Nutrition counselling in general practice: the Stages of Change Model

PROMOTOREN

Prof. dr. ir. WA van Staveren, Hoogleraar in de Voeding van de oudere mens, Wageningen Universiteit

Prof. dr. ir. C van Weel, Hoogleraar in de Huisartsgeneeskunde, Radboud Universiteit Nijmegen

CO-PROMOTOR

Dr. JC Bakx, Huisarts-onderzoeker, Radboud Universiteit Nijmegen

PROMOTIECOMMISSIE

Prof. dr. JJ van Binsbergen, Radboud Universiteit Nijmegen

Prof. dr. WJ van den Bosch, Radboud Universiteit Nijmegen

Prof. dr. ir. J Brug, Universitair Medisch Centrum Rotterdam

Prof. dr. ir. GJ Hiddink, Wageningen Universiteit

Prof. dr. WW Rosser, Queen's University, Canada

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Nutrition counselling in general practice: the Stages of Change Model

Marieke W Verheijden

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ABSTRACT

Healthy lifestyles in the prevention of cardiovascular diseases are of utmost importance for people with non insulin-dependent diabetes mellitus, hypertension, and/or dyslipidemia. Because of their continuous contact with almost all segments of the population, general practitioners can play an important role in initiating and encouraging dietary change. Unfortunately, dietary change programs that may be successful on the short term, often do not lead to long-term success. Using the Stages of Change Model to tailor nutrition counselling activities to patients' different levels of awareness and motivation has been shown to increase program effectiveness. Data from our studies, showed that decreases in (saturated) fat intake were larger in patients who received tailored counselling than in patients who received usual care (total fat intake: -5.6 percent of energy versus -2.4 percent of energy). The extent to which patients reduced their (saturated) fat intake after a nutrition counselling program, however, did not depend on how much their levels of awareness and motivation had changed.

In research, short questionnaires are used to measure patients' stage of change. In general practice, however, this does not usually happen and general practitioners likely estimate their patients' interest in lifestyle change. Our study showed that general practitioners do not accurately estimate their patients' readiness to reduce their dietary fat intake (Kappa=0.25). To make dietary counselling in general practice more effective, it was therefore suggested that general practitioners should repeatedly ask their patients about their interest in lifestyle change.

In our studies, social support was an independent predictor of intention to reduce dietary fat intake. As our systematic review also supported the key role of social support in the long-term maintenance of dietary change, increasing levels of perceived social support should be incorporated in dietary change interventions. The role general practitioners can play in increasing social support, however, may be limited because of the non-reciprocal relationship they have with their patients. Internet has also been suggested as a potential tool to help achieve long-term dietary change.

Our final study was therefore designed to study the effectiveness of web-based tailored nutrition counselling and social support for patients at elevated risk for cardiovascular diseases. Patients who reported to use the Internet regularly were either given access to an online counselling tool (intervention) or were given usual care (control). The 33% of the patients in the intervention group who used the online tool had larger reductions in systolic blood pressure (-5.3 mmHg versus -0.16) than patients who did not use the tool. No changes in social support were observed.

Nutrition counselling based on the Stages of Change Model is a feasible approach in general practice. As patients' levels of awareness and motivation change continuously, general practitioners' repeated attention for lifestyle is necessary. Collaboration with dieticians can help overcome some of the barriers limiting nutrition counselling practices by general practitioners. In the future, Internet can also play an important role.

CONTENTS

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Introduction

The doctor of the future will give no
medicine but will interest his patients
in care of the human frame, in diet and
in the cause and prevention of disease.
Thomas Alva Edison

In recent years, cardiovascular diseases led to the largest number of lost years of life, and were the cause of death with the most mortality in the Netherlands (Koek *et al.*, 2003; Centre for Public Health Forecasting, 2003). In 1999, the nutrition sensitive conditions hypertension (prevalence: 5.4%), obesity (prevalence: 4.2%), diabetes mellitus (prevalence: 2.1%) and dyslipidemia (prevalence: 1.7%) were among the ten most commonly diagnosed chronic conditions in general practice (Van Weel, 1999). Cardiovascular diseases are related to substantial loss in quality of life. Yet, there are hardly any improvements in unhealthy risk behaviours related to cardiovascular diseases. The prevalence of smoking, excessive drinking, physical inactivity, and poor diet remain high and the prevalence of obesity and diabetes are rapidly increasing. Although food and pharmaceutical industries continue to invest in product development in relation to cardiovascular health (e.g., the replacement of saturated with unsaturated fats and the development of lipid lowering drugs), three quarters of the Dutch population consume too much saturated fat (Centre for Public Health Forecasting, 2003). Individuals' dietary change is therefore inevitable to help reduce the burden of cardiovascular diseases. Funding for public health campaigns to achieve dietary change is limited. The search for relevant intermediary groups to reach and motivate large groups of people, as well as effective approaches to initiate and maintain dietary behaviour change is therefore evident. Several theoretical frameworks, such as the Social Learning Theory (Bandura, 1986), the Theory of Reasoned Action (Ajzen & Fishbein, 1980), the ASE Model (De Vries *et al.*, 1988), the Theory of Planned Behaviour (Ajzen & Madden, 1986), the Precaution-Adoption Model (Weinstein, 1988), the Health Belief Model (Rosenstock, 1966; Becker, 1974), and the Stages of Change Model (Prochaska & DiClemente, 1982) are available as a basis for intervention approaches. Because of its origin in smoking cessation practice and the success of its applications in many other health behaviours, the Stages of Change framework is particularly interesting. The general practice is a powerful setting for health promotion because general practitioners reach nearly all segments of the population, and because they can specifically target preventive services to high-risk individuals, rather than the general population (Holt & Ohno-Machado, 2003; Mant, 2004). The research described in this thesis thus aims to identify and evaluate general practice-based approaches based on the Stages of Change Model to help patients at elevated cardiovascular risk to lower their dietary fat intake.

THE STAGES OF CHANGE MODEL

Prochaska & DiClemente and their colleagues laid the foundations for the central idea of behaviour change through a series of stages rather than as a discrete all-or-nothing event: the Stages of Change Model. The Stages of Change Model (also known as the Transtheoretical Model) was initially described in the 1980's (Prochaska & DiClemente, 1982 & 1983). The model consists of five distinct stages of change, based on people's perceptions of their current behaviour and their intentions for future behaviour change. The stages of behaviour change are defined as follows:

Precontemplation: People are unaware of the consequences of their behaviour and/or the need for behaviour change. They tend to avoid reading, talking and thinking about their high risk behaviours and do not intend to take action in the foreseeable future, usually measured as the next six months.

Contemplation: People are aware of the need for behaviour change and intend to take action within the next six months. However, they are still uncertain about the balance between pros and cons of behaviour change. This uncertainty can last for long periods of time.

Preparation: People are committed to take action in the immediate future, usually measured as the next month. They often have a concrete plan of action, such as: taking up sports, joining a health education program, or buying a self-help book.

Action: People have made specific overt modifications in their lifestyle within the past six months. Only changes that meet criteria scientists and professionals agree to be sufficient to reduce risks for disease, are considered action.

Maintenance: People have shown the desired behaviour for over six months and are working to prevent relapse. They are increasingly confident that they can continue their new healthy lifestyle.

Termination is sometimes added as a sixth stage of the Stages of change Model to classify people who are sure they will not return to their old unhealthy behaviours. For the majority of people, however, termination may not be reality in practice.

People do not necessarily progress through the stages of change in chronological order and relapse to earlier stages is frequent. People usually progress and regress through the stages a number of times before sustained behaviour change is achieved (see **Figure 1.1**)(Prochaska & Velicer, 1997). The Stages of Change Model also includes so-called processes of change. People use these processes to progress through the stages, and the processes thus provide important handles for intervention strategies. The ten processes that have been supported most consistently by empirical data are: *consciousness raising*, *dramatic relief*, *self-reevaluation*, *environmental reevaluation*, *self-liberation*, *social liberation*, *counterconditioning*, *stimulus control*, *contingency management / reinforcement management*, and *helping relationships* (Lamb & Sissons Joshi, 1996; Prochaska & Velicer, 1997). The importance of the processes of change varies by stage of change and the sequencing is specific for different health behaviours (Prochaska & DiClemente, 1992).

Nutrition counselling with a tailoring approach is based on the idea that adjusting content and shape of counselling messages to characteristics of the recipients can increase their effectiveness (Ashworth, 1997; Kristal *et al.*, 1999). Measuring individuals' stage of change can help select people who are most likely to change as target groups for future intervention efforts. It is also possible to develop different interventions for each of the five stages (Ashworth, 1997).

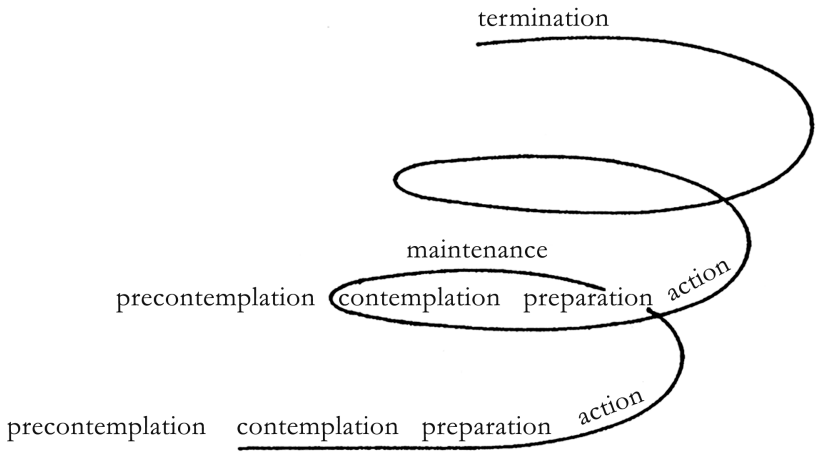

Figure 1.1 The Stages of Change Model (Prochaska *et al.*, 1992).

THE STAGES OF CHANGE MODEL FOR DIETARY CHANGE

The Stages of Change Model was originally developed for smoking cessation (Prochaska *et al.*, 1994). Since its development, the Stages of Change Model has been applied for a broad range of other addictive and non-addictive health related behaviours, such as: quitting cocaine, condom and sunscreen use, mammography screening, radon gas exposure, exercise acquisition, weight control, and the adoption of healthy diets (Prochaska *et al.*, 1994). Dietary change is in many ways different from smoking cessation, for which the Stages of Change Model was originally developed. The target behaviour, for example, is related to balance, moderation, and graduation of intake rather than complete abstinence. This makes the understanding of the goal behaviour by the lay public very poor, especially for specific nutrient goals (Horwath, 1999).

