CI: 4.4%, 28.0%) among high quality studies (16 studies). Subgroup analysis indicated significant effects if interventions included face-to-face counselling/group sessions (NPC = 35.0%, 95% CI: 9.6%, 60.5%) or mail components (NPC = 18.9%, 95% CI: 2.2%, 35.6%), or if they were focused exclusively on women (NPC = 27.2%, 95% CI 9.3%, 46.1%). According to Webel and colleagues (2010), a peer-based intervention strategy can be defined as a method in which people share specific health messages with members of their community (Webel, Okonsky, Trompeta, & Holzemer, 2010). With regard to community-based interventions, Webel and colleagues (2010) included four intervention studies that mostly applied lay-led walking groups or counselling sessions. With regard to peer-based interventions, the authors found some evidence for effectiveness based on a meta-analysis including three studies of peer interventions. Although a significant increase in self-reported PA (SMD = 0.16, 95% CI: 0.05, 0.27) was reported, the small number of studies precluded strong conclusions based on the evidence.

In a recent meta-analysis including 17 community recruitment studies, Kassavou and colleagues (2013) investigated the effect of walking groups on PA behavior (Kassavou, Turner, & French, 2013). The authors converted validated self-report and objective PA data into SMDs and found a pooled beneficial effect on PA of overall SMD = 0.52 (95% CI: 0.32, 0.71), with no significant difference between high and low quality studies. One review investigated the effect of point-of-decision prompts on stair use based on 11 environmental change intervention studies (Soler, Leeks, Buchanan, Brownson, Heath, & Hopkins, 2010). The authors included diverse settings, such as shopping malls and train stations, and reported that motivation signs led to a small but significant increase in the proportion of people using stairs (2.7 percentage points). A combination of motivational signs and stairwell enhancement; however, did not result in stronger effects. The studies focused on stair use as an outcome and did not consider overall PA. Among children and adolescents, the reviews did not provide sufficient evidence regarding intervention effects on PA and
diet. More detailed results regarding cost-effectiveness of PA interventions and the effectiveness of community-based interventions in promoting PA among adult at risk populations (i.e., socially disadvantaged women, persons at risk for type II diabetes) can be found in the attached article.

The aim of the second review of reviews was to give an overview of the current national and international evidence on effective measures to change diet and PA and anthropometric outcomes in children in the daycare setting. For an overview of the appraisal of evidence, see Table 5.

Table 5. Overview of the Appraisal of Evidence.

<table>
<thead>
<tr>
<th>Indicators for Overweight/Obesity</th>
<th># Primary Studies</th>
<th>Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body mass index</td>
<td>10</td>
<td>inconsistent</td>
</tr>
<tr>
<td>Triceps-skinfold thickness</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Hip circumference</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Body composition (% bodyfat)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Height-to-Weight Ratio</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Body weight</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Prevalence of overweight</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Other Health Indicators</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Growth</td>
<td>3</td>
<td>inconsistent</td>
</tr>
<tr>
<td>Heart rate</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Total serum cholesterol</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Primary Outcomes</th>
<th># Primary Studies</th>
<th>Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balanced Diet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruit consumption</td>
<td>3</td>
<td>some indication of positive effects</td>
</tr>
<tr>
<td>Vegetable consumption</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Fat consumption</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Unhealthy snacks</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>High-caloric drinks</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Unhealthy foods in the breadbox</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Physical Activity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor skills</td>
<td>3</td>
<td>inconsistent</td>
</tr>
<tr>
<td>Length and intensity of physical activity</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Sedentary Behavior</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monitored sedentary time (assessed via accelerometers)</td>
<td>4</td>
<td>inconsistent</td>
</tr>
<tr>
<td>Time spent on screen-based activities (e.g., TV watching)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Attempts to provide an overview of the complex findings of the review of reviews can be found in Figures 3-5. Figure 3 is a harvest plot of the evidence found for changes in anthropometric outcomes (body-mass index, % body fat, skinfold thickness, prevalence of overweight), healthy eating (consumption of fruits and vegetables, sugar-sweetened beverages, % of calories from total/saturated fat), and physical activity (time spent in moderate-to-vigorous activity/ sedentary behavior). Each review is represented by a bar in the row for the behavior that the review had reported relevant results on. The quality of the reviews was rated, according to the number of
studies included, study sample sizes, and the quality of the study designs and outcome measures employed. Based on this rating, the strength of evidence is indicated by the height of the bar in the harvest plots. Also, the total sample size of all primary studies included in each review is indicated by different colours. In brief, participation in preschool interventions aimed at promoting healthy eating and physical activity was associated with significant increases in the consumption of fruits and vegetables, significant decreases in fat intake and snacking, as well as with significant improvements in motor skills and decreases in sedentary behavior. Evidence regarding effectiveness in increasing moderate-to-vigorous PA was inconclusive.

Figure 3. Evidence regarding Changes in Anthropometric Outcomes, Healthy Eating and Physical Activity.

In terms of effective intervention components identified in the review (also see Figure 4), our results indicated that interventions which comprised (1) the development of skills and competencies, (2) medium to high parental involvement, (3) information for parents on the links of behavior change and health outcomes were most effective in facilitating changes in PA and diet among preschoolers.
Figure 4. Evidence regarding Effective Intervention Components.

Furthermore, similar to the findings of the review of review on PA and diet interventions in the community settings, we also found that multi-level interventions (children, social environment – parents) were more effective than those solely focussing on individual behavior change (Figure 5).
Figure 5. Evidence regarding the Effectiveness of single-vs. multi-level Interventions for Weight Reduction and Changes in Other Anthropometric Outcomes.

Pilot Study: Factors affecting Implementation of a Program for Health Promotion targeting Preschoolers at Daycare Facilities


The aim of this small pilot study was to examine previous health promotion activities in selected daycare facilities, the implementation status of a program for health promotion among preschoolers (‘JolinchenKids – Fit and Healthy in Daycare’) consisting of five modules, and to investigate which factors affect program implementation from the perspective of kindergarten teachers and other daycare staff. This program was pilot tested and monitored for two months at daycare facilities in three regions in Germany before its nationwide start. Fifty daycare staff were asked questions regarding previous health promotion activities at daycare facilities, implementation status, and facilitating and impeding factors during program implementation in structured interviews. Suggestions for program changes were also assessed. In addition, focus groups with
daycare staff (n=13) were conducted on the same topics. We found that previous experiences regarding the promotion of a healthy diet and PA facilitated program implementation. Also, the majority of the daycare facilities had chosen to start with modules that they felt familiar with from previous intervention activities (i.e., diet, PA) compared to modules that they felt less familiar with (e.g., stress reduction). Additional facilitating factors included the modular program structure, as well as the external supervision of daycare staff by health insurance staff during the initial months of program implementation. Parental participation was deemed important for health promotion among children but was identified as a potential barrier to implementation. Parents often lacked time to get involved in program activities. The overall acceptance of the program was high. Content and materials of the program appealed to daycare staff and were deemed child-friendly and easy to use.

6.2.2 Environmental Change

Prevention and/or Reduction of Substance Use

Universities (Theory-based Intervention Development & Baseline Results of the ‘Social Norms for the Prevention of PolyDrug Use’ Study)


The purpose of the first article included here was to describe the design of the SNIPE study, a multi-site cluster controlled trial of a web-based social norms intervention aimed at reducing licit and preventing illicit substance use in European university students (for further detail, see section 3.2). Furthermore, the design of the online questionnaire to assess rates of substance use is described in
this paper as well as recruitment for the study and the content of the web-based ‘social norms’ intervention.

The second article analyzed baseline data on tobacco use and on social norms regarding tobacco. Specifically, the two aims of this article were to a.) investigate possible self-other discrepancies regarding personal use and attitudes towards tobacco use and b.) evaluate if perceptions of peer use and peer approval of tobacco use are associated with personal use and approval of tobacco. In total, 4482 students (71% female) answered an online survey including questions on personal and perceived tobacco use and personal and perceived attitudes towards tobacco use. We found that, across all countries, the majority of students perceived tobacco use of their peers to be higher than their own use. The perception that the majority (>51%) of peers used tobacco regularly in the past two months was significantly associated with higher odds for personal regular use (OR: 2.66, 95% CI: 1.90-3.73). Perceived approval of tobacco use of peers (OR: 6.49, CI: 4.54-9.28) was associated with own approval of tobacco use. Personal smoking in the last two months (OR: 7.85, 95% CI 6.55-9.41) was associated with a higher likelihood of personal approval regarding tobacco use. Results are shown in further detail in Tables 6 and 7. For more detailed results, please see the attached article.
Table 6. Association between Perceived Behavior of Peers and own Tobacco Use adjusted for Country, Age, Sex, Study Year, and Living Situation – Results of a Multinomial Logistic Regression.*

<table>
<thead>
<tr>
<th>Variables</th>
<th>Smoked in the last two months: Three times a week or more often vs. Never</th>
<th>Smoked in the last two months: At most twice a week vs. Never</th>
<th>Not in the last two months vs. Never</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (% total sample)</td>
<td>OR (95% C.I.)</td>
<td>OR (95% C.I.)</td>
</tr>
<tr>
<td>Perceived Peer Tobacco Use</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not in the last two months/Never</td>
<td>440 (10.1)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Smoked in the last two months: At most twice a week</td>
<td>1235 (28.4)</td>
<td>1.82 (1.25-2.64)</td>
<td>4.07 (2.68-6.18)</td>
</tr>
<tr>
<td>Smoked in the last two months: Three times a week or more often</td>
<td>2673 (61.5)</td>
<td>2.66 (1.90-3.73)</td>
<td>2.52 (1.68-3.79)</td>
</tr>
<tr>
<td>Country</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slovak Republic</td>
<td>1894 (43.6)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Belgium</td>
<td>401 (9.3)</td>
<td>0.52 (0.35-0.77)</td>
<td>0.39 (0.27-0.58)</td>
</tr>
<tr>
<td>Denmark</td>
<td>448 (10.3)</td>
<td>0.68 (0.46-0.99)</td>
<td>0.72 (0.48-1.06)</td>
</tr>
<tr>
<td>Germany</td>
<td>492 (11.3)</td>
<td>1.70 (1.25-2.33)</td>
<td>1.65 (1.20-2.29)</td>
</tr>
<tr>
<td>Spain</td>
<td>181 (4.2)</td>
<td>0.82 (0.50-1.34)</td>
<td>0.69 (0.41-1.15)</td>
</tr>
<tr>
<td>Turkey</td>
<td>827 (19.0)</td>
<td>1.84 (1.45-2.34)</td>
<td>1.11 (0.85-1.45)</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>103 (2.4)</td>
<td>0.80 (0.45-1.45)</td>
<td>0.58 (0.30-1.12)</td>
</tr>
<tr>
<td>Age [per year]</td>
<td>1.02 (1.00-1.05)</td>
<td>0.97 (0.94-1.01)</td>
<td>1.04 (1.02-1.06)</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>3104 (71.4)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Male</td>
<td>1244 (28.6)</td>
<td>1.77 (1.45-2.15)</td>
<td>1.42 (1.15-1.75)</td>
</tr>
</tbody>
</table>

*Results for year of study and living situation are not shown in the table.
The third article included here was based on the baseline data regarding alcohol use. Specifically, the aims were to explore to what extent European university students had an accurate (vs. inaccurate) estimation of their peers’ amount of alcoholic drinks consumed per day, to identify predictors of accurate estimation of peer alcohol use, and to examine whether an accurate estimation was associated with a reduced likelihood of personal excessive drinking among European university and college students. A total of 4392 students from universities in six European countries and Turkey reported their own typical alcohol consumption per day and estimated the same for their peers of the same sex. Students were classified as accurate or inaccurate estimators of peer alcohol consumption. Gender, age, country, born outside the country, study subject, and being a “typical student” were examined as predictors for an overestimation. A percentage of 72% of male and 51% of female students were identified as having accurate estimations about the amount of alcoholic drinks consumed per day by their peers, while the percentage of students overestimating the norm ranged from 18% among males from Turkey to 89% among females from the United Kingdom. Male students, older students, those studying in year three and above, and Turkish and Danish students.

### Table 7. Association between Perceived Attitudes of Peers and own Attitudes towards Tobacco Use adjusted for Personal Tobacco Use, Country, Age, Sex, Study Year, and Living Situation- Results of a Binary Logistic Regression.*

<table>
<thead>
<tr>
<th>Variables</th>
<th>Positive Attitude towards Tobacco Use (okay to use even if it does interfere with study or work)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (% total sample)</td>
</tr>
<tr>
<td>Perceived Peer Attitude to Tobacco Use</td>
<td></td>
</tr>
<tr>
<td>Never okay to use</td>
<td>266 (6.3)</td>
</tr>
<tr>
<td>Okay to use</td>
<td>3932 (93.7)</td>
</tr>
<tr>
<td>Personal Tobacco Use</td>
<td></td>
</tr>
<tr>
<td>Not in the last two months/Never</td>
<td>2909 (69.3)</td>
</tr>
<tr>
<td>Smoked in the last two months</td>
<td>1289 (30.7)</td>
</tr>
<tr>
<td>Country</td>
<td></td>
</tr>
<tr>
<td>Slovak Republic</td>
<td>1843 (43.9)</td>
</tr>
<tr>
<td>Belgium</td>
<td>396 (9.4)</td>
</tr>
<tr>
<td>Denmark</td>
<td>442 (10.5)</td>
</tr>
<tr>
<td>Germany</td>
<td>485 (11.6)</td>
</tr>
<tr>
<td>Spain</td>
<td>172 (4.1)</td>
</tr>
<tr>
<td>Turkey</td>
<td>761 (18.1)</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>99 (2.4)</td>
</tr>
<tr>
<td>Age [per year]</td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>2998 (71.4)</td>
</tr>
<tr>
<td>Male</td>
<td>1200 (28.6)</td>
</tr>
</tbody>
</table>

*Results for year of study and living situation are not shown in the table
were more likely to accurately estimate their peers’ alcohol consumption. Independent from these factors students accurate estimation of peers’ drinking decreased significantly with increasing personal consumption. More detailed results can be found in the tables of the attached article.

The fourth article included here was based on an analysis of the baseline data regarding cannabis use and social norms surrounding cannabis. Specifically, in this article, we investigated whether European students perceived their peers’ cannabis use and approval of cannabis use to be higher than their personal behaviors and attitudes, and whether estimations of peer use and attitudes were associated with personal use and attitudes. 4131 students from the seven participating countries completed questions regarding cannabis use in the online SNIPE survey. The main results are shown in Table 8. Briefly, the majority of students across countries perceived that the majority of their peers used cannabis and had permissive attitudes towards it. Males were more likely to report using cannabis in the previous two months compared to females. Perceived peer descriptive norms were associated with personal cannabis use in the past two months (OR: 1.13; CI: 1.04-1.22) and perceived injunctive norms were associated with personal attitudes towards cannabis use (OR: 1.39; CI: 1.26-1.53) whilst controlling for students’ age, gender, year of study, and religious beliefs. Effect modification by country is described in further detail in the attached article.
Table 8. Associations between Perceptions of Peer Attitudes and Cannabis Use with Personal Cannabis Use Behaviors and Attitudes in the Past Two Months.

<table>
<thead>
<tr>
<th>Perceived Peer Use of Cannabis in Last Two Months</th>
<th>Cannabis Consumption in Past Two Months</th>
<th>Cannabis Attitudes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Odds Ratio</td>
<td>95% Confidence Intervals (CI)</td>
</tr>
<tr>
<td>Perceived Peer Use of Cannabis in Last Two Months</td>
<td>1.13**</td>
<td>(1.04-1.22)</td>
</tr>
<tr>
<td>Perceived Peer Cannabis Attitudes</td>
<td>0.98</td>
<td>(0.86-1.10)</td>
</tr>
</tbody>
</table>

**Personal Use**

<table>
<thead>
<tr>
<th>Personal Use</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No cannabis use in past two months</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Have used cannabis in past two months</td>
<td>16.25***</td>
<td>(10.91-24.20)</td>
</tr>
</tbody>
</table>

**Sex**

<table>
<thead>
<tr>
<th>Sex</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Male</td>
<td>1.77*</td>
<td>(1.04-3.01)</td>
</tr>
<tr>
<td></td>
<td>1.85**</td>
<td>(1.21-2.81)</td>
</tr>
</tbody>
</table>

**Age**

<table>
<thead>
<tr>
<th>Age (per one year)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.96*</td>
<td>(0.93-0.99)</td>
</tr>
<tr>
<td></td>
<td>0.99</td>
<td>(0.97-1.01)</td>
</tr>
</tbody>
</table>

**Residence Status**

<table>
<thead>
<tr>
<th>Residence Status</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Living with other students</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Alone/with partner</td>
<td>0.75</td>
<td>(0.54-1.04)</td>
</tr>
<tr>
<td></td>
<td>0.97</td>
<td>(0.76-1.24)</td>
</tr>
<tr>
<td>With parents</td>
<td>0.48***</td>
<td>(0.35-0.66)</td>
</tr>
<tr>
<td></td>
<td>0.97</td>
<td>(0.79-1.18)</td>
</tr>
<tr>
<td>Other</td>
<td>0.89</td>
<td>(0.47-1.69)</td>
</tr>
<tr>
<td></td>
<td>0.78</td>
<td>(0.48-1.28)</td>
</tr>
</tbody>
</table>

Note: Adjusted Odds Ratios are reported controlling for participant age, sex, religious beliefs, year of study and residence status.  
* p < 0.05, ** p < 0.01, *** p < 0.01
Schools (Formative Research: Review of Reviews on Evidence of Effectiveness of Interventions for the Prevention and Reduction of Substance Use)


Fourteen review articles of moderate to good quality fulfilled the a-priori defined inclusion criteria set for this review of reviews. Capacity-promoting interventions, for example, those focusing on strengthening self-confidence and peer resistance, showed promising evidence of effectiveness. Multi-component and multi-level interventions were more suitable for the prevention of alcohol and cannabis consumption. Findings regarding the prevention of tobacco consumption were deemed inconsistent. The effectiveness of knowledge-based interventions was limited. The long-term effectiveness of smoke-free competitions could not be conclusively evaluated because the findings were discrepant.

7 Discussion

The body of work presented here focuses on the development, implementation, and evaluation of interventions for chronic disease risk reduction and for health promotion in various settings. Several approaches were taken to generate new evidence regarding the feasibility, efficacy, and effectiveness of interventions to produce behavior and/or (social) environmental change. These included the execution of (cluster-controlled) intervention trials but also extensive reviews of the existing scientific literature to identify effective intervention components and/or levels of intervention for behavior and/or environmental change in various populations. The latter were performed in preparation of future intervention development and research to be conducted in Germany to examine effects of PA and diet interventions among children and older adults. Further, all articles included in this habilitation present research lying within the spectrum of the six steps of the ‘Intervention Mapping’ approach (Bartholomew, Parcel, Kok, Gottlieb, & Fernandez, 2011): Step 1.) Needs assessment [e.g., literature review, focus groups, and interviews with different target groups (Brand et al., 2014; Pöttgen, Brand, Samkange-Zeeb, Steenbock, & Pischke, 2015; Steenbock, Pischke, Schönbach, Pöttgen, & Brand, 2015); Step 2.) Preparation of matrices of change objectives; Step 3.) Selection of theory-informed intervention methods and practical applications (Allen et al., 2014; Pischke et al., 2013); Step 4.) Production of program components and materials (Allen et al., 2014; Pischケット al., 2013; Steenbock, Zeeb, Liedtke, & Pischke, 2015); Step 5.) Planning of the program
The scientific evidence presented in the first part of the habilitation indicates that intensive lifestyle changes are associated with a reduction in the risk for future cardiac events and with a reduction in coronary risk factors. At both, earlier and later stages of coronary heart disease, intensive lifestyle changes may lead to changes in risk factor profiles and may delay the progression of the disease. Specifically, results of the first article (based on the MLDP study) included in this part of the habilitation indicated that CHD patients with asymptomatic reduced LVEF were able to safely delay revascularization by making changes in lifestyle with no increased risk for cardiac events or overt heart failure over three years (Pischke, Elliott-Eller, Li, Mendell, Ornish, & Weidner, 2010). However, several study limitations should be noted. One limitation was that the control group was a non-random sample of patients drawn from medical records with similar disease status as MLDP participants. However, comparisons of demographic variables, degree of stenosis, and medical history between the two groups indicated that the two groups were similar. Also, both IG and UCG patients came from the same source - they were all enrolled in the health insurance companies participating in the MLDP. Secondly, LVEF was not assessed at follow-up. However, reductions in ischemia and angina pectoris, possibly reflecting an improved left ventricular function and reverse ventricular remodeling (e.g., Ornish, 1990; Ornish et al., 1998), had been demonstrated in an earlier randomized controlled trial, employing the same intervention as the MLDP (Ornish, 1990), and in the subsequent MCLIP study (Frattaroli, Weidner, Merritt-Worden, Freneda, & Ornish, 2008). Thirdly, the small sample size of this pilot trial precluded an evaluation of individual components of the lifestyle intervention. A later randomized controlled trial, including 2331 medically stable outpatients with HF and reduced LVEF, found that exercise training did not result in reductions in all-cause mortality, hospitalization, and clinical events (O’Connor et al., 2009), suggesting that exercise alone may not be sufficient to produce benefits in cardiac morbidity and mortality. A final limitation is the fact that the number of MLDP patients with low LVEF was very small. Our study sample was also predominantly white and did not include a sufficient number of women to stratify by gender. Therefore, our results may not apply to other ethnic groups and women.

Lastly, since the MLDP study was conducted in the 1990s, medical treatment guidelines for CHD patients at risk for HF changed and significant technological advances were made [i.e., widespread use of implantable devices, such as implantable cardioverter defibrillators (ICDs), left ventricular assist devices (LVADs)]. The avoidance or control of coronary risk factors, such as
hypertension, hyperlipidemia, obesity, diabetes mellitus, and tobacco use through medication or changes in lifestyle still remains a crucial part of treatment among stage A patients and all recommendations for stage A patients apply to those in stage B (Yancy et al., 2013). However, results of the MADIT-II (Multicenter Automatic Defibrillator Implantation Trial II) in the early 2000s demonstrated a 31% relative risk reduction in all-cause mortality in post-MI patients with an LVEF below 30% receiving a prophylactic ICD compared to those receiving standard care (Moss et al., 2001). These findings formed the basis for a broad adoption of ICDs for primary prevention of sudden cardiac death post-MI among persons with reduced LVEF, even when HF symptoms were not present (those in stage B). This implies that in today’s medical environment it may be difficult to conduct research similar to that included here. Nevertheless, the most recent ACCF/AHA guidelines state that, despite the lack of prospective randomized data, consensus exists that risk factor recognition and modification are key for the prevention of HF among at-risk patients (Yancy et al., 2013). Results of the second article which was based on a subsequent hospital-based multi-site intervention trial (MCLIP study) targeting persons with multiple coronary risk factors and persons with CHD suggested that participation in the shorter, 3-months version of the intensive lifestyle change program may lead to reductions in coronary risk factors (Frattaroli, Weidner, Merritt-Worden, Frenda, & Ornish, 2008), including favorable changes in emerging CHD biomarkers (Chainani-Wu et al., 2011). Changes in psychological risk factors associated with program participation were reported elsewhere (Pischke, Frenda, Ornish, & Weidner, 2010).

The evidence presented here supports the inclusion or institutionalization of comprehensive lifestyle interventions for the prevention and control of NCDs (for secondary and tertiary prevention) in the hospital setting. The results of the two demonstration (‘beacon’) projects, the MLDP targeting persons with established CHD (n=440; Pischke et al., 2006; Pischke, Weidner, Elliott-Eller, & Ornish, 2007; Schulz et al., 2008) and the MCLIP targeting patients with CHD (n=1152, Frattaroli, Weidner, Merritt-Worden, Frenda, & Ornish, 2008) and those at risk for CHD (n=997) which were both conducted in the U.S. (Daubenmier et al., 2007; Frattaroli, Weidner, Merritt-Worden, Frenda, & Ornish, 2008) led to a more wide-spread implementation of the ‘Lifestyle Change Program’ in hospitals in the U.S. and finally to coverage by Medicare and Medicaid. Adaptations of this U.S.-American program or of some of its program components have been implemented at German hospitals. However, I am unaware of any systematic research investigating the effectiveness of this program in the German context and health care system and/or of any coverage of the program by German health insurances. There is research in Germany; however, investigating whether lifestyle changes affect survival among CHD patients enlisted for a heart transplant (Spaderna et al., 2010) which may translate to a more frequent implementation of lifestyle change interventions at German hospitals and systematic evaluations of such interventions in this setting.
The second part of the habilitation included formative research conducted to help guide the development of interventions for tobacco control, the promotion of cancer screening, PA, and a healthy diet. In the first paper, the theory-based step-wise development of a smoking cessation intervention for teachers was described. Specifically, we used the 'Social Contextual Model of Health Behavior Change' (see section 3.2, figure 2) to identify social-contextual factors in the social environment of teachers in India as either mediating mechanisms (i.e., factors amenable to change and addressed by the intervention) or modifying conditions (i.e., factors acting at various levels independently affecting outcomes, but not influenced by the intervention itself) to be considered in the intervention. Mediating mechanisms found to be relevant in the context of Bihar included the risk perception regarding tobacco-related harm among teachers, the motivation or intention to change tobacco use behavior, social norms surrounding tobacco use, perceived self-efficacy or personal skills to quit, and support from others to quit. Modifying conditions comprised tobacco use for coping with stress (individual level); the relevance of family support for quitting (interpersonal level); factors enabling or preventing tobacco use in the school environment (organizational level), such as long breaks vs. the presence of a school principal enforcing school tobacco control policies; the availability of tobacco in neighborhoods or at celebrations (neighborhood level); and the existence of a national tobacco control legislation (societal level). Other information relevant to the development of the intervention was identified in a literature review and in direct observation at the school campuses. The information gathered indicated that the majority of teachers were college educated suggesting that intervention materials could be written at high reading levels. In addition, different forms of tobacco consumed by male and female teachers, the prevalence rates for consumption, and the presence or absence of school policies prohibiting tobacco use (and whether they were actively enforced) were identified and incorporated into the health education materials provided to teachers in the intervention.

The theory-driven identification of relevant social-contextual factors led to the development of an initial set of intervention messages regarding the identified themes which were evaluated in focus groups with teachers who were not part of the subsequent intervention trial. In a second paper included here, we described the results of focus groups that were aimed at qualitatively exploring perceptions about tobacco use among teachers and at examining how risk information may be communicated through a variety of message formats (Pischke et al., 2013). Our results indicated that messages using evidence-based information, possibly with negative emotions, such as fear, testimonials with role models, and messages emphasizing self-efficacy in the form of narratives appealed to teachers in Bihar. Thus, messages included in the intervention used the message formats that appealed most to teachers, emphasized the dangers of tobacco consumption, and outlined strategies to quit tobacco with the support from others. This formative research helped create an
intervention (the ‘Tobacco-Free Teachers/Tobacco-Free Society Program’ that focused on health education regarding the harmful consequences of tobacco use, cessation support, and the implementation of tobacco control policies at schools (for further detail on the operationalization in the intervention, see Table V in Nagler et al., 2013).

The intervention was later evaluated in a cluster-randomized trial (conducted at 72 schools) to examine whether teachers in intervention schools were more likely to have quit tobacco in the 30 days immediately after the intervention or more likely to have quit or have stayed quit for 6 months or more 9-months post-intervention (Sorensen et al., 2013). Sorensen and colleagues (2013) found that approximately one third of the teachers used smokeless tobacco products and ca. 7% smoked at baseline. Approximately half of the teachers had quit in the intervention group and 15% in the control group 30 days after the intervention was completed. The 6-months quit rate was ca. 17% in the intervention and 7% in the control group at the 9-months follow-up. A recently published paper by Pawar and colleagues (2015) reported results on intervention delivery. Their findings suggested that ‘fidelity’ (for sessions/program components) was high. Further, ‘dose’ delivered to schools was close to the maximum and more than 90% of teachers at each school had participated in at least one session of the program suggesting a high ‘reach’ of the program. In summary, the intervention was delivered as planned which explains its efficacy in changing tobacco use among teachers.

Similarly, the formative work presented in this habilitation investigating the role of various religious beliefs and themes in association with health, in general, and with the uptake of cancer screening in the population of Latinas guided the development of a subsequent intervention for the promotion of cancer screening. Partly based on these results, a church-based educational program to promote breast, cervical, and colorectal cancer screening among Latinas (> 18 years) was created (Allen, Perez, Tom, Leyva, Diaz, & Idali Torres, 2014). In this program, members of the church were trained to deliver evidence-based screening interventions (for further detail, see Allen, Perez, Tom, Leyva, Diaz, & Idali Torres, 2014; not included here).

The second part of the habilitation also included two literature reviews and the results of a small pilot study which formed the basis for two subsequent intervention studies which are currently ongoing. In the two literature reviews, existing evidence regarding the effectiveness of community-based interventions to promote PA and healthy eating (and associated changes in weight status and/or diabetes risk) in primary school-aged children, healthy adults, and adults with an elevated risk for type II diabetes (Brand et al., 2014) and in preschoolers (Steenbock, Pischke, Schönbach, Pöttgen, & Brand, 2015) was identified. In both articles, the results suggested that interventions were more successful in producing changes in anthropometric outcomes and in behavior that were not solely knowledge-based but focused on the development of concrete skills for behavior change. In addition,
interventions that involved multiple stakeholders, such as community leaders (Brand et al., 2014) or parents in the daycare setting (Steenbock, Pischke, Schönbach, Pöttgen, & Brand, 2015) and that intervened at more than one level were more likely to have an impact on health outcomes and on changes in the environment. Furthermore, the findings of the small pilot study examining factors affecting implementation of a program for health promotion targeting preschoolers suggested that previous experiences with health promotion activities among daycare staff, as well as external supervision during the first months of implementation, facilitated implementation. Parental participation in the implementation was not realizable due to time constraints of parents, as well as of kindergarten teachers (Steenbock, Zeeb, Liedtke, & Pischke, 2015). In the following paragraph, the two intervention studies which ensued this research are outlined briefly.

In the AEQUIPA (‘Physical activity and health equity: Primary prevention for healthy ageing’) network and project, we are currently developing various PA interventions targeting older adults in communities. Specifically, in the subproject of AEQUIPA entitled ‘Tailoring physical activity interventions to promote healthy ageing’ (PROMOTE), we aim to develop and compare three types of community-based interventions for the promotion of PA in a large sample of older adults (n=1200) over three months: A paper-and-pencil intervention (tracking of PA plus access to additional materials for download on a website), a web-based intervention (tracking of PA with a PA diary, i.e., subjective PA assessment), a web-based intervention with objective PA assessment via a PA tracker. Furthermore, intervention participants in all intervention arms will have access to weekly group meetings with other study participants (that will be led by trained students) to exchange their experiences with the intervention, to receive additional coaching in regard to PA, and to exercise together in their communities. Further, online portals for social networking in relation to PA will be made available to study participants in all intervention arms. The development of this intervention will be completed by the end of 2015 and implementation and the accompanying evaluation will start in early 2016. The literature review of Steenbock, Pischke, Schönbach, Pöttgen, & Brand (2015) and the results of the process evaluation of the implementation of the health promotion program for preschoolers in the small pilot study (Steenbock, Zeeb, Liedtke, & Pischke, 2015) laid the foundation for a larger study which is foreseen to start at the end of the year 2015 in which we will examine the effectiveness of this intervention in regard to changes in PA, diet, and psychological well-being in children in a larger sample of daycare facilities over the course of 18 months. Taken together, the evidence presented in the second part of the habilitation suggests that a theory-guided intervention development and participatory approaches to identify relevant social-contextual factors associated with the targeted health behavior may lead to an intervention which is perceived as relevant to the target population, fitting to their needs and real-life context, and which addresses not only individual
behavior but may also lead to more permanent changes in the environment that contribute to preventive behavior over the long term.

In the third part of the habilitation, baseline findings of a multi-site cluster-randomized intervention trial of a web-based intervention targeting social norms on substance use in the university setting were presented. The target group of this intervention was healthy and the social network level was addressed in this intervention to affect social norms around substance use. The intervention strategy is based on ‘social norms’ theory and is an innovative approach to the prevention of substance use, predominantly researched in the U.S., not yet in Europe. Our baseline data, similar to U.S.-American research on the topic, indicated that European students overestimated consumption rates of various substances in their peer group and that these perceptions appeared to be associated with higher rates of personal use (Dempsey et al., under review; Helmer et al., 2014; McAlaney et al., 2015; Pischke et al., 2015; Stock et al., 2014). This appeared to be the case for both licit (McAlaney et al., 2015; Pischke et al., 2015; Stock et al., 2014) and illicit substances (Dempsey et al., under review; Helmer et al., 2014).

Interventions which address such discrepancies may be effective in reducing or preventing substance use and substance use-related harm. Unfortunately, in the SNIPE study, we did not have sufficient follow-up data of students enrolled in control universities to examine the question of whether participation in this web-based intervention was associated with possibly greater changes in perceptions and attitudes regarding substance use and substance use behavior in intervention participants compared to controls. This is a major shortcoming and could have been due to the fact that students at control universities were informed that they would receive the intervention after five months. However, this meant that a lot of time elapsed until students were offered the intervention and we did not incentivize the completion of the follow-up survey which may explain the lack of follow-up data for controls. Hence, we will only be able to examine pre-post comparisons of attitudes towards substance use and potential changes in the behavior among intervention participants (article currently in preparation). However, the SNIPE study was followed by the INSIST ['INternet-based Social norms Intervention for the prevention of substance use among Students']-study which aimed to further examine the ‘social norms’ approach in the German university context. In this study, we conducted a cluster-randomized trial including eight universities to examine the effects of a web-based ‘social norms’ intervention on substance use among German university students. Preliminary findings suggest significant reductions in alcohol and cannabis use among students at intervention universities compared to those at control universities (article currently in preparation). Because we were able to demonstrate efficacy of this web-based intervention, we are currently working on obtaining funding to anchor this intervention in existing university structures,
both at universities that participated in the study, as well as in other universities interested in implementing such an intervention.

A challenge in future research using this approach is to show that changes in perceptions and attitudes are associated with reductions in substance use behavior and negative consequences of substance use over the long term. Studies with longer follow-up periods are necessary to demonstrate such associations. Another factor that warrants further investigation is the role of referent groups and how much individuals identify with one or several referent groups. Students may not identify with the majority of other students on their campus or with the “typical student” but may rather compare themselves with students who are in their circle or various circles of friends. It is known that friends play a considerable role in modeling substance use behavior (Deressa, & Azazh, 2011). For example, one study showed that students whose friends smoked were four times more likely to smoke (Deressa, & Azazh, 2011). However, to date, there is a lack of work exploring the role of misperceptions in smaller groups and in relation to more than one referent group. Furthermore, a recent review of the literature on ‘social norms’ feedback and its effect on alcohol-related outcomes, including 66 studies, indicates differences in effects by delivery mode (Foxcroft, Moreira, Almeida Santimano, & Smith, 2015). Web-based and individual face-to-face ‘social norms’ interventions produced small effects on alcohol-related outcomes, such as alcohol-related problems, binge drinking, frequency and amount of alcohol consumed and estimated blood alcohol concentrations at four or more months follow-up compared to mailed ‘social norms’ feedback which did not yield any effects (Foxcroft, Moreira, Almeida Santimano, & Smith, 2015). Hence, future web-based ‘social norms’ interventions should include additional components addressing the social and physical context of students to increase intervention effects. The final article included in this part of the habilitation examined existing interventions in the field of substance use prevention at primary and secondary schools. This article was written in preparation of a future intervention we are planning to develop for substance use prevention at German schools. Our review of the literature suggested that school-based interventions should include capacity-promoting components and should address further levels beyond the individual, for example, organizational changes of the school setting or changes in social norms regarding substance use. However, the findings also suggested that further research is needed, in particular on the effectiveness of multi-component, multi-level interventions for the prevention of tobacco consumption among students at primary and secondary schools.

In summary, the evidence presented in this habilitation emphasizes the careful development of interventions to translate evidence-based knowledge on methods for behavior change into interventions fitting various settings and environmental and social contexts. The results of the articles presented here also provide some evidence suggesting that interventions targeting more
than one level, typically the individual level, appear to be more effective in changing health behavior, and in affecting health status and quality of life of populations (on a continuum of health risks) in non-health-care settings. Considering the growing evidence that non-health care interventions are not only associated with behavioral and environmental change (as suggested above) but that they also seem cost-effective (Institute of Medicine, 2012), it is regrettable that most investments into improvements in health continue to flow into the health-care sector for treatment of acute and chronic diseases (Institute of Medicine, 2012; Lyons, Ford, Moore, & Rodgers, 2014). Recent research suggests that environmentally-based interventions, in particular, appear to provide better value for money (Chokshi, & Farley, 2012; Lyons, Ford, Moore, & Rodgers, 2014). However, more research is needed to further illuminate whether such interventions are associated with benefits for health and to examine whether multi-level interventions are better than more focused interventions.

The public health research community is only now beginning to discuss new methodological approaches for research investigating synergistic effects of non-health care multi-level interventions on behavioral and environmental change. Compared to clinical person-centered interventions which can be researched under controlled conditions with classical research designs, researchers conducting and evaluating interventions in real-life settings are confronted with a complexity of exposures, possibly interacting with different intervention levels and components over an extended period of time (Lyons, Ford, Moore, & Rodgers, 2014). Hence, embracing socioecological and life-course perspectives in intervention research requires careful consideration of research designs and methodologies and an adequate selection of indicators and measures for outcomes at different levels. Study designs, analytical issues, measurement, and measures with regard to the evaluation of multi-level interventions have recently been discussed in more detail for multi-level intervention research in cancer care (Charns et al., 2012; Cleary, Gross, Zaslavsky, & Taplin, 2012) and in public health practice (Craig, Dieppe, Macintyre, Michie, Nazareth, & Petticrew, 2013).

For example, Cleary and colleagues (2012) reviewed designs to generate new data further illuminating whether multi-level interventions are more effective than more focused interventions and analytic strategies to control for confounders in multi-level data. The authors acknowledge the complexity and cost involved in conducting studies in a sufficient number of units so that there is enough variation to assess more than overall effects. However, they also outline concrete methodologies [e.g., randomized experiments using cluster/group randomization, quasi-experiments and analytical strategies (e.g., propensity-score analysis)] to reduce costs for conducting research trials examining multi-level interventions and to increase the feasibility of obtaining funding for such research. Furthermore, more practical design approaches are described to evaluate additive and synergistic effects of multi-level interventions. For example, instead of using a classical full-factorial
design (e.g., 2x2x2x2, 16 conditions for four components of a multi-level intervention) to assess the effects of various components which would result in a study with a large number of units to fill all the cells of the design and would be extremely impractical, they propose a nested or split-plot design. According to the authors, this design “greatly reduces the number of units at the higher levels of a multilevel structure while still making it possible to estimate interactions among the multilevel intervention components and to have a large number of randomized units at the lower levels” (p. 52, Cleary, Gross, Zaslavsky, & Taplin, 2012). Other approaches to better map temporal changes of outcomes mentioned are interrupted time series designs where the researcher collects data on the same variable over time and examines the extent to which the slope of change over time is affected by an intervention (Cleary, Gross, Zaslavsky, & Taplin, 2012). Considering the complexity of approaches, applying these methodologies and analytic strategies in public health research will require a stronger involvement of persons with expertise in methodology and statistics in intervention development and the planning of future intervention trials.

Furthermore, the question of what types of interventions generate health inequalities warrants further investigation. Some research suggests that certain intervention strategies may increase inequalities between groups varying in socioeconomic status (i.e., “downstream” interventions: Media campaigns, workplace smoking bans; Lorenc, Petticrew, Welch, & Tugwell, 2012). In contrast, more “upstream” interventions are more likely to decrease health inequalities. These include multi-level interventions changing organizational structures at workplaces and fiscal interventions, such as changes in tobacco prizing. Again, as I outlined above, multidisciplinary teams, including persons usually not involved in intervention research, such as economists, policy makers, city planners, and others will have to be formed to create new research to further elucidate these questions.

Another challenge is to make new research findings on the effects of multi-level interventions for health promotion and on health policies on health outcomes more comparable across different countries. One initiative (funded by the European Commission) addressing this issue for Europe for the two areas of PA and diet is the DEDIPAC (‘Determinants of Diet and Physical Activity; Knowledge Hub to integrate and develop infrastructure for research across Europe’) project (see website in the reference section) which aims to harmonize the development and evaluation of diet and PA interventions in Europe. The consortium of researchers in this project have begun to create recommendations for intervention development but also for a harmonized assessment of health outcomes intended to be provided to public health researchers and practitioners in the years to come.
In my group, we have taken the lead on a work package which aims to identify good practice examples for PA and dietary interventions and policies in Europe (for more detail, see Muellmann, Pischke, Steenbock, & Zeeb, 2015). Specifically, we conducted qualitative case studies to gain a better understanding of factors facilitating or impeding the implementation and transfer of both multi-level interventions and policies targeting diet and PA in five European countries (Belgium, Germany, Ireland, Norway, and Poland). Overall, 40 interviews were conducted examining six interventions (Belgium: “Tutti Frutti”, “10,000 steps”, Germany: “IDFICS”, Ireland: “Food Dudes Healthy Eating Programme”, “Green-Schools Programme – Travel theme”, Poland: “European Schools for Healthy Food – Slow Food in the Canteen”) and six policies (Germany: “Federal state offices coordinating networks for the provision of healthy food options in schools”, Norway: “Keyhole”, “Free school fruit program”, Poland: “Fit Student”, “Tasty, Healthy, Valuable”, “Fit City”). We found that in both, intervention, as well as policy cases, one of the major factors contributing to a successful implementation was an active involvement of the relevant stakeholders. Other factors facilitating implementation which were reported by interviewees included sufficient training of staff to ensure an implementation according to existing intervention/policy protocols and tailoring of materials to match the needs, (language) skills, and socio-cultural context of various target groups. Sustainability of the implemented interventions/policies depended on whether the respective intervention/policy was embedded in existing or newly created organizational structures of the different settings and whether continued funding was secured. This often depended on political support for the intervention/policy in the respective E.U. governments and/or politicians of the party in power favouring the intervention/policy. In sum, factors facilitating and/or hindering the implementation of interventions and policies and impacting sustainability appeared to be similar across the five European countries involved in this work package. The entire DEDIPAC project will be completed at the end of the year 2016 and its results will provide further guidance to public health researchers and practitioners in Europe in regard to planning and evaluating multi-level interventions.

Another promising area for intervention research is to investigate in how far technology can be incorporated into interventions for behavior and environmental change. The European Commission has made this research a priority in the past years, particularly for the research field of ‘healthy ageing’ and has launched several initiatives, including, among other actions, research on the development of technology-based interventions for health promotion for older European adults. (Digital Agenda for Europe. e-health Action Plan 2012-2020, 2015). It is often argued that these technology-based approaches cannot replace person-based intervention approaches. However, they may supplement existing intervention approaches or may be of interest to populations interacting a great deal with technology (e.g. through the use of smart phones, etc.).
Using internet, smart phones [smart phone applications (apps)] for health promotion and for primary prevention in healthy populations is tempting to public health researchers because so called ‘small changes’ or ‘early nudges’ approaches, for example for the prevention of weight gain (Hills, Byrne, Lindstrom, & Hill, 2013; Thaler, & Sunstein, 2008), can be easily implemented using these modalities and large amounts of data on health behavior can be collected (Dietzel, 2001). A further advantage is that interventions delivered via such intervention vehicles are accessible and usable independently of an intervention team and segments of populations can be reached who may not otherwise get in contact with traditional health promotion interventions (Dietzel, 2001). Another advantage may be anonymity. In the SNIPE study, we developed an online ‘social norms’ intervention. The advantage of using a website was that students felt more comfortable providing highly sensitive information on personal substance use. However, the budget for the development of this website was very limited and, as a result, the website was very static with few interactive features.

Increasing research shows that technologically-supported interventions to promote PA may lead to increases in PA among older adults [e.g., using smartphones, mobile devices (Bock, Jarczok, & Litaker, 2014; King et al., 2007; King, Ahn, Oliveira, Atienza, Castro, & Gardner, 2008; King et al., 2013)]. However, we are aware that these approaches are not “one size fits all” and that there is more research needed on how older adults interact with such interventions, how frequently they use them, whether they are feasible, and what their actual impact on PA and health status, in general, is. In my group, we are currently conducting a systematic content analysis of apps for PA promotion available on the German market to examine whether the content of the most downloaded apps is based on evidence-based principles for behavior change. In addition, we are quantitatively and qualitatively exploring factors influencing app use in older adults. Literature reviews on the same topic are also currently underway. We hope that this research will generate new information on whether smartphone apps are a promising intervention vehicle for PA promotion among older adults in the future.
8 Conclusion and Perspective

The findings presented here emerged from (cluster-controlled) intervention trials but also extensive literature reviews aimed at providing answers regarding effective development, execution, and evaluation of interventions for chronic disease reduction and health promotion. The results demonstrate that interventions targeting different behaviors varying in intensity are necessary for populations at different stages of the prevention spectrum. They also suggest that extensive formative research, using participatory approaches before the execution of intervention trials, is worthwhile because the content of such interventions becomes more relevant and meaningful to the population and this may influence intervention uptake, long-term maintenance of changes, but may also enhance sustainability of an intervention in a given setting or environment.

Some of the research presented here also suggests that interventions operating at more than one level, meaning the inclusion of changes in the physical or social environment as intervention targets, in addition to individual behavior change, may lead to more pronounced and longer-lasting changes in health outcomes. Systematic research to investigate the effects of such multi-level interventions with appropriate research methodologies is; however, still rare. A concerted effort including researchers from multiple disciplines will be necessary to further push the envelope and provide answers, but also new questions in the field of public health.
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Attachments

Original Publications


**Teaching Experience**

(1) 10/14 – 01/15: Teach seminar (in German) entitled “Intervention Mapping”, Master of Public Health, University of Bremen, Bremen, Germany. [2 SWS]

(2) 04/14 – 07/14: Teach seminar (in English) entitled “Obesity Prevention”, General Studies, University of Bremen, Bremen, Germany. [2 SWS]

(3) 10/13 -02/14: Teach seminar (in German) entitled “Evidence-based Development of Interventions for the Promotion of Physical Activity among older Adults (in cooperation with the Bremen Home Foundation)”, Master of Public Health, University of Bremen, Bremen, Germany. [2 SWS]

(4) 12/14: Guest lecture (in German) entitled “Weight Loss Interventions among Urban Obese Men and Women”, Master of Public Health, University of Bremen, Bremen, Germany.

(5) 12/14: Guest lecture (in German) entitled “The Role of Comprehensive Lifestyle Changes in the Prevention and Treatment of Coronary Heart Disease”, Master of Public Health, University of Bremen, Bremen, Germany.

(6) 5/12: Guest lecture (in German) entitled “Internet, Cell Phones, Smart Phones, etc.: The Role of E-Technology in Health Promotion”, Master of Digital Media, University of Bremen, Bremen, Germany.

(7) 11/11 – 02/12: Teach seminar (in English) entitled “Obesity Prevention”, Bachelor & Master of Public Health, University of Bremen, Bremen, Germany. [2 SWS]

(8) 11/11 – 02/12: Teach seminar (in German) entitled “Evidence-based Prevention and Health Promotion”, Master of Public Health, University of Bremen, Bremen, Germany. [2 SWS]

(9) 10/10 – 02/11: Teach seminar (in German) entitled “Evidence-based Prevention and Health Promotion”, Master of Public Health, University of Bremen, Bremen, Germany. [2 SWS]

(10)03/10: Guest lecture (in English) entitled “Health behavior change. Theory and practice.” Master of Public Health, Harvard School of Public Health, Boston, MA, USA.
(11) 03/09: Guest lecture (in English) entitled “Health behavior change. Theory and practice.”
      Master of Public Health, Harvard School of Public Health, Boston, MA, USA.

Didactic Training

(1) 12/12: Completion of the didactic training certificate for teaching in Higher Education,
       University of Bremen, Bremen, Germany.
(2) 11/12: 1-day teaching experiment including an evaluation of a session taught, University
       of Bremen, Bremen, Germany.
(3) 11/12: 2-day training on techniques to instruct research-focused learning, University of
       Bremen, Bremen, Germany.
(4) 10/12: 2-day training on explorative learning techniques, University of Oldenburg,
       Oldenburg, Germany.
(5) 05/12: 2-day training on feedback and evaluation tools, University of Bremen, Bremen,
       Germany.
(6) 03/12: 2-day training on the didactic design of courses and lectures with large groups of
       students, University of Bremen, Bremen, Germany.
(7) 03/12: 2-day training on the development of a teaching portfolio, University of Bremen,
       Bremen, Germany.
(8) 02/12: 2-day training on the development and implementation of tests and exams,
       University of Bremen, Bremen, Germany.
(9) 10/11: 2-day training on the development of interactive courses, University of Bremen,
       Bremen, Germany.
(10) 09/11: 2-day training on the planning and execution of courses, University of Bremen,
        Bremen, Germany.
(11) 09/11: 2-day training on lecturing and learning of key competences in modularized
        degree programs, University of Bremen, Bremen, Germany.
Clinical Events in Coronary Heart Disease Patients With an Ejection Fraction of 40% or Less 3-Year Follow-up Results

Claudia R. Pischke, PhD; Melanie Elliott-Elller, RN, MSN; Minmin Li, MS; Nancy Mendell, PhD; Dean Ornish, MD; Gerdi Weidner, PhD

Background and Research Objective: It is unclear whether lifestyle changes can delay the need for surgical procedures in coronary heart disease (CHD) patients with asymptomatic reduced left ventricular ejection fraction (LVEF). The aim of this pilot study was to examine whether lifestyle changes can delay the need for surgical procedures in this population. Subjects and Methods: We compared 3-year clinical events in 27 CHD patients eligible to receive revascularization (by insurance standards), but underwent lifestyle changes (low-fat diet, exercise, stress management) instead (intervention group [IG], LVEF ≤ 40%), with those of a historically matched (age, gender, LVEF, and stenosis of the 3 major coronary arteries) control group receiving usual care (UCG, n = 13) who received revascularization at study entry. Both IG and UCG patients were enrolled in the health insurance companies participating in the Multicenter Lifestyle Demonstration Project, an insurance-sponsored, community-based, secondary prevention study implemented at 8 hospital sites in the United States. Results and Conclusion: At 3 months, there were more cardiac events in the UCG (6 events) than in the IG (1 event, P < .006; odds ratio = 13.27; confidence interval = 1.57–111.94). This difference was maintained over 3 years (P < .06; odds ratio = 2.75; confidence interval = 1.05–7.19). Of the 26 surviving (1 cardiac death) IG patients, 23 did not require primary revascularization. In conclusion, CHD patients with asymptomatic reduced LVEF may be able to safely delay revascularization by making changes in lifestyle with no increased risk for cardiac events or overt heart failure over 3 years.

KEYWORDS: asymptomatic reduced left ventricular ejection fraction, clinical events, coronary heart disease, lifestyle

The lifetime risk for developing heart failure (HF) is 1 in 5 for both men and women with myocardial infarction (MI).1 This elevated risk is already evident before the appearance of left ventricular systolic dysfunction.2–3 Once clinically present, a symptomatic HF diagnosis accounts for a high rate of rehospitalization and costly utilization of resources2 and carries a mortality rate 4 to 8 times than that of the general population of the same age.4 To tailor prevention strategies and treatments to the individual stages of HF, the American College of Cardiology (ACC) and American Heart Association (AHA) released a staging system in 2005.2 According to this staging system, coronary heart disease (CHD) patients at risk for HF are characterized in stages A and B (ie, stage A: high risk of HF but no structural heart disease or symptoms of HF; stage B: structural heart disease and left ventricular ejection fraction [LVEF] ≤ 40%, but

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without current signs or symptoms of HF). Patients with chronic HF are described in stages C and D (stage C: structural heart disease with prior or current symptoms of HF; stage D: refractory HF requiring specialized interventions). The number of patients with left ventricular systolic dysfunction in stage B is estimated to be 4 times greater than in stages C and D combined. However, despite the fact that stage B patients are at high risk for developing HF, they often remain undetected and untreated. Thus, interventions identifying and targeting patients in the early stages of HF are necessary for preventing or delaying the progression of HF.

   According to the ACC/AHA staging system, comprehensive lifestyle changes (eg, smoking cessation, regular exercise, reduced alcohol intake) are recommended in all stages of HF (A-D) to optimize systolic function, prevent acute incidence of HF, and reduce HF morbidity and mortality. Whereas exercise appears to be of benefit to patients with HF and leads to improvements in exercise capacity, self-reported health status, and reductions in adverse events and death in patients with chronic HF (stages C and D), other lifestyle behaviors are rarely investigated in this population and in patients in earlier stages of the disease.

   There is some indication that comprehensive lifestyle changes (diet, stress management, exercise, social support) are associated with improvements in coronary risk factor profiles in CHD patients with LVEF of greater than 40% (ACC/AHA stage A-C). A comparison of CHD patients with LVEF of greater than 40% to those at risk for HF with an LVEF of 40% or less (ACC/AHA stage B) suggests that the latter group was able to make comprehensive lifestyle changes showing similar improvements in coronary risk factors and quality of life as patients with an LVEF of greater than 40%. Although these results are encouraging, we still do not know whether lifestyle changes may also reduce clinical events in this high-risk population.

   The aim of this pilot study was to compare 3-year clinical events between two groups of CHD patients with asymptomatic reduced LVEF of 40% or less (ACC/AHA stage B), who were eligible to receive revascularization by insurance standards. Group 1 consisted of 27 patients enrolled in the Multicenter Lifestyle Demonstration Project (MLDP) who participated in a 1-year comprehensive lifestyle intervention in lieu of revascularization. The MLDP was a secondary prevention study targeting diet, exercise, and stress management. Group 2 was a historically matched (age, sex, LVEF, and stenosis of the 3 major coronary arteries) control group with usual care (UCG; n = 13) who underwent revascularization at study entry. All patients were nonsmokers.

   # Methods

   # Recruitment and Procedure

   Recruitment and methodology of the MLDP have been described elsewhere. Briefly, the MLDP was an insurance-sponsored, community-based, secondary prevention study implemented at 8 hospital sites in the United States (Omaha, Nebraska; New York, New York; Des Moines, Iowa; Ft Lauderdale, Florida; Columbia, South Carolina; Concord, California; Boston, Massachusetts; and La Jolla, California) by specially trained multidisciplinary teams. The MLDP included patients with CHD who had previous coronary artery bypass graft (CABG) or percutaneous transluminal coronary angioplasty (PTCA) and were in stable condition. A group of patients (n = 194) who enrolled in the MLDP had angiographically documented CHD severe enough to warrant revascularization (according to the coverage policy standards of the Mutual of Omaha Insurance Company). With medical approval, they chose lifestyle intervention in lieu of a surgical procedure. Usual care included revascularization (CABG surgery, percutaneous coronary intervention, PTCA, and/or bare metal stenting) and/or medical management and risk factor modification education (eg, lifestyle education, such as moderate exercise and dietary changes according to the guidelines of the American Heart Association).

   # Participants

   Eligibility criteria, inclusion and exclusion criteria in the MLDP have been reported in detail elsewhere. To summarize, patients were nonsmokers with angiographically diagnosed CHD severe enough to warrant revascularization and were approved by their insurance to undergo a procedural intervention, but chose the intensive lifestyle intervention in lieu of revascularization (with physician approval). Exclusion criteria included (1) greater than 50% stenosis of the left main coronary artery, (2) CABG within 6 weeks or PTCA within 6 months, (3) malignant uncontrolled arrhythmias, (4) MI within 1 month, and (5) hypotensive response to exercise (≥20 mm Hg). The research protocol was approved by the Committee on the Protection of Rights of Human Subjects, and written informed consent was obtained from all participants.

   Patients selected for this investigation had documented LVEF of 40% or less and were eligible for revascularization (n = 27194 met these criteria). Matched controls for the present study had an LVEF of 40% or less and were planning to undergo revascularization within 1 month from study entry (13138 met these criteria). Patient records of the matched controls were provided by Mutual of Omaha Insurance Company (Omaha, Nebraska). Patients of
the IG and UCG were matched for age, gender, LVEF, and stenosis of the 3 major coronary arteries.

**Adherence to the Lifestyle Change Program**

- **Diet:** Percentage of calories from fat (based on 3-day food diary; goal: 10%).
- **Exercise:** Hours per week (according to the guidelines of the American College of Sports Medicine\textsuperscript{20}; goal: 3 h/wk).
- **Stress management:** Hours per week of yoga/meditation (goal: 1 h/day).

These data were obtained in the IG and were available at baseline, 12 weeks, and 1 year.

**Measures**

**Determination of LVEF**
In the IG, ejection fraction was determined by left ventricular contrast angiography with direct left ventriculography. In the UCG, 12 patients (92%) had undergone left ventricular contrast angiography with direct left ventriculography, and 1 patient (8%) had undergone quantitative 2-dimensional echocardiography. Left ventricular ejection fraction was assessed only at baseline.

**Patient Variables**
At baseline, IG patients were assessed for demographic information; history of smoking, diabetes, hypertension, hyperlipidemia, MI, and revascularization procedures; family history of CHD, MI, and cerebrovascular accident (CVA); LVEF; percentage of stenosis for each of the 3 major coronary arteries; and angina pectoris (percent of patients reporting angina during the past 30 days). For the UCG patients, this information came from medical charts and provided a basis for matching IG patients with controls.

**Clinical Events**
Clinical events, including cardiac and noncardiac events, and deaths, were tracked over the course of 3 years. Cardiac events were defined as nonfatal MI, cardiac death, HF, CVA, and revascularization procedures (CABG, PTCA). Noncardiac adverse events and death from all other causes were also tracked. Data were extracted from participants' medical charts provided by the intervention sites, Mutual of Omaha Insurance Company (Omaha, Nebraska), and the central data-coordinating center (Massachusetts General Medical Center, Boston, MA).

**Intervention: The Lifestyle Change Program**
Patients attended an initial 12-hour weekend orientation, followed by group sessions 3 times per week for 12 weeks. Two of these weekly sessions focused on the 4 program components (diet, exercise, stress management, and group support) in 1-hour blocks. The third weekly session consisted of a 1-hour aerobic exercise session and 1 hour of lectures. Overall, 36 sessions were offered during the first 3 months of the intervention. Over the following 40 weeks, patients continued to meet in groups once a week for a 4-hour session, focusing on all program components.\textsuperscript{17,21}

**Statistical Analysis**

Group differences (IG vs UCG) in baseline demographic variables, medical history, and other relevant variables were evaluated. The continuous variables were compared using the 2-sample t tests allowing for unequal variance, and the distributions of the categorical variables were compared using a $\chi^2$ test. The results of these comparisons are reported in Table 1. Differences in cardiac events between IG and UCG patients during the 3-year follow-up were analyzed using the Fisher's exact test. The rates contributing to odds ratio (OR) and relative risk ratios are estimated by dividing the number of events by the number of patient-years for the particular time period.

**Results**

**Characteristics at Baseline**
Baseline characteristics of IG and UCG patients are shown in Table 1. There were no statistically significant group differences in demographic variables, medical history, nor disease severity.

**Lifestyle Changes (Not Shown)**
Adherence to the recommended lifestyle changes in the IG was generally high during the first year of follow-up (adherence was not assessed subsequently). Intervention group patients increased their exercise from 1.5 (SD: 1.9) h/wk at baseline to 4.7 (SD: 3.8) h/wk at 12 weeks, maintaining 5.1 (SD: 4.1) h/wk by the end of year 1. Similarly, improvements in diet (percentage of dietary fat intake) and stress management (in hours per week) were noted (from 17.7 [SD: 7.6] at baseline to 6.6 [SD: 2.2] at 12 weeks, and 6.0 [SD: 2.4] at 1 year; from 0.2 [SD: 0.4] at baseline to 5.7 [SD: 2.6] at 12 weeks, and 5.0 [SD: 3.0], respectively) (all comparisons to baseline, $P < .001$).

**Cardiac Events**
Clinical cardiac events of IG and UCG patients are shown in Table 2. At 3 months, there were more cardiac events in the UCG (6 events) than in the IG (1 event; $P < .006$; OR = 13.27). This difference was maintained over 3 years ($P < .06$; OR = 2.75). The
total number of patients having at least 1 primary cardiac event was 4 in the UCG compared with 1 in the IG at 3 months (P < .05; relative risk = 8.64). This difference was not maintained over 3 years.

Four cardiac deaths were noted over 3 years (all men). Of the 3 deaths in the UCG (7.7%), 2 occurred within 3 months; 1 death occurred at year 2. The 1 death in the IG occurred unobserved at home at year 3 (3.7%). All deaths were documented cardiac arrests. This difference was marginally significant at p < 0.08 (not shown). During the 3 years of follow-up, there were no nonfatal MIs reported in either group.

Primary percutaneous intervention in this study was defined as PTCA that did not occur for restenosis within 6 months. We were interested only in primary percutaneous intervention as repeat were secondary to the primary procedure and not due to worsening of disease. There were no primary PTCA in the UCG following their initial procedure at study entry. Two patients in the IG were hospitalized for a PTCA. One of these 2 patients had a primary PTCA at year 1 and a primary PTCA during year 2. The other patient underwent a PTCA during year 3. Group differences were not significant (not shown).

There were no subsequent (following study entry) CABG surgeries in the UCG. Two patients in the IG were hospitalized for CABG surgery during the course of the intervention (one at day 2 of the intervention, and one during the intervention at 10 months).

There were 3 hospitalizations for HF in the UCG, 2 episodes in 1 patient during the first 12 weeks and one during year 2. There were 2 hospitalizations for HF in the IG at years 1 and 2 (not statistically significant). Two patients in the UCG had a CVA, both within 3 months of program entry. There were no CVAs in the IG (not statistically significant).

In summary, there were more cardiac events in the UCG than in the IG over 3 years (P < .06; OR = 2.75). Of the 26 surviving (1 cardiac death) IG patients, 23 did not require primary revascularization. There were no additional revascularizations in the 10 surviving UCG patients after their initial procedure or group differences in noncardiac and adverse events.

Noncardiac Adverse Events (Not Shown)

There were no noncardiac deaths or sudden unexplained deaths in either group during the 3 years of follow-up. Over the 3 years of intervention and follow-up, a total of 5 patients in the UCG were hospitalized 6 times for noncardiac reasons, and 7 IG patients were hospitalized 9 times (not statistically significant). Reasons for hospitalizations in the UCG included orthopedic (degenerative joint disease with total knee replacement, n = 1); below-the-knee amputation, n = 1; hemicated cervical disk, n = 1), atherosclerotic vascular disease (carotid artery endarterectomy, n = 1), endocrine (diabetes mellitus, n = 1), and gastrointestinal

### Abbreviations
- CAGB: coronary artery bypass graft
- CAD: coronary artery disease
- CVA: cerebrovascular accident
- MI: myocardial infarction
- PTCA: percutaneous transluminal coronary angioplasty
(hepatitis, n = 1). Reasons for hospitalizations in the IG included cancer (adenocarcinoma of the colon with hemicectomy, n = 1), endocrine (exacerbation of diabetes mellitus, n = 1), general surgery (hernia repair, n = 2), gastrointestinal (pancreatitis, n = 1; partial bowel obstruction, n = 1; cholecystectomy, n = 1), and noncardiac chest pain (n = 2). There were no “no cause-specific” reasons for hospitalization in the UCG. Two no-cause-specific reasons for hospitalizations occurred in the IG for chest pain, noncardiac in origin.

One adverse clinical event in the UCG (not shown) resulting from medication use included hepatitis secondary to dipyrindamole, which was subsequently discontinued. The adverse clinical event experience in the IG was generally favorable. There were no patients in the IG who had a clinical event as a result of participation in the exercise, group support, diet, or stress management components of the intervention program. However, there was 1 adverse clinical event secondary to prescribed lipid medication (simvastatin [Zocor]), causing rhabdomyolysis complicated by septic shock and renal failure, which was also discontinued.

### Discussion

This pilot study found fewer cardiac events in the IG compared with the UCG during the first 3 months of follow-up, which were maintained over 3 years (IG and UCG were equivalent at baseline). In addition, 89% of the surviving IG patients did not require primary or secondary revascularization. Thus, changes in diet and lifestyle may not only reduce cardiac events but also delay the need for revascularization.

The observed benefits in the IG may have been due to improvements in coronary risk factor profiles during the 3-year follow-up. Unfortunately, CHD risk factors were not available for the matched controls in this study, and comparisons between the
IG and UCG therefore cannot be provided. In a previous investigation (based on data of the MLDP), however, we analyzed the feasibility of lifestyle changes and associated benefits in coronary risk factors comparing stage B patients with LVEF of 40% or less to those with an LVEF of 40% or greater. We found that, despite greater disease severity at baseline, stage B patients with LVEF of 40% or less were able to make similar changes in lifestyle as those with an LVEF of 40% or greater, showing similar improvements in body weight, body fat, blood pressure, heart rate, lipid profile, exercise capacity, and quality of life.17 These findings demonstrate the feasibility of lifestyle changes for stage B patients and associated benefits.

Overall, there is limited information on the effects of implementing lifestyle changes in CHD patients at risk for HF. A recent study examining recall and adherence to lifestyle advice in 3261 patients with suspected HF found rather disappointing rates of recall and adherence to lifestyle advice in this patient population.22 Patients recalled only 46% of lifestyle advice given, which included recommendations for exercise, rest, smoking, alcohol consumption, salt intake, cholesterol and fat intake, regular weight checks, influenza vaccination, and avoidance of nonsteroidal anti-inflammatory drugs. Sixty-seven percent of patients with 46% recall of lifestyle advice reported following the advice. Interestingly, recall and implementation were highest in patients with LVEF of 40% or less compared to patients with LVEF of greater than 40% and with those with undocument LVEF, who were least likely to recall and implement advice. This suggests that patients with LVEF of 40% or less may have felt a greater openness toward lifestyle change. The authors of this study conclude that more evidence to support the value of lifestyle advice is necessary to improve patient care.

The findings of our study, in conjunction with our previous investigation based on data from the MLDP,17 provide initial evidence that targeting multiple health behaviors in a supportive group environment may have significant benefits for cardiac morbidity and mortality in CHD patients at risk for HF. Thus, using multidisciplinary teams in patient care is not only beneficial in reducing morbidity in patients with chronic HF;23 but also seems to play a major role in the prevention of more severe stages of HF. This is of particular importance, considering that once the disease progresses to later stages, cardiac rehabilitation is no longer covered by Medicare, which is the federal health insurance program for most Americans 65 years or older.24

Several study limitations should be noted. Since the MLDP was conducted, medical treatment guidelines for CHD patients at risk for HF have changed. Therefore, new studies are necessary to replicate our findings in today’s medical environment. Nevertheless, considering the lack of studies examining lifestyle changes in this patient population, our preliminary findings are unique and highlight the importance of comprehensive lifestyle interventions. A second limitation is that the control group was not randomized. However, comparisons of demographic variables, degree of stenosis, and medical history between the 2 groups indicated that the 2 groups were similar. Also, both IG and UCG patients came from the same source—they were all enrolled in the health insurance companies participating in the MLDP.

Third, LVEF was not assessed at follow-up. However, reductions in ischemia and angina pectoris, possibly reflecting an improved left ventricular function and reverse ventricular remodeling,21,25,26 have been demonstrated in an earlier randomized controlled trial, using the same intervention as the MLDP,15 and in the more recent Multisite Cardiac Lifestyle Intervention Program.26 Fourth, the small sample size of this pilot trial precluded an evaluation of individual components of the lifestyle intervention. A recent randomized controlled trial, including 2331 medically stable outpatients with HF and reduced LVEF, found that exercise training did not result in reductions in all-cause mortality, hospitalization, and clinical events,27 suggesting that exercise alone may not be sufficient to produce benefits in cardiac morbidity and mortality. The preliminary findings of our pilot trial suggest that an intervention targeting multiple lifestyle behaviors may be necessary to produce benefits in cardiac morbidity and mortality. In the Multisite Cardiac Lifestyle Intervention Program, which included 869 patients with CHD28 and used the same intervention as the MLDP, all 3 lifestyle components of the program (ie, dietary fat intake, exercise, and stress management) were additively and interactively linked to changes in coronary risk and psychosocial status.

A final limitation is the fact that the number of MLDP patients with low LVEF was very small. Therefore, the results can be considered as only preliminary. Our study sample was also predominantly white and did not include a sufficient number of women to stratify by gender. Therefore, our results may not apply to other ethnic groups and women. It is clear that, despite the known differences in etiology and prognosis of HF, women and minorities are still underrepresented in clinical trials investigating prevention and treatment of HF.3,29,31 Furthermore, because of the small sample size in our study, group characteristics appearing as different at baseline did not achieve the conventional level of statistical significance. For example, the percentages of MI were 78% and 56% for PTCA prior to study entry in the IG, whereas the corresponding values in the UCG were 54% (for MI) and 23% (for PTCA). Intervention group patients also appeared to be more medicated than were UCG patients.
What's New and Important

- According to the ACC/AHA staging system, comprehensive lifestyle changes (eg, smoking cessation, regular exercise, reduced alcohol intake) are recommended in all stages of HF (A-D) to improve systolic function, prevent acute incidence of HF, and reduce HF morbidity and mortality. Interventions identifying and targeting patients in the early stages of HF are necessary for preventing or delaying the progression of HF.
- Nonsmoking CHD patients with asymptomatic reduced LVEF of 40% or less (ACC/AHA stage B) may be able to safely delay revascularization by making changes in lifestyle (exercise, diet, stress management) with no increased risk for cardiac events or overt HF over 3 years.
- This finding suggests that comprehensive lifestyle modification may present a potentially cost-saving alternative to revascularization for preventing or delaying the progression of HF in this medically managed patient group.

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Changes in Emerging Cardiac Biomarkers After an Intensive Lifestyle Intervention

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The present study evaluated the changes in emerging cardiac biomarkers, cognitive function, and social support measures after a comprehensive lifestyle intervention that included a low-fat, whole-foods, plant-based diet, exercise, stress management, and group support meetings. We conducted a prospective cohort study of 131 participants (59.2% women and 43.1% with diabetes mellitus), 56 with coronary heart disease (CHD) (37.5% women and 27.3% diabetes mellitus), and 75 at high risk with ≥3 CHD risk factors and/or diabetes mellitus (76% women and 54.7% diabetes mellitus). The measurements were taken at baseline and 3 months after the intervention. Improvement in all targeted health behaviors was seen in both high-risk and CHD groups (all p < 0.001) at 3 months, with reductions in body mass index, systolic and diastolic blood pressure, waist/hip ratio, C-reactive protein, insulin, low-density lipoprotein, high-density and total cholesterol, apolipoproteins A1 and B (all p < 0.009) were observed. Nuclear magnetic resonance spectroscopy analysis of lipoprotein subclass particle concentrations and diameters showed a reduction in large very-low-density lipoprotein particles, size of the very-low-density lipoprotein particles, total low-density lipoprotein particles; total, large, and small high-density lipoprotein particles (all p < 0.009) and small very-low-density lipoprotein particles (p < 0.02). Increases in fibrinogen (p < 0.03) and B-type natriuretic peptide (p < 0.001) were seen, and these changes correlated inversely with the changes in the body mass index. The observed increase in B-type natriuretic peptide can be explained by the metabolic changes related to adipose tissue lipolysis. The quality of life, cognitive functioning, and social support measures significantly improved. In conclusion, lifestyle changes can be followed by favorable changes in traditional and emerging coronary heart disease biomarkers, quality of life, social support, and cognitive function among those with, or at high risk, of CHD. © 2011 Elsevier Inc. All rights reserved. (Am J Cardiol 2011:108:498–507)

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Dr. Omish is a consultant for Safeway (Pleasanton, California), PepsiCo (Purchase, New York), and Mars (Hackettstown, New Jersey) on manufacturing healthy foods and is chair of the Google Health Advisory Council (Mountain View, California). The other authors declared no conflicts of interest.

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Comprehensive lifestyle changes have previously been studied in randomized controlled trials and prospective cohort studies and have been shown to cause a reduction in traditional risk factors of coronary heart disease (CHD) and in symptoms and signs of established CHD.\textsuperscript{1,2} To examine the possible mechanisms underlying these beneficial effects, the present study assessed the changes in emerging biomarkers that are potential risk factors for, or risk markers of, CHD.\textsuperscript{3,4} traditional risk factors for CHD, quality of life, cognitive function, and social support after a comprehensive lifestyle intervention of 3 months' duration among those at risk of, or with pre-existing, CHD.

Methods

A prospective cohort study nested within a larger cohort participating in the health insurance-administered Multisite Cardiac Lifestyle Intervention Program was conducted. The participating hospital sites included the Charleston Area Medical Center, West Virginia, Hamot Medical Center, Pennsylvania, Jameson Health System, Pennsylvania, Jefferson Regional Medical Center, Pennsylvania, and West Virginia University Hospitals, West Virginia. The institutional review board at each site approved the study, and each participant provided written informed consent before
<table>
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<td>Median</td>
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<td>3.6–10.1</td>
</tr>
<tr>
<td>Dietary fat (g)</td>
<td>52</td>
<td>49</td>
</tr>
<tr>
<td>Median</td>
<td>33–71</td>
<td>33–86</td>
</tr>
<tr>
<td>Dietary cholesterol (mg)</td>
<td>145</td>
<td>127</td>
</tr>
<tr>
<td>Median</td>
<td>74–201</td>
<td>83–219</td>
</tr>
<tr>
<td>Exercise (minutes/week)</td>
<td>80</td>
<td>0</td>
</tr>
<tr>
<td>Median</td>
<td>0–200</td>
<td>0–120</td>
</tr>
<tr>
<td>Stress management (minutes/week)</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Median</td>
<td>0.0–0.0</td>
<td>0.0–0.0</td>
</tr>
<tr>
<td>Depression</td>
<td>8.0</td>
<td>12.0</td>
</tr>
<tr>
<td>Median</td>
<td>5.0–16.0</td>
<td>4.3–20.5</td>
</tr>
<tr>
<td>Horizality (Cook-Medley scale)</td>
<td>4.0–12.0</td>
<td>2.3–9.8</td>
</tr>
<tr>
<td>Physical component score</td>
<td>47.1</td>
<td>46.0</td>
</tr>
<tr>
<td>Median</td>
<td>38.9–54.7</td>
<td>33.6–50.1</td>
</tr>
<tr>
<td>Mental component score</td>
<td>52.9</td>
<td>48.3</td>
</tr>
<tr>
<td>Median</td>
<td>42.6–57.8</td>
<td>36.9–57.0</td>
</tr>
</tbody>
</table>

Data are presented as mean ± SD, n (%), median and range, or median and interquartile range.

* Because of missing data, number of patients for specific variable ranges from 30 to 35 for men with CHD, 16 to 19 for women with CHD, 13 to 16 for men at high risk of CHD, and 44 to 55 for women at high risk of CHD.

* Full range reported owing to low baseline values.

Angina frequency, 0 (least frequent angina symptoms) to 6 (most frequent angina symptoms); angina severity, 0 (least severe) to 4 (most severe).

Depression (Centers for Epidemiologic Studies–Depression scale): 0 (least depressed) to 60 (most depressed); hostility: 0 (least hostile) to 40 (most hostile); physical and mental component scores (Medical Outcomes Study 36-item short-form survey): 0 (lowest physical/mental health) to 100 (highest physical/mental health).

NA = not available.
## Table 2
Health behaviors and clinical measures at baseline and 5 months after comprehensive lifestyle intervention

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total (n = 129)</th>
<th>p Value</th>
<th>CVD (n = 54)</th>
<th>p Value</th>
<th>High risk (n = 71)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>5 mo</td>
<td></td>
<td>Baseline</td>
<td>5 mo</td>
<td></td>
</tr>
<tr>
<td>Total energy (kcal)</td>
<td>1,798 (1,470-2,190)</td>
<td>1,399 (1,191-1,672)</td>
<td>&lt;0.001</td>
<td>1,769 (1,484-2,219)</td>
<td>1,422 (1,222-1,749)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Protein (g)</td>
<td>75 (60-90)</td>
<td>61 (55-76)</td>
<td>&lt;0.001</td>
<td>75 (60-90)</td>
<td>61 (55-76)</td>
<td>0.002</td>
</tr>
<tr>
<td>Carbohydrates (g)</td>
<td>240 (183-310)</td>
<td>254 (197-300)</td>
<td>0.006</td>
<td>261 (212-319)</td>
<td>256 (222-329)</td>
<td>0.51</td>
</tr>
<tr>
<td>Dietary fiber (g)</td>
<td>22.1 (14.5-30.2)</td>
<td>24.1 (28.3-41.6)</td>
<td>&lt;0.001</td>
<td>28.6 (15.7-31.0)</td>
<td>31.1 (25.7-41.5)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Fat intake (% calories)</td>
<td>52.9 (40.6-71.2)</td>
<td>55.2 (44.4-124.9)</td>
<td>&lt;0.001</td>
<td>45.8 (29.6-66.1)</td>
<td>60.0 (31.0-195.1)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Saturated (g)</td>
<td>17.3 (5.5-28.1)</td>
<td>21.1 (7.9-2.9)</td>
<td>&lt;0.001</td>
<td>16.5 (6.7-24.9)</td>
<td>2.1 (1.8-9.9)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Cholesterol (mg)</td>
<td>152.3 (90.9-251.0)</td>
<td>72.2 (57.1-110.3)</td>
<td>&lt;0.001</td>
<td>141.4 (76.9-202.4)</td>
<td>65.6 (29.8-124.0)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Vitamin A (mcg)</td>
<td>23.7 (18.6-33.0)</td>
<td>23.7 (18.6-33.0)</td>
<td>&lt;0.001</td>
<td>19.2 (15.9-72.0)</td>
<td>8.4 (6.8-106.7)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Vitamin C (mg)</td>
<td>71.6 (45.3-120.1)</td>
<td>114 (44.4-120.1)</td>
<td>&lt;0.001</td>
<td>73.2 (51.1-120.1)</td>
<td>117 (79.1-180.0)</td>
<td>0.002</td>
</tr>
<tr>
<td>Calcium (mg)</td>
<td>731 (516-993)</td>
<td>927 (719.1-1,166)</td>
<td>&lt;0.001</td>
<td>707 (523-979)</td>
<td>869 (851-1,088)</td>
<td>0.124</td>
</tr>
<tr>
<td>Iron (mg)</td>
<td>15.6 (10.6-20.0)</td>
<td>20.0 (15.2-27.9)</td>
<td>&lt;0.001</td>
<td>15.6 (10.6-27.9)</td>
<td>15.1 (10.6-27.9)</td>
<td>0.002</td>
</tr>
<tr>
<td>Sodium (mg)</td>
<td>2,822 (2,206-3,305)</td>
<td>2,587 (2,455-3,009)</td>
<td>&lt;0.001</td>
<td>2,667 (2,153-4,101)</td>
<td>2,284 (1,782-3,105)</td>
<td>0.024</td>
</tr>
<tr>
<td>Exercise (min/week)</td>
<td>0.0 (0.0-113.0)</td>
<td>212.0 (106.0-275.0)</td>
<td>&lt;0.001</td>
<td>60.0 (0.0-185.0)</td>
<td>235.0 (178.0-260.0)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Stress management (min/week)</td>
<td>0.0 (0.0-10.0)</td>
<td>420.0 (185.5-425.0)</td>
<td>&lt;0.001</td>
<td>0.0 (0.0-10.0)</td>
<td>180.0 (98.5-420.0)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Body mass index (kg/m²)</td>
<td>35.6 (35.6)</td>
<td>38.8 (42.8)</td>
<td>&lt;0.001</td>
<td>32.8 (35.3)</td>
<td>30.2 (5.9)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Waist/hip ratio</td>
<td>1.0 ± 0.0</td>
<td>0.9 ± 0.0</td>
<td>&lt;0.001</td>
<td>1.0 ± 0.0</td>
<td>0.9 ± 0.0</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Systolic blood pressure (mm Hg)</td>
<td>128 ± 15</td>
<td>117 ± 11</td>
<td>&lt;0.001</td>
<td>127 ± 14</td>
<td>115 ± 10</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Diastolic blood pressure (mm Hg)</td>
<td>77 ± 7</td>
<td>72 ± 7</td>
<td>&lt;0.001</td>
<td>76 ± 8</td>
<td>70 ± 7</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Functional capacity (METs)</td>
<td>7.6 (5.6-10.1)</td>
<td>10.1 (7.8-12.5)</td>
<td>&lt;0.001</td>
<td>7.0 (5.8-10.9)</td>
<td>10.8 (7.2-13.5)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Data are presented as median (interquartile range) or mean ± SD.

* By cause of missing data, numbers of patients for individual variables ranged from 118 to 129.

1 For range reported for baseline owing to low baseline values.
Table 3
Psychosocial factors at baseline and 3 months after comprehensive lifestyle intervention

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total (n = 125)</th>
<th>CVD (n = 54)</th>
<th>High risk (n = 71)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>3 mo</td>
<td>p Value</td>
</tr>
<tr>
<td>Health-related quality of life*</td>
<td>Physical functioning</td>
<td>80 (59-90)</td>
<td>90 (80-95)</td>
</tr>
<tr>
<td></td>
<td>Bodily pain</td>
<td>62 (51-84)</td>
<td>84 (62-88)</td>
</tr>
<tr>
<td></td>
<td>General health</td>
<td>62 (42-77)</td>
<td>77 (67-87)</td>
</tr>
<tr>
<td></td>
<td>Vitality</td>
<td>51 (32-68)</td>
<td>77 (62-89)</td>
</tr>
<tr>
<td></td>
<td>Social functioning</td>
<td>88 (69-100)</td>
<td>100 (88-100)</td>
</tr>
<tr>
<td></td>
<td>Mental health</td>
<td>76 (55-93)</td>
<td>88 (63-92)</td>
</tr>
<tr>
<td></td>
<td>Physical component score</td>
<td>47 (39-52)</td>
<td>52 (46-56)</td>
</tr>
<tr>
<td></td>
<td>Mental component score</td>
<td>52 (40-57)</td>
<td>57 (53-59)</td>
</tr>
<tr>
<td>Stress and Sym-Social Support Scale</td>
<td>Instrumental social support (0-9)</td>
<td>3.0 (2.0-4.0)</td>
<td>3.0 (2.0-4.0)</td>
</tr>
<tr>
<td></td>
<td>Emotional social support (0-9)</td>
<td>5.0 (4.0-6.0)</td>
<td>6.0 (5.0-7.0)</td>
</tr>
<tr>
<td></td>
<td>Total social support (0-9)</td>
<td>12.0 (8.1-17.0)</td>
<td>13.0 (10.1-18.0)</td>
</tr>
<tr>
<td></td>
<td>Social desirability (0-4)</td>
<td>2.8 (2.5-3.3)</td>
<td>3.0 (2.5-3.3)</td>
</tr>
<tr>
<td>Other</td>
<td>Depression* (0-40)</td>
<td>9.0 (5.0-15.0)</td>
<td>4.0 (2.0-8.0)</td>
</tr>
<tr>
<td></td>
<td>Health* (0-27)</td>
<td>7.0 (5.0-10.0)</td>
<td>5.0 (2.0-9.0)</td>
</tr>
<tr>
<td></td>
<td>Perceived stress* (0-40)</td>
<td>13.0 (9.0-19.0)</td>
<td>8.0 (5.0-14.0)</td>
</tr>
<tr>
<td></td>
<td>Cognitive functioning scale* (0-100)</td>
<td>83 (70-90)</td>
<td>90 (80-95)</td>
</tr>
</tbody>
</table>

Data are presented as median (interquartile range).

* In case of missing data, number of patients for specific variables ranged from 121 to 125.
\* Medical Outcomes Study 36-item Short-Form Health Survey.
\* Health-related quality of life (Medical Outcomes Study 36-item Short-Form Health Survey): 0 (lowest quality of life) to 100 (greatest quality of life), instrumental social support: 0 (lowest amount of support) to 9 (greatest amount of support), emotional social support: 0 (lowest amount of support) to 9 (greatest amount of support), total social support: 0 (lowest amount of support) to 9 (greatest amount of support), network adequacy: 1 (least adequate) to 4 (most adequate), depression: 0 (least depressed) to 40 (most depressed), hostility: 0 (least hostile) to 27 (most hostile), perceived stress: 0 (least perceived stress) to 40 (most perceived stress), cognitive functioning: 0 (lowest cognitive functioning) to 100 (greatest cognitive functioning).
\* Center for Epidemiological Studies depression scale.
\* Cohen-Mann hostility scale.
\* Cognitive Functioning subscale of Medical Outcomes Study 36-item short form.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Total (n = 125)</th>
<th>CHD (n = 84)</th>
<th>High risk (n = 73)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>5 mo</td>
<td>p Value</td>
<td>Baseline</td>
</tr>
<tr>
<td>Lipids of interest</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total cholesterol (mg/dL)</td>
<td>180 (153-205)</td>
<td>141 (125-183)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Low-density lipoprotein cholesterol (mg/dL)</td>
<td>103 (74-124)</td>
<td>81 (64-112)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>High-density lipoprotein cholesterol (mg/dL)</td>
<td>44.0 (37.0-50.0)</td>
<td>37.5 (30.0-44.9)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Triglycerides (mg/dL)</td>
<td>129 (95-165)</td>
<td>120 (90-170)</td>
<td>0.07</td>
</tr>
<tr>
<td>Very low-density lipoprotein cholesterol (mg/dL)</td>
<td>92 (68-150)</td>
<td>95 (48-145)</td>
<td>0.22</td>
</tr>
<tr>
<td>Lipoprotein (a) (mg/dL)</td>
<td>30.0 (6.0-135.5)</td>
<td>30.0 (6.0-192.3)</td>
<td>0.41</td>
</tr>
<tr>
<td>Oxidized low-density lipoprotein (mg/dL)</td>
<td>59 (66-81)</td>
<td>37 (49-78)</td>
<td>0.07</td>
</tr>
<tr>
<td>ApoA-I (mg/dL)</td>
<td>159 (124-150)</td>
<td>124 (110-138)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>ApoA-II (mg/dL)</td>
<td>87 (69-109)</td>
<td>84 (65-99)</td>
<td>0.03</td>
</tr>
<tr>
<td>ApoB (mg/dL)</td>
<td>0.6 (0.5-0.8)</td>
<td>0.7 (0.5-0.8)</td>
<td>0.064</td>
</tr>
</tbody>
</table>

Other biomarkers

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total (n = 125)</th>
<th>CHD (n = 84)</th>
<th>High risk (n = 73)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>5 mo</td>
<td>p Value</td>
<td>Baseline</td>
</tr>
<tr>
<td>C-reactive protein (mg/L)</td>
<td>2.1 (0.8-5.2)</td>
<td>1.4 (0.6-3.0)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Ferritin (mg/dL)</td>
<td>925 (241-977)</td>
<td>356 (90-401)</td>
<td>0.024</td>
</tr>
<tr>
<td>Homocysteine (micromolar)</td>
<td>7.9 (5.3-9.4)</td>
<td>8.1 (6.5-10.0)</td>
<td>0.53</td>
</tr>
<tr>
<td>B-type natriuretic peptide (pg/mL)</td>
<td>18.0 (11.0-35.0)</td>
<td>20.0 (14.0-32.0)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Insulin (mIU/L)</td>
<td>14.5 (9.0-25.5)</td>
<td>12.0 (9.0-18.5)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Fasting glucose (mmol/L)</td>
<td>113 (100-140)</td>
<td>105 (96-121)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Hemoglobin A1c (diabetic)†</td>
<td>6.5 (6.1-7.8)</td>
<td>6.1 (5.8-7.3)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Data are presented as median (interquartile range).

† In case of missing data, number of patients for individual variables ranged from 114 to 122.

p Values for biomarkers determined using paired t tests and log-transformed values.

Diabetes: only hemoglobin Alc, n = 55; fasting glucose, n = 52.
Table 5
Nuclear magnetic resonance lipoprotein subclass analysis at baseline and 3 months after comprehensive lifestyle intervention

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total (n = 125)</th>
<th>CHD (n = 56)</th>
<th>High risk (n = 71)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>3 mo</td>
<td>p Value*</td>
</tr>
<tr>
<td>Very low-density lipoprotein particles (mmol/L)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>79 (54–100)</td>
<td>79 (54–100)</td>
<td>0.904</td>
</tr>
<tr>
<td>Large</td>
<td>3.2 (3.3–3.6)</td>
<td>2.4 (0.6–5.5)</td>
<td>0.007</td>
</tr>
<tr>
<td>Medium</td>
<td>31.2 (17.7–46.7)</td>
<td>32.7 (14.4–52.2)</td>
<td>0.56</td>
</tr>
<tr>
<td>Small</td>
<td>40.1 (28.5–50.6)</td>
<td>37.4 (23.7–48.1)</td>
<td>0.018</td>
</tr>
<tr>
<td>Low-density lipoprotein particles (mmol/L)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1.14 (0.85–1.40)</td>
<td>1.12 (0.87–1.34)</td>
<td>0.001</td>
</tr>
<tr>
<td>Subclass</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large</td>
<td>0.12 (0.11–0.13)</td>
<td>0.11 (0.09–0.13)</td>
<td>0.11</td>
</tr>
<tr>
<td>Medium</td>
<td>4.05 (3.70–4.40)</td>
<td>4.99 (4.61–5.42)</td>
<td>0.14</td>
</tr>
<tr>
<td>Small</td>
<td>4.34 (3.94–4.74)</td>
<td>5.15 (4.65–5.66)</td>
<td>0.78</td>
</tr>
<tr>
<td>Medium small low-density lipoprotein particles (mmol/L)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very low-density lipoprotein particles (mmol/L)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4.44 (4.05–4.86)</td>
<td>6.22 (4.48–7.80)</td>
<td>0.60</td>
</tr>
<tr>
<td>Particle size (µm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very low-density lipoprotein</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4.84 (4.59–5.93)</td>
<td>4.69 (4.32–5.51)</td>
<td>0.035</td>
</tr>
<tr>
<td>High-density lipoprotein</td>
<td>20.6 (20.0–21.1)</td>
<td>20.0 (20.1–20.1)</td>
<td>0.94</td>
</tr>
<tr>
<td>High-density lipoprotein</td>
<td>8.6 (8.4–8.9)</td>
<td>8.7 (8.4–8.9)</td>
<td>0.12</td>
</tr>
</tbody>
</table>

Data are presented as median (interquartile range).

* p Values determined using paired samples t tests and log-transformed values.
Table 6
Lipid particle concentrations as proportion of respective total particle concentrations at baseline and 3 months after comprehensive lifestyle intervention

<table>
<thead>
<tr>
<th>Lipoprotein subclass</th>
<th>Total (n = 125)</th>
<th>p Value</th>
<th>CHD (n = 54)</th>
<th>p Value</th>
<th>High risk (n = 71)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline 3 mo</td>
<td></td>
<td>Baseline 3 mo</td>
<td></td>
<td>Baseline 3 mo</td>
<td></td>
</tr>
<tr>
<td>Very-low-density</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large</td>
<td>4% (1-9)</td>
<td>3% (1-7)</td>
<td>3% (1-7)</td>
<td>0.029</td>
<td>3% (1-7)</td>
<td>2% (1-8)</td>
</tr>
<tr>
<td>Medium</td>
<td>41% (34-49)</td>
<td>47% (36-54)</td>
<td>43% (37-51)</td>
<td>0.002</td>
<td>49% (38-55)</td>
<td>0.014</td>
</tr>
<tr>
<td>Small</td>
<td>53% (43-64)</td>
<td>49% (39-60)</td>
<td>52% (43-60)</td>
<td>0.01</td>
<td>48% (36-58)</td>
<td>0.014</td>
</tr>
<tr>
<td>Low-density lipoprotein subclass</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intermediate</td>
<td>4% (1-6)</td>
<td>3% (1-5)</td>
<td>3% (1-6)</td>
<td>0.03</td>
<td>2% (1-5)</td>
<td>0.18</td>
</tr>
<tr>
<td>Large</td>
<td>25% (13-38)</td>
<td>23% (15-34)</td>
<td>26% (11-35)</td>
<td>0.6</td>
<td>22% (10-36)</td>
<td>0.73</td>
</tr>
<tr>
<td>Medium small</td>
<td>15% (13-17)</td>
<td>14% (12-16)</td>
<td>15% (13-17)</td>
<td>0.3</td>
<td>15% (13-18)</td>
<td>0.58</td>
</tr>
<tr>
<td>Very small</td>
<td>59% (46-65)</td>
<td>57% (49-64)</td>
<td>61% (49-65)</td>
<td>0.44</td>
<td>59% (48-67)</td>
<td>0.87</td>
</tr>
<tr>
<td>High-density lipoprotein subclass (μmol/L)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large</td>
<td>15% (10-22)</td>
<td>16% (9-23)</td>
<td>16% (10-20)</td>
<td>0.64</td>
<td>17% (9-25)</td>
<td>0.29</td>
</tr>
<tr>
<td>Medium</td>
<td>5% (2-16)</td>
<td>6% (1-15)</td>
<td>5% (2-15)</td>
<td>0.8</td>
<td>6% (1-15)</td>
<td>0.44</td>
</tr>
<tr>
<td>Small</td>
<td>75% (65-83)</td>
<td>75% (69-83)</td>
<td>77% (68-83)</td>
<td>0.94</td>
<td>73% (66-80)</td>
<td>0.08</td>
</tr>
</tbody>
</table>

Data are presented as median (interquartile range).

enrollment. The present study was registered at Clinicaltrials.gov (identifier NCT00820313).

Details on the eligibility criteria for the Multisite Cardiac Lifestyle Intervention Program and the lifestyle intervention have been previously published.3

In brief, the patients were eligible if they had been diagnosed with CHD or with type 1 or type 2 diabetes mellitus or were at high risk of CHD. The diagnosis of CHD was by 1 of the following criteria: (1) noninvasive testing, including exercise testing, nuclear imaging, echocardiography, or other tests demonstrating ischemia; (2) cardiac catheterization; (3) eligibility for bypass surgery/percutaneous transluminal coronary angioplasty and seeking a clinical alternative, or (4) a history of coronary artery bypass surgery, percutaneous transluminal coronary angioplasty/stent placement, or myocardial infarction. The criteria for high-risk status were (1) a family history of premature CHD (first-degree relative) [men aged <55 years, women aged <65 years] with myocardial infarction or sudden cardiac death or men aged >45 years or women aged >55 years; and (2) had ≥2 of the following: (a) current cigarette smoking (within the past 5 years), (b) hypertension (blood pressure >140/90 mm Hg or taking antihypertensive agents), (c) low high-density lipoprotein (HDL) cholesterol <35 mg/dl or taking lipid-lowering medications, (d) elevated lipoprotein (a) >30 mg/dl, (e) total cholesterol >240 mg/dl or taking lipid-lowering medications, (f) low-density lipoprotein (LDL) cholesterol >160 mg/dl or taking lipid-lowering medications, (g) high-sensitivity C-reactive protein of 3 to 10 mg/L, (h) body mass index (BMI) >30 kg/m², or (i) insulin-resistant state (metabolic syndrome X).7

The primary exclusion criteria included (1) left main obstruction >50% in diameter; (2) >70% proximal left anterior descending artery disease, proximal left circumflex artery disease, and an ejection fraction of <50%; (3) unstable angina pectoris; (4) a history of exercise-induced ventricular tachycardia or third-degree heart block without ev-idence of current stability; (5) coronary artery bypass graft surgery or myocardial infarction within 4 weeks; (6) heart failure with functional limitations and unresponsiveness to medications; (7) current tobacco user; (8) uncontrolled malignant ventricular arrhythmia; and (9) impaired cognitive function, such as dementia or delirium.

The dietary guidelines prescribed included approximately 10% of daily calories from fat, 15% from protein, and 75% from complex carbohydrates. The participants were asked to perform a minimum of 3 hours each week of aerobic exercise and to spend a minimum of 30 minutes per session exercising within their prescribed target heart rates and/or perceived exertion levels, to perform strength training activities a minimum of 2 times each week, and to practice stress management techniques for at least 1 hour each day. In addition, they attended weekly group support sessions held twice each week by a licensed mental health professional.

The demographic information and medical history were obtained at baseline by interview and a review of medical records. The clinical measurements, blood test results, and questionnaires were collected at baseline and at 3 months. The clinical measurements included height, weight, abdominal circumference, hip circumference, and blood pressure at rest, which was measured according to the American Heart Association practice guidelines.6 Functional capacity was assessed using maximum treadmill or bicycle ergometry testing.2 A fasting blood sample was drawn for laboratory analyses, including total cholesterol, HDL cholesterol, triglycerides, LDL cholesterol, high-sensitivity C-reactive protein, fibrinogen, lipoprotein (a), homocysteine, oxidized LDL, insulin, B-type natriuretic peptide (BNP), and nuclear magnetic resonance Lipoprotein assays (Quest Diagnostics Clinical Trials, Valencia, California) for LDL, very-low-density lipoprotein (VLDL), and HDL particle concentrations and particle size. In addition, the fasting blood glucose and hemoglobin Alc were assessed for par-
participants with diabetes mellitus. Self-administered questionnaires were completed by participants to assess the exercise and stress management duration and frequency per week, quality of life,7 perceived stress,8 depression,9 hostility,10 social support,11 and cognitive function.12 In addition, 3-day food diaries were completed by the participants. These were entered into the software program Food Processor, version 10.x (Eha Research, Salem, OR) by registered dietitians for nutrient analysis. We included only those nutrients for statistical analysis for which ≥90% of the food items had reported values in the Eha nutrient database used by the Food Processor program.

Statistical analysis was conducted using the Statistical Package for Social Sciences, version 14.0 (SPSS, Chicago, Illinois). A diet adherence score and a lifestyle adherence score were calculated using the same formula as previously described.13 Higher scores indicated better adherence to the recommendations. Continuous data are presented as the mean ± standard deviation for normally distributed variables and as the median and interquartile range or range for non-normally distributed variables. Differences between groups for these variables were tested for significance using t tests and Mann-Whitney rank sum tests, and changes from baseline were tested for significance using paired t tests and the Wilcoxon signed ranks test. Cardiac biomarker distributions were not normal, and log-transformed values were used for parametric tests. The association between the continuous variables was evaluated using linear regression analysis. Pearson’s r and associated 2-sided p values were computed for bivariate correlations.

Results

The baseline characteristics are listed in Table 1. We evaluated the correlations of the baseline cognitive function scores with the lifestyle variables at baseline and found significant inverse correlations with the baseline percentage of calories from fat (n = 128, r = -0.242, p = 0.006). The correlations with exercise and stress management scores were not significant.

At 3 months, significant changes in diet with a reduction in calories, protein, fat, saturated fat, cholesterol, and sodium intake and an increase in carbohydrates, fiber, vitamin A, vitamin C, calcium, and iron were observed (Table 2). Exercise and stress management practices had increased significantly at 3 months, and group support meeting attendance was high with a mean attendance of 97% (Table 2). Health-related quality of life, cognitive function scores, and social support measures improved from baseline, and a significant reduction in depression, hostility, and perceived stress scores was seen (Table 3).

Traditional cardiac risk factors, including BMI, total cholesterol, and LDL cholesterol showed statistically significant decreases from baseline in both the CHD and high-risk groups, as did C-reactive protein and insulin. Apolipoprotein A1 and apolipoprotein B levels decreased significantly in both groups, and the change in apolipoprotein B/apolipoprotein A1 ratio was not significant. Among patients with diabetes mellitus, the fasting blood glucose and hemoglobin A1c levels had decreased significantly in both CHD and high-risk groups (Table 4). A reduction in the total particle numbers for VLDL, intermediate-density lipoprotein, LDL, and HDL was observed, with statistically significant reductions in the total LDL and total HDL particles (Table 5). The VLDL particle size decreased significantly, and the proportion of large and small VLDL particles decreased and the proportion of medium VLDL particles increased from a median of 41% to 47% (p < 0.003). The distribution of HDL size subclasses did not change significantly nor did the distribution of LDL size subclasses, except for a reduction in the intermediate-density lipoprotein particle proportion from a median of 4% to 3% (p < 0.04; Tables 5 and 6). Overall, the changes from baseline to 3 months of follow-up were in the same direction in both the CHD and the high-risk groups (Tables 2 to 6).

The change in weight from baseline correlated inversely with the change in the lifestyle index score (n = 114, r = -0.267, p = 0.004), change in the diet adherence score (n = 115, r = -0.257, p = 0.006), and change in exercise minutes weekly (n = 121, r = -0.238, p = 0.009) but not with the change in stress management minutes weekly (n = 121, r = -0.057, p = 0.536). Changes in the lifestyle index score correlated inversely with the hemoglobin A1c level (n = 47, r = -0.329, p = 0.024) and correlated positively with the changes in the LDL particle size (n = 111, r = 0.202, p = 0.034). The changes in diet adherence correlated negatively with the changes in oxidized LDL (n = 112, r = -0.210, p = 0.026).

Statistically significant increases in fibrinogen and BNP were observed (Table 4). The percentage of change in the BMI correlated inversely with both the percentage of change in BNP (n = 116, r = -0.28, p = 0.002) and the percentage of change in fibrinogen (n = 116, r = -0.20, p = 0.028). In addition the percentage of change in BNP was inversely associated with the percentage of change in insulin (n = 68, r = -0.339, p = 0.005; the analysis was restricted to those without diabetes mellitus).

Inverse associations between the changes in cognitive function at 3 months with the changes in the percentages of calories from fat (n = 118, r = -0.209, p = 0.023), changes in the percentage of calories from saturated fat (n = 118, r = -0.144, p = 0.119), and changes in fat intake in grams (n = 118, r = -0.158, p = 0.088) were found. No association was found between the change in caloric intake with the change in cognitive function (n = 118, r = -0.010, p = 0.914) nor with changes in exercise minutes weekly (n = 120, r = -0.029, p = 0.754) and stress management minutes weekly (n = 120, r = 0.040, p = 0.666) at 3 months.

Discussion

The present study is the first to evaluate the changes in emerging cardiac biomarkers, cognitive function, and social support measures after a comprehensive lifestyle intervention that included a low-fat, whole-foods, plant-based diet, exercise, stress management, and group support meetings. Both the high-risk and the CHD groups were able to make significant changes in their health behaviors. The traditional cardiac risk factors and emerging biomarkers, including C-reactive protein, insulin, and apolipoprotein B, showed favorable changes. Significant reductions in fasting
blood glucose and hemoglobin A1c occurred (Table 4), indicating better control of diabetes mellitus, which is a major cardiac risk factor. The reductions in oxidized LDL at 3 months were not significant (p < 0.08). However, interestingly, the reduction in oxidized LDL correlated with improved diet adherence (r = −0.21, p = 0.026). In previous studies evaluating this intervention, we found significant increases in the intake of antioxidants after the adoption of the recommended dietary changes, which could reduce the exposure to oxidative stress and might explain these findings.

The total particle numbers of VLDL, intermediate-density lipoprotein, LDL, and HDL, as well as the size distribution of these particles, provide information beyond that provided by the cholesterol content of these particles, such as are measured in standard lipid panels. An increased LDL particle number and a smaller LDL particle size have been associated with increased CHD risk. A statistically significant reduction in the LDL and HDL particle number was observed in our study. With insulin resistance, the mean particle diameter of VLDL increases and the mean HDL and LDL diameters decrease. In the present study, the mean VLDL particle diameter decreased in both groups, with a statistically significant decrease in the high-risk group. The proportion of large and small VLDL particles decreased and the proportion of medium VLDL particles increased in both groups (Tables 5 and 6). The distribution of HDL size subclasses did not change significantly nor did the distribution of LDL size subclasses, except for a reduction in intermediate-density lipoprotein particle proportion (Tables 5 and 6). In summary, some favorable changes in the nuclear magnetic resonance lipoprotein subclass analyses were seen at 3 months, including a reduction in the total number of LDL particles and a reduction in the mean VLDL particle diameter owing to changes in the proportion of VLDL size subclasses.

A significant increase in the cognitive functioning subscale scores from a median of 80.8 at baseline to 90 at 3 months (p < 0.001) was observed. Cross-sectional and prospective cohort studies have reported decreased cognitive function with greater saturated fat intake. Increased cortical thickness with long-term meditation practice has been reported. Also, some evidence has shown that meditation can result in improvement in blood flow to the brain, which could conceivably affect cognitive function. Some increases in cognitive function have also been reported after aerobic exercise interventions. Our findings, including the inverse association of changes in cognitive function with changes in fat intake, imply benefits from the intervention (in particular, the changes in diet composition) on cognitive function and need to be confirmed in controlled trials with more objective measures of cognitive function.

The social support measures also improved from baseline, indicating greater perceived social support after the lifestyle program. The amount of perceived social support has been shown to influence the risk of disease and mortality, with greater social support being protective.