These abstract guidelines entail the most difficult problem for applications of the Stages of Change Model to dietary change. For fat consumption, the Health Council of the Netherlands (Gezondheidsraad) has set these guidelines to 20 to 40 percent of energy for individuals whose weight is optimum and constant. For individuals who are overweight or who experience undesirable weight gain, adequate levels of fat are between 20 to 30 or 35 percent of energy (Health Council of the Netherlands, 2001). Because people have difficulties rating their fat intake accurately, it is possible that people classify themselves in the action and maintenance stages, without meeting the aforementioned behavioural criteria for risk reduction. In contemporary research, this apparent mistake is treated in two different ways.

The most theoretical approach is to consider the discrepancy between peoples' perception of their fat intake and their actual intake as a cause for misclassification. To avoid these problems, algorithms to measure stages of change can be expanded to include behavioural criteria. Researchers can also re-classify patients based on dietary intake data that can be obtained from, for example, food frequency questionnaires. Individuals who report to be in the maintenance stage, but fail to meet the appropriate behavioural criteria have been referred to as pseudomaintainers, and have been reassigned to the pre-action stages of change (Rossi *et al.*, 1993; Greene *et al.*, 1994). A study in 1998 (Lechner *et al.*,

1998) showed substantial differences in distribution across stages of change when reclassification based on estimated fat consumption levels was applied. Kristal *et al.* (1999) later explained that these nutrient intake criterion approaches have distinct disadvantages. First of all, differences in dietary behaviour between people in the different stages of change are often seen as a validation of stages of change algorithm. Yet, the association between stage of change defined by means of dietary criteria, and dietary behaviour itself is tautological. Another problem is that dichotomous breakpoint criteria for dietary behaviour may fail to uncover potentially large improvements. For example, overweight people may reduce the amount of fat in their diet from 40% of the energy intake to 30% and achieve a weight reduction of two to three kilograms. While people may still not meet the behavioural criteria, even this modest weight loss can contribute to the prevention of cardiovascular disease (Health Council of the Netherlands, 2001). Finally, the rationale behind tailoring to stage of change is to provide motivation, information, and confirmation at the right times to facilitate and accelerate the behaviour change process. Awareness of peoples' elevated intakes is at the basis of this process. However, to achieve this goal, it is pointless to use an algorithm with nutrient criteria that may accurately force people with elevated fat intakes into the precontemplation, contemplation or preparation stages. Of course, similar problems arise when people are re-classified from a researcher's office based on nutrient intake criteria. Everything taken together, the applicability of a stage of change construct defined by means of dietary criteria for tailoring nutrition counselling may be limited.

The second approach is rooted more in behaviour counselling practice and refrains from the use of nutrient criteria. It postulates that the stages of change construct reflects what people are thinking about their diets and what their interest in change is, rather than what they are eating (Kristal *et al.*, 1999). The association between stage of change, and dietary behaviour thus reflects accuracy of self-perceived dietary intake rather than the validity of the staging instrument. Peoples' self-perceived diet combined with results from an objective dietary assessment method, form a basis for counselling strategies. Bearing in mind peoples' perception, their willingness to change their diet, and their possible surprise when confronted with true intake data, health counsellors can use these data to achieve sufficient levels of awareness to initiate the behaviour change process. In this perspective, true intake data are used as an integral part of the counselling strategy to increase patient knowledge. The studies described in this thesis are all based on the second approach.

ROLE OF GENERAL PRACTITIONERS IN DIETARY CHANGE

In the Netherlands, as in many other countries, general practitioners are gatekeepers for the health care system and they can give patients access to other health professionals such as dieticians. Currently, most Dutch health insurance companies, for example, reimburse consultations by a dietician only after referral by a general practitioner or a specialist in a hospital. However, the role of general practitioners in dietary change is much more comprehensive than a mere gatekeeper function. General practitioners acknowledge their potential role in achieving behaviour change for primary prevention and patients perceive their general practitioners as an important source of nutrition information (Mirand *et al.*, 2002). A study by Hiddink *et al.* (1997a) showed that general practitioners were preferred over 10 other

potential nutrition information resources such as dieticians, the Netherlands Nutrition Centre (voedingscentrum), consumer organizations, and food retailers. This was despite the fact that the perceived level of expertise of general practitioners was lower than of dieticians and the Food and Nutrition Education Bureau. Combined with their reach of nearly all segments of the population in a setting that allows for continuity of care (Hiddink *et al.*, 1997a; Van Weel, 1999), this puts general practitioners in a unique position for nutrition counselling. Unfortunately, general practitioners perceive barriers to nutrition guidance practices, such as lack of nutrition training and education, lack of skills, lack of time, and lack of patient motivation (Hiddink *et al.*, 1997b). A study by Thompson *et al.* (2003) reviewing four studies, in which the effectiveness of dietary advice from dieticians was compared with advice from doctors, indeed showed that improvements in blood cholesterol were larger after dietary advice by a dietician. This suggests that cooperation with dieticians, who do have the relevant training and skills, can help overcome some of the barriers perceived by general practitioners. General practitioners could use their perceived importance and relatively frequent contact with patients to make patients aware of the importance of a healthy diet, and to motivate them for behaviour change. Dieticians could subsequently provide patients with the detailed and practical nutrition counselling general practitioners feel incapable of.

The Dutch guidelines for general practice (NHG standards) spell out the preferred policy of detection, investigation, treatment, and control of various clinical conditions. Particularly for overweight people, nutrition plays an important role in the NHG standards on type II diabetes mellitus, hypertension, and dyslipidemia. Dietary counselling, possibly in addition to pharmacologic measures, is therefore recommended (Van Binsbergen, 1997). Unfortunately, the NHG standards lack a detailed description of the content and implementation of the dietary counselling (Thomas *et al.*, 1996) and cooperation with a dietician is also not specifically recommended. As a result, there are currently no uniform dietary counselling strategies in general practice. The extent of the use and the actual content of dietary counselling depend to a large extent on individual general practitioners' knowledge, interest, and priority setting.

It is important to note that physical inactivity, smoking, drinking, and poor diet are not biomedical conditions that can be fully treated or controlled by general practitioners or any other health worker (Vinson, 2002). Instead, to be successful, patients need to be actively involved in behaviour change. Guidelines and policies, such as the recent extension of non-smoking policy in public buildings across many countries in Europe, can be helpful tools to enhance patient awareness and involvement.

OUTLINE OF THE THESIS

The research described in this thesis was conducted to contribute to the evidence to determine if the Stages of Change Model can be a short and effective tool for the screening and treatment of patients at elevated cardiovascular risk in general practice. Based on the idea that general practitioners can initiate behaviour change, but that long-term behaviour change can only be achieved with sufficient levels of support, *Chapter 2* provides a theoretical background for social support lifestyle interventions for cardiovascular risk reduction. The potential role of the Stages of Change Model is predominantly

discussed. A study by Van der Veen *et al.* (2002) served as a basis for the other studies described in this thesis. In that study, a randomised controlled trial was used to assess the short-term and long-term effectiveness of nutrition counselling based on the Stages of Change Model for patients at elevated cardiovascular risk in general practice. Behavioural, anthropometrical, and clinical outcomes were assessed. Data from this study (Van der Veen *et al.*, 2002), which showed favourable effects on the short-term that disappeared on the long term, were used in *Chapter 3* and *Chapter 4*. *Chapter 3* presents the role of behavioural determinants and dietary habits in the prediction of intention to reduce fat intake. The role of tailoring in the intervention effects is addressed in *Chapter 4*. In the study by Van der Veen *et al.* (2002), as well as in other studies, algorithms were used to measure patients' stage of change. In practice, however, these algorithms are not frequently used. *Chapter 5* therefore continues to describe the accuracy of general practitioners' assessment of patients' readiness to lower dietary fat intake, to increase physical activity, and to quit smoking.

The short-term effectiveness of the study by Van der Veen *et al.* (2002) was promising, but continuous lifestyle counselling for all patients with chronic diseases is not feasible in general practice, due to time constraints. Further studies described in this thesis were therefore aimed at applications of Internet-based approaches for lifestyle counselling and social support. *Chapters 6* address patients' and general practitioners' views on the potentials and pitfalls of web-based health promotion tools in general practice. *Chapter 7* presents data on the effectiveness of a web-based tailored nutrition counselling intervention. Finally, the main study results are summarized and they are put into perspective (*Chapter 8).*

2

Social support and the Stages of Change Model: a review on lifestyle behaviour change in weight loss

Nature fits all her children with something to do,
he who would write but can't write
can surely review.
James Russell Lowell

ABSTRACT

Social support is important to achieve beneficial changes in risk factors for disease, such as overweight and obesity. This paper presents the theoretical and practical framework for social support, and the mechanisms by which social support affects body weight. People's need for social support is largely determined by personal and environmental characteristics. The Stages of Change Model is discussed as a framework in which tailored social support could be implemented. Health professionals have an important role in initiating lifestyle behaviour change, but their influence may be relatively small in comparison to people's natural support networks. We strongly encourage health professionals to help patients consolidate their natural support resources to achieve or maintain weight control.

The theoretical and practical framework is supported with a literature review addressing studies involving a social support intervention in behaviour change for diet, physical exercise, weight loss, and weight loss maintenance. Most interventions discussed in this review showed positive health outcomes. Future social support intervention research would benefit from clear definitions of social support, a clear description of the intended mechanism of action and the actual intervention, and the inclusion of perceived social support as a study outcome.

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Overweight and obesity are important modifiable risk factors for cardiovascular diseases (CVD)(Lamon-Fava *et al.*, 1996; Ho *et al.,* 2001). Weight loss and the prevention of weight gain in defined groups or in the general population are therefore important factors in the prevention of CVD. This sets the stage for interventions aimed at improving dietary and physical activity patterns. While information, support and technical advice from health workers can be a key factor in behaviour change, most of the dynamics of behaviour change take place in patients' private and work settings. In these situations, the social environment plays an important role. Cross-sectional studies have related social support to health, and social support has also been shown to be important in achieving and maintaining health behaviour change (Berkman & Syme, 1979; House *et al.*, 1988; Amick & Ockene, 1994).

The idea that intervention strategies for behaviour change can be more effective if they are tailored to patients' characteristics has been studied using the Stages of Change Model (also known as the Transtheoretical model) (Prochaska & Velicer, 1997; Ashworth, 1997; Horwath, 1999; Steptoe *et al.*, 2001; Van der Veen *et al.*, 2002). This model postulates that behaviour change is not a dichotomous event, but a multi-step spiral or cyclical process through one or more of the five distinct stages of change. The model allows for skipping one or more of the stages, and for regression to earlier stages. In the *precontemplation* stage, people do not intend to change their behaviour in the next 6 months because they are unaware of the problem behaviour or because they are demoralized by unsuccessful previous behaviour change attempts. In the *contemplation* stage, people are aware of the need for behaviour change. They intend to take action within the next six months, but lack commitment to actually start changing. In the *preparation* stage, people intend to take action in the immediate future, which is usually measured as the next month. They often have a plan of action, such as: taking up sports, or buying a self-help book. In the *action* stage, people have made specific overt modifications in their lifestyle within the past six months. Theoretically, people can only be in the action stage if they have made behaviour changes sufficient to reduce risks for disease. In the *maintenance* stage, people have shown the desired behaviour for over six months and are working to prevent relapse. The behavioural criteria that are set for the action stage, also apply for the maintenance stage (Prochaska *et al.*, 1992; Prochaska & Velicer, 1997).