The BNP and fibrinogen levels increased, and these changes correlated inversely with the changes in the BMI. In addition, changes in BNP were inversely associated with changes in insulin. Adipose tissue lipolysis is strongly regulated by insulin (which is antilipolytic) and catecholamines (which are lipolytic). More recently, BNP has been found to have lipolytic activity. The observed increase in BNP in the present cohort of patients who experienced improvements in signs and symptoms and risk factors for heart disease can be explained by the metabolic changes related to increased adipose tissue lipolysis.

The present study provides additional insight into the possible mechanisms behind the demonstrated beneficial effects of a comprehensive lifestyle intervention in the prevention and reversal of CHD. The major limitation of the present study was the lack of a randomized control group; thus, the extent of the observed changes that can be attributed to the lifestyle intervention is unclear. However, the changes in standard clinical and lipid measures are similar to those observed in previously published controlled trials that demonstrated the efficacy of the intervention. It is probable that at least some of the favorable changes observed could have resulted from the weight loss, and the greater decreases in lifestyle changes were associated with greater reductions in weight. An additional limitation in interpreting the findings relating to cognitive function is that this was measured by self-report; however, these preliminary findings can help guide the design of future studies.

Acknowledgment: Charleston Area Medical Center, Charleston, West Virginia; Hamot Medical Center, Erie, Pennsylvania; Jameson Health System, New Castle, Pennsylvania; Jefferson Regional Medical Center, Pittsburgh, Pennsylvania; West Virginia University Hospitals, Morgantown, West Virginia; Highmark, Inc., Pittsburgh, Pennsylvania; Public Employee Insurance Agency of West Virginia, Charleston, West Virginia; and Mountain State Blue Cross Blue Shield, Parkersburg, West Virginia; Stacey Dunn-Emke, MS, RD; Lee Lipsenthal, MD, and Loren Yglesias, BA.


Designing in the social context: using the social contextual model of health behavior change to develop a tobacco control intervention for teachers in India

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Abstract

This article provides a theory-based, step-by-step approach to intervention development and illustrates its application in India to design an intervention to promote tobacco-use cessation among school personnel in Bihar. We employed a five-step approach to develop the intervention using the Social Contextual Model of Health Behavior Change (SCM) in Bihar, which involved conducting formative research, classifying factors in the social environment as mediating mechanisms and modifying conditions, developing a creative brief, designing an intervention and refining the intervention based on pilot test results. The intervention engages users and non-users of tobacco, involves teachers in implementing and monitoring school tobacco control policies and maximizes teachers’ role as change agents in schools and communities. Intervention components include health educator visits, discussions led by lead teachers, cessation assistance, posters and other educational materials and is implemented over the entire academic year. The intervention is being tested in Bihar government schools as part of a randomized-controlled trial. SCM was a useful framework for developing a tobacco control intervention that responded to teachers’ lives in Bihar.

Introduction

The global burden of tobacco-related mortality is increasingly shifting to low- and middle-income countries. Approximately 82% of the world’s 1.1 billion smokers are found in low- and middle-income countries, and by 2030, it is estimated that 80% of the world’s 8 million tobacco-related deaths will occur in these countries [1–3]. Systematically working towards decreasing and abolishing production of tobacco and tobacco products, banning tobacco use in public places and educational institutions, increasing taxation on tobacco through fiscal measures, preventing uptake of tobacco use by adolescents and children, and addressing cessation among tobacco users are some of the recommended strategies to decrease tobacco use [4]. Tobacco prevention and cessation interventions that address the social context, which includes life experiences, social relationships, organizational structures and societal influences, have been shown to be meaningful and relevant to the intended
audiences [5, 6] as well as effective at changing health behaviors that can reduce the risk of developing chronic diseases [7–9]. However despite this need, few intervention development or planning models exist [10–15] that integrate multiple theories and help practitioners design interventions in a step-by-step manner.

Social and behavioral theories, such as the Social Cognitive Theory, have been broadly used to inform interventions in low- to middle-income countries, including India [16–18]. This study was guided by the Social Contextual Model of Health Behavior Change (SCM), which has been applied mainly in the United States [5, 6, 19]. SCM was developed by researchers at the Dana-Farber Cancer Institute (DFCI) and the Harvard School of Public Health (HSPH) in early 2000 to guide their work to design cancer prevention interventions [5, 7, 8, 20–23]. The model is based on a rich foundation of social and behavioral research as well as lessons from social epidemiology. It includes psychosocial factors found to be predictive of behavior change, including self-efficacy, attitudes and beliefs, intentions to perform a behavior and the skills needed to do it. SCM also delineates pathways through which population characteristics, such as income or education, influence health behaviors. Interventions using this model classify factors found in the social environment as either ‘modifying conditions’ or ‘mediating mechanisms’. Modifying conditions are those factors, which may independently affect outcomes but are not influenced by the intervention; mediating mechanisms refer to those factors, which are amendable to change, and are addressed by the intervention.

Given that interventions developed based on SCM have been shown to significantly reduce tobacco use and other risk-related behaviors in the United States [7–9, 22], we believed it would be a highly relevant model to guide intervention development in low- to middle-income countries. We therefore used SCM to develop a school-based tobacco cessation intervention for teachers in India, marking it as the first effort to our knowledge to apply the model found effective in Western cultures to another setting.

The purposes of the article are to (i) provide a step-by-step approach to intervention development using SCM and (ii) illustrate its application in the Bihar School Teachers Study (BSTS)—a study designed to promote tobacco-use cessation among school personnel in the Indian state of Bihar. Teachers are the focus of BSTS because as role models for youth and key opinion leaders related to community norms [24–27], they represent an important group for tobacco control.

Methods

Study design

BSTS is a collaboration between Healis-Sekhsaria Institute for Public Health (Healis) in Mumbai and Patna, India and DFCI and HSPH in the United States. BSTS used a cluster randomized-controlled design to assess the extent to which a comprehensive tobacco control intervention results in: (i) tobacco-use cessation among teachers and (ii) implementation of school tobacco control policies. The intervention was conducted in two waves over two consecutive academic years (2009–2011). In this article, we describe how SCM was used to develop the BSTS intervention from January 2008 (the second half of the academic year) through January 2009.

Study setting and population

The state of Bihar is located in northern India and has a population of around 83 million [28]. On a broad range of indicators of socio-economic well-being, Bihar had far fewer resources and social infrastructure than most other states in India. For example, according to the 2001 Census of India, only 4% of Bihar households had tap drinking water compared to the national average of 37% [28]. Bihar is a major tobacco producing state and has a higher prevalence of tobacco use compared to the national average (Table I) [29, 30]. Tobacco use is also high among teachers; according to the Global School Personnel Survey (GSPPS) conducted in 2000, 78% of teachers in Bihar used some form of tobacco [27]. For BSTS, we randomly selected 72
Table I  Comparison of indicators of socio-economic well-being, India and Bihar

<table>
<thead>
<tr>
<th>Indicator</th>
<th>India</th>
<th>Bihar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Literacy rate&lt;sup&gt;a&lt;/sup&gt;</td>
<td>74.0%</td>
<td>63.8%</td>
</tr>
<tr>
<td>Infant mortality rates per 1000 births&lt;sup&gt;b&lt;/sup&gt;</td>
<td>57</td>
<td>62</td>
</tr>
<tr>
<td>Percent of workers employed as agricultural laborers&lt;sup&gt;c&lt;/sup&gt;</td>
<td>26.5%</td>
<td>48.0%</td>
</tr>
<tr>
<td>Percent of households with tap as source of drinking water&lt;sup&gt;d&lt;/sup&gt;</td>
<td>36.7%</td>
<td>3.7%</td>
</tr>
<tr>
<td>Percent of households with electricity as sources of lighting&lt;sup&gt;e&lt;/sup&gt;</td>
<td>55.8%</td>
<td>10.3%</td>
</tr>
<tr>
<td>Percentage of males age 15 and above who are current tobacco users&lt;sup&gt;f&lt;/sup&gt;</td>
<td>47.9%</td>
<td>66.2%</td>
</tr>
<tr>
<td>Percentage of females age 15 and above who are current tobacco users&lt;sup&gt;g&lt;/sup&gt;</td>
<td>20.3%</td>
<td>40.1%</td>
</tr>
<tr>
<td>Percentage of males age 6 and over who received no education&lt;sup&gt;h&lt;/sup&gt;</td>
<td>21.9%</td>
<td>35.3%</td>
</tr>
<tr>
<td>Percentage of females age 6 and over who received no education&lt;sup&gt;i&lt;/sup&gt;</td>
<td>41.5%</td>
<td>60.3%</td>
</tr>
<tr>
<td>Percentage of males who are currently employed&lt;sup&gt;j&lt;/sup&gt;</td>
<td>84.5%</td>
<td>78.6%</td>
</tr>
<tr>
<td>Percentage of females who are currently employed&lt;sup&gt;k&lt;/sup&gt;</td>
<td>36.3%</td>
<td>23.5%</td>
</tr>
</tbody>
</table>

<sup>a</sup>Census of India, 2011 [52].
<sup>b</sup>National Family Health Survey (NFHS-3) 2005–2006 [53].
<sup>c</sup>Census of India, 2001 [28].
<sup>d</sup>Global Adult Tobacco Survey (GATS) India Report 2009–2010 [30].

rural and urban schools representing grade levels 8–10 from a total of 6900 schools governed by Bihar state government. To be eligible for the study, schools had to have eight or more teachers and not located in flood zones. (Flooding causes schools to close, which would prohibit us from implementing the intervention.) Thirty-six schools were randomly assigned to the intervention group and the remaining 36 were assigned to the delayed intervention control group.

For the sub-study we designed to develop the BSTS intervention, we purposely sampled 110 teachers to participate in three sets of focus groups. These teachers were from rural and urban Bihar government schools, taught grade levels 8–10 and represented the same demographics as teachers from study schools, but were not from the 72 schools selected for the randomized trial.

The Indian Council of Medical Research along with Healis and the ICMR Institutional Review Boards approved BSTS procedures.

Five-step SCM intervention development process

Using SCM to develop the BSTS intervention involved five steps: (i) conducting formative research; (ii) classifying factors in the social environment as mediating mechanisms or modifying conditions; (iii) developing a creative brief; (iv) designing an intervention and (v) refining the intervention based on pilot test results. The actions needed for each step are presented in Fig. 1 and the application of them is described in the Results section.

Research methods

Data collection

Review of literature and archival data. Reviewing the literature serves as the first step in intervention development, thereby grounding the process in prior research evidence. Our research team consisted of communication scientists, epidemiologists and social and behavioral scientists from India and the United States. In Step 1, we reviewed the findings of prior research our team conducted in 2003–2004 related to school tobacco control policies and tobacco-use patterns among teachers in Bihar. This, in turn, informed the questions we would ask teachers in focus groups [27, 31]. We also reviewed the results of other tobacco-related research conducted in India and obtained demographic data from the Bihar Education Department about teachers in our study schools [32–34].

Focus groups. We conducted focus groups as part of three different steps outlined in Fig. 1: Step 1 (January 2008), Step 3 (June 2008) and Step 5
(January 2009). Table II summarizes the number and composition of these groups along with key themes that arose from the analyses. Each group had a mix of male and female teachers as well as users and non-users of tobacco. All focus groups lasted between 60 and 90 min and were guided by scripts based on stated research objectives (Table III). Staff members were trained to moderate the focus groups and were assisted by trained note takers who took careful, systematic notes during each discussion. All focus groups were audio-recorded, conducted in Hindi and translated into English immediately afterwards. Notes were also transcribed immediately following each group and compared as needed to the audio recordings to assure completeness of the data.

Direct observations. In Step 1, teams of two BSTS staff members traveled to each study school in July to September 2008 to observe school conditions using a standard checklist. Conditions included the presence of a principal’s office, a staff room and the distance of each school from the Patna study office. We also observed the types of health-related materials in the schools and the placement of important information for teachers, such as notices from the principal. These observations would help us determine what intervention activities and materials would be appropriate for this context.

Data analysis
All data were analyzed based on standard qualitative research methods [35–37]. We also used an iterative data analysis process, in which each step of the process informed the others.

Key findings from our literature review were summarized in a creative brief (Step 3). The transcribed focus group data were analyzed using a two-stage coding process: Level 1 structural coding and Level 2 thematic coding. Structural coding followed the structure of the focus group guide, in which the response to every question received a structural code. Thematic coding was based on themes that arose from the structural coding, and was applied in a second pass analysis. These methods were enhanced by the use of NVivo software (QSR International). The analysis of the
Tobacco control intervention for teachers in India

<table>
<thead>
<tr>
<th>Date and Purpose</th>
<th>Number of groups</th>
<th>Composition</th>
<th>Key themes from focus groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 2008</td>
<td>Four</td>
<td>N=44</td>
<td>- Teachers were more likely to use tobacco outside of school, and if they used it, they were more likely to use smokeless products</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Male: 31</td>
<td>- There were social pressures to use tobacco at weddings, festivals and other ceremonies</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Female: 13</td>
<td>- Perception that more men than women used tobacco</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban: 15</td>
<td>- Belief that less educated people used more tobacco because they were unaware of the harmful effects</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rural: 29</td>
<td>- Tobacco was used to deal with daily stress and tension, as well as ‘to make them fresh’</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Users: 2</td>
<td>- Misconception that tobacco enhances energy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Non-users: 17</td>
<td>- Being a role model for students, pressure from family members, teachers’ status in society, and cost were key reasons for quitting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unknown: 25</td>
<td>- Job structure (gap between classes) resulted in boredom and tobacco use for some teachers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Will power, family influences and social support from co-workers were essential for quitting</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Using sauf (fennel seeds) or cardamom, diverting one’s mind by reading books or magazines and meditation were suggested quit strategies</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Story-telling of how other people quit could also enhance quitting</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- School tobacco policies existed but were not enforced</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Principals were pivotal in supporting and enforcing school tobacco policies</td>
</tr>
<tr>
<td>June 2008</td>
<td>Three</td>
<td>N=32</td>
<td>- A lead teacher should be selected to serve as program liaison and host monthly meetings</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Male: 25</td>
<td>- Signage about school tobacco policies should be highly visible</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Female: 7</td>
<td>- Resource materials should be kept in a central place, such as a resource center</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban: 13</td>
<td>- Information about tobacco should: (i) be scientific yet practical; (ii) stress the harmful effects of it; (iii) outline the steps for quitting; (iv) provide stories of successful quitters</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rural: 19</td>
<td>- Because teachers wanted to help family and friends quit tobacco, they wanted materials they could take home</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Users: 14</td>
<td>- Family support for quitting should be integrated into intervention materials, components and discussion groups about tobacco</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Non-users: 18</td>
<td>- Teachers should engage in regular discussions about tobacco, which could also build support for quitting</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Having monthly visits from an outside health expert, such as a health educator, would add credibility and enthusiasm for a tobacco program</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Principals should be engaged throughout the program to ensure success</td>
</tr>
<tr>
<td>January 2009</td>
<td>Two</td>
<td>N=34</td>
<td>- Discussions about tobacco were key to promoting cessation</td>
</tr>
</tbody>
</table>

(continued)
thematic data culminated in a Themes Document that summarized the major themes from the focus groups and contributed to the development of a creative brief. Direct observation data collected at schools were arranged into Field Note binders and referenced throughout the intervention development process.

Throughout data analysis, our research team met regularly (in person and by phone) to interpret the data and determine how it would be used to inform the intervention.

Results

Step 1: conduct formative research

Formative research, which includes literature reviews, focus groups and direct observations, is an integral part of using SCM to guide the intervention development process [38, 39]. Using these methods, we collected teachers’ demographic data as well as information on their social context at five levels of influence (individual, interpersonal, organizational, neighborhood or community and societal).

From previous research our team conducted in India, we noted a higher prevalence of tobacco use in schools without a tobacco control policy as compared to schools with a policy [27]. Additionally, the literature revealed many tobacco myths, such as chewing tobacco being good for teeth and gums. We also learned through literature and census data that teachers are relatively advantaged and well educated compared to the rest of their community. They are government employees, receive regular salaries and most of them have at least some college education. Thus, the intervention materials could be written at a relatively high reading level and would be in Hindi, the official language of Bihar.

Despite the Global School Personnel Survey findings that 78% of male and female teachers used tobacco, there was a strong perception among the January 2008 focus group participants that overall use was higher among men than women, and likely lower than that reported in GSPE. Participants reported male teachers mainly used smokeless tobacco such as khaini (a mixture of chewing tobacco and lime) and paan (betel leaf filled with sliced areca nut, lime, tobacco and other condiments) outside of school, whereas ‘lady teachers’ occasionally chewed paan at social events, and older female teachers used gul (powdered tobacco) at home. Related to policy, female teachers were more likely than male teachers to recommend punitive approaches to enforce no tobacco use, such as fining teachers for using tobacco on campus.

From direct observations of schools, we learned many did not have electricity or a staff room. Additionally, we found tobacco products present on school grounds, indicating school tobacco

<table>
<thead>
<tr>
<th>Date and Purpose</th>
<th>Number of groups</th>
<th>Composition</th>
<th>Key themes from focus groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>To obtain teachers’ reactions to the 3-month pilot test of the intervention</td>
<td>Male: 15</td>
<td>Some women (who were non-users) did not feel the program was relevant for them</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Female: 14</td>
<td>Lack of awareness that a tobacco control policy was being formulated for their schools</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unknown: 5</td>
<td>Desire for action-oriented information about tobacco cessation or staying tobacco-free that teachers could use to help family members quit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Urban: 22</td>
<td>Objection to the program name (‘Tobacco-Free Teachers’) because it shamed teachers in front of their students</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rural: 12</td>
<td>Intervention did not clearly communicate the role that other teachers, especially non-users, could play in helping other people quit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Users: 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Non-users: 25</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unknown: 5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Tobacco control intervention for teachers in India

Table III. Focus group moderator guides

<table>
<thead>
<tr>
<th>January 2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motivation for teacher tobacco use, including social norms</td>
</tr>
<tr>
<td>(1) Do any of you use tobacco? If yes, what type(s) of tobacco do you use?</td>
</tr>
<tr>
<td>(2) What do you like about tobacco? What do you dislike about it?</td>
</tr>
<tr>
<td>(5) When do you typically use tobacco? Do you use different types of tobacco at different times? Use on versus off job?</td>
</tr>
<tr>
<td>(4) Why do you use tobacco? (Probes—peer pressure, to deal with stress, etc.)</td>
</tr>
<tr>
<td>(5) Why do you think other teachers might use tobacco?</td>
</tr>
<tr>
<td>Motivation for teachers quitting tobacco use, including social norms</td>
</tr>
<tr>
<td>For users: Have you ever thought about quitting? Why or why not?</td>
</tr>
<tr>
<td>(1) Describe your experiences with attempting to quit.</td>
</tr>
<tr>
<td>(2) How confident are you that you could quit if you tried? What would make you feel more confident that you could quit?</td>
</tr>
<tr>
<td>(5) Do you talk about quitting with co-workers?</td>
</tr>
<tr>
<td>(Ask all teachers—tobacco users and nonusers—the remaining questions):</td>
</tr>
<tr>
<td>(1) What do you think would help teachers to quit using tobacco?</td>
</tr>
<tr>
<td>(2) What would make a teacher consider quitting using tobacco?</td>
</tr>
<tr>
<td>● Do you know anyone who has quit or tried to quit using tobacco? If so, what helped them quit?</td>
</tr>
<tr>
<td>● What resources would help?</td>
</tr>
<tr>
<td>● What types of school-based cessation resources would be helpful?</td>
</tr>
<tr>
<td>(3) What makes it difficult for a teacher to quit? (Probes: On-the-job and at-home barriers (e.g. stress, boredom, smoke breaks with co-workers, addiction to nicotine, lack of family support))</td>
</tr>
<tr>
<td>(4) What role do you feel teachers’ tobacco use plays in influencing students?</td>
</tr>
<tr>
<td>School policies restricting tobacco use</td>
</tr>
<tr>
<td>(1) Does your school have any tobacco control policies?</td>
</tr>
<tr>
<td>● What resources has your school committed to tobacco control?</td>
</tr>
<tr>
<td>● Would your administration be supportive of a tobacco control program?</td>
</tr>
<tr>
<td>(2) How important do you think it is to address tobacco use at the school level? Probes:</td>
</tr>
<tr>
<td>● What could the school do to help teachers quit?</td>
</tr>
<tr>
<td>● How receptive would teachers be to a school-based policy or program?</td>
</tr>
<tr>
<td>June 2008</td>
</tr>
<tr>
<td>General questions about a school-based tobacco control program</td>
</tr>
<tr>
<td>(1) Do you have some ideas about how a school-based tobacco cessation program might work among teachers in your school?</td>
</tr>
<tr>
<td>(2) What might be some effective ways to relay the program messages in a school-based setting? Possible probes:</td>
</tr>
<tr>
<td>● Have you ever heard of any programs to promote teachers health? Or perhaps any programs offered by other types of employers? What has worked/not worked?</td>
</tr>
<tr>
<td>● What might be likely to draw teachers in—what aspects of a program would be attractive to teachers?</td>
</tr>
<tr>
<td>● How would a program need to be organized in order to fit into the school day?</td>
</tr>
<tr>
<td>● How much support would you want from outside experts or helpers?</td>
</tr>
<tr>
<td>● What elements of a program would be most important in helping teachers quit?</td>
</tr>
<tr>
<td>Potential components</td>
</tr>
<tr>
<td>(1) Based on previous research, we developed a list of core components that we are considering to develop for this program. (Moderator: Hand out component list) Overall, how does this list of components seem to you? Does it seem complete? Is there anything else that you would add?</td>
</tr>
<tr>
<td>(2) Now, we’ll spend some time talking about each of the components, one at a time.</td>
</tr>
<tr>
<td>(NOTE: Moderator walks through each of the components described below and engages participants in a discussion of what they think of that component, how it might work in their school, and how it could be improved.)</td>
</tr>
<tr>
<td>● Lead teachers—who would work with the project staff in making the program available to teachers (Describe possible roles for lead teacher.)</td>
</tr>
<tr>
<td>● Promotion of school tobacco control policies. (Describe types of policies and rules for having policies.)</td>
</tr>
</tbody>
</table>

(continued)
Table III. Continued

- A Resource Center in each school, which would provide informational materials on tobacco use and quitting.
  (Describe what resource center might look like/ functions)
- Written materials
- Group discussions and other ways to build social support for quitting.
- Group discussions of cessation methods for those interested in quitting, including members of teachers’ families.
- Contests, such as Quit and Win, to engage smokers in programs and increase cessation.
- Visits from the health educators—about once every month or six weeks.

Anything else

(1) Are there other ways we can build our program that would be especially helpful for a school like yours?

January 2009

General Questions about the Pilot Program

(1) Overall what did you think about the program? How effective do you think the program was?
- Did it change your thinking on tobacco?
- Do you know any teachers who cut down or quit using tobacco because of what they learned in the program?

(2) What did you like best about the program?

(3) What did you like least about the program?
  (For teachers who do not use tobacco):

(4) We know that you do not use tobacco—however, did you still participate in the program (Probe: why/why not)?

(5) Do you know any teachers who chose not to participate in the program? Why not?

Components

(1) Of all the program components (health educator visits, lead teacher discussions, notice board, resource center, suggestion box, tobacco policy/policy workgroup) which did you think were most liked by the teachers? Why do you think these components were popular with the teachers?

(2) Now let’s talk about the specific components. For each component let’s discuss:
- How was this component implemented in your school?
- What did teachers think about this component?
- What did you like best about the component?
- What did you like least about the component?
- What could be done to make this component better?

(3) Do you think the health educator and lead teacher discussions should be combined or should they be separate? Why?

(4) Are there any other components that you think would have been important to include in this program? Is there anything that you would change?

Materials

(1) Overall, what program materials (posters, newsletters, calendar, etc) do you think teachers like most? Why did these materials stand out for you?

(2) Now let’s talk about some specific materials. For each one (Tobacco Body poster, Role Model poster, Family Motivation to Quit poster, newsletters, calendar), let’s discuss:
- Where was the material displayed/posted in your school? When? For how long?
- Did any of the teachers think that there was a better place where the material could have been displayed? Where?
- Why?
- What did the teachers think about this material?
- What did you like most about this material?
- What did you like least about this material?
- What did this material tell you?

(3) Most of the materials were in Hindi—would you prefer the materials stay in Hindi or would you have liked to have them in English?

(4) Are there any other materials that we did not provide that you think would have been important or helpful to include in this program?

Anything else

(1) Is there anything else that we could do to the program to make it better and more effective for teachers?

(2) Is there anything that we should add to the program?
control policies either did not exist or were not enforced. Posters and calendars were popular on school walls and appeared to have greater impact if posted near the principal’s chamber.

**Step 2: identify important factors in the social context and classify them as modifying conditions and mediating mechanisms**

Based on the results of our formative research, we classified social contextual factors as either modifying conditions or mediating mechanisms. We also considered our study outcomes, setting and intervention feasibility in classifying these factors.

**Modifying conditions**

We categorized modifying conditions into five levels (Table IV). At the ‘individual’ level, teachers reported using tobacco to cope with daily stress and tension. Family support for quitting was consistently identified as a crucial factor at the ‘interpersonal’ level. At the ‘organizational’ level, school resources, including the structure of the school day (e.g., having longer break time between classes) enabled some teachers to use tobacco, whereas the principal played a key role in enforcing school tobacco control policies. At the ‘neighborhood and community’ level, the widespread availability of tobacco in neighborhoods and at celebrations appeared to influence tobacco use. Conversely, at the ‘societal’ level, the Indian respect for teachers along with national tobacco control legislation, were factors that could be leveraged to promote cessation.

**Mediating mechanisms**

Five mediating mechanisms were identified that we would seek to change as part of our intervention: (i) risk perception, (ii) motivation or intention to change, (iii) social norms or role models, (iv) self-efficacy or skills to quit, and (v) support to quit. For example, teachers felt it was important to raise collective awareness of tobacco-use risks, which could in turn influence school norms not to use. As role models for students, they also felt strongly that they should not use tobacco. Finally, teachers believed they could provide social support to their co-workers’ attempts to ‘leave tobacco’ by ‘diverting their minds in different ways’.

**Step 3: develop a creative brief**

We developed a ‘creative brief’ using findings from Steps 1 and 2. This document provides a brief description of the audience; outlines the context, objectives, channels and messengers; and details the tone the team intends to use in developing all intervention messages, materials and components [40]. In the brief, we summarized the social context in Bihar, including teachers’ demographic characteristics. We drafted potential intervention messages and components and tested these with teachers in focus groups in June 2008 (Table II). From these groups we learned that an outside health expert, such as a health educator, would bring credibility to the messages and intervention. We also learned that teachers wanted materials that provided scientific yet practical information about tobacco. They indicated signage around school would be an effective way of promoting a school tobacco control policy. They further believed discussion groups were the best way to encourage tobacco-use cessation.

**Step 4: design the intervention**

Using the creative brief, we created the ‘Tobacco-Free Teachers’ intervention to be conducted over six months (September to March) during working days of the academic year. ‘Theme-based’ (i.e. six themes—one per month) intervention activities and materials were delivered in a step-wise manner: (i) emphasize teachers as role models, (ii) enhance understanding of the risks associated with tobacco, (iii) increase motivation to quit, (iv) build skills to quit, (v) address withdrawal, (vi) promote skills for maintenance; and cutting across all steps, build a supportive normative climate for not using tobacco. We linked major themes to our mediating mechanisms and then developed messages that were incorporated into different parts of the intervention. For example, to change risk perceptions, intervention
Table IV. Examples of modifying conditions identified in the Bihar School Teachers Study

<table>
<thead>
<tr>
<th>Modifying conditions</th>
<th>Results from formative research</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Individual factors</strong></td>
<td></td>
</tr>
<tr>
<td>Daily habits and beliefs about tobacco</td>
<td>• Teachers reported using tobacco to cope with daily stress and tension.</td>
</tr>
<tr>
<td><strong>Interpersonal factors</strong></td>
<td></td>
</tr>
</tbody>
</table>
| Family support                              | • Teachers believed it was crucial to involve family members in cessation efforts as illustrated in the following quote:  
                                           | 'It will be very beneficial to engage family support for quitting. Those people who ask their children to bring cigarettes for them will have to face their opposition. An unbeatable man gets defeated in his own home. When wife and children will oppose the usage of tobacco, then surely they will quit its usage.'|
| **Organizational factors**                  |                                                                                               |
| School resources                            | • Some teachers commented that because of gaps between classes, they got bored and used tobacco |
|                                           | • The most powerful school factor teachers discussed was the headmaster or principal. As one teacher said, 'In school, the headmaster is all-in-all.' Teachers emphasized that the 'principal takes the final decision in any matter' and would need to approve everything related to intervention implementation, from allowing staff to participate in activities to enforcing school tobacco control policies. |
| **Neighborhood or community**               |                                                                                               |
| Availability of tobacco                     | • Teachers discussed the widespread availability of tobacco, with products such as pan being sold on almost every street corner. |
|                                           | • Teachers also linked high tobacco use in Bihar with production saying, 'production and consumption goes parallel here.' |
| **Societal factors:**                       |                                                                                               |
| Attitudes towards teachers                  | • Teachers were keenly aware of their social prestige, referring to themselves as the 'architects' and 'intellectual class' of society.' As one teacher noted:  
                                           | 'The teachers enjoy considerable respect in society. The image of the teachers makes the difference. The teachers will have to become the ideals for society; only then will [they] be able to influence the society.' |
|                                           | • Because of their status, they felt strongly they should not use tobacco. As a female teacher noted, 'First of all, we should avoid tobacco and then we can strongly tell users to quit tobacco.' |
| National legislation                         | • Teachers were generally aware of the national tobacco control legislation, (e.g. that tobacco cannot be sold within 100 yards of the school and that smoking is banned from public places). |
materials were designed to portray the harmful effects of tobacco. We would also encourage teachers to discuss how tobacco harms the whole family at meetings and other teacher gatherings.

We sequenced themes in this way based on our formative research and an understanding of the need to address myths about tobacco use before we could build the motivation and skills to quit [31]. The program consisted of monthly health educator visits and having a lead teacher (a school program liaison) promote discussions about tobacco with teachers; a notice board and suggestion box placed near the principal’s office; a calendar and posters displaying intervention messages; a self-help cessation brochure; and cessation support from the health educator and lead teacher. We also asked each school to form a workgroup to develop and monitor a school tobacco control policy. All intervention materials were in Hindi and activities were detailed in standardized protocols.

Throughout the intervention, we fostered the principals’ support of the program, having learned of the pivotal role they play in school tobacco policy in our formative research. For example, they played leadership roles in the selection of the lead teacher and chairing the policy workgroup. Additionally, we invited the principals to attend a mid-year gathering in Patna to learn from their experiences and identify how we could further support their important role.

Due to the lack of electricity in many schools, which we learned in Step 1, all materials were designed to be bold and easily read in dimly lit conditions. They were also printed on laminated paper to protect them from rain damage. Table V illustrates how we operationalized our mediating mechanisms, intervention messages and components.

**Step 5: pilot test and revise the intervention based on pilot test results**

We invited one urban and one rural school in Bihar, which were not part of the selected sample of study schools, to conduct an abbreviated version of the intervention from November 2008 to January 2009. A staff health educator and a lead teacher from each school were trained to deliver the school-based intervention. To assess intervention fidelity, staff members collected process tracking data regarding the extent to which the intervention was delivered as planned in each school, including the number of activities conducted and the number of teachers participating in activities. Following the pilot in January 2009, we also conducted focus groups with teachers and interviewed the lead teachers in both schools to learn about the pilot intervention: what worked, what did not work and how the intervention could be improved.

We found no major differences in results from the urban and rural schools’ process tracking and focus groups. From the process tracking data, we learned the calendar, posters, notice board and suggestion box were displayed; a policy workgroup was formed and adopted a tobacco control policy; cessation brochures were distributed; and the discussion groups during the health educator visits and lead teacher meetings were carried out according to the timeline, with most teachers participating in them. In the focus groups, teachers indicated that discussions about tobacco were key to promoting cessation. However, we also learned that some female teachers (mostly non-users) did not participate because they did not feel the intervention pertained to them. Other key findings included: teachers’ lack of awareness about the development of their school’s tobacco control policy and their desire for more detailed, action-oriented information about tobacco cessation and/or staying tobacco-free that could be used for their family members (Table II).

Otherwise, the pilot intervention was well received with two exceptions. First, teachers objected to the term, ‘Tobacco-Free Teachers’, because they believed it ‘shamed’ them in front of their students. Teachers knew that other workers, such as laborers, had a higher prevalence of tobacco use than teachers and did not understand why the intervention targeted them specifically. Teachers in focus groups during Step 1 expressed similar opinions, as one teacher commented, ‘Iliterate people use tobacco on a large scale because they are not aware of its harms.’

Second, the intervention did not clearly communicate the role that other teachers, especially
Table V. Mediating mechanisms identified in the Blue School Teachers Study, how they were operationalized in the ‘Tobacco-Free Teachers, Tobacco-Free Society’ intervention and corresponding intervention components

<table>
<thead>
<tr>
<th>Mediating mechanisms</th>
<th>Results from formative research</th>
<th>How operationalized in the intervention</th>
<th>Intervention components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk perception</td>
<td>Focus group participants said teachers needed more information about the harmful effects of tobacco in order to promote cessation, as illustrated in the following comment: Until the teachers knew the intensity of tobacco hazard, they will not stop using tobacco. Along with how tobacco affects the body, one participant felt. For creating awareness, we will have to tell them the harmful effects of it on their body as well as society. They also felt it was important to counter myths that tobacco use was healthful or intelligent enhancement medicine.</td>
<td>Provide information about the harmful health effects of tobacco as well as the harmful substances found in tobacco. Discuss how tobacco is promoted in Hollywood movies and how it influences people’s perceptions of risk. Discuss myths and truths related to tobacco use. Build collective appreciation for risks associated with tobacco in order to influence norms at school.</td>
<td>Poster · Calendar · Group discussions during health educator visit and lead teacher meetings with other teachers · Handouts teachers could take home</td>
</tr>
<tr>
<td>Intention to quit</td>
<td>The influence of tobacco on the family was repeatedly expressed by focus group participants as a strong motivator for change. As one participant indicated, “Tobacco use is harmful for health and wealth.” and ceased an “unbalanced budget” in the household. Reasons for quitting tobacco included wife’s love and anger, social pressure [and] to think about the next generation.</td>
<td>Emphasize how tobacco effects not only the user but the family too. Highlight family motivations for users to quit. Illustrate the cost of tobacco use and how it impacts the family</td>
<td>Poster · Calendar · Group discussions during health educator visit and lead teacher meetings with other teachers · Activity showing how much is spent on tobacco use and what could be done with the money saved</td>
</tr>
<tr>
<td>Self-efficacy to quit</td>
<td>Teachers in focus groups consistently raised “strong will power” as an integral part of quitting tobacco use, both in the decision to quit and throughout the quitting process. Teachers wanted to know the steps for quitting as well as how long.</td>
<td>Provide teachers with the steps to quitting. Emphasize that willpower—in addition to coping strategies—increases the chance of long-term success. Highlight that other people have successfully quit.</td>
<td>Creation self-help brochure · Poster · Calendar · Group discussions during health educator visit and lead teacher meetings with other teachers</td>
</tr>
</tbody>
</table>

(continued)
**Table V. Continued**

<table>
<thead>
<tr>
<th>Motivating mechanisms</th>
<th>Results from formative research</th>
<th>How operationalized in the intervention</th>
<th>Intervention components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social norm and role models for quitting and remaining tobacco-free</td>
<td>- We learned from the literature that few people in India quit tobacco [54], thus teachers wanted to learn from the stories of how other people quit.</td>
<td>- Enhance skills to say no to tobacco when it is offered by a friend, family member or at a social function, such as a wedding.</td>
<td>- Role play 'how to say no' to tobacco when it is offered</td>
</tr>
<tr>
<td>Social support to quit</td>
<td>- Teachers were highly aware of the influence they had on their students. According to a female participant, teachers are the role model of students. If teachers use tobacco, then some students think that teachers are good and intelligent so this is the effect of tobacco.</td>
<td>- Stress that teachers are role models to their students and to the community at large.</td>
<td>- Poster</td>
</tr>
<tr>
<td></td>
<td>- Indeed, teachers felt the best way to be role models was to avoid tobacco use. As one teacher said, 'If we don’t have any bad habits then we can say [to students] what not to do.'</td>
<td>- Give teachers an active role in adopting, promoting and monitoring changes in the school as a result of having a tobacco control policy.</td>
<td>- Calendar with role model messages</td>
</tr>
<tr>
<td></td>
<td>- Focus group participants identified ways to help colleagues leave tobacco, such as ‘we could direct their minds in different ways. We can go for lunch together or can do some other work.’</td>
<td>- Highlight the benefits of working in a tobacco-free school and being a model school for the community.</td>
<td>- Group discussions about teachers’ social prestige and their importance as role models at the beginning of the intervention and reinforced during health educator visits and lead teacher meetings</td>
</tr>
<tr>
<td></td>
<td>- Teachers believed that tobacco users should be compelled rather than pressured to quit.</td>
<td>- Throughout the intervention, stress the message that teachers (both users and non-users of tobacco) are learning information and skills to help someone quit tobacco use.</td>
<td>- Teacher participation in a tobacco policy workgroup</td>
</tr>
</tbody>
</table>

Tobacco control interventions for teachers in India.
non-users, could play in helping others quit. Based on these observations, we revised the intervention to: (i) emphasize repeatedly the important role of non-users in supporting others who want to quit and include at least one female member on the policy workgroup; (ii) add group discussions about tobacco use and cessation into intervention activities; (iii) provide handouts, such as those detailing the harmful effects of tobacco that the teachers could bring home; (iv) give teachers an active role in implementing and monitoring their school’s tobacco control policy and (v) change the name of the intervention program from ‘Tobacco-Free Teachers’ to ‘Tobacco-Free Teachers, Tobacco-Free Society’ to further promote the idea of teachers as conduits to society and their role in promoting tobacco cessation. Because teachers were highly aware of their social status, we incorporated their belief that as role models, they ‘should not’ use tobacco and should ‘spread awareness of the harms of tobacco’ into intervention messages. If teachers quit tobacco or remained tobacco-free, they could influence other groups with higher rates of tobacco use to quit. Figure 2 shows the ‘Tobacco-Free Teachers, Tobacco-Free Society’ intervention model.

**Discussion**

The purposes of this article were to: (i) provide a step-by-step approach to intervention development using SCM and (ii) illustrate its application in the BSTS. The SCM proved a helpful guide in designing a relevant, culturally appropriate intervention to promote tobacco-use cessation among teachers in Bihar. Knowing the need for examples of how theoretical models have been used to design health promotion interventions in low- to middle-income countries, we believe this article makes an important contribution to the research and practice of intervention development.

In BSTS, the SCM helped us embed the intervention within the social context of teachers’ lives mainly in two ways. First, we used the information
collected to operationalize our mediating mechanisms into messages and intervention strategies that would appeal to teachers, by using their suggested wording, having artwork created by local artists, and providing information in calendars which were found to be popular in Indian schools. Second, we sought to make the program more relevant for teachers by incorporating what we learned about the moderating conditions. For example, while our school-based intervention could not change the widespread availability of tobacco at stands in neighborhoods, we could use this as an example in discussions about barriers to quitting and have teachers identify ways to overcome it.

Our choice of intervention activities was also informed by the social context. In focus groups, teachers repeatedly expressed their desire to help others in the school and the community. We wove this into intervention messages of ‘helping others to quit’ as well as gave an active hands-on role to the policy workgroup. For example, along with adopting a school policy, we asked the workgroups to promote the policy in creative ways (e.g., one suggestion was to paint the policy on the wall), monitor changes in their schools as a result of having a policy, and celebrate their school’s success for being tobacco-free. Other studies have similarly found interventions were enhanced by actively involving participants in the delivery of an intervention—from having African American church members create policies about serving fruits and vegetables; to engaging Indian youth in peer-led activism about tobacco [41, 42]. Our formative research revealed that teachers took enormous pride in their profession. Accordingly, we began the intervention by discussing the important role teachers can play in tobacco-use cessation in society before addressing challenges to quitting. Fredrickson’s Broaden-and-Build theory of positive emotions suggests the positive emotion of pride creates the urge to envision future achievements and broadens habitual modes of thinking [43, 44]. In other words, by expressing pride, teachers could widen their array of thoughts and actions related to quitting.

This study has several strengths. To our knowledge, this is the first study to provide a step-by-step framework for using SCM to design interventions; it is also the first to describe how this model was applied to intervention development in a low- to middle-income country. We employed multiple methods and information sources in our formative research, which allowed for triangulation of the data [45, 46]. For example, across all focus groups, teachers overwhelmingly believed they should set a good example by not using tobacco. This observation corroborated findings from a prior study our research team conducted with Indian teachers [31].

We also learned from the current study and prior research in India that the use of stories enhanced receptivity to tobacco-use messages [34, 47, 48]. Finally, having a multidisciplinary team of Indian and American researchers allowed for diverse perspectives to interpret and apply the data collected.

Overall, we found many similarities in applying SCM to intervention development in India and the United States, which speaks to the robustness of the model. These included using formative data to identify intervention themes and develop a creative brief that would guide the development of messages and components. This experience has also led to capacity building, by providing colleagues in the United States and India with the steps and tools to assess the social context of other health behaviors in Bihar and India. We are currently using this approach to develop a tobacco control intervention for worksites in Mumbai, but these results are not yet available.

Despite these strengths, there are limitations to this study. Specifically, this study was not designed to test SCM, but rather to provide a step-by-step approach to intervention development using this model and illustrate its application in India. We do not know the degree to which this intervention development approach may be generalizable to other settings, although it has been applied in two very different cultural settings. Furthermore, we were not able to stratify rural versus urban responses in the June 2008 focus groups or to conduct any focus groups with tobacco users only, which would have been optimal.

In conclusion, the five-step approach to using SCM is an elegant tool planners can use to better understand the social context and to design
interventions within it. Because behavioral theory is built into the model, it helps planners develop interventions that are theory-driven and evidence-based [49, 50]. The model also allows cultural differences to be identified and incorporated into the intervention design and encourages planners to recognize community assets, strengths, and capacities as crucial blocks to build interventions upon [51]. We believe others can use this systematic process worldwide to design or adapt interventions that are responsive to the social context in which health behaviors occur.

Acknowledgements

The authors wish to thank the Education Department of the Bihar State Government for its support of this study. The authors also wish to thank the numerous field investigators and staff members in India and the United States who contributed to this study, including Quayum Ansari, Lauren Becker, Linnea Benson-Whelan, Caitlin Eicher Caspi, Josh Gagne, Adam Gerberick, Brad Kaiser, Pratibha Kumbhar, Athula Liyanapathirana, Neha Mathur, Amruta Miland, Shree Mukesh, Divya Ramamurthy, Dave Rotharbs, Laura Shulman, Melanie Silverman, Gupeshwar Singh, Manibala Singh and Lorraine Wallace for their contributions. In addition, this work could not have been completed without the participation of the schools and school personnel from government schools in Bihar and the health educators and other support staff at the School of Preventive Oncology in Patna, Bihar.

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Conflict of interest statement

None declared.

References

Tobacco control intervention for teachers in India

Message formats and their influence on perceived risks of tobacco use: a pilot formative research project in India

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Abstract

In India, tobacco kills 900,000 people every year though the burden of tobacco is faced disproportionately in poorer states such as Bihar. Teachers may be a particularly influential group in setting norms around tobacco use in the Indian context. However, tobacco use among teachers remains high and perceptions of tobacco-related health risks are unexplored. To qualitatively explore perceptions about tobacco use among teachers in Bihar and to examine how risk information may be communicated through a variety of message formats, 12 messages on tobacco health risks varying in formats were tested in focus groups with teachers from Bihar. Participants stated that teachers were already aware of tobacco-related health risks. To further increase awareness of these risks, the inclusion of evidence-based facts in messages was recommended. Communicating risk information using negative emotions had a great appeal to teachers and was deemed most effective for increasing risk perception. Messages using narratives of teachers’ personal accounts of quitting tobacco were deemed effective for increasing knowledge about the benefits of quitting. To conclude, messages using evidence-based information, possibly with negative emotions, testimonials with role models and those messages emphasizing self-efficacy in the format of narratives appear to appeal to teachers in Bihar.

Introduction

Tobacco use is one of the major preventable causes of death and disability worldwide with an estimated toll of about 5 million deaths every year with most of the deaths occurring in low and middle-income countries [1]. In India alone, tobacco use kills about 900,000 people every year and tobacco use is projected to account for 20% of all deaths in Indian men and 5% in Indian women between the ages of 30 and 69 [2]. In some Indian states, early initiation of tobacco use (as early as by the age of 10) is reported by 65% of tobacco users [3]. Early initiation is associated with a recent increase in prevalence rates of oral submucous fibrosis in younger individuals, which is caused by industrially manufactured smokeless tobacco products [4,5].

Multiple factors are responsible for early initiation of tobacco use in India. For example, media campaigns funded by the tobacco industry target the younger population [3], portraying tobacco as a symbol for women’s emancipation and glamorizing tobacco use [6]. In addition, there are few (if any) barriers to access to tobacco products by children in India [7] and the implementation of policies banning...
tobacco in public institutions varies by geographic region [8].

For example, in the state of Bihar, despite a law passed in 2003 banning the sale of tobacco products within a distance of 100 m of all educational institutions, access to tobacco products is still easy for students as well as teachers because of lack of enforcement of this law [9]. In addition, Bihar State government schools do little to regulate tobacco use on school premises neither for students nor for school personnel compared with federal schools that have specific rules and regulations prohibiting the use of tobacco by students and school personnel [9]. Strategies and interventions to reduce tobacco initiation in children and adolescents are needed to prevent addiction and tobacco-related morbidity in early stages of life.

Teachers are highly regarded members of the society and are considered role models. Therefore, they are best suited to educate the community on the harmful consequences of tobacco use. Messages on health practices coming from them may potentially help counteract the promotion of tobacco by the tobacco industry as well as help undermine the influence of tobacco vendors in local communities, thereby preventing early tobacco initiation among children and adolescents. However, this assumes that the teachers are non-users themselves. This is not the case in the State of Bihar where 78% of teachers reported being tobacco users in the year 2000 [8].

Despite heavy tobacco use among teachers, little is known about perceptions of health risks related to tobacco use and still less on how teachers’ risk perceptions are shaped by tobacco-related messages presented to them in the media and other related information channels. A growing body of literature indicates that variations in formats, features and content of messages produce variations in effects on cognitive, attitudinal and behavioral outcomes in health [10]. Some major message formats include narratives (i.e. using stories to present a health message), exemplars (i.e. using real-life examples) and fear or guilt appeals (i.e. invoking fear or guilt to motivate the person to change health behaviors). It is also known that the framing of anti-tobacco messages can be of importance [11, 12]. Negative or loss frame messages emphasize negative consequences of not adopting a certain behavior while positive frame messages emphasize the positive consequences of adopting a certain behavior, sometimes referred to as gain-frames. Previous research indicates that negative frames or loss-frames may be more effective in regard to illness-detecting behaviors such as getting a health check done for possible tobacco-related illnesses. Positive frames, on the other hand, may work better for illness-preventing behaviors such as smoking cessation [13]. Further, the persuasiveness of positive and negative message frames is influenced by message recipient characteristics (e.g. a smoker’s intentions to quit and their level of nicotine dependence, the depth of information processing, etc.) [13]. In sum, various message formats with varying frames have been shown to be effective in preventing tobacco use and in influencing tobacco cessation among youth and adults in Western countries [14, 15].

However, we are not aware of any studies, to date, investigating perceptions of different message formats in relation to tobacco use in India. Testing different message formats on the health risks of tobacco in the population of teachers in Bihar, India, and identifying messages that effectively communicate these health risks to this population may help inform future interventions for tobacco use cessation targeting teachers in this region.

The aims of this study were 2-fold: (i) to examine the tobacco-use risk perceptions among teachers in India in response to viewing 12 anti-tobacco messages and (ii) to study what kind of message appeals to ‘stop-tobacco-use’ may resonate with them. Hence, in this study, we probed teachers who were both tobacco users and non-users from the state of Bihar, reactions to the content, format and structure of 12 messages regarding tobacco-related themes through focus groups. The tobacco-related message formats examined in this study included appeal to guilt, gain and loss framing, narrative and mixture of narrative and exemplar with themes of modeling and self-efficacy. These messages were developed based on prior formative research with school teachers in Bihar.
Materials and methods

The formative research process reported in this article included focus groups with 33 school teachers from Bihar in Northeastern India (mean age: 41 ± 10 years) in June 2008. Teachers taught grade levels 8–10 and represented a broad cross-section of urban and rural state schools (55% vs. 45%), men and women (76% vs. 24%) and tobacco-users and non-users (smoking: 0% vs. 100%; smokeless use: 18% vs. 82%).

Findings from these focus groups subsequently informed the development of culturally appropriate intervention materials and messages for a tobacco use cessation intervention, which was pre-tested in the pilot intervention study in October 2008 to January 2009. The Bihar School Teacher’s Study (BSTS), a collaboration between the Healis-Sekhsaria Institute for Public Health in Mumbai and Patna, the Dana-Farber Cancer Institute and the Harvard School of Public Health [16], is a large-scale cluster-randomized trial implementing a tobacco use cessation intervention at 72 schools in Bihar, India, and was subsequently conducted from July 2009 to January 2011 but is not the focus of the current article. Teachers selected to the June 2008 focus groups were not part of the subsequent BSTS.

Message development

About 6 months before the Teachers’ Conference, in January 2008, focus groups with 44 teachers were conducted to better understand the social context of tobacco use from their perspective. Focus group participants taught grade levels 8–10 at two rural and two urban Bihar government schools.

The information from these January 2008 focus groups was used to develop a ‘Creative Brief’ that outlined key themes to be addressed in the intervention messages, such as the harmful effects of tobacco, teachers as role models for quitting tobacco and skills for quitting. It also outlined potential channels and information sources for future intervention delivery. Based on the themes identified in the ‘Creative Brief’, the research team at the Dana-Farber Cancer Institute in collaboration with the team in India developed 12 messages in different message formats, which included negative emotions, framing, social modeling and narratives. Some of the messages included graphics, such as line drawings, for example of a little girl holding her nose while standing in front of a male adult sitting in an armchair lighting up a cigar. Others included photographs, for example, of a cancerous jaw and yet others contained only text. The purpose of including graphics in the messages was to determine which types of image formats appealed to teachers; it was not to test the actual images shown. All messages were translated into Hindi.

Data collection

In June 2008, 33 Bihar teachers were invited to attend a one-day Tobacco Control Teachers’ Conference in Patna, Bihar. The purpose of the conference was to: (i) provide participants with an overview of the problem of tobacco use and the role that teachers can play in prevention; (ii) pre-test draft intervention messages and message formats; (iii) explore in-depth, the feasibility and acceptance of intervention messages and delivery mechanisms.

As a first step, participants completed a Demographic Intake Form. Once completed, participants were shown the 12 tobacco-related messages (Tables I–III) on screen. After each message was shown, participants were asked to complete a 6-item survey in Hindi related to that message assessing participants’ reactions to the messages shown, thoughts about the content of the message and who they believed the target audience for this message was. Results of these 6-item surveys are reported elsewhere (C. R. Pischke et al., manuscript under review). Approximately 5–10 min were spent on each message before moving to the next one.