The Stages of Change Model was originally designed for smoking cessation but has also been applied for non-addictive behaviours such as diet and physical exercise. Cross-sectional studies have shown better health behaviour in people in the later stages of change (Glanz *et al.*, 1994; Greene *et al.*, 1994; Dannecker *et al.*, 2003) and most intervention studies indicate positive effects of tailoring, in particular in the short term (Campbell *et al.*, 1994; Steptoe *et al.*, 1999; Oldroyd *et al.*, 2001; Van der Veen *et al.,* 2002). As this could not been demonstrated in the longer term (Steptoe *et al.*, 1999; Van der Veen *et al.*, 2002), more effective interventions for long term maintenance of change are needed. To prevent relapse, health workers should thus focus on people in the action and maintenance stages of change, in addition to initiating behaviour change in people in the pre-action stages of change.

The role of social support and the potential of the Stages of Change Model in behaviour change are both evident. Nevertheless, surprisingly little work has been done to integrate those concepts. In this paper we will therefore start by discussing the theoretical framework behind social support, and the mechanisms by which it affects lifestyle change. The role of social support in the Stages of Change Model will primarily be discussed. The effectiveness of social support interventions for diet and exercise in weight loss and weight loss maintenance will be shown in a systematic review of the literature. We will conclude with reflections on the incorporation of social support in lifestyle interventions.

THEORETICAL FRAMEWORK

Social support

The term social support is used for a broad range of concepts and partly overlapping functions, such as: emotional, instrumental, informational, and appraisal support (Cohen & Wills, 1985; Vaux, 1988 pp 18 and 136; Antonucci & Johnson, 1994; Cohen *et al.*, 1994; Langford *et al.*, 1997). A major distinction is made between *structural* and *functional* support. Structural support is the availability of significant others (e.g. spouses, family members, friends, co-workers, social and religious groups) irrespective of the actual exchange of support. Structural support is also referred to as social integration (Cohen *et al.*, 2000). Functional support, by contrast, is a subjective measure of the perception of support, depending on individual characteristics and expectations (Yopp Cohen, 1988; Connell & D'Augelli, 1990). The perception of support is strongly influenced by personal characteristics (Liem & Liem, 1978; Cohen & Wills, 1985; Lakey *et al.*, 1996; Lakey & Cohen, 2000). Therefore, structural and functional support are not necessarily highly correlated. Interventions should thus be focused on increasing functional support rather than structural support. In practice, however, intervention opportunities on the structural support level by adding health professionals or peers seem more feasible than changing people's perception of support (functional support). As perceived social support has been shown to be stronger correlated with well-being than received support (Wethington & Kessler, 1986), the effectiveness of this approach remains to be shown.

Social support has repeatedly been related to improved health. Controlling for known determinants of morbidity and mortality, people with low social support levels had a relative risk ratio for mortality of approximately 2.5 (Berkman & Syme, 1979; House *et al.*, 1988). However, because much of the social support research was cross-sectional, causal inferences are impossible. Perhaps healthy individuals are able to have more rewarding social interactions than their less healthy counterparts. It is also possible that social support results in improved health outcomes or that an unknown factor positively affects both social support and health (Cohen & Wills, 1985).

Many of the risk factors for cardiovascular disease, including obesity, are explained to a fair extent by genetic predispositions. Knox & Uvnäs-Moberg (1998) elucidated that 'the interaction of the genotype with the environment determines the extent to which these factors are expressed'. The effects of social support on health would thus be a result of the effects on the environment. These effects are

explained using both *indirect* and *direct* models. In indirect models, social support influences the occurrence of stressful events, the appraisal of stressors and individuals' responses to stressors. The latter has been suggested to be a result of social support's ability to suppress the production of the stress hormone cortisol (Heinrichs *et al.*, 2003). In indirect models (also referred to as stress-buffering models), social support would only be protective in the presence of stressful conditions (Amick & Ockene, 1994; Cohen *et al.*, 2000). In direct models, social support affects psychological and physical well-being, irrespective of the stress levels of the individual. Social support may trigger behaviour change by providing information about diet or exercise, by providing reassurance, or by increasing compliance to treatment (Amick & Ockene, 1994; Bovbjerg *et al.*, 1995; Cohen *et al.*, 2000). Lakey and Cohen (2000) provided an extensive overview of the different models explaining the effects of social support on health.

Social support can also counteract health behavior changes (Fleury, 1993; Amick & Ockene, 1994). Peer smoking, for example, may negatively affect the success rate of patients' quitting attempts or people may (unknowingly) give false or incomplete informational support (Kelsey *et al.*, 1997; Helgeson & Gottlieb, 2000). Finally, social support may counter the state of denial patients had been in to protect themselves from psychosocial effects of their illness.

Social support and the stages and processes of change

Only a few studies specifically looking at the role social support in the Stages of Change Model have been conducted. The Stages of Change Model includes ten processes of change in addition to its stages (Prochaska *et al.*, 1992; Rossi *et al.*, 1994; Bowen *et al.*, 1994; Lamb & Sissons Joshi, 1996; Prochaska & Velicer, 1997; Horwath, 1999). Individuals need to progress through these processes to move from one stage of the model to the other. The relative importance of the processes for each of the stages of change varies across behaviours. **Table 2.1** identifies the stages and processes for dietary change. Social support is relevant to virtually all of the processes: environmental reevaluation, counterconditioning, stimulus control, contingency management, helping relationships, and social liberation are all driven in part by social interactions. It has also been argued that the social environment plays a role in consciousness raising (Amick & Ockene, 1994; Prochaska & Velicer, 1997).

Varying results have been found with respect to the stages of change in which social support was highest (Lamb & Sissons Joshi, 1996; Brug, 1997; Sorensen *et al.*, 1998; Ronda *et al.*, 2001; Verheijden *et al.*, 2003). However, the mere availability of social support may not reflect the relative importance of social support in each of the stages of change. Amick & Ockene stated in 1994 that 'different degrees of social support may be more effective or necessary at one stage than another, making it necessary to identify and emphasize appropriate support resources and activities in intervention efforts'. Since their review, which did not address the preparation stage, surprisingly few studies have been done on the role of social support during each of the stages of change. Finally, the research conducted thus far has focused on the stages of change in which social support was highest and has neglected to focus on the stages of change in which social support is most important.

Table 2.1 Stages and processes of dietary behaviour change in the Stages of Change Model (Bowen *et al.*, 1994; Prochaska & Velicer, 1997; Prochaska *et al.*, 1992).

Stage	Process	Significance
Precontemplation	Consciousness raising	Involves increased awareness about the causes, consequences, and cures for a particular problem behaviour.
	Dramatic relief	Initially produces increased emotional experiences followed by reduced affect if appropriate action can be taken.
	Environmental reevaluation	Combines both affective and cognitive assessments of how the presence or absence of a habit affects one's social environment. It can also include the awareness that one can serve as a positive or negative role model for others.
Contemplation	Self-reevaluation	Assessing how lifestyle influences self, changing self-perception.
Preparation	Self-liberation	Is both the belief that one can change and the (re)commitment to act on that belief, generally known as willpower.
Action	Counterconditioning	Requires the learning of healthier behaviours that can substitute for problem behaviours.
	Stimulus control	Removes or counters cues for unhealthy habits and adds prompts for healthier alternatives.
	Contingency management	Provides consequences on taking steps in a particular direction, both as reward and as punishments.
	Helping relationships	Combines caring, trust, acceptance, openness, as well as support for the healthy behaviour change.
Maintenance	Social liberation	Requires an increase in social opportunities or alternatives, beliefs that environment support change.

Sources and mediums for social support

Family members, friends, colleagues and (church) communities are part of patients' natural support network and can play a role in the provision of social support. Involving natural support resources in intervention programs is valued by patients and increases program effectiveness, but negative consequences are also reported (Hagen, 1974; Tattersall *et al.*, 1985; Black *et al.*, 1990; Hart *et al.*, 1990; Parham, 1993; Burke *et al.*, 1999). Bringing new sources of support such as peers into action may be helpful when social support from patients' natural networks is insufficient (Helgeson & Gottlieb, 2000). This may not only lead to improved health of the patient but also of the support giver, for example because providing support makes them feel good about themselves (Riessman, 1965; Hupcey, 1998; Schwartz & Sendor, 1999). This is referred to as the helper-therapy principle (Helgeson & Gottlieb, 2000).

Approaches targeting groups rather than individuals, such as peer groups, can be very time and cost-efficient and the use of group processes to alleviate illness or stress can be beneficial (Ryle, 1976). Telephone and computer-based approaches are also promising as they can help overcome geographical and time barriers. This is particularly helpful for diseases with low prevalence rates or for people with stigmatizing diseases (Alemi *et al.*, 1996; McBride & Rimer, 1999; White & Dorman, 2001). Yet, membership of a support group itself can be stigmatising too (Helgeson & Gottlieb, 2000). Computer-based approaches have the additional benefit that they allow for communication at individuals' own pace and time, and for interventions tailored to individuals' needs, for example by using the Stages of Change Model. Several approaches have been advocated to overcome the somewhat impersonal and ambiguous style of online conversation (Parks & Floyd, 1996; Kollock & Smith, 1996; Tate *et al.*, 2001; Warisse Turner *et al.*, 2001).

It has been suggested that social support from health professionals may have a limited effect in comparison to support from patients' natural support networks. This is largely due to the non-reciprocal relationship between patients and health professionals. A similar non-reciprocal situation is present when trained peers receive financial rewards or when worksite based programs involve supervisors or managers for support (Hupcey & Morse, 1997; Hupcey, 1998). Zablocki (1998), however, showed with anecdotal evidence from various worksites, that worksite weight management programs supported by employers can be very successful. Evidence for the success of commercial self-help groups such as the Weight Watchers is also predominantly anecdotal. One of the few studies showed no effect on weight loss (Djuric *et al.*, 2002). The proliferation of self-help groups, however, indicates the public's belief in their effectiveness.

SOCIAL SUPPORT IN LIFESTYLE INTERVENTION TRIALS

Literature search strategies

To identify papers describing social support intervention studies, the Medline, CINAHL, ClinPSYC, PsycINFO, ACP Journal Club, and Cochrane databases were searched in cooperation with reference librarians. Combinations of the following keywords were used: diet, nutrition, weight loss, (physical) exercise, (physical) activity, social support, functional support, structural support, social network, peer group, self help group, group education, and patient education. Only publications between 1970 and 2003 were included. This yielded over 6050 titles that were reviewed for relevance. Reference lists of the papers were also screened for relevant publications. In this initial step, papers addressing health issues other than adult obesity, such as breast-feeding practices and cancer were excluded. Over 570 abstracts were reviewed, and over 210 papers were read. Papers were included when meeting the following criteria:

1) randomized controlled trials;
2) adult and older-aged participants;
3) social support provided through written, face-to-face, telephone, or computer-based interaction; studies involving pets for the provision of social support were

excluded. Studies looking at group-based interventions without a specific mentioning of social support were also excluded;

4) effects measured in terms of objectively measured biological and biochemical outcomes such as body weight, blood pressure, cholesterol levels, and energy expenditure.

Papers that were included in the reviews of Black *et al.* (1990) and Kelsey *et al.* (1997) were excluded from our review. In seven of the 28 included papers, social support was mentioned without giving details on how this was achieved during group education classes. In 21 other papers, the operationalisation of the social support intervention was described in more detail.

RESULTS

Over the years, a number of intervention studies involving social support have been conducted. **Tables 2.2 and 2.3** at the end of this chapter give an overview of the designs and outcomes of intervention studies that were not addressed in earlier reviews by Black *et al.* (1990) and Kelsey *et al.* (1997) on dietary change and weight loss. A principal concern in the social support literature is the heterogeneity of definitions, operationalisations and measurement tools for social support, which hampers comparisons across studies. **Table 2.2** therefore presents studies in which a group-based approach was the only operationalisation for social support. By contrast, more elaborate information was available on the studies presented in **Table 2.3**.

The baseline health characteristics of participants varied between studies. Some studies were conducted with extremely overweight participants, others with diabetic patients, or seemingly healthy individuals. In most studies, participants were recruited by means of newspaper advertisements, or patients who were already attending a clinic were asked to participate in research projects. This suggests highly motivated participants and leaves questions about the applicability for the population at large. The interventions varied from four weeks to two years and follow-ups ranged from 4 weeks to 6 years after the intervention. We found no apparent difference in effectiveness between shorter and longer interventions.

Attrition in the studies ranged from 0 to 65 percent. A previous review of 16 group counselling studies found an average attrition rate of 35% (Foreyt *et al.*, 1981), and an overview of commercial and self-help groups reported as much as 80% (Rosenblatt, 1988). The demanding nature or duration of some interventions may help explain the high attrition rates. Wing & Jeffrey (1999) found considerable lower numbers of dropouts when patients were recruited with a group of friends. Monetary incentives, (partial refund upon completion of parts of a study, or upon achievement of a behavioural goal) are often used and likely resulted in highly motivated study populations. Notably, effects of social support are hard to distinguish from the effects of financial commitment. Attendance rates were not presented in nine of the studies in our review. In many of the studies attendance was around or below 50%. One study addressing an Internet intervention for maintenance of weight loss found lower session-attendance rates in the Internet group than in a more traditional therapist-led group (Harvey-Berino *et*

al., 2002b). Participants in the Internet group possibly felt less obliged to attend because of the relative anonymity of Internet contact.

The outcome measures of the interventions in **Tables 2.2 and 2.3** varied largely. Even a straightforward outcome such as weight was presented in multiple different ways, for example as a percentage above desirable weight as defined by life or health insurance companies, or as the percentage of the study population being overweight or obese. This makes a meta-analytic effectiveness evaluation complicated. Overall, most of the interventions in **Tables 2.2 and 2.3** showed beneficial outcomes of the intervention. Similar findings were also reported in the reviews of Black *et al.* (1990) and Kelsey *et al.* (1997). A true evaluation of the effectiveness of the social support component of the interventions is difficult because social support was often not clearly defined, combined in an intervention with other intervention activities, or not included as an outcome measure (Black *et al.*, 1990; Parham, 1993).

Despite the widespread use of the Stages of Change Model and the specific role of social support in the process of change, the model was not used for any of the above-mentioned interventions. One study by Joseph *et al.* (2001) showed positive behavioural outcomes of a peer intervention for diabetes patients based on the Stages of Change Model, but clinical outcomes were not assessed. Furthermore, peer support interventions are rarely theory-based (Helgeson & Gottlieb, 2000). The rationale for incorporating social support in intervention approaches seems to have been based less on a theoretical justification than on a pre-existing interest in the social support phenomenon. As was previously reported for other health problems, very few of the papers described in **Tables 2.2 and 2.3** mention a theoretical framework for the intervention (Bourgeois *et al.*, 1996; Turner & Shepherd, 1999).

IMPLICATIONS: SOCIAL SUPPORT IN FUTURE RESEARCH AND INTERVENTIONS

Because behaviour change is a complex process, the use of multi-component intervention approaches is advocated (Perri *et al.*, 1993; Calfas *et al.*, 2002). As a result, social support is often combined with other intervention approaches. This limits the possibility to accurately assess the separate effects of social support. Also, it is common practice to control for known covariates such as smoking, physical exercise and diet, when assessing the effects of risk factors on health. However, as social support affects these covariates too, controlling for these variables reduces the discernible effects of social support (Knox & Uvnäs-Moberg, 1998). As both informational support and more traditional educational activities provide patients with knowledge and skills, it would be relevant to assess the difference in the effectiveness of both approaches. However, as peers may give informational support as well as emotional support at the same time, distinguishing the relative contribution of each of the support components may be difficult. This also complicates an intervention trial evaluating social support. Yet, the first and foremost concern in the research thus far is the lack of a social support outcome measure in most of the studies.

While tailoring lifestyle counselling messages to patients' individuals desires and needs is increasingly becoming the method of choice in research, as of yet this does not hold true for social

support (Lakey & Cohen, 2000). This is surprising, as it has been shown repeatedly that characteristics of the recipient and the provider, as well as of the type of disease, determine the need for and exchange of social support (Cutrona & Russell, 1990; Kahn, 1994; Hupcey, 1998; Helgeson & Gottlieb, 2000). Kahn (1994) formulated the optimal matching theory as the 'expectation that positive effects would be maximized when the kind of support offered was congruent with the requirement of the situation and needs of the person'. Tailoring the frequency, types, sources, and media of social support to individual patients may, therefore, hold promise for the future. As discussed earlier, the Stages of Change Model may be a particularly useful framework for the tailoring process. **Figure 2.1**, therefore, gives an overview of the potential of social support for lifestyle counselling based on the Stages of Change Model.

In the precontemplation stage, the natural social support network may provide a powerful setting to initiate the change process. The illness or death of a relative or friend, for example, may be a stronger cue to action than an increase in knowledge and awareness of health risks. Health professionals as well as social and societal factors can play a vital role in increasing people's awareness and motivation for change. In the subsequent preparation, action and maintenance stages, support from health professionals combined with natural support networks is increasingly important. The relative success of social support interventions in behaviour change maintenance rather than in initial behaviour change (Yopp Cohen, 1988) also supports the idea that social support in the later stages of change can be very helpful. In the maintenance stage, people's natural support networks would ideally be sufficient to assure continuity of the desired behaviour. This would allow health professionals the time to focus primarily on people in the earlier stages of change, who are least convinced of the need for behaviour change and of their ability to actually do so.

The need for time- and cost-effective lifestyle counselling approaches in health care is evident. This also explains the tendency to study social support predominantly in relation to clinical outcomes with a direct relation to morbidity and mortality. Very few studies have incorporated use of the health care system as a study outcome. McBride & Rimer (1999) showed that supportive telephone calls can reduce the number of scheduled and unscheduled clinic appointments as well as the use of medication and the length of hospital stays. Future studies should show if social support lifestyle interventions can truly serve as a partial substitute for regular health care. In these studies, clinical outcomes that have a direct relation to morbidity and mortality, and therefore to health care costs, are evident measures of effectiveness. WHO's definition of health, however, is 'a state of complete physical, mental and social well being and not merely the absence of disease or infirmity' (World Health Organization, 1946). Therefore, psychosocial measures such as quality of life and patient satisfaction, of which the direct financial benefit to the health care system are hard to quantify, should also be taken into account.

The theoretical rationale for social support in lifestyle interventions is strong. While the rationale for incorporating support in Stages of Change-based interventions is just as strong, there is hardly any evidence from intervention trials. The results of social support in non-staged interventions are sometimes conflicting, but suggest beneficial effects of the inclusion of social support in interventions