 Afterwards, participants were divided into three groups to discuss the 12 messages in-depth using a focus group guide (Table IV). Messages were randomly assigned to the three focus groups. Group 1 discussed messages 1, 5, 6, 9 and 12; group 2 discussed messages 2, 6, 8, 10 and 12 and group 3 discussed messages 3, 4, 7, 11 and 12. During the
Table 1  Low-framed messages communicating health risks using fear or guilt appeals—main themes raised in the focus groups

<table>
<thead>
<tr>
<th>Message format—fear or guilt appeals</th>
<th>Reactions to message content and format</th>
<th>Example quote</th>
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<tbody>
<tr>
<td>Message 1: You know that tobacco may hurt you in the future. But do you know how it’s hurting you and your family now? She worries about her dad chewing tobacco. She saw what happened to her grandfather, and she is scared. He loves his dad, but he hates the way he smells. Yuck! A visitor came to the school today and explained that tobacco is bad for health. Does his dad know, he wonders? She wishes she had more money to fix some things around the house. She could do those things if he didn’t buy tobacco every day. Learn to quit tobacco with our program. Picture showing a man in an armchair lighting up a cigar and a little girl next to the armchair holding her nose.</td>
<td>The general opinion voiced in the focus groups was that teachers were already educated about the harmful effects of tobacco and were aware of the risks of using it. Participants suggested including more specific evidence-based information in tobacco-related messages (e.g., information on short- and long-term effects of tobacco and chemicals contained in tobacco on both, tobacco users and passive smokers’ health). The message format was deemed effective in making both teachers and students want to quit. Inclusion of more visual material to enhance the message requested.</td>
<td>Since teachers are intellectuals, they want to be informed about the logic of everything. If they understand the logic in these chemicals, they’ll collect more and more information regarding the health effects of these chemicals. They will discuss the impact of the chemicals, which will affect them to some extent. All messages are written in the same size. It should be written in different font. The place where it is written that smoking increases the heart beat and blood pressure should be bold and underlined to make it effective.</td>
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<td>Message 2: You know that tobacco is bad for your health. But we would like to tell you something else about tobacco. Using tobacco is an addiction, not a habit. This means that your body feels like it needs tobacco, not just wants it. It is the reason why people say they can’t stop, even when they know it’s bad for them. It’s why it can be hard for some people to quit. When you use tobacco, it hurts your body, even though you can’t see it. It increases your heart rate and your blood pressure. It gives you a bad breath and puts you at risk for mouth sores. When you are addicted to tobacco long enough, the increased heart rate and blood pressure can lead to heart attack and stroke. The mouth sores can develop into oral cancer. Learn how to quit tobacco with our program. Picture showing a person with a mouth ulcer.</td>
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<td>Message 3: If it can happen to him, it can happen to you. Tobacco can hurt anyone. It doesn’t matter who you are, what you do or where you live. Tobacco doesn’t care if you have a family to support, or if you have lots of friends. It only wants to hurt you. You would never guess it, but Mahesh is already developing ulcers and sores in his mouth. He looks fine. He feels fine. He doesn’t even know they are there yet. But he is addicted to tobacco, and they will get worse. Learn to quit tobacco with our program.</td>
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<td>Message 4: Sometimes things aren’t what they seem. If you use tobacco, everything may look fine from the outside. But everything is not fine on the inside. Even if you only use tobacco a few time a week, you are still taking a risk. You are putting dangerous chemicals into your body. And you make it more likely that you will become addicted in the future. Learn to quit tobacco with our program.</td>
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</table>

focus groups, moderators showed each message and facilitated a discussion about it.

All focus groups were conducted in Hindi, the official language in India. Trained Indian staff took careful notes in Hindi during each group’s discussion. In addition, the discussions were audio-recorded. Immediately after the focus groups, there was a debriefing and notes were transcribed and compared with the audio-recordings for completeness and subsequently translated into English.

Format and content of messages related to tobacco health risks

Messages 1–4 (Table I) were aimed at increasing the risk perception of the audience and at eliciting negative emotions associated with tobacco-related...
<table>
<thead>
<tr>
<th>Message format—narrative with social modeling theme</th>
<th>Reactions to message content and format</th>
<th>Example quote</th>
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<tr>
<td>Message 5: Lessons don’t only come from books. Your students don’t learn from your lessons alone. They learn from your words and actions. Show them that good health is important by quitting tobacco. Let them see that you take good care of yourself, so they learn to take good care of themselves. Aren’t you worth it? Aren’t they worth it? Learn to quit tobacco with our program. First picture in the Indian context: Female teacher teaching a group of students (4th graders) sitting on the floor. Second picture in the American context: American teacher teaching a group of students. Message 6: Lessons don’t only come from books. Your students learn from your actions—the good ones and the bad ones. If you use tobacco, they will think that tobacco is OK. You have so much power to influence your students. Send a positive message instead. Quit tobacco—show them that you take good care of yourself, so they learn to take good care of themselves. Aren’t you worth it? Aren’t they worth it? Learn to quit tobacco with our program. Picture showing Indian teacher smoking a cigarette.</td>
<td>Participants felt that messages based on social modeling communicated the benefits of quitting tobacco, and subsequent decreases in disease risk, well. The format worked for teachers as they pointed out that it was important for teachers (&quot;as highly dignified persons in society&quot;) to lead by demonstration.</td>
<td>Merely providing bookish knowledge to children is not sufficient. A teacher needs to provide information, differentiating between good and bad habits. That is why we need to correct ourselves and become a role model. It is our duty to beautify their future. So, we shouldn’t use tobacco. We should make them learn and teach them the right lesson. This will improve their future and make a non-tobacco society.</td>
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<td>Message 7: 'We talk about a lot of things in the common room at school, like what we did over the weekend. Since I’m quitting tobacco, I had a chance to tell everyone what happened to me at a function on Saturday. A lot of people at the gathering were using tobacco, of course. In the past I might have felt strange saying no, but this time I said, 'No thanks, I’m quitting tobacco.' I had to say it a lot! Saneeta was in the common room, too, and she said, 'I know how hard that is to do!' My husband had to say 'no' many times when he was quitting'. It made me feel better to know that others went through the same thing. Before I could answer her, Rajeev added, 'It’s good to hear these stories. I think about quitting sometimes, and this makes me feel more like I can do it. Also, the more people say 'No, thanks!' at gatherings, the less I’ll feel like I have to use it to fit in.’ Learn to quit tobacco with our program. Picture of teachers and students sitting in a circle.</td>
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<td>Message 8: Be a leader. Don’t use tobacco. ‘Over the years, I have known many teachers who use tobacco. I always wish they wouldn’t, for a lot of reasons. I worry about my best teachers getting sick and suffering from the health problems that we know tobacco can cause. I know one who did have problems, and I saw how hard it was on his students. Just as importantly, I worry about the example the teachers are setting. I see the students watch their teachers and pay attention to what they do—both inside and outside the classroom. We teachers know that kids don’t miss a thing! As a teacher, you are in a position of respect and prestige—kids look up to you and listen to you. Teach your students about tobacco with your words and actions. Quit tobacco, and show that good health is important. Be the role model they expect you to be.’ Learn to quit tobacco with our program.</td>
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Table III. Messages promoting self-efficacy and strategy to quit using narratives—main themes raised in the focus groups

<table>
<thead>
<tr>
<th>Message format—narrative promoting a planned approach to quitting tobacco</th>
<th>Reactions to Message Content and Format</th>
<th>Example quotes</th>
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<tbody>
<tr>
<td><strong>Message 9:</strong> 'I needed to learn a new equation to quit tobacco. I thought I knew everything I needed to teach math to my students. But I needed to learn a new equation to quit tobacco. Willpower + Skills = Success. Willpower can help you quit, but it isn’t the only thing you need. Wanting to quit isn’t always enough. To be successful, you also need skills and a plan for quitting. When I was quitting tobacco, there were challenges every day. But I had ways to beat them. You can learn them, too.' Learn to quit tobacco with our program.</td>
<td>Reactions were mixed in regard to the content of the message. There was a consensus view that one can quit tobacco if one has willpower and focus group participants were skeptical of a need for a quit plan. Also, participants seemed confused about the idea of making a plan to quit tobacco on their own and suggested ready-made quit plans by doctors. Discussions revolved around the content and not the format of these messages.</td>
<td>There is no need of any equation in front of strong willpower. It is suggested to make plans but it can take years to make plans. So why don’t we introduce ready-made plans made by a doctor to the public.</td>
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<td><strong>Message 10:</strong> Everyone believes in you! [child one] 'I really want my mother to quit tobacco—and I know she has the willpower to do it.' [father] 'She has something more than willpower. She also has a plan. Now that she knows what triggers her to use tobacco, it will be easier for her to quit.' [child two] 'I’m so proud of my mom! I know she can do it!' Learn to quit tobacco with our program.</td>
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<tr>
<td><strong>Message 11:</strong> 'I don’t treat a patient without a plan. You don’t teach your students without a plan. So, why try to quit tobacco without a plan?’ ‘Many people tell me that they want to quit tobacco. But wanting to quit isn’t always enough. You need a plan. Researchers and doctors have learned a lot about ‘triggers’. These are the things that make you want to use tobacco. We’ve studied how to beat these triggers. If you have a plan for dealing with them ahead of time, you will be able to beat tobacco.’ Learn to quit tobacco with our program.</td>
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<td><strong>Message 12:</strong> 'I started using tobacco when I was at university—when I was with friends or out at gatherings. Soon I was using it a lot more; it just seemed to fit into my life. By the time I graduated, I had become a habit I couldn’t break. When I started teaching, it was really stressful—so many things to do during the day, so many tasks to get used to. Tobacco helped me deal with those feelings. But eventually, I really didn’t like what tobacco was doing to me. I hated having bad breath, and I had mouth sores. I wanted to stop, but I didn’t know how. The habit just seemed too much to deal with. Luckily, I learned about triggers. A trigger is something that makes you want to use tobacco. I had a lot of different triggers. For example, I always used tobacco for my morning bowel motion. Now I take charan when I go to bed instead. My tea breaks were also triggers. Now that I don’t use tobacco while I drink my tea, it tastes so much better! My biggest trigger was stress. I would use tobacco to unwind and calm down during the day. Now that I’m quitting, I take walks instead. When I walk, I have time to think. I don’t miss the tobacco very much now—and walking is much healthier for me.' Learn to quit tobacco with our program.</td>
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morbidity and mortality. The message format of appeal of ‘guilt’ was used in the construction of these messages. Given that the evidence on the effectiveness of fear or guilt appeals is mixed, research has shown that strong negative emotion accompanied by high efficacy on how to address fear are likely to produce greater behavior change compared with weak fear appeals combined with low efficacy messages which produce defensive or negative responses [17]. Our goal here was not to use negative emotions but to use them in combination with other formats that also include efficacy.

Messages 5–8 (Table II) were narratives focusing on the benefits of teachers as role models for quitting tobacco. These messages emphasized that teachers are powerful role models in society, especially if they chose to commit themselves to this role. The gain for the teacher is to feel respected and to contribute to his or her students’ health by being a strong role model. Gain-framed messages revolve around benefits of adopting a health behavior, whereas loss-framed messages focus on the costs of not adopting a certain behavior [18]. Gain-framed as well as loss-framed messages have been shown to be effective in influencing cognitions, affect and behaviors related to both cancer prevention and treatment [19].

Messages 9–12 (Table III) used a mixture of narratives and exemplars and dealt with skills necessary for quitting such as willpower and a plan to quit and how to handle triggers for tobacco use and manage relapse. Similar to fear appeals and gain-framed messages, narratives and exemplars are effective in shaping health behaviors and in increasing knowledge about health-related issues [20, 21].

**Data analysis**

Our analytical procedures took a methodical approach to analyze the data. Specifically, the thematic coding followed a ‘grounded theory’ approach [22], meaning no assumptions about the data were made beforehand, rather the thematic codes emerged from our analysis of the structural code reports.

First, the transcripts of all focus groups were translated from Hindi into English and the translation was double-checked by the investigators who were bilingual. The transcribed data were supplemented by notes taken by several observers from the study team. These notes were used to correct any discrepancies in transcribed notes which improved the reliability of the transcribed notes.

The transcribed data were analysed according to a two-stage coding process: Level 1, structural coding and Level 2, thematic coding. Structural coding followed the structure of the focus group guide (Table IV); hence, every question received a structural code that was applied to the appropriate text. Thematic coding was based on themes that arose from the structural coding and was applied in a second pass analysis. Thematic coding followed an emergent, grounded theoretical approach. These methods were enhanced by the use of a state-of-the-art ethnographic data management software program, NVivo (QSR International, version 8). The program uses an organizer indexing system for coding, categorizing, searching, retrieving, attaching analytical memos and creating conceptual relationship networks in textual data that have been taxonomically coded. After the 2-stage coding

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**Table IV. Focus group guide**

<table>
<thead>
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<th>Message-specific questions:</th>
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<tbody>
<tr>
<td>(Moderate – show this specific message/advertisement again).</td>
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<tr>
<td>Overall, what do you think about this advertisement? What is this ad saying to you?</td>
</tr>
<tr>
<td>What do you think are the main messages of this advertisement? What is this ad saying to you?</td>
</tr>
<tr>
<td>What do you like about this ad?</td>
</tr>
<tr>
<td>What do you dislike about this ad?</td>
</tr>
<tr>
<td>What do you think of the visual that accompanies this ad? Do you think it’s appropriate, or would you rather see something else there?</td>
</tr>
<tr>
<td>What else would you like to see in this ad?</td>
</tr>
<tr>
<td>Who do you believe this ad is directing its message to?</td>
</tr>
<tr>
<td>Do you believe that teachers will pay attention to this ad? Why/why not?</td>
</tr>
<tr>
<td>If time: Did any of the other seven ads stick out to you?</td>
</tr>
<tr>
<td>Which ones?</td>
</tr>
<tr>
<td>Why?</td>
</tr>
</tbody>
</table>

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process was completed, a comprehensive thematic analysis summary report was written and delivered by an experienced qualitative researcher.

To ensure reliability of coding themes, the primary author re-read the original transcripts in relation to the thematic coding. This allowed for further immersion into data and crystallization of themes, an approach that is recommended in qualitative research [22]. In summary, we adopted a multi-step, immersive process to extract and validate the themes from the focus group transcripts.

A document of themes was created based on our earlier work and literature review and our analysis of the focus group data. We organized the results with the key findings reported first followed by more ancillary findings, which we chose to include in the article because they may be of interest to readers designing health behavior change interventions in the socio-cultural context of India (e.g. the cultural relevance of tobacco use in religious ceremonies).

The majority of quotations of focus group participants are reported verbatim. To improve understanding, some minor corrections to the quotations have been made by the authors.

**Results**

Key findings are summarized in Tables I–III.

**Focus group participants’ reactions to loss-framed messages communicating health risks using fear/guilt appeals**

When asked whether the first four messages would increase teachers’ perception of risk of using tobacco, the general opinion voiced in the focus groups was that teachers were already educated about the harmful effects of tobacco and were aware of the risks of using it. To further increase teachers’ risk perception and to inform them beyond their existing knowledge on tobacco-related risks, participants suggested including more specific evidence-based information in tobacco-related messages. For example, participants recommended that messages contain information on short- and long-term effects of tobacco and chemicals contained in tobacco on both tobacco users and passive smokers’ health. One teacher stated:

Since teachers are intellectuals, they want to be informed about the logic of everything. If they understand the logic in these chemicals, they’ll collect more and more information regarding the health effects of these chemicals. They will discuss the impact of these chemicals, which will affect them to some extent.

In regard to the second aim, participants thought that fear appeal was effective in making both teachers and students want to quit but that any type of visual material either in the form of ‘gory’ photographs or bolded written warnings would enhance these messages and would have a more lasting effect on the intended audience. Accordingly, one participant commented on font size of the messages shown:

All messages are written in the same size. It should be written in different font. The place, where it is written that smoking increases the heart beat and blood pressure should be bold and underlined to make it effective.

Addressing the question how these messages could be improved and modified to better fit the context of Bihar, the use of exemplars was repeatedly raised by focus group participants. Teachers thought that using someone of a higher social status like a doctor, engineer or university professor in the messages talking about how he or she had been affected by cancer would be effective in both teachers and in the general public. Suggestions included:

Show a picture of a university professor with text that says, ‘nothing can happen to me’ then show a picture of him using tobacco then show a picture of his dead body. When a process is described it makes more sense for us.

Taking the names of 50 high profile people who have died due to tobacco or are facing some acute health problem (due to tobacco) [and incorporating this information into the message.]
According to participants, these types of messages would also counter the misperception in the general public that people from higher social strata were not affected by the harmful consequences of tobacco use. Teachers also raised the concern that messages not including exemplars and/or pictures would not reach the 'lower classes' with high illiteracy rates. One suggestion was to incorporate cultural icons such as Bollywood movie actors, to reach people in the villages.

**Focus group participants’ reactions to gain-framed messages using social modeling**

Addressing the first aim of the study, focus group participants thought that these messages based on social modeling communicated the benefits of quitting tobacco, and subsequent decreases in disease risk, well. Furthermore, participants agreed that it was important for teachers (‘as highly dignified persons in society’) to lead by demonstration and not just with words. The general theme of messages 5–8 identified by teachers was that students copy their teacher’s behavior and that it was therefore the teacher’s duty to not use tobacco. One participant said:

> It is our duty to beautify their future. So, we shouldn’t use tobacco. We should make them learn and teach them the right lesson. This will improve their future and make a non-tobacco society.

Another participant stated:

> Merely providing bookish knowledge to children is not sufficient. A teacher needs to provide [information]… differentiating between good and bad habits. That is why we need to correct ourselves and become a role model.

Teachers’ reactions to the format of the narratives used in messages 5–8 varied. For example, some teachers thought that the narrative of a teacher refusing an offer of tobacco at a social ceremony (in message 7) should be more about the challenge of saying no to tobacco and that it should be kept brief and powerful. One participant said:

> Sir, today people don’t have time to read big things, but there is a big message in this small text. The picture [accompanying such a message] should be such that it attracts people’s eye. Then there is a weight to the challenge of saying ‘no’. There are no guts in saying ‘yes’ that our brother has told us.

Two other participants stated:

> If you have the guts, then say ‘no to the offer’ [of tobacco].

> Do you have the courage, if you have, then say no to tobacco.

 Asked about how messages 5–8 could be improved, focus group participants pointed out that messages would only be culturally accurate if they described teachers applying or chewing tobacco inside or outside the classroom instead of smoking. Hence, to make the messages more effective, teachers advised to include other forms of tobacco, such as khaini (rubbed tobacco), gutka (chewed) and beetle leaf/pan in the messages.

**Focus group participants’ reactions to messages promoting self-efficacy and strategy to quit using narratives**

Because messages 9–12 focused on strategies for quitting and dealing with triggers for using tobacco (Table III), the question of whether these messages helped teachers to realize the risk of tobacco use in Bihar or whether they increased risk perceptions was not discussed in the focus groups. The messages 9–12 promoted a planned approach to quitting tobacco and received mixed reactions from the participants. There was a more consensual view that one can quit tobacco if one has will power and they were skeptical of a need for a plan. One participant stated:

> There is no need of any equation in front of strong willpower.
Participants also believed that willpower comes from the dedication to quitting and that children can provide a strong motivation for parents to quit tobacco. In other words, participants suggested that having a parent who quits would also steer children away from using tobacco. Participants also seemed confused about the idea of making a plan to quit tobacco on their own. Some felt it may be unrealistic for teachers to make up their own plan for quitting tobacco. Instead, they suggested that ready-made plans should be introduced by a doctor. One participant pointed out:

It is suggested to make plans but it can take years to make plans. So why don’t we introduce ready-made plans made by a doctor to the public.

Regarding teachers’ thoughts on how messages 9–12 could be improved, discussions revolved around healthy substitutes for tobacco and alternative behaviors to tobacco consumption that would work in the context of Bihar. Alternative behaviors to tobacco consumption proposed by teachers included changes in diet, such as drinking water/ juices, eating vegetarian and other easily digestible foods; exercise, such as walking and swimming; and yoga and meditation. Participants’ ideas for messages and pictures surrounding the theme of substituting tobacco and alternative behaviors to tobacco consumption included the following:

We can give stepwise messages along with graphics. It should be written below the pictures that instead of tobacco it is better to swim, drink juices, do yoga, walk, jog, sing, etc.

The first picture can show that firstly he was in tension and he is taking tobacco to de-stress himself. Then the next picture can show that he is out of stress temporarily and so the next picture can show that now he is even more stressed. He is addicted to tobacco. Then someone gave him advice and he started taking a walk or doing yoga instead. Now he is feeling better. If we show all these pictures then it will be more effective.

Other alternative behaviors brought up in the focus groups included staying occupied in general, and at work, singing, reading religious books and visiting places. For example, one participant stated:

Firstly, the main thing is that I used tobacco for 35–40 years. I have experienced that when I am busy I don’t use tobacco so much but when I don’t have any work that day I use tobacco more. If someone uses tobacco then we should advise him to do something or to make himself busy doing something or the other. If he will be busy he will not have time to think about tobacco.

However, participants felt that none of these substitutes and alternative behaviors would replace sufficient willpower for quitting and staying quit. In addition, participants advocated for including suggestions regarding healthy substitutes for tobacco and alternative behaviors to tobacco consumption in a quit plan tailored to the individual. Specifically, participants recommended that these alternatives should be based on the reason why a person is using tobacco. Hence, a person using tobacco to reduce stress would get a different suggestion from their doctor compared with a person using it to improve their digestive system.

**Discussion**

The two main goals of this article were to examine risk perceptions of tobacco use among teachers in India and to find out how perceptions about the risks of using tobacco, building self-efficacy and using a planned approach to quit may be promoted through different message formats that include negative emotions, framing, social modeling and narratives in the Indian context. In sum, focus group participants stated that teachers, as educated people in Indian society, were already aware of the risks associated with tobacco use. However, teachers advised including more specific evidence-based information in tobacco-related messages to reach the intended audience of teachers. The format of loss-framed fear or guilt appeal was deemed effective and
appropriate by teachers even while they asked for messages that include evidence. In line with findings from the literature, suggesting that messages using negative emotions such as fear and guilt produce high levels of perceived severity and susceptibility [17, 23], and have a great appeal, focus group participants advocated for the use of photographs or posters depicting harmful effects of tobacco that would enhance the fear appeal. The fact that this is an audience that has high formal education may have something to do with their desire for an analytical approach instead of just an emotional one.

However, it is also known that fear appeal is only effective in promoting actual health behavior change when combined with a concrete action plan on how to change behavior and when a person has high perceived self-efficacy to change and maintain health behavior [24]. Accordingly, teachers, when shown messages 5–8, which emphasized the importance of teachers as role models, suggested that these messages should be accompanied by pictures that show teachers demonstrating high self-efficacy to change behavior by ‘saying no’ to tobacco in various situations of everyday life. Further support for this standpoint comes from teachers’ reactions to messages 9–12 (themes: how to handle and cope with triggers for tobacco use, self-made quit plans). When shown these messages, teachers recommended that the messages needed a greater emphasis on willpower and on the necessity of a ready-made quit plan by the doctor outlining steps for quitting and healthy alternative actions to tobacco use in the context of Bihar. Consequently, teachers called for messages and pictures showing teachers exuding their willpower when facing triggers for tobacco use, obtaining a ready-made quit plan from their doctor and practicing alternative behaviors to smoking and chewing tobacco. These messages were deemed most effective in promoting tobacco use cessation in Bihar.

Findings of these focus groups also informed the development of culturally appropriate education materials for the BSTS. For example, in response to teachers’ need for more detailed and specific information about chemicals in the tobacco and how its use may affect different body parts, intervention material including an information sheet on short- and long-term effects of tobacco, a list of chemicals in tobacco and how they were harmful for the body, and a ‘Tobacco Body Poster’, which depicted a body and how chemicals contained in tobacco harm certain parts of the body, was created.

Based on teachers’ sentiments about being role models, discussion guides for teachers’ fortnightly meetings (used during the intervention of the BSTS) were developed that revolved around the theme of teachers as role models. These guides were designed to target teachers at the intervention schools who were both users as well as non-users and to deal with issues around smoking as well as the consumption of smokeless tobacco-products. Following teachers’ suggestions to use exemplars in tobacco-related messages, narratives of famous Indian movie actors who successfully quit tobacco were included in the intervention materials. Additional materials inspired by the focus groups included a ‘how to say no’ poster and instructions in the discussion guides for role play at the fortnightly meetings on how to say no to tobacco in various situations of everyday life (for further detail see [16]).

Upon teachers’ request for a ready-made quit plan including alternatives to using tobacco, a cessation self-help brochure was developed which was handed out to every teacher participating in the intervention group of the BSTS. This cessation brochure included information on positive health effects of quitting, an action plan for quitting including instructions on how to pick a quit date, steps for quitting and information on how to deal with triggers and relapse. Furthermore, following teachers’ suggestions to include materials that were visual and colorful, a calendar with pictures for each monthly theme of the intervention (e.g. motivation to quit, relapse prevention), and several other posters (e.g. showing alternative actions to tobacco use) were developed and put up on a notice board next to the principal’s office at each intervention school. Following the teachers’ concern about implementation of legislation banning tobacco from schools, tobacco policy groups were formed at intervention schools that evaluated the
implementation of tobacco policies at each intervention school.

One limitation of our study is that due to the low rate of tobacco users among our focus group participants, our study population may not have been representative for Bihar teachers. Alternatively, it is conceivable from a social-desirability perspective that teachers under-reported their personal tobacco use. Also, this formative research was exploratory as an approach not used in India before. The quotes used in the article are examples and were stated once by each respective person. Response patterns were not analysed in this study. A second limitation is that not all 12 messages were discussed in each focus group although all messages were viewed prior to focus group discussions. Participants may have discussed the selection of messages in reference of all messages shown. However, this may reflect an individual's reality. People are frequently exposed to multiple messages from multiple media at the same time. Our focus here was not to formally test hypotheses in experimental conditions as much as to make an in-depth exploration of participants' reactions to messages. A third limitation of our study is that messages were randomly assigned to focus groups but not order randomized to avoid message order effects. The selection of messages for each group was defined during the development of the focus group guide. A fourth limitation is that, for ethical reasons, it was impossible to determine whether tobacco use status affected the endorsement or non-endorsement of certain message formats.

To conclude, this study's findings offer a viable approach to testing the reactions to and effects of specific messages and message formats around tobacco use in India. Much of the work on message formats has been done in developed countries such as the United States of America and Australia among others. Very little work has been done in the developing countries. The findings here suggest that formats such as framing, negative emotions and narratives are also viable in India but the messages within those formats will have to account for local, social and cultural contexts. Accordingly, the respondents asked for and found messages using evidence-based information, negative emotions such as guilt, role models and self-efficacy in the form of narratives more appealing. Testing of the socio-cultural relevance of these messages helped inform a culturally appropriate intervention for tobacco use cessation targeting teachers in Bihar, India, and this study offers viable methodology for message development as a part of a larger intervention on tobacco use cessation.

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Conflict of interest statement

None declared.

References

Dimensions of Religiousness and Cancer Screening Behaviors Among Church-Going Latinas

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Abstract Churches are a promising setting through which to reach Latinas with cancer control efforts. A better understanding of the dimensions of religiousness that impact health behaviors could inform efforts to tailor cancer control programs for this setting. The purpose of this study was to explore relationships between dimensions of religiousness with adherence to cancer screening recommendations among church-going Latinas. Female Spanish-speaking members, aged 18 and older from a Baptist church in Boston, Massachusetts \((N = 78)\), were interviewed about cancer screening behaviors and dimensions of religiousness. We examined adherence to individual cancer screening tests (mammography, PAP test, and colonoscopy), as well as adherence to all screening tests for which participants were age-eligible. Dimensions of religiousness assessed included church participation, religious support, active and passive spiritual health locus of control, and positive and negative religious coping. Results showed that roughly half (46 %) of the sample had not received all of the cancer screening tests for which they were age-eligible. In multivariate analyses, positive religious coping was significantly associated with

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adherence to all age-appropriate screening (OR = 5.30, \( p < .01 \)). Additional research is warranted to replicate these results in larger, more representative samples and to examine the extent to which enhancement of religious coping could increase the impact of cancer control interventions for Latinas.

**Keywords**  Latino · Religion · Spirituality · Cancer screening · Coping · Health

**Introduction**

Latinos represent the largest and fastest growing ethnic minority population in the United States (U.S. Bureau of the Census 2010). Although the incidence of many cancers is lower among Latinos compared to non-Latino whites, Latino men and women are less likely to survive most cancers, even after accounting for differences in age (American Cancer Society 2009). Lower rates of survival likely reflect diminished access to early detection, diagnostic, and treatment services. Many Latinos face financial, structural, and sociocultural barriers to health care and are therefore less likely to seek and receive healthcare services (American Cancer Society 2008; Balluz et al. 2004). Latinos have lower rates of screening for breast, cervical, and colorectal cancer compared to non-Latino whites (American Cancer Society 2008). Persistent cancer disparities suggest the need for new approaches to reach this population.

Faith-based organizations (FBOs) are a promising avenue to reach Latinos. Ninety percent of Latinos report membership in a religious group (Cadge and Ecklund 2007; Espinoza et al. 2003). Moreover, religious institutions play a prominent role in Latino communities, shaping numerous behaviors from political decisions to daily family life (Pew Hispanic Center and Pew Forum on Religion and Public Life 2007). Qualitative research suggests that Latinas, in particular, view religiousness/spirituality as an important dimension of overall health (Jurkowski et al. 2010).

Religiousness is a multidimensional construct that reflects the shared beliefs and practices of a faith-based, social organization (Miller and Thoresen 2003). A sizeable body of literature documents relationships between religiousness and health outcomes (Chatters et al. 1998; Koenig et al. 2001; Powell et al. 2003). Recent research has focused on the link between different dimensions of religiousness and preventive health behaviors (e.g., Benjamins et al. 2011; Holt et al. 2009a). However, little is known about the specific religious factors that may impact preventive health behaviors among Latinas (Benjamins 2007).

Religious coping theory (Pargament 1997) and social support theory (Israel 1990) suggest several possible avenues through which religious factors may influence use of preventive health services, including cancer screening behaviors. First, *church participation*, generally defined as frequency of attendance at religious services or other church-related events (Idler 1999), may influence exposure to church norms (e.g., no smoking and moderation of alcohol). Second, *increased access to religious support*, defined as instrumental, informational, or emotional assistance exchanged within a religious community, may buffer stressful life events, thereby providing increased ability to cope with negative events (e.g., abnormal screening results) (Krause 1999; Pérez et al. 2011; Strawbridge et al. 1997; van Olphen et al. 2003). Third, one’s relationship with a higher power may affect perceived control over health behaviors and outcomes (Thoresen and Harris 2002). For instance, a collaborative relationship with a higher power in the management of one’s health, known as an *active spiritual health locus of control*, may empower people to engage in behaviors beneficial for their own health. Alternatively, a *passive spiritual health locus of control* may lead people to rely
solely on God to determine their health (Holt et al. 2003, 2007), akin to what has been
described as fatalismo (fatalism)—a sense that one’s life outcomes are beyond one’s control
(Abraido-Lanza et al. 2007; Añez et al. 2005). Finally, religion may impact health behaviors
through religious coping, a construct that reflects how people utilize religion to understand and
deal with stressors (Pargament 1997; Pargament et al. 2000). Positive religious coping
reflects benevolent religious methods of understanding and managing life stressors, whereas
negative religious coping reflects religious struggles in coping (Pargament et al. 1998). An
association between religious coping and health suggests the presence of stressors in a
population. In the current sample of participants, factors such as low socioeconomic status,
racism, language barriers, undocumented immigration status, and lack of access to health
care were expected to be stressors.

A better understanding of the specific dimensions of religiousness associated with health
behaviors (in this case, cancer screening) among Latinas could enable the development of
effective, religiously tailored interventions to promote cancer early detection with the ultimate
goal of reducing health disparities. Studies conducted with African-American popu-
lations suggest that incorporation of religious themes into health interventions may enhance
their relevance, improve program participation, and, ultimately, boost intervention efficacy
(Campbell et al. 2007; Holt et al. 2009b; Voorhees et al. 1996; Yanez et al. 2001). Church-
based interventions have been used to promote cancer education and cancer screening among
low-income Latinas (e.g., Duan et al. 2000; Fox et al. 1998b; Lopez and Castro 2006).
However, to our knowledge, none of these programs have integrated religious content into
their health promotion messages. Therefore, we sought to understand the relationship
between varied dimensions of religiousness and cancer screening practices among Latinas in
order to inform such interventions. Specifically, we explored the association between cancer
screening practices and four dimensions of religiousness: (1) church participation, (2) per-
ceived religious support, (3) spiritual health locus of control, and (4) religious coping.

Method

Setting and Sample

We conducted a cross-sectional survey among members of a moderate-sized Baptist church
located in Boston, Massachusetts. Data were collected as part of a pilot intervention study
to evaluate the feasibility and impact of a peer-led cancer screening intervention that incorpo-
rated spiritual themes and practices.

A current church roster was used to identify 97 potentially eligible respondents. Those
eligible for participation were (1) 18 years of age or older, (2) self-identified as Hispanic or
Latino, and (3) Spanish or English speaking. We included only women in the analysis due
to the small number of men in the congregation who were age-eligible for screening ages
50+. To promote participation, the pastor made announcements after worship services
during the data collection period, informing congregants about study procedures and
purpose. In addition, personalized invitations signed by the pastor and principal investi-
gators were distributed. In-person reminders following church services and up to three
telephone calls were made to non-respondents.

Female Spanish-speaking research assistants conducted in-person interviews immedi-
ately following religious services in church offices that afforded privacy. Data collection
took place between May and October of 2009. Voluntary completion of the survey fol-
lowing the provision of verbal consent information constituted informed consent. The
study protocol was approved by the Institutional Review Boards at the University of Massachusetts Boston and the Harvard School of Public Health.

Measures

Where available, we employed existing validated scales that had been previously tested among Latino populations. To ensure accurate cultural interpretation, we forward- and back-translated data collection tools and subsequently conducted cognitive interviews among 10 Latinos to assess item comprehension, as well as linguistic and cultural appropriateness (Willis 2004). Participants in cognitive interviews were recruited from a demographically similar Spanish-speaking Baptist church not participating in the parent study, and these data were not included in subsequent analyses.

Outcomes

Outcomes of interest were adherence to cancer screening recommendations current at the time of data collection (American Cancer Society 2009). For women aged 40–49, “adherence” to breast cancer screening recommendations was defined as having had a mammogram within the prior 2 years and a clinical breast examination (CBE) within the prior year. For women over age 50, breast cancer screening adherence was defined as having had a mammogram and CBE within the prior year. In terms of cervical cancer, women aged 18 and over who had a Pap test within the prior 3 years were considered compliant. Among those aged 50+, having had an annual fecal occult blood test (FOBT), sigmoidoscopy within prior 5 years, or colonoscopy within prior 10 years was deemed compliant for colorectal cancer screening. Participants who met the criteria for adherence to breast, cervical, and colorectal cancer screening tests appropriate for their age were categorized as being compliant with “all age-appropriate screening.”

Items to assess screening behaviors were drawn from the Behavioral Risk Factor Surveillance System (BRFSS; Centers for Disease Control and Prevention 2004). The BRFSS is a state-based survey of the civilian, non-institutionalized adult population that is widely used to measure the prevalence of behavioral risk factors. It has been found to be reliable (Cronbach’s alpha coefficients above 0.70) across a variety of populations, including native Spanish speakers (Stein et al. 1993).

Church Participation

Two standardized items assessed frequency of attendance at church services and other activities, with categorical responses ranging from “never” to “every day” (Fetzer Institute & National Institute on Aging Working Group 2003).

Religious Support (Krause 1999)

Two items assessed perceived positive religious support from members of the church community with response categories on a four-point scale ranging from “none” to “a great deal.” Two items assessed perceived negative religious support on a four-point scale ranging from “never” to “very often.” The internal consistency of the positive religious support scales was good (α = 0.86). However, the internal consistency of the negative religious support scale was poor (α = 0.37) and thus was dropped from the analyses.
Spiritual Health Locus of Control (Holt et al. 2007)

This scale assessed the belief that a higher power (e.g., God) has control over one’s health. Three items assessed an active spiritual health locus of control, whereby God plays a collaborative role in one’s health. Three items assessed a passive spiritual health locus of control, whereby respondents do not take protective health actions because they believe God is in sole control of their health. All items were measured on a four-point scale ranging from “strongly disagree” to “strongly agree.” The internal consistency of the active dimension was good ($\alpha = 0.81$). After dropping one reverse-coded item (“God and I share responsibility for my health”) with a low item-total correlation, the internal consistency of the two-item passive dimension also was good ($\alpha = 0.79$).

Religious Coping (Pargament 1999)

Two scales were used to measure how people make use of religion to understand and cope with major problems in their lives (Pargament et al. 1998). Three items measured positive religious coping (i.e., benevolent religious methods of understanding and managing life stressors) and three items measured negative religious coping (i.e., religious struggle in coping). All items were measured on a four-point scale ranging from “not at all” to “a great deal”. The internal consistency of the positive religious coping scale was adequate ($\alpha = 0.74$). However, the internal consistency of the negative religious coping scale was not acceptable ($\alpha = 0.13$) and, therefore, was dropped.

Socio-demographic Variables

Age, income, education, gender, proficiency with spoken English, and region of origin/ethnicity were measured using standard items from the BRFSS. Items to assess health access, including type of health insurance, were also from the BRFSS (Centers for Disease Control and Prevention 2004).

Statistical Analyses

First, we used descriptive statistics (e.g., frequencies, proportions, and means) to describe socio-demographic characteristics of the study sample, distributions of church participation, social support, spiritual health locus of control, religious coping, and adherence to breast, cervical, colorectal, and overall cancer screening guidelines. We were unable to present reliable associations between dimensions of religiousness and adherence to cervical cancer screening among women because fewer than 10 women in this sample had not been screened (Hosmer and Lemeshow 2000; Peduzzi et al. 1996). As a second step, we examined characteristics of each religious scale by computing an item-intem reliability coefficient (Cronbach’s $\alpha$). As noted, scales with poor interitem reliability ($\alpha < 0.60$) were not used in any of the analyses; these included negative religious support and negative religious coping. We then used logistic regression to examine bivariate and multivariate relationships among cancer screening adherence (yes/no), demographic variables, and dimensions of religiousness. Variables selected for inclusion in multivariate models were those that demonstrated bivariate associations ($p < .10$) with adherence to screening recommendations. Analyses included all available data using SPSS statistical software, version 19.0 (IBM Corporation, New York, NY).
Results

Characteristics of Study Sample

Of the 97 eligible female church members, 78 (80%) participated in interviews, which took approximately 45 minutes to complete. Socio-demographic characteristics of the sample are depicted in Table 1. Nearly half (49%) had a household income of less than $30,000, and almost a third (28%) did not have health insurance. Over a third (36%) had less than a high school education, and more than half (60%) reported that they did not speak English at all or did not speak very well. Respondents were predominantly from Central (49%) or South America (38%). The mean length of time living in the United States was roughly 13 years.

Table 1 Socio-demographic characteristics of the study sample by category (N = 78)

<table>
<thead>
<tr>
<th>Characteristic</th>
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<td>15</td>
<td>19.2</td>
</tr>
<tr>
<td>Refused or missing</td>
<td>2</td>
<td>2.6</td>
</tr>
<tr>
<td><strong>Employment status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td>51</td>
<td>65.3</td>
</tr>
<tr>
<td>Unemployed</td>
<td>10</td>
<td>12.8</td>
</tr>
<tr>
<td>Homemaker</td>
<td>6</td>
<td>7.6</td>
</tr>
<tr>
<td>Retired</td>
<td>3</td>
<td>3.8</td>
</tr>
<tr>
<td>Other</td>
<td>6</td>
<td>7.6</td>
</tr>
<tr>
<td>Refused or missing</td>
<td>2</td>
<td>2.5</td>
</tr>
<tr>
<td><strong>Insurance status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insured (private)</td>
<td>17</td>
<td>21.8</td>
</tr>
<tr>
<td>Insured (public)</td>
<td>36</td>
<td>46.1</td>
</tr>
<tr>
<td>Not insured</td>
<td>22</td>
<td>28.2</td>
</tr>
<tr>
<td>Don’t know or missing</td>
<td>3</td>
<td>3.8</td>
</tr>
<tr>
<td><strong>Educational level</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No school or only kindergarten</td>
<td>1</td>
<td>1.3</td>
</tr>
<tr>
<td>Grades 1 through 8</td>
<td>19</td>
<td>24.4</td>
</tr>
<tr>
<td>Some high school</td>
<td>8</td>
<td>10.3</td>
</tr>
<tr>
<td>High school or GED</td>
<td>28</td>
<td>35.9</td>
</tr>
</tbody>
</table>
Table 1 continued

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Some college or technical school</td>
<td>16</td>
<td>20.5</td>
</tr>
<tr>
<td>College graduate or higher</td>
<td>6</td>
<td>7.7</td>
</tr>
<tr>
<td>Missing</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>English language proficiency</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very well, well</td>
<td>31</td>
<td>39.7</td>
</tr>
<tr>
<td>Not very well, not at all</td>
<td>47</td>
<td>60.3</td>
</tr>
<tr>
<td>Missing</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Region of origin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caribbean</td>
<td>4</td>
<td>5.1</td>
</tr>
<tr>
<td>Mexico</td>
<td>3</td>
<td>3.8</td>
</tr>
<tr>
<td>Central America</td>
<td>38</td>
<td>48.7</td>
</tr>
<tr>
<td>South America</td>
<td>30</td>
<td>38.4</td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
<td>3.8</td>
</tr>
<tr>
<td>Missing</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married/living as married</td>
<td>44</td>
<td>56.4</td>
</tr>
<tr>
<td>Not married/not living as married</td>
<td>34</td>
<td>43.5</td>
</tr>
<tr>
<td>Time living in United States</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years</td>
<td>13.24 (mean)</td>
<td>8.8 (SD)</td>
</tr>
<tr>
<td>Missing</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

* Percent of non-missing; columns may sum to greater than 100 % due to rounding.

Dimensions of Religiousness

Descriptive characteristics of dimensions of religiousness are presented in Table 2. Church participation was high, as 94 % of respondents reported that they attended church at least once a week. Respondents also reported high levels of perceived social support from their church (mean score = 3.3 out of a maximum score of 4.0). Most reported that they could count on fellow church members “some” or “a great deal” for help if they were ill (74 %), or for comfort if they had a problem 84 %. Only 6 % of respondents felt that church members often made too many demands on them, and only 3 % of respondents felt that others in their church were often critical of what they did (results not shown). On average, church members in our sample reported very high levels of active spiritual locus of control (mean score = 3.7 out of a maximum score of 4.0) as well as high levels of positive religious coping (mean score = 3.7 out of a maximum score of 4.0).

Adherence to Cancer Screening Recommendations

Distributions for adherence to cancer screening recommendations are presented in Table 3. Among women between the ages of 40–49, 65 % had a mammogram within the past 2 years. Among women 50 years and older, 60 % had a mammogram within the prior year. Only 60 % of women over 40 had a clinical breast examination within the prior year. Among all women, only 43 % had both screening examinations at recommended intervals. Two-thirds (67 %) of women aged 18 and older reported having had a Pap test within the
Table 2  Characteristics of religiousness measures among women ($N = 78$)

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Cronbach's $\alpha$</th>
<th>Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Church participation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>How often do you usually attend religious services?</td>
<td>N/A</td>
<td>93.8 %</td>
</tr>
<tr>
<td>Daily or once per week</td>
<td></td>
<td>4.7</td>
</tr>
<tr>
<td>Few times per month</td>
<td></td>
<td>1.6</td>
</tr>
<tr>
<td>Less than once per year or never</td>
<td></td>
<td>1.6</td>
</tr>
<tr>
<td>Besides regular services, how often do you take part in other activities at your place of worship?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daily or once per week</td>
<td></td>
<td>48.4 %</td>
</tr>
<tr>
<td>Few times per month</td>
<td></td>
<td>26.6</td>
</tr>
<tr>
<td>Few times per year</td>
<td></td>
<td>4.7</td>
</tr>
<tr>
<td>Less than once per year or never</td>
<td></td>
<td>20.3</td>
</tr>
<tr>
<td>Religious support (positive)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. If you were ill, how much would the people in your congregation help you out?</td>
<td>0.87</td>
<td>3.34</td>
</tr>
<tr>
<td>2. If you had a problem or were faced with a difficult situation, how much comfort would the people in your congregation be willing to give you?</td>
<td>(0.91)</td>
<td></td>
</tr>
<tr>
<td>Spiritual health locus of control (active)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Please indicate how much you agree with the following statements:</td>
<td>0.86</td>
<td>3.65</td>
</tr>
<tr>
<td>1. Living the way the Lord says I'm supposed to means I have to take care of myself.</td>
<td>(0.60)</td>
<td></td>
</tr>
<tr>
<td>2. Even though I trust God will take care of me, I still need to take care of myself.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. God gives me the strength to take care of myself.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spiritual health locus of control (passive)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Please indicate how much you agree with the following statements:</td>
<td>0.78</td>
<td>1.90</td>
</tr>
<tr>
<td>1. It's ok not to seek medical attention because I feel that God will heal me.</td>
<td>(0.80)</td>
<td></td>
</tr>
<tr>
<td>2. There is no point in taking care of myself when it's all up to God anyway.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Religious coping (positive)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Think about how you try to understand and deal with major problems in your life.</td>
<td>0.83</td>
<td>3.68</td>
</tr>
<tr>
<td>1. I think about how my life is part of a larger spiritual force.</td>
<td>(0.53)</td>
<td></td>
</tr>
<tr>
<td>2. I work together with God as partners.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. I look to God for strength, support, and guidance in crisis.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Percent of non-missing; columns may sum to greater than 100 % due to rounding

past year; 88 % have had a Pap test within the prior 3 years. Nearly two-thirds (60 %) of women aged 50 and older were compliant with colorectal cancer screening recommendations. Still, only 54 % of respondents reported having had all the recommended examinations for their age.

Associations with Cancer Screening

In bivariate analyses, age (OR = 0.92; 95 % CI = 0.88–0.96), English language proficiency (OR = 2.60; 95 % CI = 1.00–6.70), passive spiritual health locus of control (OR = 0.52; 95 % CI = 0.28–0.96), and positive religious coping were significantly associated with all age-appropriate screening (p < .10). None of the variables were significantly associated with adherence to individual screening tests (data not shown).
Table 3  Adherence to screening guidelines

<table>
<thead>
<tr>
<th>Screening type</th>
<th>n</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorectal cancer screening (age 50+)</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Compliant with recommendations</td>
<td>18</td>
<td>(60)</td>
</tr>
<tr>
<td>Mammography screening (age 40–49)</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Within past 1–2 years</td>
<td>11</td>
<td>(65)</td>
</tr>
<tr>
<td>More than 2 years ago</td>
<td>2</td>
<td>(12)</td>
</tr>
<tr>
<td>Never</td>
<td>4</td>
<td>(24)</td>
</tr>
<tr>
<td>Mammography screening (age 50+)</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Within past year</td>
<td>18</td>
<td>(60)</td>
</tr>
<tr>
<td>Within past 2 years</td>
<td>7</td>
<td>(23)</td>
</tr>
<tr>
<td>More than 2 years ago</td>
<td>2</td>
<td>(7)</td>
</tr>
<tr>
<td>Never</td>
<td>3</td>
<td>(10)</td>
</tr>
<tr>
<td>Clinical breast examination (age 40+)</td>
<td>47</td>
<td></td>
</tr>
<tr>
<td>Within past year</td>
<td>28</td>
<td>(60)</td>
</tr>
<tr>
<td>More than 1 year ago</td>
<td>6</td>
<td>(13)</td>
</tr>
<tr>
<td>Never</td>
<td>11</td>
<td>(23)</td>
</tr>
<tr>
<td>Don’t know/not sure</td>
<td>2</td>
<td>(4)</td>
</tr>
<tr>
<td>All breast cancer screening recommended for age a</td>
<td>47</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>20</td>
<td>(43)</td>
</tr>
<tr>
<td>No</td>
<td>27</td>
<td>(57)</td>
</tr>
<tr>
<td>Cervical cancer screening (age 18+)</td>
<td>58</td>
<td></td>
</tr>
<tr>
<td>Within past year</td>
<td>39</td>
<td>(67)</td>
</tr>
<tr>
<td>Within past 3 years</td>
<td>12</td>
<td>(21)</td>
</tr>
<tr>
<td>More than 3 years ago</td>
<td>1</td>
<td>(2)</td>
</tr>
<tr>
<td>Never</td>
<td>6</td>
<td>(10)</td>
</tr>
<tr>
<td>Adherence to all screening tests recommended for age</td>
<td>78</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>42</td>
<td>(54)</td>
</tr>
<tr>
<td>No</td>
<td>36</td>
<td>(46)</td>
</tr>
</tbody>
</table>

a Columns may not sum to 100 % due to rounding; non-answers were coded as “No” or “Never”
b Annual FOBT, sigmoidoscopy every 5 years, or colonoscopy every 10 years

c For women aged 40–49: mammogram within prior 2 years and clinical breast examination within prior year; for women aged 50+: mammogram and clinical breast examination within prior year

d Pap smear within prior 3 years

e For cervical cancer screening, 20 cases were missing due to reported hysterectomy. For those 20 cases, not having the cervical cancer screening was not considered non-adherence in calculating adherence to all screening tests

Variables with significant bivariate relationships were entered into a multivariate logistic regression model (Table 4). In this model (p < .05), age, positive religious coping, and passive spiritual health locus of control remained significantly associated with all age-eligible screening, but English language proficiency was no longer significant. In a final model (with English language proficiency removed), positive religious coping remained strongly associated (OR = 5.30; 95 % CI = 1.18–23.71), while passive spiritual health locus of control was reduced to marginal significance (OR = 0.50; 95 % CI = 0.24–1.00).
Table 4  Multivariate results for adherence to cancer screening recommendations

All cancer screening (N = 78)

<table>
<thead>
<tr>
<th>Correlates</th>
<th>OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1 (Nagelkerke R² = .40; % correctly classified = 72 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>0.91***</td>
<td>0.86–0.96</td>
</tr>
<tr>
<td>English language proficiency</td>
<td>0.69</td>
<td>0.18–2.66</td>
</tr>
<tr>
<td>Spiritual health locus of control (passive)</td>
<td>0.48*</td>
<td>0.24–0.99</td>
</tr>
<tr>
<td>Religious coping (positive)</td>
<td>5.51*</td>
<td>1.20–25.25</td>
</tr>
<tr>
<td>Final model (Nagelkerke R² = .40; % correctly classified = 73 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>0.92***</td>
<td>0.88–0.96</td>
</tr>
<tr>
<td>Spiritual health locus of control (passive)</td>
<td>0.50~</td>
<td>0.24–1.00</td>
</tr>
<tr>
<td>Religious coping (positive)</td>
<td>5.30*</td>
<td>1.18–23.71</td>
</tr>
</tbody>
</table>

All logistic regressions were conducted using the enter method. Variables selected for inclusion in multivariate models were those that demonstrated significant bivariate associations with adherence to screening recommendations (p < .10). Results are not presented for breast, cervical cancer, or colorectal cancer screening individually due to small cell sizes.

~ p < .10, * p < .05, ** p < .01, *** p < .001

Discussion

We sought to identify possible relationships between dimensions of religiousness—church participation, religious support, spiritual health locus of control, and religious coping—and adherence to cancer screening recommendations. The most noteworthy finding was a strong association between positive religious coping and adherence to all age-appropriate screening, even after controlling for relevant covariates. For every one-point increase on the positive religious coping scale, the odds of having completed all cancer screenings were increased by a factor of 5.3. Positive religious coping involves actively seeking spiritual support and working in partnership with God to solve problems (Pargament 1999). Such actions may reduce anxiety about getting screened or receiving positive test result. Cancer screening may be perceived as a “risky” behavior among some Latinos; one risks discovering that one has cancer through screening, which is often linked to muerte (death) in the Latino community (Fernandez et al. 2008). In this context, positive religious coping may help individuals overcome fear that may act as a barrier to screening.

While passive spiritual locus of control was negatively associated with all age-appropriate cancer screening, it did not achieve statistical significance. Notably, few in our sample expressed a highly passive spiritual health locus of control. Levels of active spiritual locus of control—a collaborative relationship with God—were much higher. This finding is consistent with qualitative work by Florez et al. (2009), showing that breast cancer screening behaviors among Dominican women were influenced by a combination of internal (personal agency) and external (e.g., based on God’s will) forces. It was also consistent with qualitative work among healthy Latina women, showing that an active relationship with God in maintaining one’s health was much more common than a passive relationship where God alone is responsible for one’s health (Jurkowski et al. 2010). Taken together, these findings suggest that simplistic conceptions of fatalismo may not accurately reflect the predominant health locus of control about cancer screening and prevention among Latinas (Abraido-Lanza et al. 2007).
Overall, we found low rates of adherence to all screening tests for which one was eligible; nearly half of respondents needed one or more of the recommended examinations. However, adherence to individual cancer screening tests in our predominantly female sample was similar to Massachusetts screening rates among Hispanic women (Massachusetts Department of Public Health 2009). For example, 88% of women aged 18 and older in our sample reported having had a Pap test within the past 3 years, compared to 86% in a Massachusetts sample (Massachusetts Department of Public Health 2009). Mammography in the past 2 years for women aged 50+ was 83% in our sample, compared to 89% for women aged 40+ in Massachusetts (Massachusetts Department of Public Health 2009).

Not surprisingly, we found high levels of church participation among our church-based sample; the majority of respondents were at the church on a daily or weekly basis. Although respondents frequently attended church and reported high levels of positive religious support, neither of these variables was associated with cancer screening practices. Prior studies of these relationships have been mixed, with some finding no association (Fox et al. 1998a; Katz et al. 2008) and others finding positive associations (Benjamins 2006) between church attendance, self-rated religiousness, and breast cancer screening. In our sample, there was very little variability in these measures (i.e., ceiling effects), which may partially account for the lack of associations.