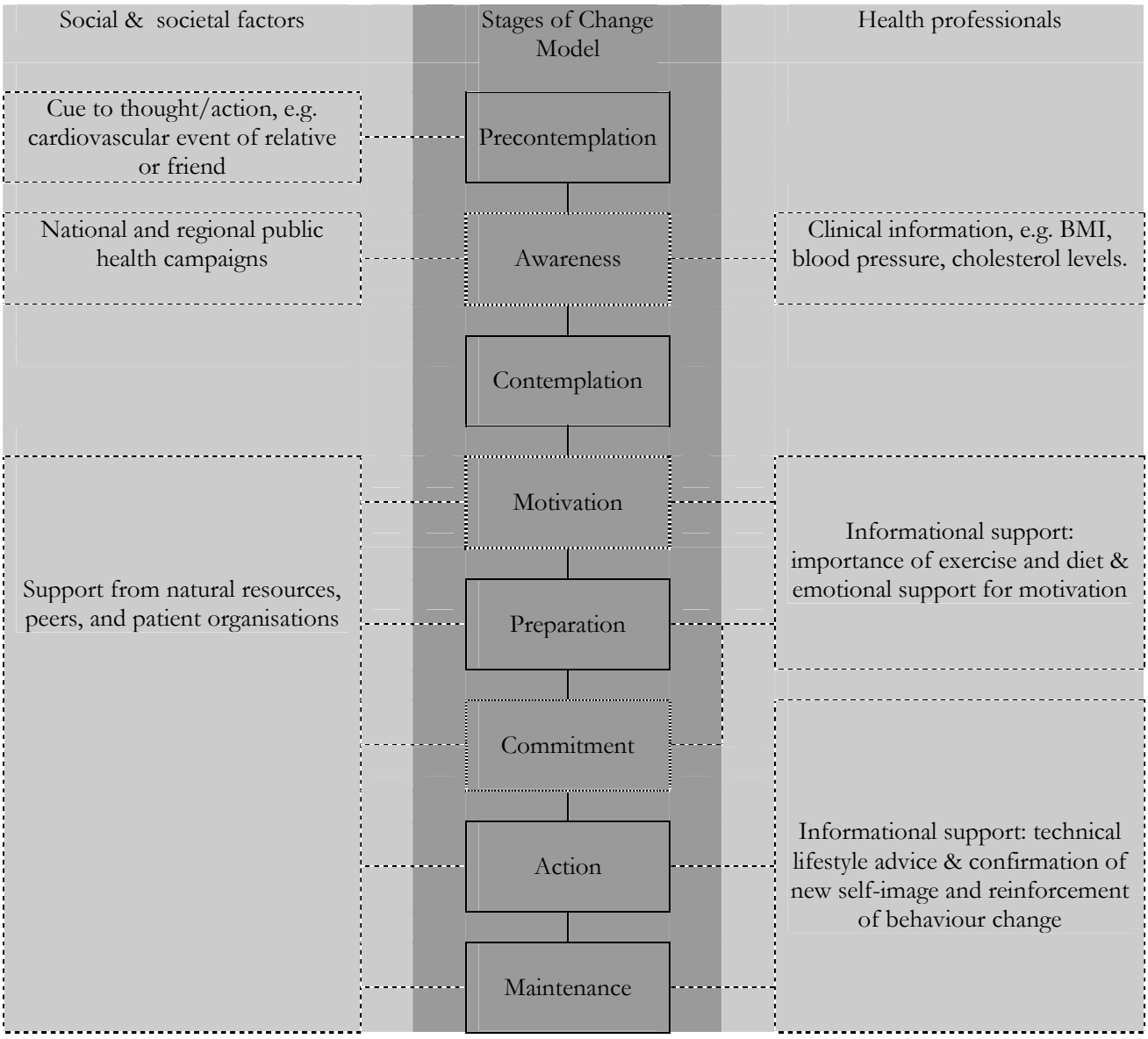

Figure 2.1 The Stages of Change Model and social support; role of social and societal factors, and health professionals.

aimed at long-term health behaviour change. Adding social support to lifestyle interventions programs has the potential to reduce workload for health professionals, and is appreciated by at least part of the patient population. Many questions need to be answered, however, before social support interventions can be successfully implemented. First and foremost, we need to address if increasing structural support, which seems to be the method of choice in practice, can lead to increased functional support. We also need to realize that a very successful intervention strategy for one type of behaviour may not initiate change in another health-related behaviour. We need to know more about why, how, and for whom particular characteristics of functional and structural support are beneficial. Tailoring on motivation to change or on other personal characteristics such as age and sex may not only be the

keyword for intervention; it should also indicate caution in extrapolating a successful strategy from one type of behaviour to others.

Table 2.2 Design and outcomes lifestyle interventions with a group component.

Authors	Target behaviour	Study population	Intervention	Intervention medium	Source of support	Relevant outcomes assessed	Intervention duration	Time to latest follow-up	Attendance assessment	Loss to follow-up
Hagen, 1974	Weight loss through changes in diet and physical activity	90 overweight women aged 17-22	Manual only	written		Height, weight, dietary patterns, physical activity	11w	4w post-intervention	-	1%
			Manual plus contact	written & face-to-face	Peers & therapist					
			Contact only	face-to-face	Peers & therapist					
			No-treatment control	-						
Results: Weight loss and improved eating patterns in all treatment groups. No changes in physical activity or additional effects of group contact.										
Karvetti & Hakala, 1992	Weight loss through diet and exercise	Data available on 42 overweight men and 147 overweight women, aged 17-65	Control			Weight, blood pressure, cholesterol, food consumption, physical exercise	1y	6y post-intervention. No follow-up of control group	85% of the subjects attended > 84% of the group sessions	Treatment group: 26%, control group: 18%
			group-based weight reduction program	face-to-face	Therapist and peers					
Results: Improved weight loss and weight loss maintenance.										

Hakala *et al.*, 1993	Weight loss	20 overweight men and 40 overweight women, aged 22-54	Individual counselling In- and outpatient group counselling.	Face-to-face face-to-face	Peers	Weight loss	2y	3y post-intervention	31-86% of individual appointments 29-69% of group sessions	2y: 3% in individual, and 0% in group counselling. 5y: 17% in individual, and 7% in group counselling
Results: Weight loss in all groups. Women benefit more from group counselling, men more from individual counselling.										
Hakala, 1994	Weight loss	60 overweight but otherwise healthy people aged 20-54	RC: 3w inpatient weight reduction HC: 10w group weight reduction program arranged by local health authority Followed by GP contact for motivation and support	face-to-face face-to-face	Not specified: Peers? Not specified. Peers?	Weight, waist and hip circumference	2y	3y follow-up	37% attended 9 or more of the 18 planned GP appointments. The number of appointments kept ranged form 1-15.	After 2 years: 13% in HC and 3% in RC. At 5 years 10% was lost to follow-up, 28% of weights at 5 y follow-up were self-reported rather than measured at the clinic
Results: After 2y, more and better sustained weight loss in RC group. Only men in RC group maintained weight loss at 5y.										

Trento *et al.*, 1998	Weight loss, metabolic control	Data available on 51 NIDDM women and 61 NIDDM men, aged 35-80	Conventional consultations Group education, specific option to bring relatives	face-to-face	Not specified: Peers, relatives, group facilitator?	Body weight, fasting blood glucose, HbA1c	1y	-	Control: 3.9 visits/y Intervention: 4 visits/y	20%
Results: No difference between groups.										
Trento *et al.*, 2001	Weight loss, metabolic control	51 female & 61 male NIDDM patients	Control group (usual care) Group education with encouraged group interaction and sharing of experiences	face-to-face	Not specified: Peers and trained facilitator?	Body weight, fasting blood glucose, HbA1c	2y	-	8.2 visits/2y 7.9 visits/2y	16% 23%
Results: Improvements in metabolic control, no weight loss.										

Burke *et al.*, 2002 (study 1)	Physical activity, adherence to Australian national dietary guidelines	137 newly cohabiting couples	Control group			Blood pressure, dietary intake, physical activity	16w	36w post-intervention	-	19% post intervention, 41% at follow-up
			Initial contact session, modules mailed	written & face-to-face						
			Half of the modules in contact sessions, others mailed	written & face-to-face	Not specified: Partners and peers?					
Results: Better outcomes in intervention groups.										

Table 2.3 Design and outcomes of lifestyle interventions with a social support component other than a mere group-based intervention.

Authors	Target behaviour	Study population	Intervention	Intervention medium	Source of support	Relevant outcomes assessed	Intervention duration	Time to latest follow-up	Attendance assessment	Loss to follow-up
Rosenthal *et al.*, 1980	Weight loss	43 overweight women and their husbands	No husband involvement	written & face-to-face		Weight, eating habits, spousal support	4m	3y post-intervention	-	14%
			Partial husband involvement	written & face-to-face	husband					
			Full husband involvement	written & face-to-face	husband					
Results: Group with no husband involvement lost weight at a slower rate										
Ureda, 1980	Weight control	8 male and 98 female overweight adults	Commitment contract signed alone	written & face-to-face		Weight loss	4w	10-15w post-intervention	Attendance assessed, not presented	-
			Commitment contract signed witnessed by peers, relatives or friends	written & face-to-face	peers/ relatives/ friends				Some analyses based on participants with 100% attendance	
Results: Witness group lost weight at faster rate than alone group.										

Murphy *et al.*, 1982	Weight loss	97 couples	spouse attendance & personal contract	written & face-to-face	spouse	Weight loss, skin fold thickness	26w	2y post-intervention	75 couples (76%) attended at least one session and 45 (46%) completed the treatment without missing more than 2 sessions	Of those who attended at least one session: 56% was lost at 2y.
			spouse attendance & couples contract	written & face-to-face	spouse					
			personal contract	written & face-to-face						
			couples contract	written & face-to-face	spouse					
			supportive control group	face-to-face	therapist & group					
			waiting list control group							

Results: Waiting list control lost less weight than all other groups. At 1y and 2y post intervention, spouse attendance led to largest weight loss.

Jeffery *et al.*, 1983	Weight loss	120 overweight men aged 35-57	30$ deposit & individual based rewards	written & face-to-face		Weight change	15w	1y post-intervention	1/3 of spouses attended sessions	0% at 6m, 3% at 12m
			150$ deposit & individual based rewards	written & face-to-face						
			300$ deposit & individual based rewards	written & face-to-face						
			30$ deposit & group based rewards	written & face-to-face	peers					
			150$ deposit & group based rewards	written & face-to-face	peers					
			300$ deposit & group based rewards	written & face-to-face	peers					

Results: Post treatment and follow-up weight loss greater for group-based rewards. Effects of financial deposit less convincing. Substantial post treatment weight gain in all groups.

Perri *et al.*, 1984a	Weight loss maintenance	14 overweight men & 115 overweight women aged 21-57	Non-behavioural therapy (NBT)	written & face-to-face		Weight change	15w	12m after initial 15w intervention	Those who did not drop out during treatment attended 13.4 of the 15 treatment sessions Participants returned 69% of postcards and 72% of scheduled calls were completed	15w: 22% & 12m: 26%
			NBT & contact	written, face-to-face & telephone	therapist		15w + 24w			
			behaviour therapy (BT)	written & face-to-face			15w			
			BT & contact	written, face-to-face & telephone	therapist		15w + 24w			
			BT with relapse prevention	written & face-to-face			15w			
			BT with relapse prevention & contact	Written, face-to-face & telephone	therapist		15w + 24w			

Results: 15w: weight loss in all groups. Further contact enhanced weight loss maintenance for groups with NBT and BT with relapse prevention.

Perri *et al.*, 1984b	Weight loss maintenance	56 overweight people aged 21-60	6 post-counselling booster sessions	face-to-face		Weight change, BMI	26w	21m post-intervention		Post-treatment 15%, follow-up 35%
			post-counselling meetings with focus on self-help groups	face-to-face, telephone, & written	peers		26w + 1y		Average of 8.5 self-help group meetings, 22.5 postcards, 26.9 telephone calls	post-treatment and at follow-up 13%
Results: Post-counselling meetings with focus on self-help groups significantly enhanced weight loss maintenance.										
Perri *et al.*, 1986	Weight loss	14 overweight men & 76 overweight women aged 22-60y	behaviour therapy (BT)	written & face-to-face		Weight and physical fitness	20w	18m post-intervention	clients attended 42% of peer meetings and had 57% of the possible telephone therapist contacts	20% during treatment, 26% at 18m follow-up
			BT & peer groups	written, face-to-face, & telephone	peers and therapist		20w + 1y			
			BT & exercise	written & face-to-face			20w			
			BT & exercise & peer groups	written, face-to-face, & telephone	peers and therapist		20w + 1y			
Results: Inclusion of aerobic exercise increased weight loss during treatment by 29%. A multi-component maintenance program including peer self-help groups results in greater weight loss maintenance: possibly forestalled rather than prevented relapse.										