Before discussing implications, there are a number of study limitations that must be noted. First, data were collected from a small, purposive sample of low-income, Spanish-speaking Latinas primarily from Central and South America. Although the focus on an underserved, minority sample is a strength of the study, generalizability of this data is limited. Second, participants self-reported both cancer screening behaviors and religiousness, which leaves open the possibility of recall and social desirability biases. To minimize the potential for this, we assessed the religious measures after the cancer screening items to minimize order effects. Third, the negative religious coping and negative religious support variables had very low interitem reliability and, therefore, could not be included in the analyses. This may be due to a floor effect, as very few participants in this highly religious sample endorsed these items. Finally, we used a cross-sectional design, which limits our ability to explore temporal or cause-effect relationships. Accordingly, relationships between religiousness and screening utilization may be explained by additional unknown, unmeasured factors. For example, an underlying personality trait, such as optimism, could have influenced both religious coping and cancer screening behaviors (Koenig, et al. 2001).

Nevertheless, we believe this to be one of the few studies to employ multidimensional measures of religious/spiritual constructs that assess distal aspects of religion (e.g., church attendance) and proximal aspects of religion (e.g., religious coping) that may influence cancer screening behaviors in a Latina population. If proximal religious predictors of cancer screening behaviors can be identified, they should be examined as potential mechanisms in church-based interventions. Understanding these underlying mechanisms could enhance the efficacy of cancer control interventions.

Churches provide access to a large segment of the Latino population—including people of diverse ages, socioeconomic levels, and ethnic groups (Pew Hispanic Center & Pew Forum on Religion and Public Life 2007), and provide existing infrastructures, communication networks, and facilities that are useful for health promotion activities. As such, they represent a promising venue for the dissemination of health interventions. Understanding the aspects of religion that can support health behaviors will be helpful in designing interventions that resonate with a church-based audience. If replicated in a larger, more representative sample, our findings suggest that religious coping can play an
important role in motivating cancer screening. Such investigations are warranted given the health disparities among Latinos.

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What Works in Community-Based Interventions Promoting Physical Activity and Healthy Eating? A Review of Reviews

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Abstract: Chronic diseases, such as type II diabetes, are on the rise worldwide. There is consistent evidence that physical activity and healthy eating are important lifestyle factors which affect the risk for chronic diseases. Community-based interventions are of particular public health interest as they reach target groups in their natural living environment and may thus achieve high population-level impacts. We conducted a systematic literature search to assess the effectiveness of community-based interventions to promote physical activity and healthy eating. Specifically, we searched for promising intervention strategies in this setting. We narratively summarized the results of 18 systematic reviews. Among children and adolescents, we found moderate evidence for effects on weight change in primary school-aged children for interventions containing a school component. The evidence for interventions aimed at general adult populations was inconclusive. Self-monitoring, group-based components, and motivational signs to encourage stair use were identified as promising strategies to increase physical activity. Among adults at risk for type II diabetes, evidence was found for beneficial effects on
weight change and diabetes incidence. However, interventions for this group were not integrated in more comprehensive community-based approaches.

**Keywords:** prevention; chronic diseases; health promotion; physical activity; healthy eating; community

1. Introduction

Chronic diseases such as type II diabetes are on the rise worldwide [1]. According to the International Diabetes Federation, 382 million people are currently affected by the disease with an expected increase to 592 million cases globally by the year 2035 [2]. Diabetes and other chronic diseases are closely interlinked. Uncontrolled or undetected type II diabetes contributes to an elevated risk for cardiovascular diseases and can lead to complications associated with conditions with considerable direct and indirect medical costs [3,4].

It is known that chronic diseases such as type II diabetes and the resulting complications are largely preventable as they are determined by lifestyle factors, such as diet and physical activity (PA). Being overweight or obese, the consumption of high-fat, high-sugar, low carbohydrate, low fiber diets as well as physical inactivity are widely recognized as key contributors to an increased cardiovascular and diabetes risk [5]. Furthermore, associations with increased all-cause mortality have been established [6,7]. For example, the consumption of low-carbohydrate high-protein diets was associated with higher all-cause mortality in a prospective study examining 85,168 initially disease-free men and women over a period of more than 20 years in the U.S. [6]. Similar increases in all-cause mortality due to a prolonged consumption of diets low in carbohydrate and high in protein have been observed in a large population cohort in Europe [8]. Further evidence at the population-level suggests that a lack of moderate-to-vigorous PA or prolonged sitting time is associated with all-cause mortality [7,9,10], and with elevated risk factors for type II diabetes, such as obesity [11]. Conversely, moderate PA such as walking and the consumption of complex-carbohydrate and low-fat diets are inversely associated with clinical disease endpoints and mortality at the population-level [6,12,13].

There is already a large and growing number of studies investigating the effectiveness of community-based interventions to promote PA and healthy eating and several reviews have been conducted to summarize intervention effects for various outcomes and populations [14,15]. Community-based interventions are of particular interest as they reach target groups in their natural living environment and have the potential to achieve high population level impacts [16]. Communities can be defined as geographic areas (e.g., neighborhoods, villages, cities or regions), or as social groups which share a common culture or identity. Both definitions do not exclude one another as in most cases the members of the social groups interact at certain places (e.g., churches). Different definitions of community-based interventions exist [17,18]. Typically, community-based approaches to health promotion and disease prevention emphasize that the individual’s behavior is shaped by a dynamic interplay with the social environment including interpersonal, organizational, cultural, socioeconomic, environmental and policy influences [19,20]. However, interventions differ with regard to the degree to which they address these different levels [21]. Drawing on the typology of
McLeroy and colleagues, we distinguish three types of community-based approaches: (1) Communities as a setting/community recruitment: communities are the place where the participants are recruited, but the interventions strategies are mainly individual-focused (e.g., local mass media campaigns, individual counseling); (2) Multi-player or multi-level interventions: the interventions include several components addressing multiple social-ecological levels or multiple stakeholders (working with non-government organizations, e.g., sports clubs, working in several settings, e.g., workplace, shopping malls, community centers); (3) Environmental change interventions: intervention targeting to change the social or physical environment in the community (local policies, availability of recreational facilities for PA, availability of healthy food) [21].

Due to the great heterogeneity of community-based approaches, differences in study designs employed in various studies and populations targeted by these interventions, results of existing reviews are still inconclusive. The aim of this paper is to give an up-to-date summary of the current evidence and to analyze intervention effects according to the different intervention strategies and components that were employed as well as the different populations targeted. The information generated in this review of reviews will inform funding bodies, policy makers and service providers about promising strategies to modify physical activity and diet in various population groups.

2. Methods

We searched the following databases for systematic reviews and meta-analyses of primary studies on community-based interventions to promote physical activity and healthy eating published: Cochrane Library, PubMed, Campbell Collaboration, Database of Abstracts of Reviews of Effects (DARE, via NICE). In addition, we searched the database of the National Institute for Health and Clinical Excellence (NICE) for evidence summaries. Various combinations of the keywords “prevention”, “promotion”, “intervention”, “physical activity”, “physical inactivity”, “motor activity”, “exercise”, “ergonomic”, “musculoskeletal disorder”, “fitness”, “sedentary behaviour”, “healthy eating”, “nutrition”, “diet”, “overweight”, “obese”, “obesity”, “weight”, “body mass index”, “fruit”, “vegetable”, “community”, “neighborhood”, “quarter”, “population-based”, “multi-level”, “multi-component”, “environmental intervention”, “social environment” and “built environment” were used to search for relevant literature (* indicates truncations). The keywords were combined using the Boolean operations OR and AND.

A more detailed search protocol is available as online supplementary material.

Reference lists of potentially relevant systematic reviews of reviews were also perused for reviews that fitted the predefined inclusion criteria. The literature search was conducted by BS in April 2014. Systematic reviews and meta-analyses were included if they fulfilled the following criteria:

- assessed the effectiveness of community-based primary prevention interventions to promote physical activity and healthy eating at the population-level or in at-risk groups (e.g., prediabetes, overweight, inactive individuals)
- presented at least a subgroup analyses for community-based interventions
- published between 2007 and 2014
- included randomized controlled trials and/or other primary studies with non-random control groups and/or other quasi-experimental designs (e.g., time series approaches)
• published in English
• included at least one primary study which was conducted in Europe or America

During the literature search, we focused on reviews that reported to have included community-based intervention studies regardless of reviewer’s definition of the term “community-based” (in most cases no definition was provided). If studies from other specific settings were included in the reviews (e.g., non-public or semi-public areas, such as worksites, schools, health care), we included them if the majority of the primary studies (>80%) were classified as community-based or if the review provided a subsection of a subgroup analysis for the community based studies. We excluded reviews that focused on specific settings such as childcare facilities, schools, occupational or clinical settings because these institutions are not public or semi-public areas and also because there is a distinct body of research for each of these settings. We furthermore excluded reviews focusing on breastfeeding, obesity treatment, malnutrition, cancer prevention, and mental wellbeing, as well as those focusing on very specific groups (e.g., pregnant women, preterm infants, and frail community-dwelling older adults).

Two authors (BS, JS) selected relevant reviews from the identified full text publications and independently assessed the quality of all selected reviews according to the AMSTAR criteria, an 11-item questionnaire developed to assess the methodological quality of systematic reviews [22,23]. They compared their quality assessment results, discussed the differences and consulted TB where they could not reach consensus. Studies were excluded from this review if they scored ≤4 on the AMSTAR checklist. The results of the AMSTAR rating are available as an online supplementary table (Table S1).

Berit Steenbock, Johanna Schoenbach, Saskia Poettgen and Tilman Brand extracted the study details and core results from all selected reviews and narratively summarized them. As there are varying definitions of the term “community-based”, respectively, no clear definition of the term, we classified the underlying studies of the selected reviews according to the typology defined above: (1) community recruitment, (2) multi-player/multi-level intervention, (3) environmental change interventions. As the AMSTAR criteria mainly focus on the methodological quality of the review and not so much on the evidence of the underlying studies, we briefly appraised the evidence of the reviews we included using the following criteria: adequate sample size in the underlying studies, inclusion of randomized trials, use of objective or validated outcome measures, and inclusion of community-based interventions type 2 or 3. Concerning the question “What works?”, we considered an intervention strategy to be “promising” if it was said to be an effective strategy in at least one systematic review offering at least moderate evidence.

3. Results and Discussion

The systematic literature search identified 2,164 publications, 163 of which were assessed in detail. Of these, 27 met the selection criteria and were included in the quality assessment. Nine publications were excluded due to poor quality, leaving 18 publications for this review of reviews (Figure 1). The selected publications include nine meta-analyses and nine narrative systematic reviews. Most of the publications were not restricted to community-based interventions but also contained primary studies from other settings (schools, workplaces, health care settings), which we did not take into account for our review. After exclusion of duplications, the selected publications summarize
the results of 195 primary studies on community-based interventions. A complete list of the primary studies is available as an online supplement.

**Figure 1.** Identification of relevant studies.

We present the results of our review of reviews separately for the population groups, children and adolescents, adult general population, and at-risk adult population. For each population group we also present the results separately for healthy eating and physical activity.

3.1. *Children and Adolescents*

Seven reviews (five narrative reviews [24–28] and two meta-analyses [29,30]) investigated the effects of community-based interventions to promote healthy eating and physical activity among children and adolescents. Most of the underlying studies focused on children aged 8 to 12 years. None of the reviews included only healthy eating interventions or only PA intervention. Two meta-analyses and two narrative systematic reviews investigated the effects of healthy eating and PA interventions on weight change. Four of the reviews [25,27–29] provided only limited evidence due to a small number of included community-based studies, small sample sizes in the underlying studies, and very few multi-level or environmental change interventions. Underlying studies included in the remaining three reviews [24,26,30] included more of the latter interventions and provided moderate evidence (Table 1).
Table 1. Children and adolescents: healthy eating and physical activity.

<table>
<thead>
<tr>
<th>Author</th>
<th>Type of Review/Type of Intervention Included</th>
<th>Sample/Target Group</th>
<th>Intervention Components</th>
<th>Outcome Measures</th>
<th>Main Results</th>
<th>Evidence and Conclusion</th>
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<tbody>
<tr>
<td>Bleich et al. 2013</td>
<td>Narrative systematic review</td>
<td>Age: 0-17 years; most studies 8-14 years; 2 studies included only girls, 1 study only boys; sample size: 46-83,811</td>
<td>Community awareness campaigns, group counselling, guided resistance training, dance classes, school-based physical education enhancement, changes in food environment at school, schoolyard garden programs, community capacity building</td>
<td>HE: FFQ, direct observation PA: Accelerometers, direct observation, self-report Weight: BMI/MBMI, fat mass, obesity prevalence</td>
<td>HE: no significant effects on consumption of FV, fatty food or sugar sweetened beverage or total energy intake PA: significant increase in PA energy expenditure in one study Weight: beneficial effects on BMIeMBMI in 4 of the 9 studies.</td>
<td>Moderate evidence: studies with large sample sizes and anthropometric outcome measures included; relatively few studies that were solely community-based; moderate evidence for community-based intervention with a school component, insufficient evidence without school component.</td>
</tr>
<tr>
<td>Hendrie et al. 2011</td>
<td>Narrative systematic review</td>
<td>Girls, 8-12 years, in one study both boys and girls included; sample size: 35-61</td>
<td>Summer camp for girls (4 weeks), dance classes, information material, lessons on healthy eating, home work</td>
<td>HE: 24 h dietary recall FV consumption PA: Accelerometers (3 studies) and self-report Weight: BMI, WC, % body fat</td>
<td>HE: no significant effects PA: no significant effects Weight: no significant effects</td>
<td>Limited evidence: all included studies were pilot studies with small sample sizes; no conclusion can be drawn.</td>
</tr>
<tr>
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<tr>
<td>Kellou et al. 2014</td>
<td>Narrative systematic review</td>
<td>not community-based</td>
<td>1 study: 0–5 years, 1 study 6–12 years, 3 studies &gt; 13 years, both genders, mostly low SES communities, sample size: 1,001–43,811</td>
<td>Social marketing, school audits, food handlers training, distribution of canteen guidelines, changes in food environment at school, schoolyard garden programs, world food day celebrations, capacity building among school project officers and student ambassadors</td>
<td>HE: not assessed in this review PA: Accelerometers, direct observation, self-report Weight: BMI/WR, fat mass, obesity prevalence</td>
<td>Moderate evidence: studies with large sample sizes and valid measures included, but only non-random control groups, relatively few community-based interventions. Authors view comprehensive approach as most successful</td>
</tr>
<tr>
<td>van Shijs et al. 2007</td>
<td>Narrative systematic review</td>
<td>not community-based</td>
<td>Girls (3 studies), only boys (1 study), 8–14 years, sample size: 35–473</td>
<td>Group activities (&quot;troop meetings&quot;), summer camps, group goal setting, internet-based program (also for parents)</td>
<td>HE: 24 h dietary recall, FV consumption PA: Accelerometers (3 studies) and self-report Weight: BMI, WC, % body fat Other: bone mineral content and density</td>
<td>HE: no significant effects PA: no significant effects Weight: no significant effects Bone health: no significant effects</td>
</tr>
<tr>
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<td>van Sluijs et al. 2011 [28] (updated review)</td>
<td>Narrative systematic review Not community-based: n = 6 Community recruitment: n = 3 Multi-level intervention: n = 0 Environmental change: n = 1</td>
<td>Both genders, 5-16 years, mostly from low SES neighborhoods; sample size: 75-276</td>
<td>School playground made available outside of school hours, variety of equipment provided, computer-tailored storybook, newsletter, curriculum delivered by troop leaders, troops meeting policies, badge assignments, mentoring schemes</td>
<td>HE: Youth adolescent FFQ, direct observation, parent and child reports PA: Accelerometers (2 studies), direct observation, self-report Weight: BMI, WC, fat (free) mass</td>
<td>HE: significant reduction in calories in a subgroup of obese children in 1 study PA: more children engage in outdoor PA in 1 study based on observation Weight: significant decrease in proportion of obese children in 1 study</td>
<td>Limited evidence: small number of studies with community interventions included, effects on HE and PA are restricted to subgroups or direct observation; no conclusion can be drawn</td>
</tr>
<tr>
<td>Waters et al. 2011 [29]</td>
<td>Meta-analysis Not community-based: n = 48 Community recruitment: n = 5 Multi-level intervention: n = 2 Environmental change: n = 0</td>
<td>Four studies included only girls, the others boys and girls, 4-12 years; sample size: 35-1,235</td>
<td>Advertising media campaigns, Summer camps, dance classes, interactive group sessions (also with parents), individual goal setting, support from dietitian, changes in the school curriculum</td>
<td>HE: not assessed in the meta-analysis PA: not assessed in the meta-analysis Weight: Standardized Mean Difference (SMD) in BMIFzBMI</td>
<td>Effects on BMIzBMI assessed for “education plus other” (SMD = -0.09, 95% CI: -0.20, 0.02, I² = 50%) and “non educational setting” (SMD = -0.28, 95% CI: -0.72, 0.16, I² = 87%), both included community-based and other studies</td>
<td>Limited evidence: mixture of community-based and other studies, high degree of heterogeneity, re-calculation of effect sizes from some primary studies questionable; Authors find strongest evidence for primary school-aged children</td>
</tr>
<tr>
<td>Author</td>
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<td>Wolfenden et al. 2014</td>
<td>Meta-analysis</td>
<td></td>
<td>Social marketing, school audits, food handlers training, distribution of canteen guidelines, changes in food environment at school, schoolyard garden programs, community vegetable garden, removal of soft drink from vending machines, world food day celebrations, capacity building among school project officers and student ambassadors, consultation with health department</td>
<td>HE: not assessed in the meta-analysis PA: not assessed in the meta-analysis Weight: zBMI; % body fat</td>
<td>Combined MD in zBMI = -0.09 (95% CI: -0.16, -0.02, I² = 93%) Subgroup analysis for age groups: MD in zBMI for adolescents (12-18 years) = -0.02 (95% CI: -0.08, 0.03, I² = 70%); primary school-aged children (5-11 years): MD = -0.16 (95% CI: -0.27, -0.05, I² = 92%); preschool children (0-5 years): only 1 study</td>
<td>Moderate evidence: studies with large sample sizes and valid measures included, but high degree of heterogeneity and only non-random control groups. Strongest evidence for primary school-aged children</td>
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Notes: BMI: body mass index, CI: confidence interval, FV: fruit and vegetables, HE: healthy eating, MD: mean difference, PA: physical activity, SMD: standardized mean difference, WC: waist circumference, zBMI age and sex-standardized body mass index.
None of the reviews reported significant effects of community-based interventions on healthy eating. In addition, only a few of the underlying studies indicate some intervention effects on PA. With regard to weight change, Waters and colleagues report small, non-significant effects on the body mass index (BMI) (Standardized Mean Difference (SMD) = −0.28, 95% CI: −0.72, 0.16) for “non educational settings” and find strongest evidence for primary school-aged children [29]. This finding is limited by the high degree of heterogeneity and the small number of multi-level or environmental change interventions in the underlying studies. In a very recent meta-analysis by Wolfenden and colleagues in which three multi-level interventions and four interventions containing environmental changes were included, a small, significant effect on the age and sex-standardized body mass index (zBMI) in primary school-aged children (Mean Difference (MD) = −0.16, 95% CI: −0.27, −0.05) and a small, non-significant effect for adolescents (MD = −0.02, 95% CI: −0.08, 0.03) were found [30]. In both subgroups heterogeneity was substantial (I² > 90%). In one of the two narrative systematic reviews investigating effects on weight change, Bleich and colleagues found beneficial effects on the children’s BMI or zBMI in four out of nine studies [24]. In the second one, Kellou and colleagues found effects on the children’s BMI, zBMI or fat mass favoring the intervention in all of the five included studies (all multi-level or environmental change interventions) [26].

Overall, the results of the last indicate moderate evidence for beneficial effects of community-based interventions on weight change among primary school-aged children, but insufficient evidence for preschool children and adolescents. Among all reviews, only those which included large samples, multi-level and environment change interventions reported beneficial effects. The two reviews by Bleich et al. and Waters et al. [24,29] provide evidence that including a school component can increase the effectiveness of community-based interventions for primary school-aged children.

3.2. General Adult Population

Eight reviews assessed the effectiveness of community-based interventions promoting healthy eating and/ or PA (five meta-analyses [31–35], three narrative systematic reviews [36–38]; Table 2). Although this section focusses on the general adult population, some of the reviews also included primary studies that targeted specific groups, such as inactive adults, ethnic minorities, older adults, or women. Unfortunately, in most cases the reviews did not provide separate results for these specific groups. Only one review analyzed effects of community-based interventions on healthy eating [31], eight reviews investigated effects on PA, and none systematically assessed effects on anthropometric measures, such as BMI.
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</table>
Not community-based: n = 24  
Community recruitment: n = 3  
Multi-level intervention: n = 1  
Environmental change: n = 1 | General adult population or at risk population (obese, low income, women), sample size: 79–3322 | Bag with fresh FV, cookbook, dietary education materials, free cereal servings, tailored print and video material, web-based tailored feedback, lay health visitor support, motivational interviewing counselling, small group seminars, phone calls | FFQ, FV consumption, Fat and Fiber Behavior Questionnaire, macronutrient intake, folic intake, dietary fiber, measures converted into SMDs for meta-analysis | Meta-analysis summary of results: positive combined effect for FV consumption; significant difference between community-based studies and studies from other settings; Meta-regression shows that combining self-monitoring with one or more self-regulatory techniques improved the effects (SMD = 0.31 vs. SMD = 0.24) | Moderate evidence: large number of studies included, but studies of varying quality, outcome assessment and target groups were combined; almost all studies were rather individual-focused. Self-regulation techniques seem to be promising individual-focused approach |
| Baker et al. 2011 [36] | Narrative systematic review  
Not community-based: n = 1  
Community recruitment: n = 3  
Multi-level intervention: n = 13  
Environmental change: n = 8 | Adult population in high- and low-income countries, 11 studies provided interventions to deprived areas, sample size: 578–15,261 | Local media campaigns, websites, pedometers and logbooks, individual counselling, walking groups, inclusion of specific settings (e.g., shopping malls, churches), community events (fun walks), community task force activities, labelling walk trails | Self-reports of PA; proportions of participants attaining a certain level of PA (8 Studies), proportion of inactive or sedentary participants (8 studies), amount of LTPA (3 studies), amount of time spent walking (4 studies), total daily PA (2 studies) | Narrative summary of results: 8 Studies, only 1 increased the population level to a pre-defined amount of PA. 1 out of 8 studies reported no significant reduction in the proportion of inactive adults favoring the intervention group. Some evidence for an increased amount of LTPA in all 3 studies. Some evidence in 2 out of 4 studies for increased time spent walking. Greater decrease in total daily PA in the comparison arm than the intervention group in 1 out of 2 studies. In some cases results also among more intensive or higher quality studies. | Moderate evidence: many community-based studies with adequate sample size included, but only self-reported outcome measures, only 1 RCT included. Authors find insufficient evidence for effectiveness |
| Ogilvie et al. 2007 [37] | Narrative systematic review  
Not community-based: n = 43  
Community recruitment: n = 0  
Multi-level intervention: n = 3  
Environmental change: n = 2 | Adults mostly in rural areas, 1 study targeted at sedentary 50–65 year-old adults, sample size: 177–1,831 | Mass media campaigns, tailored newsletters, walk-a-thons, social support activities, formation of walking groups, park modifications | Self-reports of time spent walking | Narrative summary of results: significant increase in self-reported walking in 2 of 5 studies. Range: 1.4 min/week to 7.5 min/week, effects were concentrated in most sedentary subgroups | Limited evidence: only self-reported outcome measures and a small number community-based studies included. Evidence based on isolated studies |
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<tr>
<td>Kasavou et al.</td>
<td>Meta-analysis</td>
<td>Young or middle-aged adults (18–59 years, 12 studies), only women (6 studies), sample size: 34–573</td>
<td>Walking groups (lay and expert walk leaders), meeting sessions, self-help material, newsletters</td>
<td>Validated PA questionnaires, pedometers, accelerometers, converted into SMD for meta-analysis</td>
<td>Overall: SMD = 0.32 (95% CI: 0.32, 0.37), no significant difference between high and low quality studies; Moderate analysis: stronger effects for interventions targeting both genders vs. only women (SMD = 0.61, 95% CI: 0.33, 0.88) or SMD = 0.18, 95% CI: 0.03, 0.33), stronger effects among older adults vs. younger adults (SMD = 0.37, 95% CI: 0.17, 0.58) vs. SMD = 0.48, 95% CI: 0.27, 0.69), no differences between lay and expert walk leaders</td>
<td>Moderate evidence: several small studies included, but large fail-safe N (753 studies), no anthropometric outcomes assessed in the meta-analysis, no complex community-based study included. Overall, walking groups seem to be a promising component.</td>
</tr>
<tr>
<td>Mickle et al.</td>
<td>Meta-analysis</td>
<td>General adult population or at-risk population (obesity, low activity, obesity, cardiovascular disease, low income, women), sample size: 37–3,800</td>
<td>Written information, web-based tailored PA monitoring, pedometers, PA diary, individual counselling, group sessions</td>
<td>Positive combined effect for PA (SMD = 0.22, 95% CI: 0.26, 0.38), I² = 58%; no significant difference between community-based studies and studies from other settings; Meta-regression showed that combining self-monitoring with one or more self-regulation techniques improved the effects (SMD = 0.38 vs. SMD = 0.28)</td>
<td>Moderate evidence: large number of studies included, but studies of varying quality, outcome assessment and target groups were combined; almost all studies were either individual-focused. Self-regulation techniques seem to be promising individual-focused approach.</td>
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<tr>
<td>Garrett et al.</td>
<td>Narrative systematic review</td>
<td>Sedentary adults (18–65 years), inactive couples (28–31 years), sample size: 137–239</td>
<td>Telephone-based feedback on PA, print-based feedback on PA, group sessions, mailed intervention</td>
<td>7- and 14-days PA recall, outcome analysis: annual costs per participant to become active, costs of shifting into the active category</td>
<td>Both studies show some evidence for positive PA changes in the low intensity study groups (print-based feedback, mailed intervention), Cost-effectiveness: €84 (print-based feedback) and €5,673 (telephone-based feedback) Costs per QALY: €350 (mailed intervention) and €349 (group sessions)</td>
<td>Limited evidence: small number of studies, no complex community-based intervention, limited effectiveness of the interventions under study.</td>
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<td>Author</td>
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<td>Rock et al. 2014 [33]</td>
<td>Meta-analysis</td>
<td>Not community-based: n = 0 Community recruitment: n = 48 Multilevel intervention: n = 3 Environmental change: n = 4</td>
<td>General population or inactive adults (23 studies), only women (20 studies), older adults (55+; 22 studies), low SES (8 studies), sample size: 31-3,114</td>
<td>Social marketing, print information material, telephone-only motivational interviewing, face-to-face individual counseling, group education sessions, walking groups, nutrition and PA diaries, pedometers, accelerometers, web-based feedback, social support from community peers, labelling of walking trails, improving street lighting</td>
<td>PA questionnaires (47 studies), step counts derived from pedometers or accelerometers (8 studies), converted into net percent change (NPC) for meta-analysis</td>
<td>Combined effect for PA NPC = 16.6% (95% CI: −6.6%, 39.2%), significant combined effect among high-quality studies (16 studies; NPC = 16.2%; 95% CI: 4.4%, 28.0%), subgroup analysis: significant effects if interventions included face-to-face counseling/group sessions (NPC = 33.5%; 95% CI: 9.9%, 60.5%) or mail components (NPC = 18.0%; 95% CI: 2.3%, 35.6%); or if they were focused exclusively on women (NPC = 27.2%; 95% CI: 9.9%, 46.5%)</td>
</tr>
<tr>
<td>Webel et al. 2010 [34]</td>
<td>Meta-analysis</td>
<td>Not community-based: n = 0 Community recruitment: n = 3 Multilevel intervention: n = 1 Environmental change: n = 0</td>
<td>Inactive adults, older adults after myocardial infarction, African-American adults, sample size: 89-723</td>
<td>Lay-led walking groups, lay-advisors to spread information and to enhance social support, computerized feedback, lay-led chronic disease self-management course, self-help book</td>
<td>Self-report PA measures, converted into SMD for meta-analysis</td>
<td>Combined SMD in PA = 0.16 (95% CI: 0.05, 0.27) was calculated including 3 studies.</td>
</tr>
<tr>
<td>Sober et al. 2010 [35]</td>
<td>Meta-analysis</td>
<td>Not community-based: n = 1 Community recruitment: n = 0 Multilevel intervention: n = 0 Environmental change: n = 12</td>
<td>General population in public spaces (e.g., shopping mall, train stations, libraries), sample size: 12,288-15,350 observations</td>
<td>Signs encouraging stair use posted on wall near to stair areas and elevators, vinyl footprints stuck on floor leading to stairs, enhancements to stairwells (carpets, artwork, music, paintings)</td>
<td>Frequency of stair use recorded, converted into absolute (percentage points) and relative change in stair use</td>
<td>Median absolute increase in stair use of 2.4 percentage points (IQ: 0.8, 6.7), median relative improvement: 50% (IQ: 3.4, 90.6); insufficient evidence for motivational signs plus stairwell enhancements</td>
</tr>
</tbody>
</table>
Table 2. Cont.

<table>
<thead>
<tr>
<th>Author</th>
<th>Type of Review/Type of Interventions Included</th>
<th>Sample/Target Group</th>
<th>Intervention Components</th>
<th>Outcome Measures</th>
<th>Main Results</th>
<th>Evidence and Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adults at risk population: socially disadvantaged women</td>
<td>Meta-analysis</td>
<td>Socially disadvantaged adult women (18-64 years); sample size: 43-1,578</td>
<td>Print information material on HII and PA benefits, group education sessions, pedometer feedback, computer-based lied messages, telephone counselling, text messages, exercise lessons, written information on walking routes</td>
<td>Self-reported PA (16 studies), pedometer or accelerometer (3 studies), converted into SMD for meta-analysis</td>
<td>No pooled effect computed due to high degree of heterogeneity, the authors, subgroup analysis: interventional were more effective if they included a group component (SMD = 0.36, 95% CI: 0.17, 0.54), community interventions were effective if they were placed in community organization i.e., churches, SMD = 0.26, 95% CI: 0.03, 0.49</td>
<td>Moderate evidence: large number of studies included</td>
</tr>
<tr>
<td>Adults at risk population: adults with prediabetes</td>
<td>Meta-analysis</td>
<td>Adults with impaired glucose tolerance, sample size: 88-574</td>
<td>Counselling or encouraging to increase PA or HII, supervised activity sessions, exercise classes, stress management, residential treatment</td>
<td>HIE: not assessed in the review PA: not assessed in the review Weight: weight change in kg Other: diabetes incidence</td>
<td>Pooled effect for weight change = −2.6 kg (95% CI: -3.3 to −1.9) at 2-year FU. Decrease in diabetes incidence in 1 of 3 studies (38% RR reduction).</td>
<td>Moderate evidence: sufficient sample size and valid outcome parameters, but no multi-level or environmental change intervention included</td>
</tr>
<tr>
<td>Adults at risk population: adults with prediabetes</td>
<td>Narrative systematic review</td>
<td>Adults with impaired glucose tolerance, overweight, adults; sample size: 325-3234</td>
<td>Individual counselling, supervised exercise sessions, progressive resistance training, individual goal setting</td>
<td>HIE: not assessed in the review PA: not assessed in the review Weight: not assessed in the review Other: diabetes incidence</td>
<td>RR reduction in diabetes incidence ranged from 29%−3.5% Interventions with theory-based behavioral strategies were more effective than information and advice approaches</td>
<td>Moderate evidence: sufficient sample size and valid outcome parameters, but no multi-level or environmental change intervention included</td>
</tr>
</tbody>
</table>

3.2.1. Effectiveness of Interventions on Healthy Eating

The meta-analysis by Michie and colleagues provides moderate evidence for the effectiveness of community-based interventions on healthy eating [31]. They report a positive combined effect for healthy eating derived from various food frequency questionnaires across all studies (SMD = 0.31, 95% CI: 0.23, 0.39, I² = 73%) with no significant difference between community-based studies and studies from other settings (workplace, healthcare settings). The evidence from this review is limited by the fact that almost no multi-level or environmental change intervention was included. In addition, studies of varying quality were pooled and substantial heterogeneity was reported.

The authors investigated a list of 26 potential behavior change strategies, e.g., providing general information, modeling behavior, setting graded tasks, feedback on performance, and analyzed whether any of these techniques was associated with effectiveness. The results from the meta-regression indicate that combining self-monitoring with one or more self-regulatory techniques improved the effects on healthy eating (SMD = 0.54 vs. SMD = 0.24).

3.2.2. Effectiveness of Interventions on Physical Activity

In the aforementioned meta-analysis, Michie and colleagues also report a pooled beneficial effect of community-based interventions on PA derived from questionnaire and objective PA data (SMD = 0.32, 95% CI: 0.26, 0.38, I² = 58%). Once again, the evidence was limited by the lack of multi-level or environmental change interventions and the pooling of studies of differing quality. According to the meta-regressive results, combining self-monitoring with one or more self-regulatory technique improved the effects on PA (SMD = 0.38 vs. SMD = 0.28).

The narrative systematic review by Baker and colleagues focuses on community-wide interventions and incorporates a large proportion of multi-level and environmental change intervention with moderate to large sample sizes. The authors assessed a variety of self-reported PA outcome measures and did not find sufficient evidence for the effectiveness of community-based interventions. None of the included studies was classified as being at a low risk of bias because all of them did not use random allocation of the study groups or an objective measure of PA [36].

A further review from Ogilvie and colleagues focused on interventions to promote walking [37]. The review comprised three multi-level interventions and environmental change interventions including mass media campaigns, walking groups, community events, and park modifications. Of the five studies, two showed a significant net increase in self-reported time spent walking at 12 months follow-up. The authors concluded that the evidence was still insufficient as the review included only a small number of community-based studies.

A recent meta-analysis by Bock and colleagues included 55 intervention studies (seven multi-level or environmental change interventions) [33]. The authors found a significant net percent change (NPC) in PA (both self-report and objective measures) of 16% (95% CI: 4.4%, 28.0%) among high quality studies (16 studies). Subgroup analysis indicated significant effects if interventions included face-to-face counselling/group sessions (NPC = 35.0%, 95% CI: 9.6%, 60.5%) or mail components (NPC = 18.9%, 95% CI: 2.2%, 35.6%), or if they were focused exclusively on women (NPC = 27.2%, 95% CI 9.3%, 46.1%).
According to Webel et al., a peer-based intervention strategy can be defined as a method in which people share specific health messages with members of their community [34]. With regard to community-based interventions, Webel and colleagues included four intervention studies that mostly applied lay-led walking groups or counselling sessions. The authors found some evidence for effectiveness based on a meta-analysis including three studies of peer interventions. Although a significant increase in self-reported PA (SMD = 0.16, 95% CI: 0.05, 0.27) was reported, the small number of studies precluded strong conclusions on evidence.

In a recent meta-analysis including 17 community recruitment studies, Kassavou and colleagues investigated the effect of walking groups on PA behavior [32]. The authors converted validated self-report and objective PA data into standardized mean differences and found a pooled beneficial effect on PA of overall SMD = 0.52 (95% CI: 0.32, 0.71), with no significant difference between high and low quality studies. Subgroup analyses indicated stronger effects for interventions targeting both genders compared to interventions targeting only women, and stronger effects among older adults compared to younger adults. No differences occurred between interventions using lay and expert walk leaders.

One review investigated the effect of point-of-decision prompts on stair use based on 11 environmental change intervention studies [35]. The authors included diverse settings such as shopping malls and train stations, and reported that motivation signs led to a small but significant increase in the proportion of people using the stairs (2.7 percentage points). A combination of motivational signs and stairwell enhancement however did not result in stronger effects. The studies focused on stair use as an outcome and did not consider overall PA.

One review analyzed the cost-effectiveness of PA interventions but included only two community-based interventions [38]. The cost-effectiveness to move a person into the active category at 12 months (€884 and €3,673) and cost per quality-adjusted life year (QALY) (€349 and €350) of the community interventions, however, indicated a good cost-benefit ratio. The authors state that most of the PA interventions were below the acceptable threshold for funded interventions, considered to lie between £20,000 to £30,000 as reported by the UK National Institute for Health and Clinical Excellence [42]. Nevertheless, the evidence for cost-effectiveness or cost-utility is very limited due to the small number of informative studies available.

3.3. Adult at Risk Populations

3.3.1. Socially Disadvantaged Women

Assessing the effectiveness of PA community-based interventions targeted at socially disadvantaged women, Cleland and colleagues included 18 community-based studies with few multi-level and no environmental change interventions [39]. Due to high degrees of heterogeneity, the authors did not provide a pooled effects size, but they report subgroup effects. The results indicate that interventions were more effective if they included a group component (SMD = 0.36, 95% CI: 0.17, 0.54). Furthermore, community interventions were effective if they were delivered by community organizations (e.g., churches, SMD = 0.26, 95% CI: 0.03, 0.49).
3.3.2. Adults at Risk for Type II Diabetes

Two reviews included studies focusing on adults at risk for type II diabetes [40,41]. Both reviews report beneficial effects in weight change or BMI as well as on diabetes incidence, with a relative risk reduction of 29%–75% for the latter. In sum, it appears that while the evidence for effectiveness in the general adult population is still disputable, evidence exists for community interventions focusing on adults at risk for type II diabetes. The two reviews that addressed adult populations at risk for diabetes found that the most successful interventions in their meta-analysis had adopted an intensive, long-term approach involving several intervention components. Specifically, Norris et al report a significant correlation between the number of intervention contacts and decrease in weight. In general, Baker et al. observed that interventions that included behavior change strategies and were theory-based were more effective than the information and advice approaches given to the control group [27]. As both reviews did not include multi-level or environmental change interventions, the evidence from these studies is limited to individual-focused approaches in the community.

3.4. Discussion

In this review of reviews, we investigated the effectiveness of community-based interventions to promote PA and healthy eating. Specifically, our goal was to identify promising intervention strategies. Overall, 18 reviews of moderate to good methodological quality according to the AMSTAR criteria were included. The included reviews differed with regard to the target groups of the underlying studies (children and adolescents, general adult population, and specific adult at risk groups), the outcomes assessed (healthy eating, PA, weight change and other anthropometric measures), and the types of community-based interventions (community recruitment, multi-level, and environmental change) included.

With regard to children and adolescents, the reviews did not provide evidence for beneficial effects on healthy eating or PA. However, there was moderate evidence from three of the seven reviews [24,26,30] for beneficial effects of community-based interventions on weight change. Compared to the reviews reporting no effects, these reviews included primary studies with larger sample sizes and more studies addressing multiple social-ecological levels or environmental changes. It seems that more comprehensive community-based approaches are more successful in targeting weight change in children and adolescents. Moreover, the reviews indicated that the evidence for beneficial effects was strongest for primary school-aged children and insufficient for adolescents and preschool children. In the latter case, only a small number of primary studies was available [29,30]. A combination of school components, such as more and enhanced PA lessons at school, changes of the food environment at school, and community-based approaches (e.g., awareness campaigns, parent counselling, community capacity building) is indicated as a promising strategy in two of the reviews [24,29].

Reviews on community-based interventions targeting the general adult population provided equivocal conclusions. None of the reviews assessed anthropometric measures, such as BMI, and only one review analyzed intervention effects on healthy eating finding moderate evidence for beneficial effects [31]. However, the interventions included in this review mostly applied a community recruitment approach with individual-focused intervention strategies, such as provision of (tailored)
information material, individual or group counselling, and pedometers for self-monitoring. Assessing effective behavior change strategies, this review provided evidence that self-monitoring (in combination with additional strategies derived from the behavior regulation theory) contributes to intervention effectiveness.

All reviews targeting general adult population assessed PA. Two meta-analyses including a large number of studies showed evidence for moderate effects of community-based intervention on PA [31,33]. However, the review by Baker and colleagues reported insufficient evidence for beneficial effects of communities on PA. Differences between the two reviews with regard to selection criteria and operationalization of the term “community-based intervention” may explain why the reviews came to different conclusions. For example, from the 25 studies in the review by Baker et al. [36], only one was included in the meta-analysis by Michie et al. [31]. While the two meta-analyses primarily included interventions applying community recruitment approaches, most interventions in the review of Baker et al. targeted multiple levels or environmental change strategies. There are several potential reasons for the inconclusive effectiveness of more comprehensive community-based intervention that address the general population. Specifically, low levels of community penetration and exposure to health promotion activities have been discussed to be major reasons [19].

Although the overall evidence for beneficial effects is still inconclusive, some of the other included reviews gave hints on promising interventions strategies. At the environmental level, motivational signs have been identified to increase stair use, although the evidence for this strategy was limited by the fact that overall PA was not taken into account and no study applied random allocation. On the interpersonal level, Webel et al. [34] provided some evidence for the effectiveness of peer-based PA interventions (mostly lay-led walking groups), and there is moderate evidence that walking groups (lay-led or expert-led) are an effective intervention component to increase PA [32]. A group component was also found to be effective in two other reviews [33,39]. On the individual level, as for healthy eating outcome, Michie et al. found increased effects on PA if the interventions applied self-regulation behavior change techniques [31]. A reasonable intervention strategy may be to combine the different promising components into one community-based intervention approach.

With regard to adult at risk population, we included one review on interventions promoting PA among socially disadvantaged women and two reviews targeting adults at risk for type II diabetes. Cleland et al. included interventions that used community recruitment to target socially disadvantaged women [39]. They found that interventions using a group component and those delivered by community organizations were more effective. Other reviews also reported gender differences. One review found that walking group interventions were more effective if both genders targeted were targeted [32]. In contrast to that one other review reported stronger effects for PA interventions that focused exclusively on women [33]. Thus, the benefits of gender-specific PA interventions seem inconclusive.

Two reviews on adults at risk for type II diabetes provided evidence that combined healthy eating and interventions can effectively contribute to weight loss and reduce the risk for type II diabetes in at-risk adults [40,41]. The authors found stronger effects for intensive, long term interventions. None of reviews included multi-level or environmental change strategies. The effectiveness of the interventions within broader community intervention contexts is subject to future research.
A strength of this review of reviews is that it includes systematic reviews in which only primary studies that applied an experimental (randomized controlled trial) or quasi-experimental study design (non-random control group, interrupted time series), were included i.e., the validity of the study designs was comparatively high. However, this approach led to the exclusion of a considerable number of reviews and studies with weaker designs. We note that it is often hard to find adequate control communities when evaluating the community-based interventions. This especially applies to interventions where environmental changes are planned or conducted [20]. Even though we introduced above restrictions, the application of the AMSTAR tool was not always straightforward, as information was missing and some items seemed not well suited for the body of reviews we studied. Additional critical appraisal of the underlying studies was necessary to adequately assess the evidence presented in the reviews.

Although the 18 included reviews summarized results of 196 primary studies, several of them included only a small number of community-based interventions, which limited our ability to draw valid conclusions from these reviews. Furthermore, the primary studies were very heterogeneous with regard to the extent to which the whole community was addressed. In many cases the community was treated as a setting for recruiting participants or delivering the intervention. The interventions entailed changes in the communities’ social and physical surroundings only in a few cases. The evidence for environmental changes to increase PA and healthy eating is hence still very limited. The reviews generally reported several methodological weaknesses of the included complex community interventions. Most of the studies included only a small number of communities (mostly one intervention and one control community, see [36]). To reach an adequate statistical power it has been estimated that at least ten communities per study condition are necessary [43]. In addition, most of the studies relied on self-report measures of PA and healthy eating and did not include objective measures (e.g., accelerometers). There was also a lack of information with regard to intervention reach and fidelity of implementation. This information is necessary to estimate the population-level impact of the intervention and may also help to explain why effectiveness was not achieved among healthy adults [19].

In this review of reviews we identified a small number of promising intervention strategies. Future research should generate more multi-level or environmental change intervention studies that apply high-quality research designs with objectively measured outcomes, have sufficient statistical power and include indicators for reach and fidelity. From our perspective, more studies that test different intervention strategies against each other in order to generate more evidence on effective strategies are needed. In addition, recent research has highlighted the important influence of environments, including the concept of neighborhood walkability and the community availability of high-fat, sugar-rich foods [44,45]. Insights from this area of research should inspire future intervention development of community-based interventions. For example, Giles-Corti and colleagues investigated the impact of relocating people to a new “walkable” urban housing development in a natural experiment [46]. More studies of this kind which investigate the effects of major environmental changes on PA and healthy eating are required. However, the challenges to such work are extensive.
4. Conclusions

Community-based interventions for health promotion and prevention are important approaches for public health, but the evaluation of these interventions is associated with numerous methodological challenges. In this review of reviews we found moderate evidence that community-based interventions can have beneficial effects on weight gain among primary school-aged children. A combination of school-based and community-based interventions is a promising strategy. Evidence for community-based interventions targeting the general adult population is limited by the lack of multi-level or environmental change intervention studies using objective PA or anthropometric outcome measures. Self-monitoring elements, (walking) group components and point-of-decision prompts to use stairs are promising interventions strategies to address different social-ecological levels. Combined healthy eating and PA interventions can contribute to weight loss and reduce the risk for type II diabetes in adults with prediabetes. However, these approaches have not been assessed in a more comprehensive community-based approach. More studies that investigate the effects of changing environments on population health and health behavior are needed.

Acknowledgments

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Author Contributions

Tilman Brand and Hajo Zeeb led the review of reviews. Berit Steenbock and Tilman Brand designed the search strategy. Berit Steenbock and Johanna Schoenbach executed the literature search, screened the initial results, and critically appraised the reviews. Berit Steenbock, Johanna Schoenbach, Saskia Poettgen and Tilman Brand extracted the data from the reviews. All authors contributed to the discussion of the extracted data. Tilman Brand, Claudia R. Pischke, and Florence Samkange-Zeeb drafted the manuscript. All authors contributed to the critical revision of the manuscript and approved the final version.

Conflicts of Interest

The authors declare no conflict of interest.

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Wie wirksam sind ernährungs- und bewegungsbezogene primärpräventive Interventionen im Setting Kita? Ein Review von Reviews


Methoden


Eingeschlossen wurden systematische Reviews und Metaanalysen, die folgende Kriterien erfüllten:

- veröffentlicht im Zeitraum von 2007 bis 2014,
- verfasst in englischer oder deutscher Sprache,
- Untersuchung von primärpräventiven Maßnahmen in den Handlungsfeldern Ernährung und Bewegung,
- Einschluss mindestens einer Primärstudie im Setting Kita,
- Einschluss von Primärstudien mit mindestens Evidenzklasse 2b (quasi-experimentelles Studiendesign),
- Einschluss von mindestens einer europäischen und/oder amerikanischen Primärstudie.

Aufgrund internationaler Unterschiede in den Kindergarten- und Vorschulsystemen folgten wir während der Literaturrecherche den Definitionen der

- Keine Wirksamkeit nachgewiesen: Interventionsstudien zeigen keine signifikanten Effekte.
- Inkonstante Wirksamkeit: Ein Teil der Interventionsstudien zeigt signifikante Effekte, aber die Mehrheit der Interventionsstudien zeigt keine Effekte.
- Positive Hinweise für eine Wirksamkeit: Die Mehrheit der Interventionsstudien zeigt signifikante Effekte.
- Klarer Wirksamkeitsnachweis: Es werden mehrheitlich signifikante Interventionseffekte in qualitativ hochwertigen Interventionsstudien angezeigt (angemessene Stichprobengröße, valide Zielparameter-Erfassung, programmgerechte Umsetzung).

Abschließend wurden Merkmale effektiver Interventionen aus den Reviews extrahiert. Die Reviews wurden dabei dahingehend untersucht, ob sie Angaben zu einer differenziellen Wirksamkeit der Interventionen hinsichtlich 1) anvisierter Zielgruppe, 2) Handlungsfeld der Intervention (Ernährung, Bewegung/sitzende Ver-
Zusammenfassung

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B. Steenbock · C. R. Pischke · J. Schönbach · S. Pötgen · T. Brand

Wie wirksam sind ernährungs- und bewegungsbezogene primärpräventive Interventionen im Setting Kita? Ein Review von Reviews

Zusammenfassung

Hintergrund. Unzweideutige Ernährungs- und Bewegungsgewohnheiten bilden sich oft bereits in der Kindheit aus und führen zu Übergewicht und Adipositas.


Schlüsselwörter
Prävention · Ernährung · Bewegung · Übergewicht · Kita

The effectiveness of primary prevention interventions promoting physical activity and healthy eating in preschool children. A review of reviews

Abstract

Background. During their preschool years children establish nutritional and physical activity (PA) habits that may contribute to the development of overweight and obesity.

Objective. To examine the evidence for effective interventions promoting healthy eating and PA in childcare settings.

Methods. We searched PubMed, the Cochrane Library, and Campbell Collaboration for systematic reviews published between 2007 and 2014. Ten systematic reviews and three meta-analyses met the inclusion criteria, including a total of 22 intervention studies. Intervention studies were conducted in North America (N = 14), Europe (N = 5), Asia (N = 2), and Australia (N = 1). Half of these addressed ethnic minority groups or socially disadvantaged children. We extracted information about the effects regarding anthropometric measures, eating habits, and physical activity, as well as the characteristics of effective interventions, and summarized them narratively.

Results. Evidence for intervention effects on anthropometric measurements was inconclusive. Seven out of nine studies showed beneficial effects on diet-related outcomes. Only isolated effects were reported on improvements in PA. Reviews indicated that interventions which comprised (1) the development of skills and competencies, (2) medium to high parental involvement, and (3) information on behavioral health links for parents were more effective.

Conclusion. Preschool-based interventions showed some early improvements in eating habits and PA. Evidence is limited by the small number of studies, a lack of methodological quality, and inconsistencies among outcome measures. Evidence regarding anthropometric measurements is still inconclusive.

Keywords
Prevention · Healthy eating · Physical activity · Obesity · Preschool

Ergebnisse


Nach Ausschluss von Duplikaten enthielten die relevanten Übersichtsarbeiten insgesamt 22 kibasierten Interventionssstudien. Die Mehrzahl stammte aus Nordamerika (N = 14), gefolgt von Euro-
<table>
<thead>
<tr>
<th>Review</th>
<th>Typ. Qualität (0–11)</th>
<th>n (N), Population</th>
<th>Studiendesign</th>
<th>Zielparameter Erfassung</th>
<th>Zentrale Ergebnisse</th>
</tr>
</thead>
<tbody>
<tr>
<td>De Mattia et al. 2007 [24]</td>
<td>Narrativ (6)</td>
<td>1 (12), bevorzugt benachteilte Familien</td>
<td>RCT</td>
<td>ST: Eltern-Framebogen AM: BMI, zBMI, TSF</td>
<td>ST: Rückgang im TV-Konsum in der Interventionsgruppe um 24,4 % bei einem Anstieg in der Kontrollgruppe um 11,8 % (p &lt; 0,007) AM: nicht signifikanter Rückgang im BMI und in TSF zugunsten der Interventionsgruppe</td>
</tr>
<tr>
<td>D’Onise et al. 2010 [22]</td>
<td>Narrativ (7)</td>
<td>4 (27), benachteiligte Familien</td>
<td>KS, QE</td>
<td>AM: Körpergröße, Gewicht, BMI</td>
<td>AM: signifikante Effekte auf das Wachstum, signifikante Effekte auf Übergewicht (ARD = 42 %, 95 % Kl: 55,7 % bis – 27,8 %)</td>
</tr>
</tbody>
</table>
Tab. 1 (Fortsetzung)

<table>
<thead>
<tr>
<th>Review</th>
<th>Typ. Qualität (0 − 11)</th>
<th>n (N), Populationsstrei design</th>
<th>Zielparameter Erfassung</th>
<th>Zentrale Ergebnisse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waters et al. 2011 [25]</td>
<td>Metaanalyse (9)</td>
<td>6 (55), teilweise ethnische und benachteiligte Gruppen</td>
<td>CIRCT</td>
<td>MOT: signifikante Verbesserungen in motorischen Fähigkeiten ST: signifikante Rückgang im TV Konsum, kein Effekt auf Computerspiele KA: keine signifikanten Effekte AE: signifikant geringere Aufnahme von gesättigten Fetten (in 1 von 2 Kohorten) AM: nicht signifikantem Effekt auf BMI/WDI-Werte (0,03, 95% Kl. 0,015 bis 0,09, p = 0,58, t = 27%)</td>
</tr>
</tbody>
</table>


Tab. 1 gibt einen Überblick über die eingeschlossenen Übersichtsarbeiten und

Tab. 2 fasst zentrale Ergebnisse für die untersuchten Zielparameter zusammen.

### Anthropometrische Maße

Elf Übersichtsarbeiten [16–26] untersuchten die Wirksamkeit von ernährungs- und bewegungsbezogenen Interventionen hinsichtlich anthropométrischer Maße. Insgesamt war eine inkonsistente Evidenzlage festzustellen. Die Metaanalyse von Waters und Kollegen zeigte keine Evidenz für laborsierte Interventionen auf Basis von sechs Kita/Vorschulprogrammen (Standardisierte Mittelwertdifferenz im BMI: 0,03, 95% Konfidenzintervall [KI] – 0,15 bis 0,09) [25]. Auch in der zweiten Metaanalyse, die auf die Reduktion sitzender Verhaltensweisen fokussierte, zeigten sich keine Interventionseffekte der einbezogenen laborsierten Studien auf den BMI [26]. Ebenso schienen weder einzelne noch kombinierte Interventionsmaßnahmen, d. h. das Adressieren von mindestens zwei Verhaltensänderungen in den Bereichen Ernährung, Bewegung und sitzende Verhaltensweisen, einen Einfluss auf die Übergewichtsprävalenz oder eine Einschränkung von Gewichtszunahmen zu haben [17, 20, 21].

Die Evidenz für die Wirksamkeit von Maßnahmen auf anthropométrische Maße beruht bisher auf Einzelbefunden. So

Positive Effekte wurden ebenfalls für das Interventionsprogramm Head Start berichtet (mittlere Risikodifferenz für Übergewicht: -42,95 %, p < 0,02) [22]. Head Start richtete sich an sozioökonomisch benachteiligte Familien und beinhaltete eine wissensbasierte Ernährungsbildung für Kinder und Eltern sowie die Bereitstellung gesunder Lebensmittel (Früchte, Getreide, gesunde Snacks) [29].

Vereinzelt wurden weitere anthropometrische Maße untersucht. Ergebnisse zu Effekten auf das Wachstum erweisen sich insgesamt als inkonsistent [22]. Keinen Effekt auf die Herzfrequenz gab es in einer 10-monatigen peerbasierten Intervention, in der Paare aus Grundschülern und Kitakinder gebildet wurden. Die Intervention enthielt Komponenten zu Bewegung, ausgewogener Ernährung und zum Selbstwertgefühl [16]. Im Programm Healthy Start, einem Teilprogramm zur Reduktion kardiovaskulärer Risiken im Rahmen von Head Start, konnte dagegen eine signifikante Abnahme im Gesamtserumcholesterin (Mittelwertdifferenz 5,6 mg/dl, 95 % KI: 1,3 mg/dl bis 9,9 mg/dl, p < 0,05) in zwei Interventionsarmen im Vergleich zur Kontrollgruppe gezeigt werden. Bestandteil der Intervention waren im ersten Interventionsarm Menümodifikationen, die eine Reduktion des Fettgehalts im Essen an Interventionseinrichtungen beinhalteten, bzw. im zweiten Interventionsarm Menümodifikationen ergänzt um eine wissensbasierte Ernährungsbildung für Kinder. Es zeigte sich im zweiten Interventionsarm keine stärkere Abnahme im Gesamtserumcholesterin im Vergleich zum ersten Interventionsarm [19, 30].

Verhaltensbezogene Maße

Fettkonsum

Obst- und Gemüsekonsum
Die eingeschlossenen Reviews berichteten Ergebnisse aus vier Interventionsstudien zum Obst- und Gemüsekonsum [17, 19, 31]. Insgesamt ergaben sich Hinweise auf positive Effekte. Eine dusterandomisierte, kontrollierte Studie (CRCT) mit drei Interventionsarmen zeigte eine Zunahme im Gemüsekonsum in den experimentellen Testsituationen über den Studienverlauf mit größeren Zunahmen in den Interventionsarmen gegenüber der Kontrollgruppe. Der Konsum stieg in den dreimonatigen Follow-up-Erhebung um 40 g durch positive Rückmeldungen in Form von Stücken, um 30 g bei verbalen Lob im Vergleich zu einem Anstieg um 20 g in
der Kontrollgruppe und bei einigerer Exposition gegenüber unbeliebten Gemüsesorten [32]. Eine weitere Interventionsstudie, basierend auf Eltern- bzw. Lehrerangaben, lieferte Hinweise auf eine geringfügige Zunahme im Obstkonsum und keine Zunahme im Gemüsekonsum. Zu den Interventionsinhalten zählten ein Ernährungsleitfaden für Erzieher/innen, experimentelle Lerneinheiten (z. B. zum Thema Schmecken), Newsletter und die Bereitstellung gesunder Lebensmittel. Es konnte gezeigt werden, dass der Anstieg im Obstkonsum auf eine höhere Verfügbarkeit von frischem Obst an Interventionseinrichtungen (0,11, 95% Kl: 0,00 bis 0,21, p < 0,04) und nicht auf mehr Obst von Zuhause (-0,02, 95% Kl: -0,13 bis 0,08, p = 0,677) zurückzuführen war [33].

Für das deutsche Programm TigerKids wurden signifikante Zunahmen im Anteil der Kinder mit einem hohen Obst- (adjustiertes Odds Ratio (OR): 1,59, 95% Kl: 1,26 bis 2,01) und Gemüsekonsum (OR: 1,48, 95% Kl: 1,08 bis 2,03) in der 18-monatigen Follow-up-Erhebung berichtet. Bestandteile der Multifaktorenintervention waren die Bereitstellung von Obst und Gemüse, Kartoffeln, CDs mit Liedern und Elterninformationen in Form von Newslettern [16, 18]. Für das bereits beschriebene Programm Tooty-Fruity-Veggie wurde ebenfalls eine signifikante Zunahme im Obst- und Gemüsekonsum festgestellt (0,63 Portionen, p = 0,001) [16, 34].

Sonstige Ernährungsverhaltensweisen
Eine Interventionsstudie untersuchte Effekte einer Ernährungsintervention auf ungesunde Ernährungsverhaltensweisen (z. B. Snacking, einseitige Ernährung, Spielen und Fernsehen beim Essen) [36]. Das Programm bestand aus monatlichen Ernährungsberatungen für Kinder und Eltern, durchgeführt von Studierenden der Ernährungswissenschaften, und der Verteilung von Büchern und Broschüren zum Thema Ernährung. Die Studienergebnisse wiesen darauf hin, dass Eltern durch die Intervention mehr auf gesunde Lebensmittel und weniger auf Geschmackspräferenzen der Kinder achten – als Eltern der Kontrollgruppe (38,2 vs. 44,4%, χ² = 4,84, p < 0,05) [35]. Überdies konsumierten Kinder in der Interventionsgruppe nach 12 Monaten weniger Snacks als in der Kontrollgruppe (31,7 vs. 41,8%).

Motorische Fähigkeiten
Das Programm Movement and Activity Glasgow zeigte signifikante Verbesserungen der motorischen Fähigkeiten zugunsten der Interventionsgruppe im 6-monatigen Follow-up (Mittelwertdifferenz: 0,8, 95% Kl: 0,3 bis 1,3, 15-stufiger Testscore) [16, 25]. Zum Inhalt des 24-wöchigen Programms zählten drei Trainingsinheiten für Erzieher/innen, die anschließend drei 30-minütige Bewegungseinheiten pro Woche in den Kits durchführten. Poster in den Kits und Informationsmaterialien für Zuhause mit Spielangeboten und Broschüren über Bewegungsmöglichkeiten und Anforderungen zur Reduktion sitzender Tätigkeiten waren ebenfalls Bestandteil der Intervention [39].


Dauer und Intensität körperlicher Aktivität
Ventilationsgruppe gegenüber feinmotorischen Einheiten (Mallen, Werken) in der Kontrollgruppe [19].

Sitzende Verhaltensweisen und TV-Konsum

Merkmale effektiver Interventionen

Anvisierte Zielgruppe

Handlungsfeld
Nixon et al. gaben für Interventionen, die signifikante Verbesserungen in zwei oder mehr Zielparametern erzielen konnten, an, dass es sich um kombinierte Interventionen der Handlungsfelder Ernährung und Bewegung handele [16].

Ebenen der Intervention
In keinem der Reviews wurden Unterschiede in der Wirksamkeit zwischen verhaltens- oder verhältnispräventiven bzw. Mehr-Ebenen-Interventionen untersucht.

Strategien der Verhaltensänderung

Dosis/Intensität
Bond et al. empfahlen für künftige Bewegungsinterventionen eine anhaltende moderne bis intensive körperliche Aktivität, jedoch konnten sie auf Basis der einbezogenen Studien keinen Dosis-Wirkungs-Zusammenhang zeigen [20].

Elternbeteiligung
Mehrere Reviews wiesen auf einen möglichen Zusammenhang zwischen dem Grad der Elternbeteiligung und der Wirksamkeit von kitabasierten Interventionen hin [16, 19, 20, 22]. Insbesondere für Bewegungsinterventionen, die insgesamt wenige Hinweise auf Wirksamkeit zeigten, stellten Heekel et al. einen Mangel an Elternbeteiligung in den bisherigen Interventionsprogrammen fest [19]. Auch Waters et al. gaben in ihrer Metaanalyse Hinweise darauf, dass in der Altersgruppe unter 3 Jahren eine starke Elternbeteiligung vielversprechend sei [25].

Diskussion


Methodische Einschränkungen
Insgesamt wird die Evidenz durch die geringe Anzahl und Qualität der in den Reviews eingeschlossenen kitabasierten Primärstudien eingeschränkt [17, 18, 22, 31]. Neben Schwächen in der Zielparametererfassung (z. B. Selbstangaben zum Ernährungs- und Bewegungsverhalten) [16, 17, 24, 25], sind Teilnehmerzahlen gering. Evaluationen zur Einhaltung der Studienprotokolle fehlen und Follow-up-Zeitraume sind kurz gewählt [17, 25, 26, 31].

Übertragbarkeit auf den deutschen Kontext


Gegen eine Übertragbarkeit sprechen Unterschiede in den Kindergartensystemen zwischen den Ländern, z. B. Unterschiede in der Strukturiertheit der Tagesabläufe insbesondere zwischen Kitas und Vorschulen. Programme, die Änderungen in den Curricula vorsehen, sind daher nicht direkt übertragbar. Des Weiteren richtete sich die Hälfte der in den Reviews beschriebenen Programme an ethnische Minoritäten oder an Kinder aus sozioökonomisch benachteiligten Familien. Auch wenn positive Einzelbefunde aus dem Programm Head-Start etwas anderes nahelegen, ergaben sich insgesamt keine konsistenten Belege dafür, dass die in diese Zielgruppen gerichteten Programme eine höhere Wirksamkeit erzielt haben. Allerdings zeigen sich erste Hinweise, dass Programme, die kulturale Besonderheiten berücksichtigen, besser wirken. Da in Deutschland andere ethnische Minoritäten vorhanden sind als beispielsweise in den USA, lassen sich die dort entwickelten Programme nicht ohne Weiteres auf den deutschen Kontext übertragen.

Klinische Relevanz der Ergebnisse


Implikationen für Forschung und Praxis


Fazit

Die Evidenzgrundlage für Effekte kitabasierter Ernährungs- und Bewegungs-In-
tventionen auf Übergewicht und Adipo-
oposita ist nicht beweiskräftig. Hinweise
auf positive Verhaltensänderungen zeig-
ten sich für Interventionen zur Förderun-
gewogener Ernährung. Einzel-
befunde weisen auf interventionssassi-
zierte Reduktionen in sitzenden Verhal-
ten, Zunahmen an körperlicher Aktivität
sowie von motorischen Fähigkeiten hin,
sodass sich insgesamt eine frühe Beein-
flussbarkeit von Lebensstilfaktoren zeigt.
Merkmale effektiver Interventionen sind
bisher nicht ausreichend untersucht,
könnten aber insbesondere zur Weiter-
entwicklung von Bewegungsinterven-
tionen von Bedeutung sein, die bisher we-
rig wirksam waren. Darüber hinaus sind
Langzeitstudien erforderlich, um Aus-
 sagen über die klinische Relevanz und
Nachhaltigkeit kitabasierter Interventio-
nen treffen zu können.

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Einhaltung ethischer Richtlinien
Interessenkonflikt. B. Steenbock, C. R. Pischke, J.
Schrönbach, S. Pötgen und T. Brand geben an, dass
keine Interessenkonflikte vorliegen.

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Ergebnisse der Prozessevaluation eines Programms zur Gesundheitsförderung von 3- bis 6-jährigen Kita-Kindern: „JolinchenKids – Fit und gesund in der Kita“

Hintergrund

Gesundheitsschädigende Verhaltensweisen bilden sich oft bereits in der Kindheit aus und haben die Tendenz über den Lebenslauf zu persistieren [2, 8]. Neben der Familie gelten Kindertagesstätten und Kindergärten (Kitas) mittlerweile als Schlüsselsetting für die Prävention und Gesundheitsförderung im Kindesalter [5]. Über 90% der 3- bis 6-jährigen Kinder werden erreicht [12]. Durch die Aufgeschlossenheit der Eltern gegenüber Fragen der Kindergesundheit in den ersten Lebensjahren ihrer Kinder lassen sich Gesundheitsförderungsaktivitäten in Kitas außerdem in die Familien tragen [1].


In einer sowohl quantitativen als auch qualitativen Prozessevaluation wurde die Programmimplementierung in den ersten 2 Monaten an Kitas in 3 Pilotregionen (Niedersachsen, Rheinland/Hamburg und Sachsen/Thüringen) monitorniert. Folgende Fragen sollen in diesem Artikel beantwortet werden:

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<table>
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<tr>
<th>Prävention/Gesundheitsförderung</th>
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### Tab. 1 Übersicht über die modulspezifischen Bausteine

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<thead>
<tr>
<th>Die Bausteine des Moduls „Ernährung“</th>
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<tbody>
<tr>
<td>1) Kita-Umgebung</td>
</tr>
<tr>
<td>„Trinkoase“ und „Bunter Garten“ einrichten (frei zugängliche ungesüßte Getränke; 2-mal am Tag Rohkost- und Obststeller)</td>
</tr>
<tr>
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<tr>
<td>2) Drachenzug</td>
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<tr>
<td>6 Waggons stehen für die einzelnen Lebensmittelgruppen der aidi-Ernährungspyramide</td>
</tr>
<tr>
<td>3) Kartenbox „Gesund-und-lecker-Land“</td>
</tr>
<tr>
<td>1 Übung/Spiel pro Woche. Auswahl der Inhalte und Zeitpunkt nach Bedarf</td>
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<tr>
<td>4) Jolilchenfrühstückbuffet</td>
</tr>
<tr>
<td>Einmal pro Woche</td>
</tr>
<tr>
<td>5) Elternaktionen</td>
</tr>
<tr>
<td>2-mal pro Jahrz. B. im Rahmen von regulären Elternabenden, beim Abholen der Kinder oder in Kombination mit Elternaktionen aus dem Modul Bewegung</td>
</tr>
<tr>
<td>6) Newsletter</td>
</tr>
<tr>
<td>Infos, Tipps und Spielideen für den Familienalltag, einmal pro Jahr an Eltern ausgeben, z. B. mit Start des Moduls</td>
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<tr>
<th>Die Bausteine des Moduls „Bewegung“</th>
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<tbody>
<tr>
<td>1) Kita-Umgebung</td>
</tr>
<tr>
<td>Bewegungsräume/-ecken dauerhaft einrichten</td>
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<tr>
<td>Flure als Bewegungsräume öffnen</td>
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<tr>
<td>Sporträume in das freie Spielen einbeziehen</td>
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<tr>
<td>2) Kartenbox „Fitmach-Dschungel“</td>
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<tr>
<td>1 Bewegungstunde pro Woche</td>
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<tr>
<td>Mehrere Bewegungserlebnisse pro Tag: Inhalte, Zeitpunkt und Umfang nach Bedarf</td>
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<tr>
<td>3) Elternaktionen</td>
</tr>
<tr>
<td>2-mal im Jahr, z. B. im Rahmen von regulären Elternabenden oder als Einzelaktion in Kombination mit Elternaktionen aus dem Modul Ernährung</td>
</tr>
<tr>
<td>4) Newsletter</td>
</tr>
<tr>
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<tr>
<th>Die Bausteine des Moduls „Seelisches Wohlbefinden“</th>
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<tbody>
<tr>
<td>1) Kita-Umgebung</td>
</tr>
<tr>
<td>Ruhe- und Rückzugsbereiche einrichten</td>
</tr>
<tr>
<td>Jolilchen-Handpuppe hat ihren Platz in der Kita und ist für die Kinder erreichbar</td>
</tr>
<tr>
<td>2) Kartenbox „Insel Gefühl mich gut“</td>
</tr>
<tr>
<td>Jolilchen-Handpuppe einsetzen</td>
</tr>
<tr>
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</tr>
<tr>
<td>Kurze Auszeiten nach Bedarf (z. B. Entspannungsübungen)</td>
</tr>
<tr>
<td>3) Workshop „Kinder stärken“ für Eltern</td>
</tr>
<tr>
<td>Einmal pro Jahr durch Erzieher/innen angeboten</td>
</tr>
<tr>
<td>4) Elternaktionen</td>
</tr>
<tr>
<td>2-mal im Jahr</td>
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<tr>
<td>5) Newsletter</td>
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<tr>
<td>Infos, Tipps und Spielideen für den Familienalltag, einmal pro Jahr an Eltern ausgeben, z. B. mit Start des Moduls</td>
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<tr>
<th>Die Bausteine des Moduls „Elternpartizipation“</th>
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<tbody>
<tr>
<td>1) JolilchenKids-Team</td>
</tr>
<tr>
<td>Zur Planung und Begleitung der Programmumsetzung: zum Programmstart, im weiteren Verlauf Bedarf</td>
</tr>
<tr>
<td>2) Workshop „Eltern sind dabei“ für Erzieher/innen</td>
</tr>
<tr>
<td>Einmal in 3 Jahren von der AOK angeboten</td>
</tr>
<tr>
<td>3) Leitfadenheft „Eltern sind dabei“</td>
</tr>
<tr>
<td>Informationen für die Umsetzung in der Praxis</td>
</tr>
<tr>
<td>4) Register „Elternaktionen“ in den Kartenboxen</td>
</tr>
<tr>
<td>Anregungen zu Elternaktionen innerhalb der Module „Ernährung“, „Bewegung“ und „Seelisches Wohlbefinden“</td>
</tr>
<tr>
<td>5) Newsletter</td>
</tr>
<tr>
<td>Infos, Tipps und Spielideen für den Familienalltag, einmal pro Jahr pro Modul an Eltern ausgeben</td>
</tr>
<tr>
<td>6) Spielesammlung „Flaschenpost“</td>
</tr>
<tr>
<td>Alle 2 Wochen von Kind zu Kind weitergeben</td>
</tr>
<tr>
<td>7) Informationen zum Stand von JolilchenKids</td>
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<tr>
<td>Im Rahmen der regulären Kita-Elternabende</td>
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<tr>
<th>Die Bausteine des Moduls „Erzieherrinnengesundheit“</th>
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<tr>
<td>2) Leitfadenheft „Gesundheit selber leben“</td>
</tr>
<tr>
<td>Informationen und Anregungen für die Umsetzung im Alltag</td>
</tr>
<tr>
<td>3) Weitere Kurs- und Beratungsangebote der AOK für Erzieherinnen</td>
</tr>
<tr>
<td>Bei Bedarf</td>
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- Welche gesundheitsfördernde Aktivitäten und Programme wurden vor JolilchenKids in den Pilot-Kitas durchgeführt und welche Vorerfahrungen bestehen im inhaltlichen Interventionsbereich von JolilchenKids?
- Welche Module werden bevorzugt gewählt und welche Modulbausteine wurden bereits umgesetzt?
- Welche Module werden bevorzugt gewählt und welche Module werden bevorzugt umgesetzt?
- Wie ist der Stand der bisherigen Elternbeziehung aus Sicht der Kita-Mitarbeiter/innen?
- Welche programmspezifischen und -hinderlichen Faktoren werden von der Kita-Mitarbeiter/innen in der Startphase der Implementierung von JolilchenKids wahrgenommen?
**Zusammenfassung**

**Hintergrund.** Neben der Familie gelten Kindertagesstätten und Kindergärten (Kitas) als Schlüsselsetting zur Gesundheitsförderung bei Kindern unter 6 Jahren. „JolchenKids – Fit und gesund in der Kita“ (JolchenKids) ist ein neues Programm der AOK zur Gesundheitsförderung von Kindern dieses Alters. Vor seinem deutschlandweiten Start wurde es in 3 Regionen pilotiert und die Implementierung in den ersten 2 Monaten monitordiert.

**Fragenstellungen.** Ziele der Studie waren a) bisherige Aktivitäten zur Gesundheitsförderung in den Kitas zu erfassen, b) den Stand der Implementierung von JolchenKids nach 2 Monaten zu überprüfen sowie c) Faktoren zu untersuchen, die Kita-Mitarbeiter/innen die Programminplementierung fördern bzw. erschweren.

**Material und Methoden.** In einer quantitativen und qualitativen Prozessevaluation wurden Kita-Mitarbeiter/innen telefonisch und in Fokusgruppen befragt (n = 50; n = 13, respektive). Kita-Mitarbeiter/innen wurden zu bisherigen Aktivitäten/Projekten zur Gesundheitsförderung, dem Implementierungsstand, programmförderlichen und -hinderlichen Faktoren während der Implementierung sowie Änderungswünschen befragt.


**Diskussion.** Vorerfahrungen, praktikable Materialien für den Kita-Alltag und eine externe Betreuung helfen bei der Implementierung von neuen Gesundheitsförderungsprogrammen in diesem Setting. Für eine intensive Elternpartizipation stehen hingegen häufig zu knappe zeitliche Ressourcen bei Eltern zur Verfügung.

**Schlüsselwörter.** Kinder- und Jugendrichtungen - Implementationsforschung - Elternpartizipation - Intervention - Gesundheitsförderung

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**Results of a Process Evaluation of a Program for Health Promotion targeting 3-to-6-Year-Old Preschoolers: “JolchenKids – Fit and Healthy in Daycare”**

**Abstract**

**Background.** Apart from the family setting, daycare facilities represent a key setting for health promotion among children under the age of 6 years. “JolchenKids—Fit and healthy in daycare” is a new program for health promotion among preschoolers developed by the health insurance AOK. This program was piloted tested and implemented.

**Objectives.** The study aims were to (1) assess previous health promotion activities at daycare facilities, (2) document the state of program implementation after 2 months, and (3) identify factors facilitating or impeding implementation from the perspective of daycare staff.

**Materials and methods.** A quantitative and qualitative process evaluation, which included structured telephone interviews and focus groups with daycare staff (n = 50, n = 13, respectively), was conducted. Daycare staff were asked questions regarding previous health promotion activities/projects at daycare facilities, the state of implementation after 2 months, and facilitating and impeding factors during program implementation. Suggestions for program changes were also explored.

**Results.** Previous experiences regarding the promotion of a healthy diet and physical activity facilitated program implementation and program modules addressing these topics were implemented by the majority of daycare facilities during the first 2 months. Content and materials of the program appealed to daycare staff and were deemed child-friendly and easy to use. Facilitating factors included the modular program structure as well as the external supervision provided to daycare staff by health insurance staff during implementation. Parental participation was deemed important with regard to health promotion among children but was identified as a potential barrier to implementation because parents lacked time to participate in program activities.

**Conclusions.** Previous experiences in health promotion, the availability of hands-on program materials, and external supervision appear to facilitate the implementation of new programs in this setting. Parental participation in health promotion activities may often not be realizable due to time constraints of parents.

**Key words**

Preschools/daycare facilities - Implementation research - Intervention - Parental participation - Health promotion

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- Welche Änderungswünsche an das Programm bestehen seitens der Kita-Mitarbeiter/innen?

**Methoden**

Um bisherige Aktivitäten zur Gesundheitsförderung in den Kitas und den Stand der Implementierung von JolchenKids zu erheben, wurden strukturierte Telefoninterviews („computer assisted telephone interviews“, CATT) in den 3 Pilotregionen durchgeführt. Zur Analyse von Faktoren, die von den Kita-Mitarbeiter/innen als förderlich oder hinderlich für die Programminplementierung wahrgenommen wurden, fanden Fokusgruppen sowohl im städtischen als auch


**Ergebnisse**

**Ergebnisse der quantitativen Telefonbefragung**


In Bezug auf den Start der Modulumsetzung ergaben sich die Befragungen in den meisten Einrichtungen eine zeitliche Verspätung. So waren 33 der 50 befragten Einrichtungen (66%) eine tatsächliche Modulumsetzung von mindestens 6 Wochen auf. Bei diesen lag die durchschnittliche Umsetzungszeit bei 16 (Median: 16; SD: 8; Range: 7–35) Wochen. Im Folgenden werden gesundheitsfördernde Aktivitäten/Programme sowie Vorfahrungen in der Gesundheitsförderung und die Ausstattung an Kita der Gesamtstichprobe (n = 50) berichtet. Weiter wird berichtet, welche Module bevorzugt gewählt wurden. Anschließend werden der Implementierungsschritt und die Elternbindung im Rahmen der ersten 2 Monate der Programmmumsetzung von JolichenKids anhand der Daten, die alle Einschlusskriterien erfüllten, dargestellt (n = 33).

**Vorverfahrungen und parallele Gesundheitsförderungsaktivitäten in den befragten Kitas**

Nahezu die Hälfte der Kitas der Gesamtstichprobe führte innerhalb der letzten 3 Jahre Prventions- und Gesundheitsförderungsprogramme durch. Ein Fünftel der befragten Kita-Mitarbeiter/innen gab an, parallel zu JolichenKids an weiteren Prventions- und Gesundheitsförderungsprogrammen teilzunehmen (Tab. 3). Nahezu alle Kitas gaben an, vor der Implementierung von JolichenKids über Ruhe- bzw. Entspannungsbereiche für die Kinder zu verfügen (82%), separate Bewegungs- oder Turnerillen nutzen zu können (98%), sowie den Kindern jederzeit zuckerfreie Getränke (98%) und
grüne Bereiche Obst und Gemüse (96 %) zur
Verfügung zu stellen. Am wenigsten ver-
breitet waren strukturelle Maßnahmen
zur Förderung der Erzieher/innengesund-
heit. Hier gaben 72 % an, über passendes
Mobiliar und 52 % über Ruhe/Entspan-
nungsbereiche für die Kita-Mitarbeiter/-
innen zu verfügen.

Modulwahl
Bezüglich der Modulwahl zeigte sich in
der Gesamtstichprobe, dass ein Großteil
der Kitas (78 %) bereits mit mehreren Mo-
dulen gleichzeitig gestartet hat. Am häu-
figsten wurde als Startmodul das Modul
„Ernährung“ (70 %) und am zweithäuf-
stigen das Modul „Bewegung“ (60 %) ge-
wählt. Die Hälfte der Kitas hatte für den
Einstieg die Module „Seelisches Wohlbef-
finden“ (50 %) und/oder „Erzieher/innengesundheit“ (46 %) gewählt; ein Drittel der Kitas das Modul „Elternpartizipation“ (32 %). In den Begründungen zur Wahl
der Module wurde mehrfach angegeben,
Bereiche gewählt zu haben, in denen die
Kita schon aktiv sei, bzw. dass der Wunsch
da sei, bisherige Kenntnisse auf den neu-
esten Stand zu bringen. Insgesamt wur-
den alle Themenbereiche von Jolilchen-
Kis als wichtig erachtet (Tab. 4).

Stand der
Programminplementierung
Zur Erfassung des Stands der Implemen-
tierung von JolilchenKids wurden gene-
reller Bausteine abgefragt, die innerhalb
der Startphase von JolilchenKids vorgese-
hen sind (Gründung eines JolilchenKids-
Teams, Durchführung einer Bedarfsana-
lyse, Teilnahme an einer Schulung für Er-
zieher/innen, Ausfüllen eines Planungs-
posters, Einsatz der Jolilchen-Handpup-
pe, Lesen des JolilchenKids-Leitfaden-
kapitels). Die Ergebnisse werden für die
33 Kitas mit mindestens 6-wöchiger Pro-
grammunsetzung berichtet. Es zeigte
sich, dass jeweils 30 der 33 Kitas (91 %) die
JolilchenKids Handpuppe bereits einsetz-
ten und das Leitfadenkapitel zum Hinter-
grund, Inhalt und den Zielen von Jolil-
chenKids gelesen hatten. 28 der 33 Kitas
(85 %) hatten eine Punktierung erhäl-
t. Eine Bedarfsanalyse war dagegen
bisher nur in 17 der 33 Kitas (55 %) durch-
geführt und ein JolilchenKids-Team in
22 von 33 Kitas (67 %) gegründet worden.

Zusätzlich wurde die Umsetzung mo-
dulspézifischer Bausteine erfragt, sofern
das jeweilige Modul von der Kita als ge-
wählt angegeben wurde (Tab. 1). Ein-
e Bausteine wurden bereits flächendeck-
end umgesetzt. So hatten ein Großteil der
Kita-Mitarbeiter/innen die jeweiligen
Leitfadenkapitel und -hefte gelesen [„Er-
nährung“: 18 von 24 (75 %), „Bewegung“:
14 von 23 (61 %), „Seelisches Wohlbefi-
den“: 12 von 16 (75 %), „Elternpartizipa-
 tion“: 6 von 11 (55 %), „Erzieher/innenge-
sundheit“: 8 von 12 (67 %)]. Die Kartenbo-
 xen wurden v. a. in den Modulen „Ernäh-
 rung“ und „Bewegung“ bereits gut ange-
nommen [„Ernährung“: 21 von 24 (88 %),
„Bewegung“: 18 von 23 (78 %), „Seelisches
Wohlbefinden“: 5 von 16 (31 %)]. Während
Newsletter bisher kaum Verwendung ge-
sunden hatten [„Ernährung“: 8 von 24
(33 %), „Bewegung“: 5 von 23 (22 %),
„Seelisches Wohlbefinden“: 0 von 16 (0 %),
„Elternpartizipation“: 1 von 11 (9 %)]. El-
ternaktionen hatten bisher hauptsächlich
innerhalb des Moduls „Ernährung“ statt-
gefunden [„Ernährung“: 12 von 24 (50 %),
„Bewegung“: 9 von 23 (39 %), „Seelisches
Wohlbefinden“: 1 von 16 (6 %)]. 3 von 12
Kitas (25 %) hatten an dem Erzieher/in-
nen-Workshop „Fit im Job“ teilgenom-
men. Der Elternworkshop im Rahmen des
Moduls „Seelisches Wohlbefinden“ wurde
zur Zeit der Evaluation noch nicht ange-
boten. 13 der 16 Kitas mit der Modulwahl
„Seelisches Wohlbefinden“ (81 %) hatten
bereits Rückzugszonen und die Hälfte der
Kitas „kurze Auszeiten“ und die „Beson-
dere Stunde“ eingeführt. In den Modulen
„Ernährung“ und „Bewegung“ ergab sich
durch Überschneidungen mit bisherigen
Aktivitäten zur Gesundheitsförderung,
dass in fast allen Kitas Bewegungsräume,
zuckerfreie Getränke und griffbereites
Obst bereits vorhanden waren (s. oben).
Der Zeitaufwand, der wöchentlich auf
JolilchenKids verwendet wurde, lag im
Durchschnitt bei 4 Stunden (Median: 3 h; SD:
2 h; Range: 1-9 h) und stieg mit der
Anzahl gewählter Module (r = 0,19). Mo-
dulspezifische Unterschiede im Zeitauf-
wand zeigten sich nicht.

Einbindung der Eltern
Bezüglich der bisherigen Elternbeteili-
gung gaben 32 der 33 befragten Mitarbei-
ter/innen (97 %) an, dass ihnen die Eltern-
einbindung bei JolilchenKids „wichtig“
oder „sehr wichtig“ sei. In weniger als der
Hälfte der Kitas hatte jedoch bisher eine
Elternaktivitätenvertretung stattgefun-
den (42 %) und die Frage „Beteiligen sich
die Eltern bisher an JolilchenKids Aktivitä-
ten?“ wurde insgesamt von 24 von 31 Kitas
(77 %) bzw. 8 der 11 Kitas (73 %), die das
Modul „Elternpartizipation“ gewählt hat-
ten, mit „ja“ oder „gar nicht“ beant-
wortet.

Ergebnisse der qualitativen
Erhebung
Die zentralen Ergebnisse der offenen Fra-
gen der telefonischen Befragung (n = 50)
der und der Fokusgruppen (n = 4, mit n = 13
Kita-Mitarbeiter/innen) sind in Tab. 5
dargestellt.

Abbildung 1: Anteil an Kitas mit bestimmten Arbeitsansätzen und/oder pädagogischen Arbeits schwerpunkten in der Gesamtstichprobe (n = 50)
Tab. 3 Teilnahme an weiteren Programmen und/oder Aktivitäten zur Gesundheitsförderung im inhaltlichen Interventionsbereich von JolchenKids (Mehrfachnennung möglich)

<table>
<thead>
<tr>
<th>Entwicklungs-</th>
<th>Parallel Teilnahme an weiteren Programmen/Aktivitäten</th>
<th>Vorherige Teilnahme an Programmen/Aktivitäten (letzte drei Jahre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multimodale</td>
<td>„TigerKids“</td>
<td>„TigerKids“</td>
</tr>
<tr>
<td>Programme</td>
<td>BKK Gesundheitskoffer „Fit von klein auf“</td>
<td>„Prima Leben“</td>
</tr>
<tr>
<td></td>
<td>„PEKIP – Floh &amp; Co“</td>
<td>„Ball und Birne“</td>
</tr>
<tr>
<td></td>
<td>„Unsere Kita bleibt gesund“</td>
<td></td>
</tr>
<tr>
<td>Bewegung</td>
<td>„Kids aus dem Sitz“</td>
<td></td>
</tr>
<tr>
<td>Seelisches Wohlbefinden/Soziale Entwicklung</td>
<td>„Stark durch Gefühle“</td>
<td>„Zappeln erwünscht – Träumen erlaubt“</td>
</tr>
<tr>
<td></td>
<td>„Faustlos“</td>
<td></td>
</tr>
<tr>
<td></td>
<td>„PaC – Prävention als Chance“</td>
<td></td>
</tr>
<tr>
<td></td>
<td>„Joko, du und ich“</td>
<td></td>
</tr>
<tr>
<td></td>
<td>„Papilio – Prävention gegen Sucht und Gewalt“</td>
<td></td>
</tr>
</tbody>
</table>

Tab. 4 Ausgewählte Zitate der Begründungen zur Wahl des Startmoduls (Fokusgruppen- und Interviewergebnisse)

| Themenkomplexe | „Kita will ein Bewegungskinderkindergarten werden, brauchen Anregung u. Unterstützung. Erzieherinnengesundheit, weil das Team es gerne wollte.“ |
|                | „Sind schon Schwerpunkte in der laufenden Arbeit, Programm passt zum Konzept der Einrichtung.“ |
|                | „Erzieherinnengesundheit weil es Grundvoraussetzung für gute Arbeit ist. starke Überbelastung unter den Mitarbeitern, Erzieherinnen fanden toll, dass das mal Thema ist.“ |
|                | „Wir Stadtkindergarten, Kinder haben draußen keine Spielmöglichkeiten, viele Nationalitäten, viele Ernährung unterschiedlich, Versuch auf ein gesunden Norden zu kommen.“ |
|                | „Wird schon praktiziert, durch JolchenKids vertieft.“ |
|                | „Im Vordergrund stehen ja eigentlich die Kinder und nicht wir. Ich meine, wir sollen sowieso nicht im Vordergrund stehen, aber wir dürfen uns dabei auch nicht ganz vergessen. Das hat uns auch eigentlich dazu motiviert, sich für dieses Modul auch zu entscheiden und dass wir dort gucken, was gibt es dort für Dinge, die wir unkompliziert in den Alltag hier mit einfließen lassen können […]“ |

Programmförderliche und hinderliche Faktoren

Als programmförderliche Faktoren wurden insbesondere die zeitliche und inhaltliche Flexibilität in der Implementierung der Module über 3 Jahre, die Materialien und die daraus resultierende gute Integrierbarkeit des Programms in den Kita-Alltag beurteilt. Inhaltlich betrachtet passten die Themen sehr gut in den Kita-Alltag. Als besonders hilfreich galten die kindgerechten und immer griffbereiten Materialien (insbesondere die Kartonboxen und Handpuppe) sowie die Betreuung und Schulungen seitens der AOK. Auch das Konzept „Gesundheit als Entdeckungsräume“ wurde als förderlich empfunden.

Als hinderliche Faktoren wurden der hohe Zeitaufwand, insbesondere zu Beginn der Projektimplementierung im Zusammenhang mit der Planungspflege, d.h. die regelmäßigen Treffen und die Einarbeitung in die umfangreichen Hintergrundinformationen, genannt. Weiterhin wurden Probleme in der Einbeziehung der Eltern genannt (z.B. mangelnde Zeit und Berufstätigkeit der Eltern), so dass die Umsetzung von Bausteinen, die eine aktive Teilnahme von Eltern vorsehen, als zeitaufwendig und schwer umsetzbar wahrgenommen wurde.

Änderungswünsche

In Bezug auf Änderungswünsche nannten die Erzieher/innen eine Ausweitung des Programms auf Krippenkinderv. eine flexibler gestaltete Elterneinbindung und einen regionalen Austausch auf Seiten der teilnehmenden Kitas. Zudem wünschten sich Kitas mit vielen Kita-Gruppen eine größere Stückzahl an Materialien.

Diskussion


Die Priorität lag in den meisten Fällen auf den die Kinder betreffenden Themen. Entsprechend wurde das Modul „Erzieher/innengesundheit“ im Vergleich zu den Modulen, die sich an die Kinder richteten, seltener als Startmodul gewählt. Gerade im Hinblick auf die flexible Gestaltung des Programms deuten unsere Ergebnisse in Bezug auf die Inanspruchnahme von zeit- und leseintensiven Materialien und Workshops darauf hin, dass ausreichend Zeit eingeplant werden muss, um sich mit der thematischen Bandbreite des Programms vertraut zu machen. Bezugnehmend der Elternpartizipation, die Über- sichtsarbeit zufolge einen entscheidenden Faktor für die Wirksamkeit kitabasierter Interventionen darstellt [4, 10], fanden wir, dass die gezielte Einbindung von Eltern zumindest in der Anfangsphase einer Programmmplementierung von einigen Kitas als hinderlich empfunden wurde. Nicht nur im Rahmen der Gesundheitsförderung, sondern auch im
| Tab. 5 Zusammenfassende Darstellung programmförderlicher und -hinderlicher Faktoren (Fokusgruppen- und Interviewergebnisse) |
|----------------------------------|--------------------------------------------------|
| Förderlicher Faktor | Veranschaulichendes Zitat |
| Materialien | „Was geholfen hat, sind vor allem diese Material-Kärtchen. Dass man sich eben neue Anregungen holen kann, was kann man mit den Kindern machen, was auch nicht zu viel Zeit in Anspruch nimmt, dass man es wirklich jeden Tag mit einfließen lassen kann.“ |
| Bisherige Aktivitäten/Ausstattung | „Das heißt solche Sachen wie Trinkstationen […], was bei uns […] einfach schon vorhanden.“ |
| Betreuung | „[Die] Ansprechpartner vor Ort, [und ihr] individuelles Eingehen auf die Kitas.“ |
| Konzept „Gesundheit als Entdeckungsreise“ | „Kinder lernen ja eigentlich nur, indem sie es ausprobieren. Und an sich selber erforschen und erleben in ihrem Alltag. Und von daher denke ich ist das Projekt dazu geeignet, dass Kinder da auch Lernfreude haben.“ |
| Modulwahl/Flexibilität | „Wir haben ein ganz vielfältiges Programm und noch zig andere Themen oder auch das was aktuell von Kindern reinkommt. […] Von daher finde ich das […] gut, wenn man da nicht ganz so eng die Sache zuert.“ |
| „Wir sind gebunden an den Tagesablauf im Haus. Und an Abläufe im Haus, wo wir einfach gezwungen sind uns ein Stück weit da auch anzupassen und unsere Nischen zu finden, um das tatsächlich noch so zu machen, dass wir uns noch dabei gut fühlen. Und […] wie gesagt, so wie es momentan läuft, fühle ich mich dabei eigentlich ganz gut.“ |

<table>
<thead>
<tr>
<th>Hinderlicher Faktor</th>
<th>Veranschaulichendes Zitat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elternbeteiligung</td>
<td>„Worum geht es die Eltern mit ins Boot holen. Und so weiter. Das wissen wir alles. […] Und das setzt uns immer so ein bisschen unter Druck. […]“</td>
</tr>
<tr>
<td>„Wir haben viele berufstätige Eltern, die das dann auch vom Zeitlichen her nicht schaffen. […] Wenn ich […] eine Aktion am Nachmittag ansetze auf 14 Uhr, da haben viele einfach noch nicht Feierabend. […] Und wenn ich es nach der Dienstzeit ansetze, entstehen Überrunden, das heißt, ich fehle dann an anderen Tagen.“</td>
<td></td>
</tr>
<tr>
<td>„Schwierig die Eltern miteinzubeziehen / zu motivieren, lohnt sich der Aufwand für die Elternaktionen.“</td>
<td></td>
</tr>
<tr>
<td>Mangel an zeitlichen Ressourcen</td>
<td>„Das fängt an bei dem Leitfaden für das ganze Projekt, das geht dann weiter über die Beschreibungen der einzelnen Module, die vorgestellt werden, hin über Vorschläge, wie man Sportstunden aufbauen könnte. Da ließ man sich immer mal richtig was durch, aber man nimmt sich einfach nie die Zeit zu sagen: Ich setz mich jetzt hin und arbeite jetzt das ganze hieß am Stück durch. Das passiert immer so bruchstückhaft, was eigentlich ein bisschen schade ist.“</td>
</tr>
<tr>
<td>„Das ist so ein Projekt, da ist immer […] viel los und da ist viel Spannung und alle denken, was erwartet mich denn hier. Aber wenn es dann am Laufen ist, bei uns ist es ja fast schon jetzt ein Dreivierteljahr. Dann merkt man auch, dann wird vieles zur Routine.“</td>
<td></td>
</tr>
<tr>
<td>Organisatorisches</td>
<td>„Wir wollen auf keinen Fall nur mit den 3-Jährigen diese Sache machen. Bei uns sollen […] die beiden Krippengruppen […] mit einbezogen werden und auch wieder die Eltern und so weiter.“</td>
</tr>
<tr>
<td>Änderungswünsche</td>
<td>Veranschaulichendes Zitat</td>
</tr>
<tr>
<td>Organisatorisches</td>
<td>„Manchmal finde ich eigentlich auch so einen Austausch […] unter Kitas [sinnvoll], […] vielleicht als Anregung […]? Dass es so ein Treffen zwischen den Kitas […] vielleicht einmal im Quartal oder so etwas gibt, wo man einfach mal zusammen reflektieren kann, was ist gut, was ist nicht so gut, habt ihr eine andere Idee. Was habt ihr gemacht?“</td>
</tr>
</tbody>
</table>


**Stärken und Limitationen**


**Fazit für die Praxis**

Prävention/Gesundheitsförderung

ker zu thematisieren. Vor dem Hintergrund des Ausbaus der Unter 3-Jährigen-Betreuung in Deutschland und der verbreiteten Praxis von offenen bzw. altersgemischten Kita-Gruppen erscheint es zudem empfehlenswert, JolínchenKids, aber auch andere bestehende Gesundheitsförderungsprogramme für 3–6-Jährige auf den Unter-3-Jährigen-Bereich zu erweitern.

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**Einhaltung ethischer Richtlinien**

Interessenkonflikt. B. Steenbock, H. Zeed, S. Liedtke und C.R. Pischke geben an, dass keine Interessenkonflikte vorliegen.

Dieser Beitrag beinhaltet keine Studien an Menschen oder Tieren.

**Literatur**

A feasibility trial to examine the social norms approach for the prevention and reduction of licit and illicit drug use in European University and college students

Claudia R Pischke1, Hajo Zeeb1, Guido van Hal2, Bart Vriesacker2, John McAlaney3, Bridgette M Bewick4, Yildiz Akvardar5, Francisco Guillén-Grima6, Olga Orosova7, Ferdinand Salonna7, Ondrej Kalina7, Christiane Stock8, Stefanie M Helmer1 and Rafael T Mikolajczyk1,9,10

Abstract

Background: Incorrect perceptions of high rates of peer alcohol and tobacco use are predictive of increased personal use in student populations. Correcting misperceptions by providing feedback has been shown to be an effective intervention for reducing licit drug use. It is currently unknown if social norms interventions are effective in preventing and reducing illicit drug use in European students. The purpose of this paper is to describe the design of a multi-site cluster controlled trial of a web-based social norms intervention aimed at reducing licit and preventing illicit drug use in European university students.

Methods/Design: An online questionnaire to assess rates of drug use will be developed and translated based on existing social norms surveys. Students from sixteen universities in seven participating European countries will be invited to complete the questionnaire. Both intervention and control sites will be chosen by convenience. In each country, the intervention site will be the university that the local principal investigator is affiliated with. We aim to recruit 1000 students per site (baseline assessment). All participants will complete the online questionnaire at baseline. Baseline data will be used to develop social norms messages that will be included in a web-based intervention. The intervention group will receive individualized social norms feedback. The website will remain online during the following 5 months. After five months, a second survey will be conducted and effects of the intervention on social norms and drug use will be measured in comparison to the control site.

Discussion: This project is the first cross-national European collaboration to investigate the feasibility of a social norms intervention to reduce licit and prevent illicit drug use among European university students.

Final trial registration number: DRKS00004375 on the ‘German Clinical Trials Register’.

Keywords: Social norms, Prevention, Drug use, Intervention, University/College students, Europe

Background

Licit and illicit drug use remains a major public health threat in Europe. One quarter of European 18–21 year olds and 41% of 21–24 years olds report having consumed an illicit drug (i.e., cannabis, amphetamines, ecstasy, LSD, opiates, cocaine, crack or mushrooms) in their lifetime [1].

Four percent of all European Union (EU) deaths among those aged 15–39 years are drug-related [1]. The harmful use of legal drugs, such as tobacco and alcohol, also continues to be a problem in the EU. For example, in Germany, 21% of young adults report binge drinking at least once a month and 30% of women and 38% of men aged 20–24 are regular smokers [2-6]. Lastly, the use of multiple drugs at the same time (i.e., polydrug use) is widespread in Europe with the majority of drug use combinations including alcohol [1]. To date, no large-
scale study has compared single and polydrug use by college and university students living in different EU countries.

Public health strategies and policies addressing issues of drug use in Europe are heterogeneous. Some European countries have a strategy for preventing illicit drug use but none for alcohol whereas others have separate or interlinked strategies for illicit drugs and alcohol compared to yet others without a national policy regarding drug use [1]. There are multiple reasons for the absence of a shared European policy model addressing issues of drug use across all European countries. One reason is that prevalence rates of short- and evidence of long-term health consequences associated with licit and illicit drug use vary by country [1,7-9] and pose differential demands on the respective national health care systems (which also vary by European country). Secondly, legal ramifications of licit and illicit drug use vary across countries. This diversity renders a development of a joint public health policy to address drug use among young European adults problematic. Instead of focusing on the development of such a joint policy, public health strategies aimed at changing social and interpersonal processes surrounding drug use among young adults may be more feasible for the prevention and reduction of drug use.

Social influence in the form of social norms, or the "perceptions and beliefs what is 'normal' behaviour in the people close to us" (p.3, [10]) has been identified as a key factor modifying drug use behaviour among young adults [11-13]. It is known that individuals, and young adults in particular, tend to overestimate drug use in their respective peer group and that these incorrect perceptions are predictive of higher rates of personal drug use [14-20]. In regard to alcohol use, these misperceptions can be about both rates of peer alcohol use (descriptive norms) and the social acceptability of alcohol use (injunctive norms). Individuals may overestimate the frequency and quantity of alcohol consumption of their peers, and also overestimate how acceptable their peers feel heavy drinking to be. The individual is then motivated to match their own alcohol consumption to what is an incorrect perception [21,22]. A smaller number of studies have evaluated the role of injunctive norms on illicit drug use. For example, one study showed that students tend to overestimate the level of approval of marijuana use behaviour in their peer group [23].

The social norms approach is one harm reduction strategy that has gained rapid recognition in the past two decades. This approach takes advantage of young adults' susceptibility to peer influence. The approach works on the premise that if misperceptions are challenged then the social pressure on the individual will lessen and their own rate of use will fall. In the case of alcohol consumption, a social norms campaign may consist of surveying a college student population to identify the actual and perceived rates of alcohol use, and then presenting this information back to the student population. Traditional social norms campaigns have done this by providing social norms feedback to student populations through mass media campaigns and a variety of peer education activities. This approach has been found to be an effective method of reducing alcohol and drug harm at several college campuses [24,25], and has also been used successfully to address other risky behaviours [26]. More recently, online technology has been used to offer individuals personalised social norms feedback. Online feedback operates on the same principles as mass media social norms campaigns, except that the discrepancy between personal consumption, perceived peer consumption and actual reported peer consumption is made even more explicit to the individual. Preliminary research suggests that instantaneous, personalised, computer delivered feedback can be highly effective [27]. There is, however, a relative paucity of empirical studies which have explored this technique.

The social norms approach originated in the United States of America (USA) and to date many of the published studies address reduction of alcohol and drug harm on American college campuses. Initial studies assessing rates of drug use and associated social norms in European students indicate that a discrepancy between perceived and actual social norms on tobacco and alcohol use also exists in European young adult and student populations [18-20,28]. This raises the possibility of using the social norms approach to address risky health behaviours in Europe in the same way that it has been used in the USA. A relatively small number of social norms campaigns have been implemented in Europe and Australia [26]. Limitations in the existing evidence base mean that there is however a need for further studies investigating the feasibility of using this approach outside of the USA. In particular, there are several cultural and legislative differences between the USA and European countries that could potentially moderate both the role of misperceptions in alcohol and drug use behaviour, as well as the outcome of a social norms campaign. In addition, there are several gaps in the literature which need to be addressed. Firstly, there is a need to more fully explore the potential of online personalised feedback social norms campaigns in university and college settings. Secondly, there is a lack of research on the social norms approach in the prevention of tobacco, illicit and polydrug use, which is identified as an area of action in the EU Drug Action Plan 2009 – 2012. Finally, there is a lack of multi-language social norms interventions which can be applied simultaneously to students in different countries. If the social norms approach is to be implemented in
more culturally and geographically diverse settings such as Europe then it is important these issues are addressed.

The objective of this paper is to describe the aims and study design of the project, entitled 'Social Norms Intervention for the prevention of Polydrug use (SNIFE)'. SNIFE is a European co-operation project funded by the European Commission, Directorate General Justice, Freedom and Security. This paper will outline the SNIFE project, a multi-site cluster controlled trial of a web-based social norms intervention aimed at reducing licit and preventing illicit and polydrug use in university and college students in seven participating countries. SNIFE is the first cross-national European study investigating the feasibility of such an intervention.

Methods/Design

Aims of the project
This project aims to examine the feasibility of an intervention to prevent and reduce the consumption of licit and illicit drugs among university students in six European countries and Turkey, which is a candidate country for the EU (for simplicity we refer to seven European countries in the remaining text). The specific aims of the SNIFE project are:

a) To assess and compare self-reported consumption rates of licit and illicit drugs among university and college students from at least two universities or colleges in seven European countries

b) To examine the feasibility (i.e., understanding, utility and applicability) of a web-based social norms intervention in the participating countries, and

c) To compare the effects of this e-health intervention on related norms and consumption of both licit (alcohol, especially binge drinking, tobacco and sedatives) and illicit drug use (cannabis, cocaine, synthetic drugs, not prescribed medication, inhalants) in study participants allocated to the intervention with a control group over the course of 5 months.

Study design
The SNIFE study is a multi-site cluster controlled trial conducted in seven European countries. Each country aims to recruit 2000 students at two or more different universities (or colleges); n=1000 at the university serving as the intervention site, n=1000 at a second university serving as the control site. Both intervention and control sites will be chosen by convenience. In each country, the intervention site will be the university that the local principal investigator is affiliated with. The total duration of the project will be 24 months. Data collection instruments and preliminary work on the intervention will take place over the summer preceding the start of the academic year. Data will then be collected from students at both intervention and control sites during the start of autumn semester of the academic year (T0). This information will then be used as the basis for the online intervention, which will be made available to students at the intervention sites later in the semester. Discussion groups will be held with students during the development and implementation of the intervention and changes may be made according to their input. A second period of data collection will take place towards the end of the spring semester of the same academic year at both intervention and control sites (T1). At the end of the study, students at the control sites will be given access to the intervention.