Perri *et al.*, 1987	Long-term weight loss	22 overweight men & 87 overweight women aged 21-60	peer group maintenance therapist-contact maintenance	face-to-face face-to-face	peers therapist	Body weight, body mass index, percent overweight	20w weight loss + 30w program	18m	-	22% post treatment, 31% at follow-up
Results: Greater maintenance of weight loss in therapist group than in peer group										
Perri *et al.*, 1988	Weight loss	123 overweight people 22-59y	Behaviour therapy (BT) BT & therapist contact (TC) BT & TC & social influence program BT & TC & exercise program BT & TC & exercise program & social influence program	face-to-face face-to-face face-to-face and telephone face-to-face face-to-face and telephone	 therapist therapist and peers therapist therapist and peers	Weight	20w BT when applicable: 1y therapist contact/ exercise program. Length of social program not specified	18m after initial 20w intervention	On average, clients attended 67% of the scheduled sessions	26% at 18m follow-up
Results: All 4 post-treatment maintenance programs were more beneficial than the behaviour therapy only program.										

Clifford *et al.*, 1991	Weight loss	48 YMCA members Self-randomized by picking day for meetings	Assessment only control			Weight, body composition, cardiovascular fitness, blood pressure	6m	6m post-intervention	Treatment: 65-85%, post-treatment: 31-60%	29%
			group meetings	written & face-to-face						
			group meetings & individual therapist-sessions	written & face-to-face	therapist					
			group meetings & individual peer problem-solving support sessions	written & face-to-face	peers					
Results: Improved outcomes in treatment groups. No effects of adjunct peer and professional support.										
Rippe *et al.*, 1998	Weight loss	80 overweight women, aged 20- 49	Control group			Body weight, exercise, diet, cardiovascular fitness, psychosocial constructs	12w	-	-	65%
			Weight Watchers	face-to-face	peers					25%
Results: Weight loss in intervention group, weight gain in control group										
Toobert *et al.*, 1998	Weight loss through diet and exercise	28 post-menopausal women with documented CHD	Control			Adherence/self-care	-	24m	Women: 81%, spouses and support partners: 70%	-
			Retreat & group meetings. Request for involvement of spouse or other support partner	face-to-face	spouse or support partner, and peers					
Results: Improvements in diet and exercise.										

Buller *et al.*, 1999	Diet (fruit and vegetable intake)	766 labour and trades blue collar employees, matched and randomized per clique	General Five a Day program	written		Intake of fruit and vegetables	18m	6m post-intervention	Trained peers reported >9000 contacts with co-workers, 95% of co-workers reported having a discussion about Five a Day	11%
			General Five a day program & peer education program as of 9m	written & face-to-face	trained peers					8%
Results: Some persistence of post-intervention improvements in fruit and vegetable consumption.										
Burke *et al.*, 1999	Diet and physical activity	39 newly cohabiting couples	Control			Blood pressure, height, weight, waist- and hip circumference, cholesterol, dietary intake, physical activity	16w	-	-	13%
			Lifestyle education program	written & face-to-face	partner					
Results: Favourable outcomes for diet and cholesterol, not for exercise.										
Estabrooks & Carron, 1999 (study 2)	Physical exercise, measured by program attendance	30 older women and 3 older men	Control group			physical exercise	6w	10w post-intervention	Attendance was used as operational level for exercise behaviour	After 10-week layoff: 8-60%
			Weekly visits by research assistant	face-to-face						
			Team building intervention	face-to-face	peers					
Results: Higher physical activity program attendance levels and return rates in team building group.										

Wing & Jeffery, 1999	Weight loss & weight loss maintenance	84 overweight women % 82 overweight men, aged 25-55	Recruited alone	written & face-to-face		Weight loss and weight maintenance	16w. Support groups had additional 6m weight loss competition	6m post-intervention & 12m post-intervention for interested participants	-	Post-treatment: 10%, 6m post-treatment 18%, 12m post-treatment 46%.
			Recruited alone & social support	written, face-to-face & telephone	peers					
		recruitment alone or with overweight friends based on patients' preference	Recruited with friends	written & face-to-face	friends					
			Recruited with friends & social support	written, face-to-face & telephone	friends					
Results: Recruitment strategy had greater impact than support intervention. Initial weight loss higher in people recruited with friends than people recruited alone. Social support improved weight loss maintenance.										
Tate *et al.*, 2001	Weight loss	81 overweight women & 10 overweight men	Internet Education	face-to-face & internet		Height, weight, waist circumference, physical activity, dietary intake	6m	-	0-3m: 9 visits 3-6m: 1 visit	15% at 3m & 22% at 6m
			Internet behaviour therapy including access to bulletin board	face-to-face & internet	peers via online bulletin board				0-3m: 19 visits 3-6m: 7 visits	
Results: Better outcomes in behaviour therapy group.										

Djuric *et al.*, 2002	Weight loss	48 obese breast cancer survivors, aged 18-70	Control	written		Weight, physical exercise, percentage body fat, dietary intake	1y	18m post-intervention not presented		1y: 19%
			Weight watchers	face-to-face	peers				28-76%	
			Individual counselling & monthly group meeting	written, face-to-face & telephone	dietician & peers				9-92% , 5-10 phone calls/3m	
			Individual counselling & Weight watchers	written, face-to-face & telephone	dietician & peers				52-93%, 6-10 phone calls/3m	
Results: Most rapid weight loss in group with individual counselling and weight watchers program. Weight watchers only successful in preventing weight gain.										
Harvey-Berino *et al.*, 2002b	Weight maintenance	37 overweight women & 9 overweight men.	Behavioural treatment (BT)			Height, weight, BMI, energy and fat intake, energy expenditure	15w BT (+ 22w)	-	58% of therapist-led, 33% of Internet session	7%
			BT & therapist-led maintenance	face-to-face & telephone	therapist & peers					0%
			BT & Internet maintenance	computer	therapist & peers					13%
Results: No differences between groups in weight, BMI, diet, or exercise change										

Harvey-Berino *et al.*, 2002a	Weight loss maintenance through diet and exercise	104 overweight women & 18 overweight men, aged 48 ± 10	Minimal in-person maintenance support	face-to-face		Body weight, energy intake, energy expenditure	24w + 6m	6m post-intervention	Ranging from 39% for chat sessions to 54% for face-to-face meetings	18% after 6m, 24% 6m post-treatment
			In-person maintenance support	face-to-face & telephone	peers		24w + 12m			
			Internet maintenance support	face-to-face & internet	peers		24w + 12m			
Results: Internet intervention least beneficial. Participants preferred in-person interventions.										
Burke *et al.*, 2002 (study 2)	Diet, physical activity, weight loss	Data available on 35 overweight women & 28 overweight men, aged 40-70	Control group			Blood pressure, weight, waist and hip circumference	16w	12m post-intervention	-	-
			8 group or individual sessions	written & face-to-face	partner					
Results: Better outcomes in intervention group.										

3

Nutrition guidance in Dutch general practice: Behavioural determinants of reduction of fat consumption

People need to have things trumpeted into their ears several times and from all directions. The first sound pricks up the ear, the second shakes it, and with the third it goes in.
René-Théophile-Hyacinthe Laennec

ABSTRACT

Background. Studies have shown that the psychosocial determinants attitude, self-efficacy, subjective norm, and health threat are important in predicting intention to change fat consumption. However, the role of habit in relation to those determinants is still largely unknown.

Objective. We aimed to assess whether and how habit influences intention in relation to attitude, self-efficacy, subjective norm, and health threat.

Design. Cross-sectionally, we studied the self-reported psychosocial determinants and intention of 105 (52 intervention and 53 control) patients who participated in a general practice-based tailored nutrition counselling intervention study for lowering cardiovascular risk. Fat intake 15 months before the assessment of psychosocial determinants was used as a measure of habit. We used logistic regression analyses to develop a model predicting intention to change fat consumption.

Results. Our regression model explained 43% of the variance in intention. Patients with perceived higher subjective norm or more social support had a higher intention. Habit was a significant predictor of intention in interaction with self-efficacy and health threat. Attitude, health threat, age, and group membership (i.e., whether patients had been in the intervention group or he control group of the intervention study) were also included in the regression model.

Conclusions. The results suggest that habit in addition to subjective norm and the other more frequently investigated psychosocial determinants are important in predicting intention to change fat consumption. To achieve sustainable health improvement through nutrition education programs, these programs should therefore start focusing more on subjective norm and habit.

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In the past 2 decades, numerous programs to improve health and to prevent diseases through promotion of desirable fat consumption patterns have been developed and evaluated (Milkereit & Graves, 1992; Barratt *et al.*, 1994; Neil & Godlee., 1995; Simkin-Silverman *et al.*, 1995; Rhodes *et al.*, 1996; Ockene *et al.*, 1999; Steptoe *et al.*, 1999; Hilton *et al.*, 1999; Finckenor & Byrd-Bredbenner., 2000). These programs are likely to be more effective if they are based on both theory and practice of changing health-related behaviours, and of understanding determinants of fat consumption (Stafleu *et al.*, 1991/2; Glanz *et al.*, 1993; Nguyen *et al.*, 1996). Several theories are commonly used in understanding and predicting such human health behaviour as the reduction of fat intake. The terms used for the psychosocial determinants of behaviour differ for the various theories. Nevertheless, there is substantial overlap among the underlying constructs (Becker *et al.*, 1977; Houts & Warland, 1989; Reed *et al.*, 1997; Prochaska & Velicer, 1997; Baranowski *et al.*, 1999; Horwath, 1999; Elder *et al.*, 1999; Katz, 2001). The constructs most commonly used are attitude, self-efficacy, subjective norm (also known as perceived social support), and health threat (also known as perceived severity and susceptibility). Numerous studies have shown the importance of these determinants in relation to intention to change behaviour and current or future behaviour (De Vries *et al.*, 1888; Stafleu *et al.*, 1991/2; Fuchs *et al.*, 1992; Van Assema *et al.*, 1993; Sporny & Contento, 1995; Brug *et al.*, 1995; Bovbjerg *et al.*, 1995, Abusabha & Achterberg, 1997; Anderson *et al.*, 2000, Packman & Kirk, 2000.

Most contemporary social psychological models of human behaviour emphasize the conscious nature of behaviour choice (Ajzen, 1991; Aarts *et al.*, 1998; Ouelette & Wood, 1998). It is argued, however, that repeated activities (e.g., food choice, fat consumption) become a habitual rather than a conscious and reasoned action (Aarts *et al.*, 1998, Verplanken *et al.*, 1998). They are therefore less likely to be controlled solely by the behavioural determinants involved in conscious decision making. This led Triandis in 1977 to the first inclusion of habit as a determinant in a behaviour model (Triandis, 1977). Since then, the importance of habit for the prediction of current or future behaviour has been shown several times (Aarts *et al.*, 1997; Aarts *et al.*, 1998; Ouelette & Wood, 1998; Verplanken *et al.*, 1998; Trafimow, 2000). However, it is still questionable whether previous behaviour influences behaviour directly, or through feedback that influences attitudes, self-efficacy, subjective norm, and health threat (Ajzen, 1991; Aarts *et al.*, 1998; Ouelette & Wood, 1998; Trafimow, 2000).