Sample size calculation
For the purpose of describing relevant social norms and behaviours, we aim to reach a sample size of 1000 participants in the baseline surveys, allowing the estimation of prevalence with a 95% confidence interval of max. ±3%. Assuming a 40% loss during follow-up, 600 students are expected to participate in the second survey at each site of each participating country. This sample size is sufficient to detect a difference in the rate of binge drinking between the intervention and control sites (at follow-up) corresponding to an effect size of 0.2 at the level of p<0.05 with 89% power. The standardized effect size of 0.2 was reported for a binge drinking reduction in a previous study [27] and is a weak effect according to Cohen. This sample size calculation is based on the assumption of a relatively low intra-cluster correlation (0.02), i.e., assuming small differences between countries.

Ethics
The study protocol was approved by the relevant institutional review boards or ethics committees in all participating countries (e.g., University of Bremen, Bremen, Germany; University Hospital Antwerp and the University of Antwerp, Antwerp, Belgium; University of Bradford, Bradford, United Kingdom; Public University of Navarra, Navarra, Spain; University of Southern Denmark, Esbjerg, Denmark; University of Pavol Jozef Safárik University, Košice, Slovak Republic; Marmara University School of Medicine, Istanbul, Turkey). SNIFE researchers obtained permission from deans of the respective universities/colleges in each country to recruit students at their universities.

Setting and participants
Students from all faculties of the respective university or colleges and from all semesters will be invited to enrol in this study.
Recruitment
Students will be contacted via email, the universities’ intranet or website, or via direct face-to-face communication in seminars. To increase the visibility of the study and to facilitate recruitment, flyers and postcards advertising the study will be printed and laid out at all participating universities and at communal areas around the university (information desks, cafeterias). The project will also be publicized in general local newspaper articles, in student newsletters, at local radio broadcasts, at university announcements, and at university lectures and seminars. Furthermore, information about the study will be provided on social media accounts such as Twitter and Facebook. Participants will be consented to the study upon their online-registration.

Study registration
Students at both intervention and control sites will be invited to register on the project website, whilst the online survey is under development. When registering on the website they will only be asked to supply their email address. They will be told that by doing so, they will later be invited to take part in a project that will let them see how their alcohol and drug use compares to their peers. When the survey goes online all pre-registered students will be emailed a link to it and will be invited to take part. Simultaneously, efforts will be made at each site to advertise the website to students who have not already registered.

Data collection
When these students log onto the website they will be asked to provide their email address and then proceed to the baseline survey. The baseline survey will include questions regarding the frequency of personal and peer drug use and related social norms. After a month students at the intervention site who have completed the baseline survey will be emailed and notified that they can now access the intervention website.

All data collected up until this point therefore will become the baseline data. However, the intervention website will operate by asking students for their current use and perceptions so that this information can be immediately presented back to them alongside the actual campus norms. As such, although the baseline data will already be complete, the website will continue to collect data every time a student logs on to get their personalised feedback – i.e., every time the student wants to get personalised feedback they will have to do the survey again. New students who did not complete the survey during the baseline period can still register, complete the survey, and get their personalised feedback. The second data collection phase will occur at 5 months. All study participants will be emailed and asked to visit the website to complete the survey, even if in the case of students at the intervention sites, they have already been visiting the website and completing the survey.

Students at both control and intervention sites will be given the same basic information – that by taking part in the project and completing the surveys they will be able to access personalised feedback. The only difference is that intervention site students will be told they will get access to this feedback in a short time period, whereas control site students will be told that they will get access the following year, i.e., the control group will receive access to this feedback after the follow-up assessment is completed.

The social norms intervention
The social norms intervention will be an instantaneous personalized feedback and will take the following form: the perceived peer drug use (e.g., 60% of the male/female students at your university think that the majority of male/female students use marijuana at least once a month) will be contrasted with the assessed peer drug use among students of the same gender from the baseline questionnaire (e.g., 4% of the male/female students at your university use marijuana) to highlight discrepancies. Additionally, the personal drug use pattern (e.g., “I have five alcoholic drinks during a typical drinking session.”) will be put into relation to the drug use in the peer group (same-gender, same university, e.g., “Actually, most male students of my university (68%) drink no more than four alcoholic drinks during a typical drinking session!”). These two comparisons will form the descriptive norms feedback. In addition, information on injunctive norms (i.e., general perceptions about whether drug use is accepted in the peer group) will be provided in some of the feedback messages (e.g., “Did you know that 91% of male students at Bradford think it is never okay to use ecstasy?”).

Study participants from the intervention sites will be invited to access the feedback approximately two weeks after the baseline assessment and they will be informed that they will have the opportunity to access the intervention multiple times during the next 5 months. It is important to note that every time a student wishes to get feedback using the intervention they will have to first provide information about their own drug behaviour and perceptions.

All intervention materials including the text for the registration page, the baseline screening survey, and the feedback will be developed in English. The English version will then be translated into Dutch, Danish, German, Slovakian, Turkish, and Spanish. All materials will be pre-tested with students in each country.
Content of the questionnaire

Demographic information
The questionnaire will include demographic questions on age, gender, religiosity, place of residence (e.g., university accommodation with other students, private accommodation), disposable income, disposable income spent on alcohol, tobacco and other drugs, country of origin, length of stay in the respective country and whether a student came to study to their current country. Participants will also be asked to provide information regarding their degree, subject, and year of their study.

Drug use
The use of the following drugs will be assessed: Alcoholic beverages (beer, wine, spirits, etc.), tobacco products (cigarettes, chewing tobacco, cigars, etc.), cannabis (marijuana, pot, grass, hash, etc.), medication to improve academic performance (Ritalin) which was not prescribed, synthetic cannabis (spice, etc.), cocaine (coke, crack, etc.), ecstasy, other amphetamine-type stimulants (speed, meth, etc.), sedatives or sleeping pills (diazepam, alprazolam, flunitrazepam, midazolam, stilnox, etc.) which were not prescribed, hallucinogens (LSD, acid, mushrooms, trips, ketamine, etc.), inhalants (nitrous, glue, petrol, paint thinner, etc.). In addition, binge drinking and polydrug use (alcohol and tobacco, alcohol and any other illicit drug) will be assessed. The choice of drugs included will be based on the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST), developed by the World Health Organisation [29].

A number of revisions will be made to adapt this measure for use in a student population. An item on the use of non-prescribed medication used as either sedatives or to improve academic performance will be included, in light of the existing literature on this issue [30]. In contrast to the ASSIST measure, separate items will be used to measure ecstasy use as opposed to other amphetamine type stimulants. Recent research suggests that after several years of declining use, there has been a recent resurgence in the use of ecstasy in young adult populations [31]. Therefore it is of interest to measure use of this substance separately so that more precise data on rates of use in student populations can be determined. This also allows for specific norms messages on ecstasy to be delivered to students during the intervention. The item on the use of opioids in the ASSIST will not be used in the current study, as previous work would suggest that use of this drug is relatively low in young adults populations [31] and there is a need to keep the survey to be used in this study at an overall length which participants can realistically be expected to complete.

The response options that will be used for the substance use items will follow the same pattern of ascending frequency as similar surveys in the area, such as the CORE Alcohol and Drug Survey Long Form [32], which is delivered annually to college students in the USA. The first response option is 'Never in my life' followed by 'Have used but not in the last two months,' 'Once in the last two months,' 'Twice in the last two months' and so on up to 'Every day or nearly every day'. The time frame of the previous two months will cover the period when students are attending university, as planned by the schedule of data collection.

Perceptions of rates of peer drug use
Perceptions of rates of peer drug use will be assessed using items based on the corresponding personal use items. As each social norms survey is by necessity specific to the target population being studied, there are not any single existing measures which can be used for the current project. However, the perception items which have been designed will follow the same principle of previous social norms surveys [18,33], in which the perception item will be as closely worded to the personal use item as possible.

Attitudes toward personal and peer drug use
Personal and perceived social norms regarding attitudes towards drug use will also be assessed. These items will again be based on existing research [32] and will be tailored to the target population of students. The response options range from 'Never ok to use' to 'Ok to use frequently if that is what the person wants to do'.

Frequency of negative consequences in relation to drug use
Items based on the CORE Alcohol and Drug Survey Long Form [32] will be used to assess negative consequences of getting drunk and of other drug use (e.g., missing a class or another commitment, unprotected sex, engagement in violent acts).

Analysis of data
Baseline analyses
Baseline descriptive analyses of social norms and drug use behaviour by gender, social class, nationality, religiosity and residence (e.g., living with parents or other students) will be conducted. Detailed analyses on rates of drug use between reported and perceived drug use and the factors which predict these will be conducted using a MANCOVA analysis.

Outcome evaluation of the intervention trial
Individual changes in drug use behaviours and social norms between baseline and follow-up in intervention and control sites will be tested by bivariate tests and in adjusted regression analyses, similar to previous work [34]. In addition, potential dose response relationships
between frequency of intervention use (e.g., # of times the feedback was accessed online) and changes in norms and behaviours will be evaluated to quantify the “minimal dose” of the intervention or feedback received necessary to produce changes. In further steps, structural equation models will be used to assess relationships between changes in norms and drug use behaviours [35,36].

**Process evaluation**

To document the process of conducting the current study, a process evaluation will be conducted that focuses on recruitment, data collection, intervention development and implementation. Information will be collected throughout the research study. Data collection will primarily be via completion of bespoke written questionnaires by research leads in each country. Email correspondence pertaining to the process evaluation will also be routinely collected and included as a secondary source of data.

**Discussion**

In the past three decades, a multitude of public health strategies targeted toward the prevention of drug use among young adults emerged in the USA and the EU. Some involved anti-drug media campaigns aimed at informing about harmful health consequences of licit and illicit drugs, such as the “Drugwatch” campaign in the USA. Others were educational interventions for drug use prevention informing about the harmful effects of drug use at schools and universities [37,38]. The majority of these prevention approaches were ineffective in reducing rates of licit and/or illicit drug use in young adults [26,39].

Major shortcomings of these approaches included the use of fear appeals and scare tactics, which often emphasize the harmful effects of drugs. These messages may not be taken seriously by the target population because negative consequences of drug use are often overstated and students often correctly perceive that the majority of these consequences are unlikely to occur [39]. In addition, some of the earlier anti-drug campaigns were based on the “Social Inoculation Theory”, according to which teaching students skills to resist peer pressures or “inoculating” them against social influences to use drugs will prevent actual drug use [40]. Our study aims to examine an alternative approach, the social norms approach, which acknowledges the influence of peers on young adults’ drug use behaviour and the role of social norms surrounding drug use in the peer group. Instead of inoculating students against social influence of their peers, this influence is leveraged to affect students’ drug use behaviour by correcting exaggerated perceptions of risky behaviours in the peer group.

The SNIPE project is the first cross-national European multisite cluster-controlled trial to assess and reduce and/or prevent the consumption of licit and illicit drugs among university and college students using the social norms approach. The three major innovations in this study are the application of the social norms approach to the realm of illicit and polydrug use; the comparison of rates of drug use and social norms across the participating countries and the study of feasibility of the same social norms intervention in multiple countries at the same time.

Because this intervention is implemented online, it can be easily made available to other student populations across Europe. We will attempt to disseminate the intervention, should we be able to demonstrate that it is feasible in the European context. A subsequent study in additional European countries and including a longer follow-up is conceivable.

Future avenues of social norms research may also include the conception of studies investigating why and how a person chooses a certain group as a social referent and how they perceive the behaviour of these groups. To date, research has focused on students’ perceptions of other students on their campus. However, there is a lack of work exploring misperceptions in smaller sub-groups of peers. For example, a student’s specific perceptions of the behaviours of the peers in their class rather than just their perception of other students on the campus overall. Further insights into these issues may help us effectively tailor future social norms interventions to persons belonging to various peer groups and to compare intervention effects across peer groups varying in socio-demographic characteristics.

To conclude, the SNIPE study will provide data on rates of drug use and on perceptions about the consumption of licit and illicit drugs among university and college students comparing seven European countries. Further, it will provide answers toward the feasibility of a social norms intervention designed for the reduction of licit and the prevention of illicit drug use at institutions of higher education in the European context.

**Competing interests**

The authors declare that they have no competing interests. In the past, Bewick has received funding from the European Research Advisory Board and has received travel expenses from Anheuser-Busch.

**Authors’ contributions**

All authors contributed to the conception and design of the study, critically revised the manuscript and approved the final document of this protocol. No other manuscripts are under submission with other journals based on this study protocol.

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Student estimations of peer alcohol consumption: Links between the Social Norms Approach and the Health Promoting University concept

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Abstract
Background: The Social Norms Approach, with its focus on positive behaviour and its consensus orientation, is a health promotion intervention of relevance to the context of a Health Promoting University. In particular, the approach could assist with addressing excessive alcohol consumption. Aim: This article aims to discuss the link between the Social Norms Approach and the Health Promoting University, and analyse estimations of peer alcohol consumption among European university students. Methods: A total of 4392 students from universities in six European countries and Turkey were asked to report their own typical alcohol consumption per day and to estimate the same for their peers of same sex. Students were classified as accurate or inaccurate estimators of peer alcohol consumption. Socio-demographic factors and personal alcohol consumption were examined as predictors for an accurate estimation. Results: 72% of male and 51% of female students were identified as having accurate estimations about the amount of alcoholic drinks consumed per day by their peers. Male students, older students, those studying year 3 and above, and Turkish and Danish students were more likely to accurately estimate their peers’ alcohol consumption. Independent from these factors, students’ accurate estimation of peers’ drinking decreased significantly with increasing personal consumption. Conclusions: As accurate estimates of peer alcohol consumption appear to affect personal drinking behaviour positively, Social Norms interventions targeted at correcting possible misperceptions about peer alcohol use among students may be a useful health promotion tool in the context of a Health Promoting University.

Keywords: Social Norms Approach, alcohol consumption, university students, Health Promoting University

Introduction
This article aims to explore to what extent the Social Norms Approach is a useful intervention strategy in the context of a Health Promoting University. Empirical data of alcohol consumption among European students is compared with estimated consumption of their peers to elucidate a need for correcting misperceived norms in university students.

The Health Promoting University concept
The concept of the Health Promoting University was developed as an example of settings-based health promotion in the late 1990s, and has been supported and legitimised by the World Health Organization (WHO) through development and publishing of a strategic framework for the Health Promoting Universities project [1,2]. Three main arguments

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have been raised for promoting health within institutions of higher education: 1. Universities are large institutions in which many people live and experience different aspects of their lives; 2. Students will become professionals and leaders in society and, therefore, universities can increase commitment to health in a wide range of disciplines; and 3. Universities can set an example of good practice with outreach into the community [1]. In addition, entry to universities often coincides with transition into adulthood and living away from the parental home for the first time. The WHO framework identified eight key objectives for a Health Promoting University: promoting health and sustainable policies and planning throughout the university; providing healthy working environments; offering healthy and supportive social environments; establishing and improving primary health care; facilitating personal and social development; ensuring a healthy and sustainable physical environment; encouraging wider academic interests and developments in health promotion; and developing links with the community. The process towards a Health Promoting University requires a commitment to health by senior-level management, and institutional and cultural changes aiming at embedding the principles and aims of a Health Promoting University into the organizational structures and practices of the institution. Based on such structural processes, innovative action for health promotion, such as implementing healthy policies and health promotion interventions, should take place that focuses on the key objectives. Universities then need to decide which type of health promotion interventions should be given priority. The Social Norms Approach is an example of an intervention approach that has potential to facilitate personal and social development among students; this being one of the key objectives of a Health Promoting University.

What is the Social Norms Approach?

Social norms are the ‘perceptions and beliefs what is “normal” behaviour in the people close to us’ [3, p.3] and appear to be among the key factors modifying drug use behaviour among young adults [4,5]. Previous research suggests that young adults tend to overestimate drug use including alcohol in their respective peer group (e.g. [6]), and that these incorrect perceptions are predictive of higher rates of personal use [5,7-10].

Overestimations of peer alcohol use and associations with higher rates of personal use have been widely demonstrated among US college students in the past two decades [4,11-13]. Berkowitz [13] stated in a review that peer influences have a greater impact on individual behaviour than biological, personality, familial, religious, cultural and other influences. In recent years, an increasing number of studies have indicated a similar pattern of overestimation of peer alcohol use and associated increased personal use among European university and college students [6,14-16]. For example, in a study with French students, Franca et al. [15] found that 56% of the students overestimated the prevalence of heavy episodic drinking behaviour in their peers. Overestimations were associated with higher rates of personal heavy episodic drinking and correlates for increased alcohol use included cannabis and tobacco use, academic discipline, sex, and the number of friends. Similarly, Arbour-Nicitopoulos et al. [17] reported correlates with alcohol use. Being in a relationship, living away from home, being white, and the perception that a typical student often consumed alcohol in the past 30 days all predicted personal alcohol use. Predictors for the observed overestimations (vs. correct estimates) of peer alcohol consumption are, however, not generally well understood.

Social norms interventions work on the premise that if overestimations are challenged then the social pressure on the individual will lessen and their own rate of use will fall. In the case of alcohol consumption, a Social Norms campaign may consist of surveying a student population to identify the actual and perceived rates of alcohol use, and then presenting this information back to the student population. Traditional Social Norms interventions provided Social Norms feedback to student populations through mass media campaigns and a variety of peer education activities. This approach has been found to be an effective method of reducing alcohol and drug harm at several college campuses (e.g. [5]), and has also been used successfully to address alcohol-related harms [18]. However, the Social Norms Approach is a harm reduction approach and considers abstinence, although optimal from a health perspective, as an unrealistic goal for the lifestyle of adolescents. Therefore, the Social Norms Approach faces the ethical dilemma that for most students it is likely to reduce the consumption, but for some students with very low or no consumption it might encourage use.

The potential of the Social Norms Approach for a Health Promoting University

The Social Norms Approach is most effective when delivered as part of an ongoing and multifaceted programme that challenges misperceived norms within the population. As such, there is a need for Social Norms practitioners to be mindful of the ability for the context in which the messages are embedded to
undermine the message content. In particular, practitioners should be aware of the synergistic relationship between the wider context and the individual campaigns. Therefore, although a Social Norms Approach is sometimes implemented without incorporating a systems perspective, it is posited that the approach will be more effective if developed in tandem with organizational practice. Specifically, the Social Norms Approach has key characteristics that make it suitable for application in the context of a Health Promoting University. Firstly, the settings approach in general draws on the work of theorists who are not so much concerned with the avoidance of ill-health as with the creation of positive health, described as a salutogenic approach by Antonovsky [19]. In line with the salutogenic paradigm, the Social Norms Approach focuses on positive behaviour rather than blaming deviant or risk behaviours. Secondly, one of the principles and values of a Health Promoting University is a consensus orientation [20,21]. The Social Norms Approach offers the chance to address a potentially conflict-prone theme such as alcohol and other drug use in a way that does not conflict with consensus building communication practices in the setting. The Social Norms Approach does not condemn drug use and does not put moral pressure on students who decide to use alcohol and other drugs, but rather informs students about the predominant lifestyle choices in their own community. As the data used are derived from their own community, the Social Norms Approach helps to facilitate ownership. This is important when addressing alcohol and other drugs as there is a long history of prevention programmes with limited success among young people [22]. The ineffectual nature of some prevention programmes may be partially attributed to their following paternalistic perspectives that conflict with the wish for autonomy in decision making among students. Thirdly, the Social Norms Approach has been successfully applied to addressing and influencing norms across a number of topics ranging from alcohol consumption to sexual harassment [23]. In a healthy setting, different actors, themes and outcomes are interlinked with each other [24], so this holistic approach could be applied to themes subsequently included in the settings agenda.

To investigate the need for a Social Norms intervention among university students in Europe, this article uses data from the baseline data collection of the Social Norms Intervention for the Prevention of Polydrug use (SNIPE) study to explore: 1. to what extent European university students have an accurate (vs. inaccurate) estimation of their peers' amount of alcoholic drinks consumed on a drinking day; 2. to identify predictors of accurate estimation of peer alcohol use; and 3. whether an accurate estimation is associated with a reduced likelihood of personal excessive drinking among university and college students in six European countries and Turkey.

Methods

Study design

The study design is reported in detail elsewhere [25]. The current article is based on the baseline data collected in the SNIPE study, a European collaborative project aimed at assessing the potential of the Social Norms Approach to reduce alcohol and other drug use among university and college students from six European countries and Turkey. Ethical approval for the SNIPE study was obtained at all study sites and permission to recruit students was obtained from university leaderships.

Data collection

Data collection is outlined in detail in the study protocol [25]. In 2012 an online survey was promoted at all study sites (typically two to five institutions per country) using a range of techniques including email, social media, classroom announcements, announcements on virtual learning environments, printed flyers and stalls in social areas. Anonymous online surveys can be a reliable form of data collection when conducted among computer literate populations such as university students [26]. The survey contained items on age and sex, year of study, main area of study (Arts, Business and Law, Engineering, Health and Medicine, Sports Science, Media, Sciences, Social and Educational Sciences) and whether the student was born in another country. Students were also asked: 'How typical a student of your university do you consider yourself to be?', with four response categories from 'very atypical' to 'very typical'. Participants were provided with a definition of an alcoholic drink as half a pint of lager or beer, a shot of vodka, a small glass of wine, a shot of raki, or a small bottle of a ready to drink beverage and were then asked for the number of drinks: 'How many alcoholic drinks would you normally have on a day that you do drink alcohol?'. Students who drank alcohol entered the number of drinks, and students who did not drink alcohol entered 0. Similarly students were asked to estimate: 'How many alcoholic drinks do you think most (at least 51%) of the students of your sex at your university normally have on days that they do drink alcohol?'

The final sample included 4392 participants. Participation by students from universities in the UK
Table I. Male and female students’ own consumption and their estimation of the drinking of their peers of same sex (typical number of alcoholic drinks per day on a day when drinking alcohol).

<table>
<thead>
<tr>
<th>Country (n)</th>
<th>Typical number of drinks per day</th>
<th>Perceived number of drinks among the majority of peers of same sex</th>
<th>Accurate estimators of peer drinking</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>75% percentile</td>
<td>Mean (SE)</td>
</tr>
<tr>
<td><strong>Males</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belgium (n=885)</td>
<td>4.4 (3.7)</td>
<td>6</td>
<td>6.9 (4.1)</td>
</tr>
<tr>
<td>Denmark (n=100)</td>
<td>6.8 (5.8)</td>
<td>10</td>
<td>8.8 (4.1)</td>
</tr>
<tr>
<td>Germany (n=206)</td>
<td>5.4 (4.3)</td>
<td>8</td>
<td>6.2 (3.6)</td>
</tr>
<tr>
<td>Slovak Republic (n=389)</td>
<td>5.3 (4.8)</td>
<td>8</td>
<td>8.0 (4.8)</td>
</tr>
<tr>
<td>Spain (n=50)</td>
<td>5.0 (2.4)</td>
<td>6</td>
<td>6.1 (4.4)</td>
</tr>
<tr>
<td>UK (n=32)</td>
<td>3.3 (4.3)</td>
<td>5</td>
<td>5.3 (3.6)</td>
</tr>
<tr>
<td>Turkey (n=386)</td>
<td>2.6 (4.9)</td>
<td>4</td>
<td>3.3 (4.5)</td>
</tr>
<tr>
<td>All countries (n=1248)</td>
<td>4.5 (4.9)</td>
<td>6</td>
<td>6.2 (4.9)</td>
</tr>
<tr>
<td><strong>Females</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belgium (n=332)</td>
<td>2.9 (2.6)</td>
<td>4</td>
<td>4.8 (2.7)</td>
</tr>
<tr>
<td>Denmark (n=354)</td>
<td>5.7 (4.1)</td>
<td>8</td>
<td>7.6 (3.3)</td>
</tr>
<tr>
<td>Germany (n=295)</td>
<td>3.8 (3.2)</td>
<td>5</td>
<td>5.3 (2.6)</td>
</tr>
<tr>
<td>Slovak Republic (n=1520)</td>
<td>2.9 (2.3)</td>
<td>4</td>
<td>6.1 (4.0)</td>
</tr>
<tr>
<td>Spain (n=131)</td>
<td>3.3 (2.2)</td>
<td>4</td>
<td>5.0 (2.8)</td>
</tr>
<tr>
<td>UK (n=72)</td>
<td>3.4 (4.0)</td>
<td>4</td>
<td>6.5 (5.1)</td>
</tr>
<tr>
<td>Turkey (n=440)</td>
<td>1.6 (1.9)</td>
<td>2</td>
<td>2.7 (1.7)</td>
</tr>
<tr>
<td>All countries (n=3144)</td>
<td>3.1 (2.8)</td>
<td>4</td>
<td>5.5 (3.7)</td>
</tr>
</tbody>
</table>

*75% percentile used as cut-off for accurate estimation.

*Wilcoxon signed ranks test to test for differences between actual drinking and perceived peer drinking.

and Spain was lower compared with the other countries (Table I). The relatively low participation rate was attributed to barriers faced around participant recruitment, for example changes in university regulations meant it was not possible to email notifications directly to all registered students.

Statistical analysis

Data on reported personal behaviour were summarized using means and standard deviation (SD). Using IBM SPSS 20, we applied Wilcoxon signed ranks test to test for differences between personal drinking and perceived peer drinking. Binary logistic regression was used to determine odds ratios (OR) and 95% confidence intervals (95% CI) for factors associated with accurate estimation of peer drinking. Students were classified as accurate estimators if they estimated the number of drinks per day among peers of their sex up to the 75% percentile of the actual number of drinks consumed per day in this group.

The 75% percentile was used as a cut-off, as it represents data from the majority of students. Personal number of alcoholic drinks per day was entered as an independent variable into the regression model. Sex, age, country, born outside the country, typicality as student from low to high were included for adjustment in the regression models. We assumed that students born outside the country were less likely to estimate the alcohol consumption among peers accurately because they may be less experienced with the alcohol drinking culture of the respective country. For the same reason we included typicality as a student into the model, as students who regard themselves as typical may be better able to estimate alcohol consumption among peers. In addition medicine/health as study subject was added to the model as an independent variable, as we assumed that students studying medicine and other health-related subjects are more likely to estimate alcohol consumption among peers accurately. We assumed such a higher level of accuracy as students of medicine and health-related subjects are more likely to have access to information and data on health behaviour.

Results

The mean of the typical number of drinks on a day when drinking alcohol was 3.5 (3.6 SD) drinks in the whole sample, and differed between the seven countries ranging from 2.1 (3.6 SD) among Turkish students to 5.9 (4.5 SD) among Danish students. For males the mean number of drinks on a drinking day was 4.5 (4.9 SD) drinks, whereas the estimated number of drinks among male peers was significantly higher at 6.2 (4.9 SD) drinks per day (see Table I). For females the mean number of drinks on a drinking day was 3.1 (2.8 SD), whereas the estimated
Table II. Factors associated with accurate estimation of the number of drinks per day among peers of same sex.

<table>
<thead>
<tr>
<th></th>
<th>p value</th>
<th>Odds ratio* OR</th>
<th>95% CI for OR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Lower</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>&lt;0.001</td>
<td>0.27</td>
<td>0.23</td>
</tr>
<tr>
<td><strong>Age (per year)</strong></td>
<td>0.011</td>
<td>1.03</td>
<td>1.01</td>
</tr>
<tr>
<td><strong>Year of study</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Higher years of study</td>
<td></td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>First or second year of study</td>
<td>0.009</td>
<td>0.81</td>
<td>0.69</td>
</tr>
<tr>
<td><strong>Study subject</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Medicine/health as study subject</td>
<td>0.756</td>
<td>0.97</td>
<td>0.79</td>
</tr>
<tr>
<td><strong>Country</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turkey</td>
<td></td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Belgium</td>
<td>&lt;0.001</td>
<td>0.28</td>
<td>0.19</td>
</tr>
<tr>
<td>Denmark</td>
<td>0.107</td>
<td>1.40</td>
<td>0.93</td>
</tr>
<tr>
<td>Germany</td>
<td>0.094</td>
<td>0.67</td>
<td>0.47</td>
</tr>
<tr>
<td>Slovak Republic</td>
<td>&lt;0.001</td>
<td>0.14</td>
<td>0.10</td>
</tr>
<tr>
<td>Spain</td>
<td>&lt;0.001</td>
<td>0.32</td>
<td>0.21</td>
</tr>
<tr>
<td>UK</td>
<td>&lt;0.001</td>
<td>0.04</td>
<td>0.02</td>
</tr>
<tr>
<td><strong>Typicality as student</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very atypical/untypical</td>
<td></td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Very typical/typical</td>
<td>0.758</td>
<td>1.07</td>
<td>0.69</td>
</tr>
<tr>
<td><strong>Country of origin</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Born in the same country</td>
<td></td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Born in another country</td>
<td>0.758</td>
<td>1.07</td>
<td>0.69</td>
</tr>
<tr>
<td><strong>Number of drinks per day</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-3 drinks</td>
<td></td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>4-6 drinks</td>
<td>&lt;0.001</td>
<td>0.28</td>
<td>0.23</td>
</tr>
<tr>
<td>7-9 drinks</td>
<td>&lt;0.001</td>
<td>0.16</td>
<td>0.12</td>
</tr>
<tr>
<td>10 or more drinks</td>
<td>&lt;0.001</td>
<td>0.08</td>
<td>0.06</td>
</tr>
</tbody>
</table>

*Odds ratio adjusted for all other variables in the table.

The proportion of students classified as accurate estimators were those who estimated the number of drinks per day among peers of their sex up to the 75% percentile (cut-off) of the actual number of drinks consumed per day in this group. Overall, this proportion was 72% among males (ranging from 52% in Belgium to 82% in Germany and Turkey) and 51% among females (ranging from 34% in the Slovak Republic to 87% in Turkey).

Female students had lower odds for accurate estimations as did students in the first or second year of studies (see Table II). Consequently, older students were more likely to be accurate estimators. When compared with Turkish students as reference, Belgian, German, Slovakian and Spanish students were less likely to estimate their peers' drinking accurately, whereas Danish students did not differ significantly from Turkish students. Whether students perceive themselves as typical students, whether they study medicine/health and whether they were born in another country were not associated with accurate estimation. However, accurate estimation of peers' drinking decreased significantly with increasing numbers of own drinks per day.

**Discussion**

Overall, 28% of male and 49% of females overestimated the number of drinks per day among fellow students of the same sex. This suggests that Social Norms feedback would be useful in correcting inaccurate perceptions of normative alcohol consumption in a substantial number of students.

Bertholet et al. [27] examined predictors for accurate and inaccurate estimations of alcohol use among 9686 Swiss students. They found that approximately 19% made a correct estimate compared with 46% of the students overestimating drinking behaviour.
among their peers. Those students who overestimated rates of alcohol consumption in their peers also drank more. Except for current drinking, variables such as age, education level, occupation, living environment, family history of alcohol problems did not predict overestimations of peer alcohol use. A second study compared correct and overestimates (and underestimates) by drinking norm on the campus (i.e. median frequency of alcohol use at the campus: once per month, twice per month, once per week) [28]. Overestimates were apparent for 87%, 86% and 56% of the students in each category. Correct estimates were prevalent among 9%, 10% and 41% of the students. In addition, Perkins [28] compared light drinkers or abstainers who overestimated the norm to those accurately perceiving the campus norm and found that those who overestimated the norm felt less valued as a person at their school, were unhappier at the school most of the time, felt that they fit in less and that it was not important to work with other students to improve the school compared with those who accurately perceived the norm. To our knowledge, these two studies are the only ones to date investigating predictors of overestimations of alcohol consumption. Further, we are not aware of previous studies comparing predictive factors for perceptions about peer alcohol use in several EU countries.

The proportion of students accurately estimating the alcohol consumption of peers differed between countries, with higher levels found in Denmark and Turkey and relatively lower levels in Belgium, Spain, the Slovak Republic and Germany. In the UK the level of accurate estimation was high only among males, but low among females. Most differences between countries remained significant even after adjusting for own alcohol consumption and other factors like sex and age. These country differences are, therefore, hard to explain from the current data.

Female students were less likely to estimate the consumption of female peers accurately. A meta-analysis has also found that females are misperceiving more [29] and this has been attributed to females being more influenced by the social environment or women being less involved in the culture of alcohol use, therefore misperceiving it more [13]. Older students who were in year three or above of their studies were more likely to be accurate estimators of peer drinking, which is most likely because they have more time to observe their peers' behaviour. McAlaney and McMahon [16] also found less misperceptions among older students. Bertholet et al. [27], however, did not find an association between age and estimates of peer alcohol use.

Although we assumed that students studying medicine or any other health-related subject are more likely to estimate alcohol consumption among peers accurately, this assumption was not supported by our analysis. Moreover, being born outside the country and seeing oneself as a typical student were also not associated with accurate estimation of peer drinking. There are other factors not included in this study that are related to overestimating alcohol use in the peer group that, had the data been available, could have helped to explain the moderators and mediators of estimation. Bertholet et al. [27] examined education level, occupation, living environment, family history of alcohol problems and could not demonstrate a relationship between these factors and accurate and inaccurate estimations of alcohol use. Perkins [28] found a sense of alienation from campus life in a sub-analysis with light drinkers and abstainers who overestimated drinking rates among their peers. Other factors not explored in our study such as current portrayal of alcohol use in the media or alcohol consumption among friends outside of university may be more salient when estimating peer alcohol use.

Accurate estimation of peer alcohol consumption was strongly associated with low number of alcoholic drinks consumed per day. This indicates that independent of the country, sex and other factors, students who made accurate estimates of their peers drinking are more likely to drink moderate amounts of alcohol per day when compared with overestimating students. This finding lends support to the use of Social Norms feedback to create realistic perceptions of the level of alcohol consumption of peers. As such feedback has been successful in reducing excessive alcohol drinking among students in some studies [5,30], we assume that the approach might lead to lower consumption in European students as well.

Limitations of the current study need to be acknowledged. We used self-reported data of alcohol consumption and potential under-reporting by respondents needs to be taken into account, although previous research has demonstrated that self-reported data of alcohol use can be reliable [31,32]. As a result of the self-selecting nature of the sample, we cannot rule out that those who responded have alcohol consumption behaviours different from the whole student body at each institution. This may be particularly true for male students, because they were less likely than females to participate in the study. In addition, prevalence data on actual alcohol consumption needs to be interpreted with caution, because in some countries (e.g. the UK) the sample size was low. As the data are cross-sectional, the direction of effects cannot be ascertained and the findings could only talk of associations not causations. The analysis
assumes that perceptions are the cause of behaviour rather than behaviour being the cause of perceptions. This assumption is supported by longitudinal studies in the field, although it has been noted that a degree of reciprocal causality is present [33].

The SNIE study was designed as a standalone feasibility study [25] without being embedded in a whole system approach of a Health Promoting University. Therefore, any testing of the effectiveness of the Social Norms intervention would only provide evidence for effectiveness of an intervention in a setting, but would not contribute to the sparse evidence-base of comprehensive settings approaches, which is a methodologically difficult and complex task [24]. We argue that universities who are developing a comprehensive whole university approach towards better health of students may take advantage of such feasibility research to decide on the usefulness of the Social Norms Approach for addressing their specific health goals. Dooris [24] proposes a model that highlights the need to combine organization development with high visibility projects in settings projects. A Social Norms Approach intervention could be such a high visibility project that meets the need to correct misperceived norms among students. The positive messages encouraging students to engage in only moderate or no alcohol consumption, as the majority of students do, are in accordance with the focus on resources and competencies that the salutogenic paradigm of the Health Promoting University suggests. Moreover, one can assume that organizational practices of a Health Promoting University such as non-alcoholic social events and a limitation of alcohol availability on campus, provide an environment that makes Social Norms interventions even more effective. In conclusion, we argue that the Social Norms Approach and the Health Promoting University would mutually support each others’ aims when combined in health promotion practice.

Conflict of interest
The authors declare that there is no conflict of interest.

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References
Student estimations of peer alcohol consumption: Links between the Social Norms Approach


Normative misperceptions of tobacco use among university students in seven European countries: Baseline findings of the ‘Social Norms Intervention for the prevention of Polydrug use’ study☆

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HIGHLIGHTS

- Tobacco use remains substantial among European university students.
- Students appear to have misperceptions of peer use and approval of tobacco use.
- Perceived norms are an important predictor of personal tobacco use.

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ABSTRACT

Introduction: Research conducted in North America suggests that students tend to overestimate tobacco use among their peers. This perceived norm may impact personal tobacco use. It remains unclear how these perceptions influence tobacco use among European students. The two aims were to investigate possible self-other discrepancies regarding personal use and attitudes towards use and to evaluate if perceptions of peer use and peer approval of use are associated with personal use and approval of tobacco use.

Methods: The EU-funded ‘Social Norms Intervention for the prevention of Polydrug use’ study was conducted in Belgium, Denmark, Germany, Slovak Republic, Spain, Turkey and United Kingdom. In total, 4482 students (71% female) answered an online survey including questions on personal and perceived tobacco use and personal and perceived attitudes towards tobacco use.

Results: Across all countries, the majority of students perceived tobacco use of their peers to be higher than their own use. The perception that the majority (>50%) of peers used tobacco regularly in the past two months was significantly associated with higher odds for personal regular use (OR: 2.68, 95% CI: 1.90–3.73). The perception that the majority of peers approve of tobacco use was significantly associated with higher odds for personal approval of tobacco use (OR: 6.49, 95% CI: 4.54–9.28).

☆ SNIP: 'Social Norms Intervention for the prevention of Polydrug use'.
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1. Introduction

Despite the large reduction in global smoking prevalence rates for both men and women in the past three decades, the number of daily smokers is still on the rise worldwide (Wipfli & Samet, 2009). Currently, 1.3 billion people are estimated to smoke (Wipfli & Samet, 2009). Smoking and second-hand tobacco smoke exposure is associated with adverse health outcomes, such as cancer, respiratory or cardiovascular diseases (Eriksen, Mackay, & Ross, 2012). Six million deaths worldwide are attributable to tobacco use every year (World Health Organization, 2014a). Low and middle-income countries are disproportionately affected as 80% of all tobacco users live and two thirds of all tobacco-related deaths occur in these countries (World Health Organization, 2014a). Even in high-income countries, where substantial financial resources are allocated by governments towards the implementation of population-based tobacco-control strategies (Gallet & Catlin, 2009), rates of smoking remain relatively high (Gallus, Lugo, La Vecchia, et al., 2014; Lorert-Tielen, Renteria, Sharp, et al., 2013). This is true for European countries and tends to be particularly true for younger populations (Huisman, Kunst, & Mackenbach, 2005). Approximately one in three males and one in four females in Europe below the age of 25 years is a smoker (Huisman, Kunst, & Mackenbach, 2005).

The lack of harmonization of implementation of tobacco-control strategies across Europe could explain the relatively high tobacco use in the region. There are considerable variations in the strategies (e.g., smoking bans, tobacco taxation, anti-tobacco media campaigns) adopted by individual countries and differences in the degree to which these strategies are enforced (Gallus et al., 2014). In some countries, such as Ireland, public smoking bans were introduced (starting in 2004) and strictly enforced and led to immediate reductions in tobacco-related mortality and morbidity (Stallings-Smith, Goodman, Kabir, Clancy, & Zeka, 2014; Stallings-Smith, Zeka, Goodman, Kabir, & Clancy, 2013). In contrast, in Germany, while federal smoke-free laws to ban smoking in public places were passed in 2007 (Gesetz zur Einführung eines Rauchverbots in Einrichtungen des Bundes und öffentlichen Verkehrsmitteln (Bundesnichtraucherschutzgesetz), 2007; Gesetz zum Schutz vor den Gefahren des Passivrauchens, 2007), smoking ban exemptions of the introduced law were subsequently passed at the state level. As a consequence, reductions in smoking rates (from 2005–2009) were only noted in those states with an early ratification of the law (Kohler & Minkner, 2014). Initiatives to harmonize tobacco control efforts across Europe, for example MPOWER (World Health Organization, 2014b) which was launched in 2013, may result in more consistent reductions in smoking rates and associated morbidity and mortality in the decades to come.

National and local social norms regarding tobacco use may change when European countries begin to implement and enforce tobacco control strategies more stringently. These new strategies may lead to smoking becoming less visible in public and may weaken approval towards smoking. In the U.S., new several decades after the implementation of smoking bans the approval of smoking has progressively decreased (Robert Wood Johnson Foundation, 2014). Americans now endorse smoking bans and limits on advertisements for tobacco products more than 20 years ago. In the younger segment of society (under 25 years) rates of smoking fell to under 20% in recent years and disapproval of tobacco use appeared to increase (Robert Wood Johnson Foundation, 2014). Such changes in social norms may manifest themselves in several decades in Europe. Efforts to change social norms in closed settings targeting groups at risk for smoking initiation or risk for increased smoking might help address currently high rates of smoking among young European adults.

One promising closed setting to target social norms is universities. Students are faced with social and academic challenges and pressures when entering university. Strategies to cope with these pressures and to alleviate stress also include smoking (Kassel, Stroud, & Paronis, 2003; Nichter, Nichter, & Carlisle, 2007). The role of both, descriptive norms (i.e., the perception of quantity and frequency of substance use in the peer group) as well as injunctive norms (i.e., the perception of approval of substance use in the peer group) (Borsari & Carey, 2003) in predicting personal tobacco use has been extensively researched at U.S. and Canadian college campuses (e.g., Arbour-Nicitopoulos, Kwan, Lowe, Taman, & Faulkner, 2010; Edwards, Bennett, Wolin, et al., 2008; Perkins, Meilman, Leichliter, Cashin, & Presley, 1999). For example, Perkins et al. (1999) conducted surveys on substance use, including tobacco, at 100 different college campuses and found that respondents substantially overestimated how often average students consumed the respective substance. On campuses where no use was predominantly reported by students, only 66% of students accurately perceived that the average student did not consume any tobacco products. Conversely, more than three thirds of students falsely believed that the typical student consumed tobacco weekly; approximately 50% thought that students at their campus consumed tobacco daily. Interestingly, inflated misperceptions were also evident at campuses where monthly use of tobacco was common (i.e., median response).

Here, ca. 90% of students perceived weekly or daily use as the most typical. Similar patterns were observed on campuses of historically black colleges and universities. In a sample of 2,277 African-American students, 90% overestimated the rate of smoking among their peers and this overestimation was associated with a >80% increased risk of smoking (Edwards et al., 2008). Arbour-Nicitopoulos et al. (2010) surveyed 1,203 Canadian students to assess campus substance use norms. Their results paralleled those in the U.S. The majority of respondents reported that the typical student on their campus had used cigarettes in the past month (86%). Further, this perception was associated with a three times increased likelihood to use cigarettes. Thus, at North-American campuses, students tend to overestimate smoking in their peers and these descriptive norms appear to influence personal use as well as initiation of use. Injunctive norms have been widely researched in regard to alcohol use (e.g., Borsari & Carey, 2003; Gamett, Crane, West, Mitchie, Brown, & Winstock, 2015; Neighbors, Lee, Lewis, Posos, & Larimer, 2007), however; studies investigating their role regarding tobacco use remain sparse. One French study looked at the association between proximal (friends’ approval) and distal (students’ approval) injunctive peer norms and smoking status and quantity of cigarettes smoked by smokers (Riou Françà, Dautzenberg, Falissard, & Reynaud, 2009). The perception that friends approve of regular smoking was not associated with smoking status, but with a greater quantity of cigarettes consumed by current smokers (Riou Françà, Dautzenberg, Falissard, & Reynaud, 2009).

In sum, data on descriptive and injunctive tobacco norms among European students remain sparse and there is a lack of work addressing social norms on tobacco use (Mcalaney, Hughes, & Bewick, 2011). Hence, the current paper aimed to investigate descriptive and injunctive norms among college and university students and their association with personal tobacco use comparing baseline data of the “Social Norms Intervention for the prevention of Polydrug use” (SNPE) study, a feasibility study conducted in seven European countries (for further detail, see below). Specifically, we investigated possible self-other discrepancies regarding personal use and attitudes towards use and evaluated if perceptions of peer use and peer approval of use were associated with
personal use and approval of tobacco use. Based on the literature (Arbour-Nicitopoulos, Kwan, Lowe, Taman, & Faulkner, 2010; Riou Franç, Dautzenberg, Falisard, & Reynaud, 2009), we expected to find self-other discrepancies of perceptions of use and approval of tobacco among European university students and higher odds for engaging in smoking behavior in students with a perception that the majority of their peers uses and/or approves of tobacco use.

2. Materials and methods

2.1. Data

This paper focuses on baseline data regarding tobacco use assessed in the SNIE study, a multi-national cluster-controlled intervention trial to examine the feasibility of a web-based, personalized social norms feedback intervention for polydrug use in university students. An overview of the entire study, including a description of all work packages, the recruitment (including settings and locations) for the study, the registration process and the intervention, is provided elsewhere (Helmer, Miłolajczyk, McNalley, et al., 2014; Pischke, Zeeb, van Hal, et al., 2012). Study registration started October 25th 2011. Students could fill in the baseline survey from mid-January – mid-February 2012. Baseline recruitment was completed in all countries by mid-June 2012. Students were eligible for the study if they were over 18 years of age, enrolled at their respective university and if they had an e-mail address. All students were invited to participate in the study via a website. Those agreeing to participate self-selected to the study. Briefly, the SNIE study involved the development of a personalized feedback website for substance use for students from universities in Belgium, Denmark, Germany, the Slovak Republic, Spain, Turkey and the United Kingdom. The survey included questions on the student’s personal use of tobacco and other licit and illicit substances, their attitudes towards the use of these substances and their perceptions of their peers’ substance use behaviors and attitudes. Demographic data, including participant’s age, gender, migrant status, year of study and living situation (with other students or not) were also collected. Study participation was voluntary. Research ethical approval was obtained from each site involved in the study.

2.2. Measurements

To measure personal use of tobacco products, students were asked in an online survey how often they used tobacco (cigarettes, chewing tobacco, cigars, etc.). Response options ranged from ‘never in my life’ to ‘every day or nearly every day in the last two months’. For this analysis, four categories of tobacco use were created: Never (‘never in my life’), not in the last two months (‘have used but not in the last two months’), smoked in the last two months: At most twice a week (from ‘once or twice in the last two months’ to ‘twice every week in the last two months’), smoked in the last two months: Three times a week or more often (from ‘three times every week in the last two months’ to ‘every day or nearly every day in the last two months’).

Perceptions of rates of peer tobacco use were assessed using sex-specific items based on the corresponding personal use categories. The respondents were asked “How often in the last two months do you think most (at least 51%) of the [female/male] students at your university have used tobacco?” (descriptive norm). Data on personal and perceived peer attitudes towards tobacco use were collected with the following questions: “Which of the following best describes your attitude to using tobacco?”, “Of the following do you think best describes the attitude of most (at least 51%) of the [female/male] students at your university to the use of tobacco?” The latter question assesses the injunctive norm meaning the students’ belief about the approval or disapproval of smoking in the peer group. Response options included ‘Never ok to use’, ‘Ok to use occasionally if it doesn’t interfere with study or work’, ‘Ok to use frequently if it doesn’t interfere with study or work’, and ‘Ok to use occasionally if it doesn’t interfere with study or work’, and ‘Ok to use frequently if that is what the person wants to do’. The response option regarding potential interference with work might be surprising in the context of tobacco use. Tobacco use may interfere less with study or work (e.g., smoking breaks) than the use of other substances which were assessed in the SNIE survey. However, the decision was to keep the response options consistent across all substances for comparison purposes. For the analysis examining the association between perceived attitudes of peers and own attitudes towards tobacco use in this paper, personal and perceived attitudes towards tobacco use were summarized into the two categories ‘never ok to use’ and ‘ok to use’.

3. Statistical analysis

Firstly, estimates for personal and perceived tobacco use by country and sex were generated. Secondly, the percentages of respondents who perceived the tobacco use of the majority of students of their own sex and university as higher/as identical/as lower as the report of the corresponding own behavior estimate were calculated. Subsequently, multinomial (for personal tobacco use) and binary logistic regression (for attitude towards tobacco use) analyses were performed to examine associations between perceived and personal tobacco use and attitudes towards tobacco use. Sex, age, year of study, and living situation (possible confounders) and perceived substance use/attitude towards tobacco use (independent variables) were included in the models. In the model with the outcome variable ‘attitude towards tobacco use’, personal tobacco use was also added as an independent covariate. Only persons with complete data in the variables above were included in the analyses. To investigate whether sex or country moderates the association between perception and personal behavior/attitude, the two relevant interaction terms were added to the regression models. Stratified analyses by variables were planned for those interactions that were significant at the p < 0.05 level. Data analysis was performed using SPSS for windows, version 20.0.

4. Results

The web-based questionnaire was completed by 4482 university students (71.4% female) in 2012 choosing to participate in the survey. Overall, 39% of the male and 27% of the female students were using tobacco. A minority of participants in each country (5.2%) were foreign born. In the overall sample, participants from the Slovak Republic (43.2%, n = 1938) and Turkey (19.1%, n = 858) accounted for more than half of the sample, followed by Germany (11.2%, n = 594), Denmark (10.4%, n = 464), Belgium (9.5%, n = 426), Spain (4.1%, n = 185) and the UK (2.4%, n = 107). A detailed description of sample characteristics is provided in Table 2.1.

Percentages of students who never smoked varied from 30.1% in Germany to 60.6% in Belgium. Students from the Slovak Republic (31.1%), Spain (31.0%) and Denmark (30.0%) showed the highest percentages of former smokers. As shown in Table 2.2, the highest percentages of regular smokers (at least three times a week) were found among Turkish students (27.8%) and the lowest among Belgian students (9.0%).

The approval of tobacco use (injunctive norm) was highest in Danish and German students with 25.8% and 27.5% of students, respectively, responding that it is ok to use tobacco, even if it does interfere with study or work (see Table 2.3). Disapproval rates varied from 48.4% in the Slovak Republic to 25.1% in Denmark. In Turkey, the majority of respondents (56.0%) reported that it is never ok to smoke.

The majority of students (74.9%) viewed their peers to be more frequent users of tobacco than themselves (78.5% female, 66.1% male) (descriptive norm). Fifteen percent (13% female, 20.1% male) thought that their peers behaved similar to themselves and 10% (8.5% female, 13.8% male) believed that students in their peer group consumed tobacco less frequently than themselves. In addition, more than half of the students (58.2%; 58.3% female, 57.9% male) perceived their peers to be
more accepting of smoking than themselves. Thirty-two percent believed approval to be equal (32.6% female, 31% male) and 9.7% (9.1% female, 11.2% male) thought that the peer group approved of tobacco use less than themselves (injunctive norm).

Perceived peer use of tobacco was associated with a higher likelihood for regular personal smoking (see Table A4). Students who thought that the majority of their peers smoked at least three times a week had a 2.66 (95% CI: 1.90–3.72) times higher likelihood to smoke at least three times every week (in the past two months) themselves compared with students who never smoked. The odds for reporting tobacco use at most twice a week instead of never use was 2.52 (95% CI: 1.68–3.79) if students perceived that the majority of students smoked at most twice a week. Male (OR: 1.77, 95% CI: 1.45–2.15) and older students (OR: 1.02, 95% CI: 1.00–1.05) were more likely to report smoking at least three times a week than those reporting that they never smoked.

Perceived approval of tobacco use of peers (OR: 6.49, 95% CI: 4.54–9.28) was associated with own approval of tobacco use. Personal smoking in the last two months (OR: 7.85, 95% CI: 6.55–9.41) was associated with a higher likelihood of personal approval regarding tobacco use (Table A5). Assessment of interaction in both models showed that the effect of perception on the outcome variable was not modified by country or sex.

5. Discussion & conclusions

Our two main aims were to investigate possible self-other discrepancies regarding tobacco use and attitudes towards tobacco use and to evaluate whether perceptions of peer use and peer approval of tobacco use are associated with personal use and approval. In all countries, self-other discrepancies regarding tobacco use were found. In general, students perceived their peers to use tobacco more often than themselves. A majority of students believed that their peers were more accepting of tobacco use than themselves. The perception that the majority were using tobacco was associated with an increased likelihood of personal use. Perceived approval of tobacco use in the peer group was associated with higher personal approval, particularly among those with a recent history of smoking.