The aim of the present cross-sectional study was to address the importance of habit, attitude, self-efficacy, subjective norm, and health threat as determinants of intention to reduce fat consumption. For this, we used a structured self-administered questionnaire in Dutch patients at elevated cardiovascular risk in general practice. We paid special attention to the relation of habit to the other determinants.

SUBJECTS AND METHODS

Subjects and design

Within 9 general practices of the Nijmegen Department of General Practice Network in the Netherlands (Van Weel *et al.*, 2000), a randomised controlled intervention study was conducted. The study, which lasted 1 y, aimed at reducing fat consumption in adult men and women (Van der Veen *et al.*, 2002). One hundred forty-three Dutch patients at elevated cardiovascular risk (diagnosed hypertension, n = 131; type II diabetes mellitus, n = 9; both, n = 3) were recruited. At general practice level (Van Houwelingen, 1998), the patients were randomly assigned to either the intervention group or the control group. Patients in the intervention group received nutrition counselling based on the Stages of Change Model (Prochaksa & Velicer, 1997) from their general practitioner and from a study dietician. Patients in the control group received the usual care from their general practitioner, which according to existing guidelines for hypertension and type II diabetes mellitus includes nutrition counselling (Walma *et al.*, 1997; Rutten *et al.*, 1999). At baseline, after 6 months, and after 12 months, patients filled out a food frequency questionnaire (FFQ) and a stages of change algorithm. The present study was conducted in the context of the intervention study. A questionnaire on psychosocial determinants of fat reduction was sent to all patients who had completed the intervention study. Twenty-three patients did not complete the current study, mainly because they refused to take further part in the intervention study (n = 11) or refused to fill in the study questionnaire (n = 10). In 2 cases, subjects' concurrent illnesses or referral to a secondary care specialist led to dropout. There were no significant differences between the intervention group and the control group: 58 and 62 completed the study, respectively (**Figure 3.1**). The design of this study has been extensively described elsewhere (Van der Veen *et al.*, 2002). Ethical approval for the study was obtained from the Medical Ethical Committee of the Division of Human Nutrition and Epidemiology of Wageningen University. This committee works in accordance with the Helsinki Declaration of 1975.

Determinants of intention to reduce fat consumption

We measured habit, intention to reduce fat consumption, and psychosocial determinants of (saturated) fat consumption. Habit was defined as prior behaviour (Brug *et al.*, 1995) and, at an operational level, as the baseline value for fat consumption in the intervention study. Fat consumption was measured by means of a self-administered FFQ, which included 104 food items. This FFQ was validated (Feunekes *et al.*, 1993) and revised according to the Dutch National Food Survey, 1992 (The Netherlands Nutrition Centre, 1993). Intention to reduce fat consumption was defined at an operational level by means of the stages of change construct. The patients were asked to fill out the stages of change algorithm that was also used in previous phases of the intervention study at the same time as the questionnaire on psychosocial determinants of fat consumption. Attitude, self-efficacy, subjective norm, and health threat were measured by means of a structured self-administered questionnaire. The questionnaire consisted of 17 propositions (**Table 3.1**) corresponding to those in previous studies

(Lloyd *et al.*, 1993; Lloyd *et al.*, 1995; Lappalainen *et al.*, 1998; Keenan *et al.*, 1999; Koikkalainen *et al.*, 1999; Ôunpuu *et al.*, 1999). For each proposition, patients were asked to give their opinion on a bipolar 5-point scale, ranging from 'strongly disagree' (score of 1) to 'strongly agree' (score of 5), with only both endpoints labelled. The questionnaire was pretested in a convenience sample of 10 Dutch students and slightly modified. The questionnaire was sent to the patients approximately 15 months after the baseline measurements with a covering letter from their general practitioner and the evaluation questionnaire of the entire intervention study (Van der Veen *et al.*, 2002).

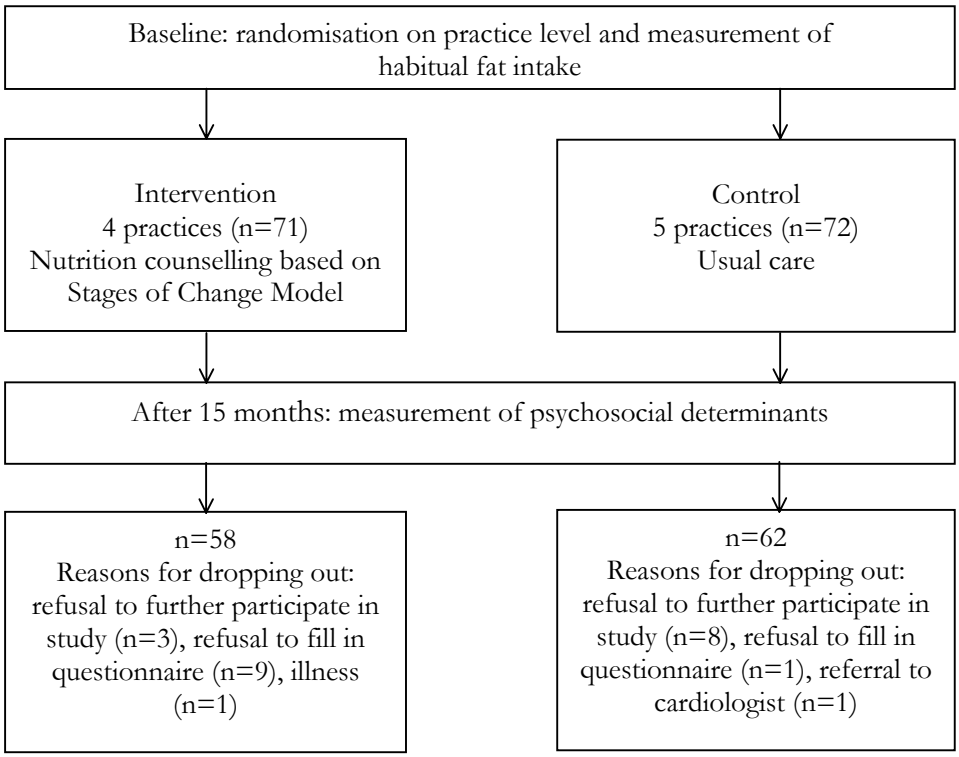

Figure 3.1 Flow of participants.

Attitude was defined as the patients' evaluations of the expected consequences of reducing fat consumption (De Vries *et al.*, 1988; Stafleu *et al.*, 1991/2; Brug *et al.*, 1995). Self-efficacy was defined as the belief or confidence patients have in their ability to successfully adopt the behaviours needed to eat a low-fat diet (Sporny & Contento 1995; Baranowski *et al.*, 1999). Subjective norm was defined as the patients' perceptions of how important others expect them to behave with respect to fat consumption (Baranowski *et al.*, 1999). Health threat was defined as patients' beliefs that they are personally susceptible to dietary fat-related chronic diseases, that the diseases are at least of moderate severity if developed, and that eating less fat will reduce the risk of getting these diseases (Sporny & Contento, 1995). Attitude was measured by means of 8 propositions; self-efficacy, subjective norm, and health threat were measured by means of 3 propositions each.

Table 3.1 Demographic variables, habits, and scores (-2,2) for attitude, self-efficacy, subjective norm, and health threat for Dutch patients at elevated cardiovascular risk with a high or a low intention to reduce fat consumption, separately.

	Intention to reduce fat consumption					
	Low (n =42)			High (n=63)		
Treatment group (% intervention group)	35			52		
Male (%)	38			21		
Age (% > 60 y)	46			50		
Habits						
Total fat intake 15 mo before the study (% of energy)	43.4	±	5.8[1]	41.7	±	5.5
Saturated fat intake 15 mo prior to the study (% of energy)	15.7	±	2.2	15.1	±	2.6
Attitude (score)						
1. If I eat less (saturated) fat, I feel less fit.	0.5	±	1.1	0.5	±	1.2
2. By consuming less (saturated) fat, I increase my life expectancy.	1.0	±	1.0	1.2	±	1.0
3. To me, an important advantage of reducing my fat consumption is that it might lead to weight loss	1.0	±	1.0	1.0	±	1.2
4. A diet with less fat tastes good	0.2	±	1.9	0.6	±	1.2[2]
5. Low-fat foods make me feel satisfied.	0.7	±	1.3	0.7	±	1.1
6. If I want to consume a diet with a low fat content, it is not difficult to dine out.	0.2	±	1.2	0.3	±	1.3
7. Eating less (saturated) fat is good for my health.	1.2	±	0.9	1.2	±	0.3
8. Foods with a lower fat content are not expensive.	-0.1	±	1.3	-0.6	±	1.2[2]
Health related attitude (items 1-3)	0.8	±	0.8	0.9	±	0.9
Practical consequences-related attitude (items 4-6)	0.3	±	0.8	0.5	±	0.9
Self-efficacy (score)						
1. I can even resist foods such as cheese, chocolate, and cookies.	-0.2	±	1.3	0.04	±	0.3
2. I am able to prepare a meal with a low fat content.	1.0	±	1.2	1.1	±	1.1
3. In a restaurant, I am able to pick something from the menu with a low fat content.	0.2	±	1.3	0.4	±	1.3
Subjective norm (score)						
1. My family does not mind eating a dish with less (saturated) fat.	0.2	±	1.3	0.8	±	1.1[2]
2. My friends support me in reducing my fat intake.	-0.3	±	1.4	0.1	±	1.4
3. At parties, or while visiting friends, no one is displeased if I refuse a cake or sausage.	0.7	±	1.3	0.7	±	1.3
Health threat (score)						
1. I'm afraid I'll get ill if I eat too much (saturated) fat.	0.4	±	1.3	0.3	±	1.4
2. If I consume too much fat, I can get very ill.	0.8	±	1.0	1.0	±	1.1
3. By lowering my fat consumption, I reduce the chance of getting cardiovascular diseases or cancer.	1.3	±	0.9	1.5	±	0.7
Health threat (items 1-2)	0.6	±	1.0	0.6	±	1.1

[1] mean ± SD, [2] significantly different from low, $P < 0.05$.

Statistical analyses

One subject in the control group who did not fill out the stages of change algorithm was excluded from analyses. Patients with one missing value in the questionnaire on psychosocial determinants of fat reduction did not differ in determinants cores from patients with no missing values (data not shown). Therefore, mean substitution was applied for 15 patients in the intervention group and 8 patients in the control group who had one missing value. This resulted in 52 patients (90%) in the intervention group and 53 (85%) patients in the control group being included in the analyses.