Only two previous studies have shown that European students tend to overestimate rates of smoking among their peers (e.g., Rieu França, Dautzenberg, Falisard, & Reynaud, 2009; Bertholet, Fauzi, Studer, DaeppeOn, & Gmel, 2013). In a Swiss study, Bertholet et al. (2013) reported that overestimations of tobacco use by others are frequent among young men and are associated with greater personal consumption (Bertholet, Fauzi, Studer, Daeppeyn, & Gmel, 2013). Our study included both men and women, was conducted in six European countries and Turkey and demonstrated a similar association. Bertholet et al. (2013) found that the overestimations varied by substances (Bertholet, Fauzi, Studer, Daeppeyn, & Gmel, 2013). In their study, more than 45% of their study participants overestimated tobacco and alcohol use compared to only 22% overestimating cannabis use. Bertholet et al. (2013) explain these differences with the differences in legal status of the substances in Switzerland suggesting that cannabis consumption appears less visible because it is illegal (Bertholet, Fauzi, Studer, Daeppeyn, & Gmel, 2013). Unfortunately, our data do not allow for such an analysis.

We did find variation in tobacco consumption by European country in our study. Turkey and Germany reported the highest levels of consumption with over 40% of students consuming tobacco regularly compared to Belgium with below 20%. However, in some countries higher

Table A1
Sample characteristics by country *.

<table>
<thead>
<tr>
<th></th>
<th>Belgium (n = 404)</th>
<th>Denmark (n = 461)</th>
<th>Germany (n = 503)</th>
<th>Slovak Republic (n = 1931)</th>
<th>Spain (n = 184)</th>
<th>Turkey (n = 855)</th>
<th>United Kingdom (n = 107)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>79.2</td>
<td>78.1</td>
<td>58.8</td>
<td>79.5</td>
<td>71.7</td>
<td>53.1</td>
<td>69.2</td>
</tr>
<tr>
<td>Male</td>
<td>20.8</td>
<td>21.9</td>
<td>41.2</td>
<td>20.5</td>
<td>28.3</td>
<td>46.9</td>
<td>30.8</td>
</tr>
<tr>
<td><strong>Age categories (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;20</td>
<td>53.1</td>
<td>11.9</td>
<td>11.1</td>
<td>30.5</td>
<td>38.6</td>
<td>40.7</td>
<td>39.3</td>
</tr>
<tr>
<td>21–25</td>
<td>38.7</td>
<td>60.1</td>
<td>57.1</td>
<td>65.7</td>
<td>41.8</td>
<td>54.0</td>
<td>29.9</td>
</tr>
<tr>
<td>26–30</td>
<td>4.5</td>
<td>17.1</td>
<td>23.5</td>
<td>2.3</td>
<td>9.2</td>
<td>3.9</td>
<td>12.1</td>
</tr>
<tr>
<td>31+ years</td>
<td>3.8</td>
<td>10.8</td>
<td>8.3</td>
<td>0.5</td>
<td>10.3</td>
<td>1.4</td>
<td>18.7</td>
</tr>
<tr>
<td><strong>Foreign student (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>7.5</td>
<td>11.7</td>
<td>7.0</td>
<td>1.1</td>
<td>9.2</td>
<td>4.2</td>
<td>33.6</td>
</tr>
<tr>
<td>No</td>
<td>92.5</td>
<td>88.3</td>
<td>93.0</td>
<td>98.9</td>
<td>95.8</td>
<td>95.8</td>
<td>66.4</td>
</tr>
<tr>
<td><strong>Residence (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(living with others)</td>
<td>21.6</td>
<td>12.1</td>
<td>35.8</td>
<td>51.5</td>
<td>22.3</td>
<td>26.2</td>
<td>50.5</td>
</tr>
<tr>
<td><strong>Religion (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Christian</td>
<td>58.6</td>
<td>55.7</td>
<td>48.3</td>
<td>81.4</td>
<td>53.3</td>
<td>0.5</td>
<td>30.2</td>
</tr>
<tr>
<td>Muslim</td>
<td>3.1</td>
<td>1.7</td>
<td>1.6</td>
<td>0.1</td>
<td>0.5</td>
<td>85.1</td>
<td>24.5</td>
</tr>
<tr>
<td>Jewish</td>
<td>0.7</td>
<td>0.0</td>
<td>0.2</td>
<td>0.1</td>
<td>0.0</td>
<td>0.4</td>
<td>0.0</td>
</tr>
<tr>
<td>Hindu</td>
<td>0.0</td>
<td>0.2</td>
<td>0.0</td>
<td>0.1</td>
<td>0.5</td>
<td>0.0</td>
<td>0.9</td>
</tr>
<tr>
<td>Buddhist</td>
<td>1.6</td>
<td>0.9</td>
<td>2.2</td>
<td>0.7</td>
<td>0.5</td>
<td>0.1</td>
<td>2.8</td>
</tr>
<tr>
<td>Other</td>
<td>3.1</td>
<td>6.0</td>
<td>4.2</td>
<td>2.7</td>
<td>3.3</td>
<td>4.4</td>
<td>9.4</td>
</tr>
<tr>
<td>No religious beliefs</td>
<td>32.9</td>
<td>35.4</td>
<td>43.5</td>
<td>15.0</td>
<td>41.8</td>
<td>9.6</td>
<td>32.1</td>
</tr>
</tbody>
</table>

* indicates number of participants who have given information on sex.

** Measured by the question about country of birth.

Table A2
Frequency of personal tobacco use by sex (female %/male %).

<table>
<thead>
<tr>
<th>Personal tobacco use (%) (f/m)</th>
<th>Never</th>
<th>Not in the last two months</th>
<th>Smoked in the last two months: at most twice a week</th>
<th>Smoked in the last two months: three times a week or more often</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td>61.4%</td>
<td>57.0%</td>
<td>21.3%</td>
<td>8.5%</td>
</tr>
<tr>
<td>Denmark</td>
<td>47.3%</td>
<td>36.0%</td>
<td>29.7%</td>
<td>11.9%</td>
</tr>
<tr>
<td>Germany</td>
<td>34.6%</td>
<td>23.7%</td>
<td>26.8%</td>
<td>16.6%</td>
</tr>
<tr>
<td>Slovak Republic</td>
<td>42.8%</td>
<td>35.7%</td>
<td>31.3%</td>
<td>13.5%</td>
</tr>
<tr>
<td>Spain</td>
<td>44.7%</td>
<td>44.2%</td>
<td>28.8%</td>
<td>15.2%</td>
</tr>
<tr>
<td>Turkey</td>
<td>44.3%</td>
<td>35.0%</td>
<td>18.0%</td>
<td>15.4%</td>
</tr>
<tr>
<td>UK</td>
<td>61.1%</td>
<td>59.4%</td>
<td>16.7%</td>
<td>12.9%</td>
</tr>
</tbody>
</table>
prevalence was not a reflection of a generally positive attitude towards tobacco use. For example, Turkey was the country with the highest rate of regular smokers compared to the other countries. However, approval of tobacco use was generally low. The majority of students (ca. 56%) did not approve of using tobacco. Social desirability may have contributed to reports of low approval in Turkey as recent media campaigns educating about the harms of tobacco may have made students more aware of the consequences of tobacco. Disapproval appears not to translate into non-smoking. Other factors not assessed in this study, such as availability of tobacco products in Turkey and pro-tobacco advertising, may be more powerful than personal approval or disapproval in influencing use. In all countries, perceived approval of tobacco use in the peer group was associated with personal approval of using tobacco; especially among those that recently smoked. Students who smoke or approve of tobacco use may self-select into a network of friends at university who also smoke. Self-selection into a social environment with similar behavior has been previously demonstrated for binge drinking (Borsari & Carey, 1999). Tobacco use among close friends was not assessed in this study.

Limitations of the study include the use of self-report measures to assess tobacco use. We did not compare perceptions with actual consumption rates. Our comparison was with personal estimates of what the majority of the peers did. The number of cigarettes smoked per time period was not assessed. We could not analyze how many more cigarettes were smoked as a result of the perception that the majority of peers smoked. Factors not assessed in this study, such as family history of tobacco use or use among close friends, may have played a role in regard to tobacco norms. This is a limitation considering that previous research suggests that friends play a considerable role in modeling substance use behavior. For example, one study showed that students whose friends smoked were four times more likely to smoke (Deseresa & Azah, 2011). Due to the cross-sectional nature of our data no causal statements can be deduced. The number of participants varied by country with smaller sample sizes in the United Kingdom and Spain. Due to the relatively small numbers in these convenience samples it is likely that they are not representative of their respective student populations. It may be that only students interested in the topic might have participated in the study; we can say little about the direction of this bias. The validity of data collected via online surveys is a further matter of discussion, but there are many advantages as well, in particular in a young and e-literate population.

This study suggests that tobacco use varies substantially in European student populations. Self-other discrepancies regarding rates of tobacco use are high, however; they are consistent throughout European student populations and perceived norms are an important predictor of personal tobacco use. A social norms intervention may be a viable method for changing perceptions of tobacco use among peers and attitudes towards tobacco and ultimately for changing smoking behavior. If found to be effective, social norms approaches may become a novel component of tobacco control policies in Europe and beyond.

Table A.3

<table>
<thead>
<tr>
<th>Personal attitude towards tobacco use (%) (t/m)</th>
<th>Ok to use if it doesn't interfere with work or study*</th>
<th>Ok to use**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td>4.3/46.5</td>
<td>14.8/12.8</td>
</tr>
<tr>
<td>Denmark</td>
<td>4.9/40.0</td>
<td>25.2/28.6</td>
</tr>
<tr>
<td>Germany</td>
<td>4.9/47.9</td>
<td>29.6/24.5</td>
</tr>
<tr>
<td>Slovak Republic</td>
<td>4.1/36.7</td>
<td>10.8/12.7</td>
</tr>
<tr>
<td>Spain</td>
<td>4.2/45.1</td>
<td>11.1/13.7</td>
</tr>
<tr>
<td>Turkey</td>
<td>3.3/25.3</td>
<td>13.2/15.8</td>
</tr>
<tr>
<td>UK</td>
<td>38.8/43.8</td>
<td>16.7/18.8</td>
</tr>
</tbody>
</table>

* Response options: 'Ok to use occasionally if it doesn't interfere with study or work' and 'Ok to use frequently if it doesn't interfere with study or work' were combined into 'Ok to use if it doesn't interfere with work or study'.
** 'Ok to use occasionally even if it does interfere with study or work' and 'Ok to use frequently if that is what the person wants to do' were combined into 'Ok to use'.

Final trial registration number

DRKS000004375 on the 'German Clinical Trials Register'.

Table A.4

<table>
<thead>
<tr>
<th>Variables</th>
<th>Smoked in the last two months: three times a week or more often vs. Never</th>
<th>Smoked in the last two months: at most twice a week vs. Never</th>
<th>Not in the last two months vs. Never</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Proportion n (%)</td>
<td>OR (95% C.I.)</td>
<td>Proportion n (%)</td>
</tr>
<tr>
<td>Perceived peer tobacco use</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not in the last two months: Never</td>
<td>460 (101)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Smoked in the last two months: At most twice a week</td>
<td>1235 (284)</td>
<td>1.82 (1.25-2.64)</td>
<td>4.07 (2.68-6.18)</td>
</tr>
<tr>
<td>Smoked in the last two months: Three times a week or more often</td>
<td>2673 (615)</td>
<td>2.66 (1.90-3.73)</td>
<td>2.52 (1.68-3.79)</td>
</tr>
<tr>
<td>Country</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slovak Republic</td>
<td>1894 (40.6)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Belgium</td>
<td>401 (93)</td>
<td>0.52 (0.35-0.77)</td>
<td>0.39 (0.27-0.58)</td>
</tr>
<tr>
<td>Denmark</td>
<td>448 (103)</td>
<td>0.68 (0.46-0.99)</td>
<td>0.72 (0.48-1.06)</td>
</tr>
<tr>
<td>Germany</td>
<td>492 (113)</td>
<td>1.70 (1.25-2.33)</td>
<td>1.65 (1.20-2.29)</td>
</tr>
<tr>
<td>Spain</td>
<td>181 (42)</td>
<td>0.82 (0.50-1.34)</td>
<td>0.69 (0.41-1.15)</td>
</tr>
<tr>
<td>Turkey</td>
<td>827 (19.6)</td>
<td>1.84 (1.45-2.34)</td>
<td>1.11 (0.85-1.45)</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>103 (2.4)</td>
<td>0.80 (0.45-1.45)</td>
<td>0.58 (0.30-1.12)</td>
</tr>
<tr>
<td>Age [per year]</td>
<td>1.02 (1.00-1.05)</td>
<td>0.97 (0.94-1.01)</td>
<td>1.04 (1.02-1.06)</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>3104 (71.4)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Male</td>
<td>1284 (28.6)</td>
<td>1.77 (1.45-2.15)</td>
<td>1.42 (1.15-1.75)</td>
</tr>
</tbody>
</table>

* Results for year of study and living situation are not shown in the table.
Table A.5
Association between perceived attitudes of peers and own attitudes towards tobacco use adjusted for personal tobacco use, country, age, sex, study year and living situation – results of a binary logistic regression*.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Positive attitude towards tobacco use (ok to use even if it does interfere with study or work)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Proportion n (%)</td>
</tr>
<tr>
<td>Perceived peer attitude towards tobacco use</td>
<td></td>
</tr>
<tr>
<td>Never to use</td>
<td>265 (6.3)</td>
</tr>
<tr>
<td>Ok to use</td>
<td>3032 (91.7)</td>
</tr>
<tr>
<td>Personal tobacco use</td>
<td></td>
</tr>
<tr>
<td>Not in the last two months/Never</td>
<td>2009 (69.2)</td>
</tr>
<tr>
<td>Smoked in the last two months</td>
<td>1289 (30.7)</td>
</tr>
<tr>
<td>Country</td>
<td></td>
</tr>
<tr>
<td>Slovakia</td>
<td>1843 (41.9)</td>
</tr>
<tr>
<td>Belgium</td>
<td>396 (9.4)</td>
</tr>
<tr>
<td>Denmark</td>
<td>442 (10.5)</td>
</tr>
<tr>
<td>Germany</td>
<td>485 (11.6)</td>
</tr>
<tr>
<td>Spain</td>
<td>172 (4.1)</td>
</tr>
<tr>
<td>Turkey</td>
<td>761 (18.1)</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>99 (2.4)</td>
</tr>
<tr>
<td>Age [per year]</td>
<td>2014 (58.6)</td>
</tr>
<tr>
<td>Sex</td>
<td>257 (71.4)</td>
</tr>
<tr>
<td>Female</td>
<td>1200 (28.6)</td>
</tr>
</tbody>
</table>

* Results for year of study and living situation are not shown in the table.

Role of funding sources
Funding for this study was provided by the European Commission, Directorate General for Justice, Freedom and Security (grant number: JLS/2009-2010/DIP/AG). The funding agency had no role in the study design, collection, analysis or interpretation of the data, writing the manuscript, or the decision to submit the paper for publication.

Contributors
All authors have made substantial contributions to the conception and the design of the SNIP study and the acquisition of data for the work; SH analysed the data for the work; CP drafted the paper and all co-authors reviewed it critically for important intellectual content. All authors have given final approval of the version to be published and have agreed to be accountable for all aspects of the work.

Conflict of interest
BB, as keynote speaker/expert advisor, has received reimbursement of travel expenses and/or time from Anheuser-Busch, Nocita, and International Centre for Alcohol Policies. BB has been a recipient of a research grant provided by the European Research Advisory Board (ERAB). All the other authors do not have any conflicts of interest.

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References


CANNABIS USE IN EUROPEAN UNIVERSITY STUDENTS

Cannabis use in European University students: Are normative perceptions of peer cannabis use and attitudes associated with personal cannabis use and attitudes?

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Abstract

Objective

Perceptions of peer behavior and attitudes exert considerable social pressure on young adults to use substances. This study investigated whether European students perceive their peers’ cannabis use and approval of cannabis use to be higher than their own personal behaviors and attitudes, and whether estimations of peer use and attitudes are associated with personal use and attitudes.

Method

Students (n = 4131) from Belgium, Denmark, Germany, the Slovak Republic, Spain, Turkey and the United Kingdom completed an online survey as part of the SNIPE project, a feasibility study of a web-based normative feedback intervention for substance use. The survey assessed students’ (1) personal substance use and attitudes, (2) perceptions of their peers’ cannabis use (descriptive norms) and attitudes (injunctive norms).

Results

Although most respondents (92%) did not personally use cannabis in the past two months, the majority of students thought that the majority of their peers were using cannabis and that their peers had more permissive attitudes towards cannabis than themselves. Controlling for students’ age, sex, year of study and religious beliefs, perceived peer descriptive norms were associated with personal cannabis use in the past two months (OR: 1.13; 95% CI: 1.04, 1.22) and perceived injunctive norms were associated with personal attitudes towards cannabis use (OR: 1.27; 95% CI: 1.14, 1.41).
Conclusions

European students appear to possess similar discrepancies between personal and perceived peer norms for cannabis use and attitudes as found in North American students. Interventions which address such discrepancies may be effective in preventing substance use related harm.

Keywords: cannabis, social norms, student health, social influence
Introduction

Globally, cannabis is the most frequently used illicit substance (WHO, 1997). Initiation of cannabis use typically occurs in late adolescence and early adulthood, a period in the lifespan which is also associated with the peak of general cannabis usage (Degenhardt & Hall, 2012; Degenhardt et al., 2008). After alcohol and tobacco, cannabis is one of the most commonly used substances by university students (Arbour-Nicitopoulos et al., 2010; Webb et al., 1996), particularly as young adulthood and university studies represent a period of time where there is a potential high exposure to illicit substances and the opportunity to use substances (Arria et al., 2009). The exact rates of cannabis use by students can, however, differ between countries with higher rates of use noted in more developed nations (Hall & Degenhardt, 2009; Smart & Ogborne, 2000). Cannabis use by university students is also typically heaviest in the first year of study and tends to reduce over the course of academic studies and in the years post-graduation (Caldeira et al., 2008). Nevertheless, students who develop and maintain regular cannabis use prior to university or over the course of their university studies are more likely to use cannabis at a heavy rate in their post-university life and are at a heightened risk of various negative mental and physical health outcomes (Caldeira et al., 2012).

Negative outcomes associated with cannabis use include poor student academic attainment, executive and cognitive deficits, the use of other illicit substances, increased risk of respiratory impairments, physical injury, and driving under the influence of substances (Caldeira et al., 2008, 2012; Grant et al., 2012; Hall & Degenhardt, 2009; Hall, 2009; Webb et al., 1996). Longer term regular cannabis use can also be associated with the heightened risk of developing psychotic symptoms in students (Skinner et al., 2011), and the risk of experiencing psychotic symptoms increases with heavier use (Moore et al., 2007). Young adults appear to be at a
particularly high risk of engaging in heavy levels of cannabis use and experiencing adverse effects of using cannabis (Hall, 2009).

Compared to other substances, cannabis use may be associated with largely transient negative consequences and may also be associated with a number of perceived positive experiences, including feelings of relaxation, increased positive affect, enhanced sensory experiences and creativity (Hall & Degenhardt, 2009; Hammersley & Leon, 2006). The lack of immediately experienced negative consequences means that some individuals who begin to use cannabis may not be initially discouraged from continued use. For young adults, the continued use of cannabis poses a significant risk to maintaining regular patterns of use that could lead some individuals to become cannabis dependent (Le Strat et al., 2009). Therefore, intervening early is necessary in order to prevent sustained and/or problematic levels of cannabis use by young adults, particularly university students, and the experience of associated negative outcomes (Caldeira et al., 2012).

Social norm perceptions and cannabis use

The use of substances by influential peers is one of a number of social factors which can exert pressure on individuals to use substances (Hawkins et al., 1992). There is convergent evidence that students tend to overestimate their peers’ substance use compared to their own personal substance consumption, in terms of the quantity and frequency of substance use (descriptive norms) and peers’ attitudes regarding the acceptability of substance use (injunctive norms). Research into the perceptions of the social norms of substance use and the effects of normative perceptions on personal use has typically focused on the use of alcohol by university students, particularly in North America. There is empirical evidence that students overestimate their peers
consumption of alcohol and their attitudes towards alcohol use (e.g., McAlaney et al., 2015; Neighbors et al., 2006).

In relation to cannabis, a number of studies have reported that university students overestimate their peers’ cannabis consumption (Arbour-Nicitopoulos et al., 2010; Bertholet et al., 2013; Franca et al., 2010; Kilmer et al., 2006; LaBrie et al., 2009; Martens et al., 2006; Page & Roland, 2004; Perkins et al., 1999) and their peers’ approval of cannabis use (LaBrie et al., 2010, 2011). Misperceptions of cannabis use norms have also been associated with increased personal cannabis consumption (Arbour-Nicitopoulos et al., 2010; Bertholet et al., 2013; Buckner, 2013; Kilmer et al., 2006; LaBrie et al., 2009, 2010; Lewis & Clemens, 2008; Neighbors et al., 2008, 2013; Page & Scanlan, 1999; Page & Roland, 2004). The presence of these misperceptions for alcohol and other substances has led to the development of the “Social Norms Approach” as a means of early intervention (McAlaney et al., 2011). Interventions based on this approach attempt to address commonly held misperceptions of peer norms and reduce the perceived social pressure to engage in heavy consumption by providing feedback comparing students’ perceptions of social norms at their university with actual campus norms (McAlaney et al., 2011). There is evidence that social norms based feedback interventions are effective in reducing student alcohol use and perceptions of peer norms (e.g., Neighbors et al., 2010). Whilst few social norms interventions have focused on reducing cannabis use, preliminary research has indicated the potential benefits of web-based personalised normative feedback on reducing perceived peer descriptive and injunctive cannabis use norms (Elliott & Carey, 2012; Lee et al., 2010).

Research into the influence of social norms perceptions on student cannabis use has, however, typically been limited to samples of students from North American universities and
there is a comparative lack of European studies into the associations between perceived peer norms and cannabis use. Given the differences in cannabis use legislation between North American and European countries, as well as potential differences in cultural and local norms, findings from U.S. college students may not be generalisable to European university students. Whether university students across Europe display similar discrepancies between their own personal cannabis use and personal attitudes with their perceptions of their peers’ attitudes and cannabis usage is unclear. Nor is it known if such perceptions are associated with heavier use of cannabis and more permissive personal cannabis use attitudes in European university students.

The current study

The current study investigated the relationship between European university students’ personal cannabis use and their perceptions of cannabis use amongst their student peers. The study had two aims. First, to investigate whether European students perceive that their peers use cannabis more frequently and have more positive attitudes towards cannabis compared to their personal reported cannabis use and attitudes. Second, the study aimed to investigate whether perceptions of descriptive and injunctive norms are associated with personal cannabis use and attitudes. It was hypothesised that both perceived descriptive and injunctive peer norms would be associated with personal cannabis use and attitudes in European students. The data analysed in the current study was taken from the baseline survey of the Social Norms Intervention for the prevention of Polydrug use (SNIPe) project, a collaborative European feasibility study of a web-based social norms feedback intervention for polysubstance use in university students (Pischke et al., 2012).

Method
Institutional ethical approval was obtained from all sites involved in the study and electronic informed consent was obtained from all individual participants included in this study (see Pischke et al., 2012 for further details about the wider SNIPE study methodology).

Participants

The SNIPE baseline survey sampled a total of 4482 students enrolled at higher education institutes from seven countries in the European area. For the current paper, analyses were conducted on 4131 participants after removal of participants with missing responses on the cannabis-related questions. Table 1 provides a summary of demographic characteristics of the sample by country.

Measures

Participants completed a baseline survey that included questions on their personal use of substances (alcohol, tobacco, cannabis and other illicit substances), their personal attitudes towards the use of these substances, negative consequences associated with their personal substance use, their perceptions of the substance use and attitudes of their student peers (i.e. the perceived descriptive and injunctive norms), and their demographic characteristics. Data on alcohol, tobacco, consequences of substance use and use of other illicit substances, will be reported in separate papers (Helmer et al., 2014; McAlaney et al., 2015). Participants rated their personal use and perceived peer use of natural forms of cannabis (e.g., marijuana, pot, hash, grass) in the past two months on a ten-point ordinal scale ranged from “never in my/their life” to “every day or nearly every day in the past two months”. The two month timeframe was chosen to assess students’ term-time use of substances (Pischke et al., 2012). Personal attitudes and perceived peer attitudes relating to the acceptability of cannabis use were rated on a five point
nominal scale from “never OK to use” to “OK to use frequently if that is what the person wants
to do”. The baseline survey was based on previously established measures of substance use
(Humeniuk et al., 2010). The survey questions for the perceived peer descriptive and injunctive
norms were institution- and sex-specific, requiring students to state their perceptions for the
majority (i.e. greater than or equal to 51%) of same-sex students at their university.

Procedure
Full details of the SNIPE project, including study processes and the recruitment of participants
can be found in the protocol paper (Pischke et al., 2012). Participants registered their interest in
the study via the SNIPE website which presented an electronic information sheet and consent
form. After confirming their consent to participating in the study, students completed the survey
items online in one sitting. The data analysed in the current study was taken from the baseline
SNIPE survey which participants completed in the native language of their host country.

Data Analysis
Descriptive analyses were conducted to calculate the percentages of students in each country
who perceived that the majority of their peers used cannabis at the same, lower or higher level
than their own reported use, and perceived that their peers have the same, less or more
permissive towards cannabis use than themselves. Differences in cannabis use between the sexes
were investigated using Chi-Squared tests. Due to the ordinal scale for the cannabis use items it
was not possible to conduct linear regression analyses, therefore the cannabis use items for
personal behaviors and attitudes were dichotomised and analysed by binary logistic regression.

Two binary logistic regressions were conducted to investigate the association between
personal cannabis use (no use versus use in the past two months) and personal attitudes towards
cannabis use (non-permissive versus permissive attitudes) by perceived peer descriptive and injunctive norms respectively. The use or non-use of cannabis by students in the past two months, and non-permissive (“Never OK to use cannabis”) versus permissive attitudes towards cannabis use (for responses collapsed across “OK to use occasionally if it does not interfere with study or work” to “OK to use frequently if that is what a person wants to do”) were treated as the outcome variable for the respective models. Demographic variables, including students’ age, sex, year of study, residence arrangement, personal religious beliefs and importance of religious beliefs, were controlled for in the analysis with personal cannabis use and attitudes treated as the outcome variables. Given prior research demonstrating that stronger religious beliefs are associated with lower likelihoods of using cannabis amongst students (e.g., Bell, Wechsler, & Johnston, 1997; Suerken et al., 2014), religious beliefs and importance of religious beliefs were included as independent categorical variables in the analyses. Personal cannabis use in the past two months was added as additional independent variable when investigating the association between perceived peer attitudes with personal attitudes. Interaction terms between perceived peer norms (behaviors and attitudes for the respective analyses) with participant sex or country were also included in both models to investigate potential moderated relationships. Stratified analyses were conducted where interaction terms indicated a significant interaction between country or sex with perceived norms in predicting personal cannabis use and attitudes.

Results

Prevalence of cannabis use in the sample

Data analyses indicated that 8.0% of the sample had reported using cannabis in the last two months, whilst 70.4% of students reported never using cannabis in their lifetime and 21.6% reported previously using cannabis but not within the last two months. In terms of sex
differences in cannabis use, 13.9% of male students (n = 164) reported using cannabis in the past two months compared to 6.0% of female students ($X^2 (1) = 78.260, p < .001$ for sex difference).

*Comparisons between reported and perceived peer descriptive and injunctive norms*

The majority of surveyed students from six of the seven sites perceived that their peers used cannabis more frequently than their own reported personal use (see Table 2). The majority of students in Turkey perceived that the majority of their peers used cannabis at the same rate as themselves. Still, a substantial proportion of the Turkish sample (40.5%) perceived that their peers had heavier cannabis consumption than themselves. In terms of attitudes towards cannabis use, the majority of students in Belgium, the Slovak Republic, Spain and the UK perceived that their peers had more permissive attitudes towards cannabis use than themselves. The majority of Turkish and Danish students perceived that their peers had similar attitudes to themselves, whilst similar proportions of German students perceived that their peers had similar or more permissive attitudes towards cannabis use.

Across the majority of sampled countries a high number of students perceived that the majority of their same-sex peers had used cannabis (see Table 3). Less than 40% of the sample in each of the countries reported personally using cannabis in the past two months. In both Denmark and Turkey, the majority of students perceived that the majority of their same sex peers did not use cannabis.

The majority of students across all countries, except Turkey, perceived that the majority of their same-sex peers had permissive attitudes towards cannabis use whilst the percentage of surveyed students who personally approved of cannabis use was generally below 50% (see Table 3). The majority of male Danish students, male British students and both male and female German students sampled reported having permissive personal attitudes towards cannabis use.
Associations between perceived peer norms and personal cannabis use behaviors and attitudes

Adjusted odds ratios, accounting for the baseline survey demographic variables, for the
associations between perceptions of peer behaviors and attitudes with personal cannabis use and
cannabis attitudes are reported in Table 4. The association between perceived peer descriptive
norms with personal cannabis use was significant (OR: 1.13; 95% CI: 1.04, 1.22), while
perceived peer injunctive norms were not significantly associated with personal cannabis use.
Perceived peer injunctive norms were significantly associated with personal attitudes (OR: 1.27;
95% CI: 1.14, 1.41) as were perceived peer descriptive norms and personal cannabis use. In both
analyses, the association between perceived peer descriptive/injunctive norms with personal
cannabis use and personal cannabis use attitudes remained significant after controlling for
participant ages, sex, year of study, religious beliefs and residential status (see Table 4). The
association between perceived peer attitudes and personal approval of cannabis use also
remained significant after controlling for personal cannabis use in the past two months. No
significant interaction between sex and perceived norms in either analysis was noted. In contrast,
a significant interaction between country and perceived norms was observed for both the
descriptive and injunctive norm models.

Stratified analyses by country (see Table 5) indicated that perceptions of peer cannabis
use were associated with higher odds for personally using cannabis in the Slovak Republic,
Germany, Belgium, Spain and Turkey. Regarding cannabis use attitudes, perceptions of peer
cannabis use behaviors and peer attitudes to cannabis use was associated with higher odd ratios
of personally having more permissive attitudes towards cannabis use in the Slovak Republic,
Belgium, Denmark, Spain and Turkey. Estimates for the associations between perceived
cannabis use norms with personal cannabis use and attitudes remained close to 1 for the
remaining countries.
Discussion

Perceptions of peer normative behaviours and attitudes have been associated with heavier cannabis use in North American students, however few studies have investigated this relationship in European student samples. Students from six of the seven sampled countries in the current study, excluding Turkey, perceived that the majority of their peers had used cannabis at least once in the past two months. A high proportion of students across countries, again excluding Turkey, thought that the majority of their peers had permissive attitudes towards the use of cannabis. The majority of students across countries perceived that their peers used cannabis more than themselves and had more permissive attitudes towards cannabis use than their own reported behaviors and attitudes.

Based on the logistic regression analyses, perceived peer cannabis use and attitudes were associated with personal cannabis use and attitudes whilst controlling for participants’ ages, year of study, residential status and religious beliefs. Consistent with other research (e.g., LaBrie et al., 2009; Suerken et al., 2014), we observed that some religious beliefs and stronger religious beliefs were associated with less favourable attitudes and lower cannabis use, whilst being male was associated with heavier cannabis use and being of younger age and living with parents was associated with lower cannabis use. Whilst there were inter-country differences in cannabis use and perceived norms, it was notable that the majority of Turkish students reported accurate perceptions of their peers cannabis use behaviours and attitudes. In contrast to other sites, the Turkish sample included a majority of Muslim students (70.9%) who rated their religious beliefs as being important or very important. Prior research has indicated that students who frequently attend religious services are less likely to use cannabis (Suerken et al., 2014) as are those who state religion as being personally important (Bell et al., 1997). It may be that the lack of
normative misperceptions in the Turkish sample relate to the inclusion of individuals with strong religious beliefs, and possibly wider campus norms of participation in religion, which act as a protective factor against cannabis use.

The results of the current study are consistent with prior North American research demonstrating that students overestimate their peers’ cannabis use behaviours and attitudes, and that these misperceptions are predictive of personal cannabis use behaviours and attitudes (Arbour-Nicitopoulos et al., 2010; Bertholet et al., 2013; Kilmer et al., 2006; LaBrie et al., 2009; Martens et al., 2006; Neighbors et al., 2013; Page & Scanlan, 1999). The findings of the current study are also in line with data relating on the use of other illicit substances from the wider SNIPE study, showing similar associations between European students’ personal and perceived peer use and attitudes towards using other illicit substances (including cocaine, ecstasy and amphetamines) (Helmer et al., 2014). Our findings add to previous research demonstrating that perceived norms are predictive of student substance use, such as the consumption of alcohol (e.g., McAlaney et al., 2015; Neighbors et al., 2006).

In comparison to alcohol, the perceived social norms associated with student cannabis use are likely to be different due to the illicit status of cannabis. Alcohol consumption is a relatively common, public and visible behavior on most European university campuses, whilst cannabis, in contrast, is typically a controlled illicit substance. Cannabis-using students may therefore engage in cannabis consumption in smaller closed friendship groups in less visible and non-public settings compared to when they consume alcohol. The perceived social norms of closer friendship groups, family members and other users may be more influential on personal cannabis use behaviours compared to the perceived norms of the majority of the student population. Indeed, a limitation of the present study is the use of the wider same-sex student
population as a reference group, particularly as recent work has indicated that perceived
descriptive and injunctive norms for friends are stronger predictors of students’ personal
cannabis use than typical student norms (Buckner, 2013). Furthermore, empirical research has
suggested that US students with heavier rates of cannabis use perceive that both their close peers
and parents are more approving of cannabis use (LaBrie et al., 2011), highlighting the potential
power of more proximal normative feedback messages. This may be important for cannabis-use
interventions based on correcting perceived social norms, such as those based on the “Social
Norms Approach” (McAlaney et al., 2011), as normative feedback based on more proximal
reference groups may be more effective in discouraging cannabis use by students compared to
using typical peer norms, particularly on campuses where cannabis is considered to be a socially
unacceptable behaviour (LaBrie et al., 2010). There is, however, a lack of European-based
research investigating the predictive power of close friend norms versus typical student norms in
predicting student cannabis use.

There are some limitations to the current study. The data was based on self-reported
cannabis use therefore over- and underreporting by students cannot be ruled out. That said,
students in the current study completed a confidential web-based survey which allowed them to
answer questions on sensitive issues, such as illicit substance use, thereby minimising perceived
pressures to provide socially desirable responses on the survey. There were some differences in
sample sizes as study sites differed in their ability to access the student population which
impacted on recruitment. Furthermore, the current analysis employed a cross-sectional design
and cannot comment whether normative perceptions may predict future patterns of cannabis use
or vice versa; the relationship between perceived norms and cannabis use may be a reciprocal
one (Neighbors et al., 2006).
In conclusion, the results of the current study support previous research into the relationship between perceived peer behaviors and attitudes towards substance use with personal use and attitudes. This is the first study to report such associations in relation to cannabis use amongst a large multi-national sample of European students. Interventions focused on harm prevention, such as those based on the “Social Norms Approach”, may be effective in challenging discrepancies between personal behaviors and attitudes with perceived peer norms, and assist in preventing and reducing cannabis use amongst student populations.

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References


findings from the WHO World Mental Health Surveys. *PLoS Medicine, 5*(7), e141. doi:10.1371/journal.pmed.0050141


Table 1. Demographic characteristics of the sample according to country.

<table>
<thead>
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<th></th>
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<th>Denmark</th>
<th>Germany</th>
<th>Slovak Republic</th>
<th>Spain</th>
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<th>United Kingdom</th>
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**Importance of religious beliefs (%)**

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<th>Importance</th>
<th>Cannabis Use (%)</th>
<th>Importance of Religious Beliefs (%)</th>
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<tr>
<td>Not at all important</td>
<td>52.1</td>
<td>48.0</td>
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<tr>
<td>Somewhat</td>
<td>38.5</td>
<td>40.0</td>
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<td>Important</td>
<td>6.7</td>
<td>9.0</td>
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<td>Very important</td>
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Table 2. Comparison between personal behaviors and attitudes with perceived use and attitudes towards cannabis by the majority of same-sex peers in the past two months

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<th>Country</th>
<th>Belgium</th>
<th>Denmark</th>
<th>Germany</th>
<th>Republic</th>
<th>Spain</th>
<th>Turkey</th>
<th>Kingdom</th>
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<td>Cannabis use behaviors (%)</td>
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<tr>
<td>Perceived Peer Use &lt; Personal Use</td>
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<td>7.0</td>
<td>16.2</td>
<td>3.1</td>
<td>2.2</td>
<td>4.4</td>
<td>7.8</td>
</tr>
<tr>
<td>Perceived Peer Use = Personal Use</td>
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<td>36.6</td>
<td>14.9</td>
<td>22.0</td>
<td>11.6</td>
<td>55.1</td>
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<tr>
<td>Perceived Peer Use &gt; Personal Use</td>
<td>78.5</td>
<td>56.4</td>
<td>68.9</td>
<td>75.0</td>
<td>86.2</td>
<td>40.5</td>
<td>67.6</td>
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<td>Approval of Cannabis use (%)</td>
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<tr>
<td>Perceived Peer Attitudes &lt; Personal Attitude</td>
<td>7.2</td>
<td>9.6</td>
<td>15.2</td>
<td>3.4</td>
<td>3.5</td>
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<td>75.9</td>
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<td>38.1</td>
<td>46.0</td>
<td>53.0</td>
<td>67.4</td>
<td>18.1</td>
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Table 3. Reported and perceived cannabis use behaviors and attitudes, and perceptions of peer cannabis use behaviors and attitudes by surveyed students according to sex and country

<table>
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<th>Country</th>
<th>Used cannabis at least once in the past two months</th>
<th>Permissive attitudes towards cannabis use</th>
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<tr>
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<td>Personal reported use (%)</td>
<td>Perceived that majority of same-sex peers use (%)</td>
</tr>
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<td>Female</td>
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<td>9.09</td>
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<td>17.99</td>
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<td>Spain</td>
<td>9.80</td>
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<td>3.90</td>
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<td>United Kingdom</td>
<td>29.03</td>
<td>9.23</td>
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Table 4. Associations between perceptions of peer attitudes and cannabis use with personal cannabis use behaviors and attitudes in the past two months

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<th></th>
<th>Cannabis consumption in past two months</th>
<th>Cannabis attitude (a)</th>
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<tr>
<td></td>
<td>Odds Ratio</td>
<td>95% Confidence Intervals (CI)</td>
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<tr>
<td>Perceived peer use of</td>
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<td></td>
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<tr>
<td>cannabis in last two months</td>
<td>1.13**</td>
<td>[1.04, 1.22]</td>
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<tr>
<td>Perceived peer cannabis attitudes (approval)</td>
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<tr>
<td>No cannabis use in past two months</td>
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<tr>
<td>Have used cannabis in past two months</td>
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<tr>
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<td>[1.04, 3.01]</td>
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<td>Age (per one year)</td>
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<td>[0.93, 0.99]</td>
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<td>With parents</td>
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<td>[0.35, 0.66]</td>
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<td>3rd Year</td>
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<td>[0.78, 1.69]</td>
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<td>[1.07, 2.63]</td>
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<td>[0.43, 1.03]</td>
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<th>Other</th>
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<td>.19***</td>
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<td>0.27</td>
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<td>Hindu</td>
<td>17.33*</td>
<td>[1.38, 216.40]</td>
<td>3.10</td>
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<td>Buddhist</td>
<td>2.61*</td>
<td>[1.07, 6.36]</td>
<td>2.43*</td>
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<td>Other</td>
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<td>[1.73, 4.63]</td>
<td>1.79**</td>
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<td>[1.10, 2.18]</td>
<td>1.66***</td>
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<th>Other</th>
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<td>1.00</td>
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<tr>
<td>Somewhat important</td>
<td>0.91</td>
<td>[0.66, 1.27]</td>
<td>1.01</td>
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<tr>
<td>Important</td>
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<td>[0.29, 0.74]</td>
<td>0.64**</td>
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<tr>
<td>Very important</td>
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<td>[0.12, 0.43]</td>
<td>0.23***</td>
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<table>
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<th>Other</th>
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<td>[0.88, 1.19]</td>
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CANNABIS USE IN EUROPEAN UNIVERSITY STUDENTS  

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<th>95% CI</th>
<th>p-value</th>
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<td>&lt;0.001</td>
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<td>[1.02, 1.23]</td>
<td>0.04</td>
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<td>Spain</td>
<td>1.01</td>
<td>[0.91, 1.16]</td>
<td>0.66</td>
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<td>Turkey</td>
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<td>[0.99, 1.31]</td>
<td>0.21</td>
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<td>United Kingdom</td>
<td>1.19*</td>
<td>[1.05, 1.36]</td>
<td>0.03</td>
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Note: Adjusted Odds Ratios are reported controlling for participant age, sex, religious beliefs, year of study and residence status. * p < 0.05, ** p < 0.01, *** p < 0.01
Table 5. Associations between perceptions of peer attitudes and cannabis use with personal cannabis use behaviors and attitudes in the past two months stratified by country

<table>
<thead>
<tr>
<th>By country</th>
<th>Cannabis consumption in past two months</th>
<th>Cannabis attitude (permissive)</th>
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<td>95% CI</td>
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<td>[1.07, 1.42]</td>
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<td>[1.01, 1.42]</td>
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<td>1.38*</td>
<td>[1.04, 1.82]</td>
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<td>1.82*</td>
<td>[1.12, 3.14]</td>
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<td>1.55*</td>
<td>[1.11, 2.17]</td>
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<td>[0.84, 2.74]</td>
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</tbody>
</table>

Note: Adjusted Odds Ratios are reported controlling for participant age, sex, religious beliefs, year of study and residence status. Odds Ratios for the personal cannabis attitude outcome also control for personal reported cannabis use behaviors. * p < 0.05, ** p < 0.01, *** p < 0.01
Wie wirksam sind schulbasierte Interventionen zur Prävention und/oder Reduktion von Substanzkonsum bei Schülern/-innen in Grund- und Sekundarschulen? Eine systematische Übersicht vorhandener Reviews

Effectiveness of School-based Interventions to Prevent and/or Reduce Substance Use among Primary and Secondary School Pupils: A Review of Reviews

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Zusammenfassung


Abstract
 Objective: The aim of this study is to provide a current overview of the effectiveness of school-based interventions on prevention and/or reduction of substance use among children and adolescents aged 5–19 years.

Methods: A systematic literature search was conducted in PubMed, Cochrane Library, Campbell Collaboration, NICE and ERIC. Systematic reviews and meta-analyses published between 2007 and 2013 were included in the analysis. 2 reviewers assessed the quality of the identified review articles and extracted the data.

Results: 14 review articles of moderate to good quality fulfilled the a-priori defined inclusion criteria. Capacity-promoting interventions, e.g., those focusing on strengthening self-confidence and peer resistance, show promising evidence of effectiveness. Multi-component and multi-level interventions are more suitable for the prevention of alcohol and cannabis consumption. Findings on the prevention of tobacco consumption are inconsistent. The effectiveness of knowledge-based interventions is limited. The long-term effectiveness of smoke-free competitions cannot be conclusively evaluated as the findings are discrepant.

Conclusions: School-based interventions should include capacity-promoting components and should address further levels beyond the individual, for example, organisational changes of the school setting. Further research is needed, in particular on the effectiveness of multi-component and multi-level interventions for the prevention of tobacco consumption.

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Einleitung ▼


Methodik ▼

• Systematische Reviews und Meta-Analysen, die im Zeitraum 2007–2013 veröffentlicht wurden.
• Systematische Reviews und Meta-Analysen, die randomisierte kontrollierte Studien bzw. Interventionsstudien mit einer Kontrollgruppe einbeziehen (Evidenzklsasse 2b).
• Systematische Reviews und Meta-Analysen in englischer oder deutscher Sprache.


Ergebnisse ▼


**Rauchfrei-Wettbewerbe**

2 Meta-Analysen untersuchten die Effekte des „Smoke-Free Class Competition“ (SFC) Programms auf den selbstberichteten Rauchstatus [12,13]. Insensee und Hanewinkel schlossen 5 Studien ein, davon 3 aus Deutschland, und ermittelten in der Interventionsgruppe ein gepooltes relatives Risiko (RR) von 0,86 (95%-KI 0,79–0,94) im längsten Follow-up (min. 1 Jahr) Raucher zu sein [12]. 4 der Studien wurden auch in die Meta-Analyse von Johnston et al. eingeschlossen (insgesamt 5 Studien). Die Autoren konnten keine positiven Langzeiteffekte (Follow-up min. 10 Monate) von SFC aufzeigen (nur RCTs: RR = 1,0; 95%-KI 0,84–1,19; nur kontrollierte Studien [CTs]: RR = 0,81; 95%-KI 0,61–1,08) [13].

**Wissensbasierte Interventionen**

Ein systematisches Review, welches wissensbasierte Interventionen zu illegalen Substanzen mit bestehenden Schulcurricula-Aktivitäten vergleicht, konnte keine Reduktion des Substanzkonsums in den Interventionsgruppen aufzeigen [7]. Zu ähnlichen Ergebnissen kamen die Autoren eines systematischen Reviews zur Langzeitwirkung und Effektivität (min. 1 Jahr) von schulspezifischen Interventionen zur Prävention des Alkoholkonsums. Die mittlere absolute Reduktion (MUR) des Alkoholkonsums betrug 2% pro Monat (MUR = 0,98; 95%-KI 0,92–1,04) [8]. Thomas et al. konnten in einer Meta-Analyse zu schulspezifischen Programmen zur Prävention des Tabakkonsums die Wirksamkeit von wissensbasiertem Interventionen ebenfalls nicht stützen [14]. Eine Meta-Analyse aus dem USA zur Wirksamkeit von Mitteilungen...
<table>
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<tr>
<th>Autor/in, Jahre</th>
<th>Studienformalität</th>
<th>Stichprobenauswahl</th>
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* Anzahl pro Analyse in geschätzter Studie
** Min. eine Studie aus Deutschland

RCT:Randomisierte Studie; CT: Konditionierte Studie; RW: Randomisierte Wirksamkeit; T: Tägliche Befehle; NK: Mehrkomponenten; ME: Mehrinheiten

an die Öffentlichkeit (z. B. Medienkampagnen über TV oder Poster) zur Veränderung der Konsumabsicht illegaler Substanzen bei Jugendlichen zeigte in 3 Studien keine signifikanten und in einer Studie unerwünschte Interventionseffekte in Form einer höheren Konsumabsicht illegaler Substanzen [15].

**Fähigkeitsfördernde Interventionen**

Interventionen, die individuelle Fähigkeiten wie Sozialkompetenzen fördern, erwiesen sich zur Reduktion der Inzidenz des Erstkonsums und der Prävalenz des Konsums von illegalen Substanzen als wirksam. Einer Meta-Analyse guter Qualität zufolge konnte bis zum Ende der Intervention die Prävalenz des Marihuanaconsums um 18% (RR = 0,82; 95%-KI 0,73–0,92) und des Konsums von „harten“ Substanzen um 55% (RR = 0,45; 95%-KI 0,24–0,85) reduziert werden [7]. Interventionen, die soziale Kompetenzen fördern und die soziale Beeinflussung einbeziehen, tragen ebenfalls effektiv zur Senkung der Rauchprävalenz bei (RR = 0,5; 95%-KI 0,28–0,87) [14]. Ein weiteres systematisches Review unterstützte die These, dass fähigkeitsfördernde Interventionen den Konsum von Alkohol, Tabak und Cannabis bei Schüler/innen reduzieren können [16].

**Mehrkomponenten-Interventionen**

Das US-amerikanische Substanzpräventionsprogramm D.A.R.E (Drug Abuse Resistance Education) für Grund- und Sekundarschüler/innen verfolgt neben der Reduktion des allgemeinen Substanzkonsums das Ziel, das psychosoziale Verhalten (z. B. Selbstbewusstsein, Peerresistenz) in Bezug auf den Substanzzusammenhang zu verbessern. Eine Meta-Analyse mit 20 eingeschlossenen Studien zum D.A.R.E.-Programm zeigte eine sehr geringe Reduction des Substanzkonsums (ungewichtete mittlere Effektstärke = 0,05; –0,08–0,38) sowie eine geringe Verstärkung psychosozialer Verhaltensweisen (ungewichtete mittlere Effektstärke = 0,10; –0,09–0,38) [17].

In 4 Übersichtsarbeiten wurden substanzzpezifische Mehrkomponenten-Interventionen (Alkohol, Marihuana, Tabak) untersucht. Im systematischen Review von Foxcroft und Tsertsvadze zeigten 6 von 11 RCTs zur Wirkung alkoholspezifischer Programme signifikante Unterschiede im Alkoholkonsum zwischen Interventions- und Kontrollgruppe zugunsten der Interventionsgruppe; ebenso 14 von 42 RCTs der allgemeinen Drogenpräventionsprogramme. Zudem wurde in einem RCT eine unerwünschter Interventionseffekt in Form eines statistisch signifikanten Anstiegs des Alkoholkonsums in der Interventionsgruppe verglichen mit der Kontrollgruppe beobachtet [18]. Interventionen, die Informationen zu Substanzen vermitteln und die Entwicklung sozialer und Selbstmanagementfähigkeiten fördern, zeigten für Alkohol eine mittlere absolute Reduktion des Konsums von 12% pro Monat (MUR = 0,88; 95%-KI 0,87–0,89) und für Marihuana von 7% pro Monat (MUR = 0,93; 95%-KI 0,92–0,94) [8]. Das schulsolierte Rauchentwöhnungsprogramm „Not on Tobacco“ mit wissensbasierten und fähigkeitsfördernden Komponenten zeigte in der geprüften Analyse, nicht aber in den Einzelstudien, einen signifikanten Rückgang des Rauchens (Follow-up min. 6 Monate) (RR = 1,31; 95%-KI 1,01–1,71) [18]. Eine Meta-Analyse zur Lungzeiteffektivität (min. 1 Jahr) von verhaltenbezogenen, wissensbasierten und fähigkeitsfördernden Interventionen zur Prävention des Zigarettenrauchens zeigte in-konsistente Reduktionen der Rauchraten in den Interventionsgruppen (–3,8 bis 5,4%). Die Auswirkungen für lebenslanges Rauchen, 30-Tages-Rauchen und regulärer Rauchen wiesen ähnliche Ergebnisse auf, wobei in einer Studie eine signifikant höhere Lebenszeitprävalenz des Rauchens bei der Interventionsgruppe verglichen mit der Kontrollgruppe beobachtet wurde [9].


**Mehrebenen-Interventionen**

Eine Übersichtsarbeit zeigte, dass Interventionen zur Rauchprävention, die in mehreren Settings agieren (z. B. Schule und Familie, Schule und Quartier) und wissensbasierte sowie fähigkeitsfördernde Elemente enthalten, wirksamer waren als alleinig schulsolierte Interventionen [21]. 7 RCTs einer Meta-Analyse konnten hingegen keinen signifikanten Langzeiteffekt von Präventionsprogrammen, die in mehreren Settings agieren (Schule, Familie, Quartier) und verhaltenspräventive Komponenten (Steuererhöhung, Verfügbarkeit von Tabakprodukten) beinhalteten, gegenüber bestehenden Schullincurricula Aktivitäten auf die Rauchprävalenz nachweisen (Odds Ratio [OR] = 0,95; 95%-KI 0,64–1,43) [14]. Ein systematisches Review untersuchte neben schulsolierten verhalten- und verhaltenspräventiven Interventionen zur Prävention des Substanzkonsums. Auf Verhältnissebenen wurden z. B. Gesundheitserziehung bezüglich des Substanzkonsums und die Förderung der sozialen Entwicklung sowie auf Verhältnissebenen z. B. die gesamte Schulorganisation und Implementierung eines Schulethos analysiert. In 3 der 4 eingeschlossenen Studien konsumierten Schüler/innen der Interventionsgruppe weniger Alkohol und noch einmal weniger Konsum von Cannabis und Schadstoffen als die Kontrollgruppe [22].

**Diskussion**

Übersichtsarbeit


2 Meta-Analysen mit nahezu identischen Studien kamen bei der Beurteilung der langfristigen Wirksamkeit von Rauchfrei-Wettbewerben zu unterschiedlichen Ergebnissen. Diese sind darin begründet, dass Isensee und Hanewinkel eine Reduktion der Rauchraten bei Interventionsteilnehmern/-innen fanden, jedoch in ihre Analysen keine Angaben zum Rauchstatus im Follow-up von Nicht-Rauchern/-innen zur Basisbefragung einbezogen [12, 13].


Ebenen, wie organisationale Veränderungen (z. B. Implementierung eines Schulethos), des Settings Schule adressieren.

Danksagungen

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Interessenkonflikt: Die Autoren geben an, dass kein Interessenkonflikt besteht.

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