Response scales were converted (-2,2) so that a positive score corresponded to a positive stance toward making changes and a negative score to a negative stance. The polytomous variable intention was redefined as a dichotomous variable. The precontemplation stage and the contemplation stage were taken as an indication of a low intention to change fat consumption. The preparation, action, and maintenance stages were taken as an indication of a high intention to reduce fat consumption or even conscious attempts to reduce fat consumption. Two age groups ($\leq$ 60 y, > 60 y) were created based on the median value of age.

We conducted correlation analyses for attitude, self-efficacy, subjective norm, and health threat separately. If there were significant Spearman correlation coefficients between the propositions, we conducted a factor analysis with varimax rotation using the latent root criterion. Factor loadings > 0.60 had both practical and statistical significance and were retained in the factor construct (Hair *et al.*, 1998). Cronbach's α was computed for all constructs to evaluate their internal consistency. Values > 0.55 were considered as sufficient for summation of proposition scores to form overall construct scores (Stafleu *et al.*, 1991/2; Brug *et al.*, 1995). Proposition scores were added up and divided by the total number of propositions to form overall construct scores. Propositions with a factor loading below 0.60 were addressed separately. If the Cronbach's α of a factor was below 0.55, the propositions were also addressed separately. The first attitude construct, the attitude related to health, had a Cronbach's α of 0.62. The second attitude construct, the attitude related to practical consequences, had a Cronbach's α of 0.55. The Cronbach's α of health threat was 0.64.

Single and multiple logistic regression analyses were undertaken to develop a model that predicts intention to change fat consumption. We tested the effects of age (Lloyd *et al.*, 1993; Silagy *et al.*, 1993; Glanz *et al.*, 1994), sex (Curry *et al.*, 1992; Silagy *et al.*, 1993; Koikkalainen *et al.*, 1999), the constructs obtained from factor analysis, and the separate propositions regarding attitude, self-efficacy, subjective norm, and health threat. Because the current study was conducted within a group of patients who had participated in an intervention study aimed at the reduction of fat consumption (Van der Veen *et al.*, 2002), the effect of treatment group on intention was also assessed. We used backward elimination to determine the final logistic regression model. The nonsignificant main effects were not included in the final model unless they were part of a significant interaction term including age, sex, treatment group, habitual fat consumption, or habitual saturated fat consumption.

Statistical analyses were performed using the SAS program version 6.12 (SAS Institute, Cary, NC). P values below 0.05 were considered significant.

RESULTS

All variables assessed in the analyses are presented in **Table 3.1**. Habitual (saturated) fat intake was slightly lower in the high-intention group than in the low-intention group. Most proposition scores for the psychosocial factors in the low-intention group were equal to or lower than the scores in the high intention group. The scores were significantly higher in the high-intention group for the proposition scores about the support of the family ($p = 0.0014$) and the idea that foods with a low fat content taste nice ($p = 0.022$). The proposition about the price of foods with a low fat content had a significantly lower score in the high-intention group than in the low-intention group ($P = 0.021$).

Based on simple logistic regression analyses for the main effects, the 2 significant predictors for intention to reduce fat consumption were support of the family and the price of foods with a low fat content (data not shown). There were also 6 significant interaction terms. Predictors interacting with the ability to resist certain foods were treatment group, total fat intake, and saturated fat intake. Furthermore, there was interaction between treatment group and the idea that low-fat foods are not costly, between age and the practical consequences-related attitude, and between total fat intake and the perceived reduced risk of cardiovascular disease and cancer.

Backward elimination with these significant variables (both main effects and the interaction terms) led to the final model presented in **Table 3.2**. The only main effect in this model that was not also party of an interaction term, is subjective norm. The model explained 43% of the variance (Nagelkerke's $R^2 = 0.43$). Based on the deviance measure (1.09), the fit of this model was good. **Figure 3.2** shows the determinants predicting intention to reduce fat consumption in the final model. Habit was a predictor of intention only in interaction with the psychosocial determinants.

Table 3.2 Results of backward logistic regression analysis with intention to reduce fat consumption as the dependent variable in Dutch patients at elevated cardiovascular risk (n=105).

	Coefficient	p
Intercept	-13.64	
Age	0.77	0.210
Treatment group	0.61	0.260
Habitual fat intake	0.31	0.009
Attitude (practical consequences)	1.02	0.048
Self-efficacy (resisting certain foods)	-7.42	0.001
Health threat	10.05	0.001
Subjective norm (family support)	0.56	0.015
Treatment group × self-efficacy (resisting certain foods)	1.15	0.015
Age × attitude (practical consequences)	-1.42	0.030
Habitual fat intake × health threat	-0.23	0.001
Habitual fat intake × self-efficacy (resisting certain foods)	0.16	0.001

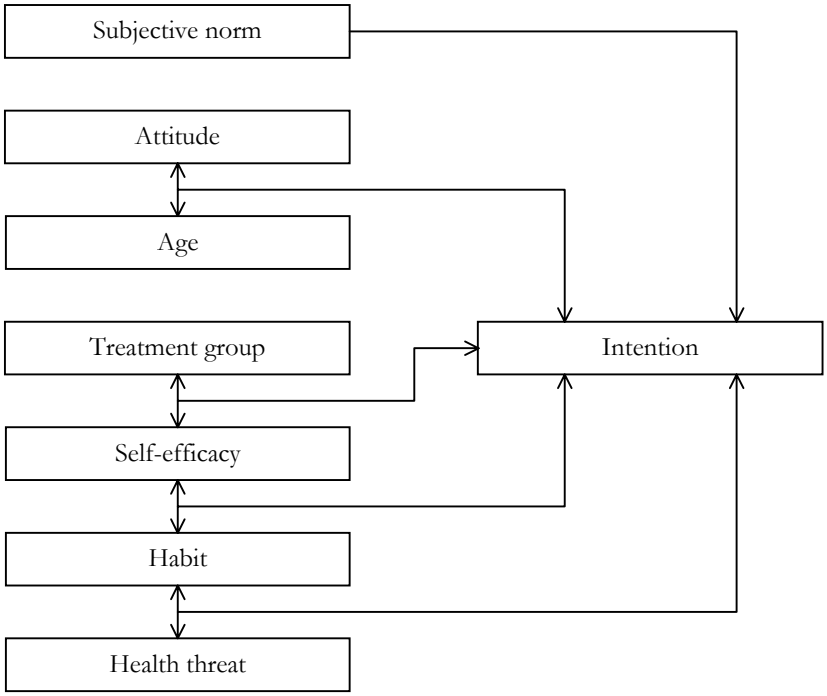

Figure 3.2 Determinants of intention to reduce fat consumption in Dutch patients at elevated cardiovascular disease risk in general practice who participated in a nutrition counselling intervention study. Double-sided arrows indicate statistical interaction.

DISCUSSION

In this cross-sectional study, we investigated the importance of habit and psychosocial variables as determinants for intention to reduce fat intake. The logistic regression model explained 43% of the variance of intention. Our findings indicate that to increase their effectiveness, intervention programs in general practice should take habit as well as psychosocial determinants into account.

Previous studies on psychosocial determinants of dietary fat reduction have been conducted with convenience samples (Glanz *et al.*, 1993; Sporny & Contento, 1995; Nguyen *et al.*, 1996; Brug *et al.*, 1997; Keenan *et al.*, 1999). In this study we recruited patients at elevated cardiovascular risk in general practice. People at elevated cardiovascular risk are more likely to be the target population of future dietary intervention programs than the healthy upper-middle-class subjects used in other studies (Ministry of Health, Welfare and Sport, 1998). Therefore, this study can provide a useful starting point for understanding factors concerning success and failure of future intervention programs.

The evaluation of models is usually done with an indicator of model fit: R^2, the squared multiple correlation of the statistical phenomenon of interest. In 1991/2, Stafleu *et al.* reviewed 15 models

predicting intention. These models explained 0.2-49% of the variance in behaviour. In none of these models was habit included as an independent variable. In 1999, Baranowski *et al.* reviewed the literature on models predicting (intention to reduce) fat intake. Most of these models accounted for approximately 30% of the variability in (intention to change) behaviour (Nguyen *et al.*, 1996; Baranowski *et al.*, 1999). Our final model explained 43% of the variance and was therefore slightly better than most of the models used previously. The predictive value may further increase if other psychosocial determinants, such as modelling (levels of dietary intake of people important to the patient), are addressed as well.

Habit is often defined at an operational level as 'prior behaviour' (Ajzen, 1991; Brug *et al.*, 1995; Ouelette & Wood, 1998, Trafimow, 2000). In studies concerning diet, this is normally the amount or frequency of consumption. Furthermore, dietary intake is often measured retrospectively. However, simultaneous assessment with the other variables of interest implies the possibility that the measurements may influence each other or that the behaviour used as a measure for habit may have changed as a result of the intervention. In our study, we collected data on habitual (saturated) fat intake 15 months before the data collection of psychological determinants of intention. This has possibly resulted in a more accurate measure of habit.

In several studies, habit was successfully used as a determinant predicting intention and behaviour (Stafleu *et al.*, 1991/2; Ouelette & Wood, 1998; Baranowski *et al.*, 1999). Our findings regarding the influence of habit correspond to the results of a study conducted by Aarts *et al.* (1998). They also showed that a measure of past behaviour or habit improves the prediction of later behaviours, after the variance in the behaviour attributable to the other determinants has been accounted for. However, in our model, habit by itself was not a significant predictor of intention to change nutrition behaviour. These results support the idea of Ajzen (1991) that habit predominantly influences intention through interaction with psychosocial determinants. However, there are also studies showing a direct influence of habit on intention (Triandis, 1977; Ouelette & Wood, 1998).

Our study showed that subjective norm is a very important determinant of intention: patients in the high-intention group reported higher scores for subjective norm than patients in the low-intention group. This is in line with previous findings (Stafleu *et al.*, 1991/2, Lloyd *et al.*, 1995; Nguyen *et al.*, 1996). The importance of subjective norm can be explained by the fact that a change in nutrition behaviour from one family member often requires simultaneous changes for other family members as well. To achieve sustainable changes in intention and behaviour, it is therefore essential to create social support during an intervention program.

Psychosocial determinants of nutrition behaviour were related to stage of dietary change in previous studies on fat consumption and fruit and vegetable consumption (Sporny & Contento, 1995; Brug, 1997; Brug *et al.*, 1997). In our study, stage of dietary change was used to define intention to reduce fat consumption. Therefore, we expected psychosocial behavioural determinants to be predictors of intention in the logistic regression model. However, attitude, self-efficacy, and health threat did not have a direct effect on intention. This may be partially explained by the fact that we have

used single-item indicators instead of multiple-item indicators as a measure of some of the psychosocial determinants. Although the use of these single-item indicators was based on the results of correlation analysis, this may not do justice to the complex nature of most psychosocial determinants. A different questionnaire with higher correlation coefficients among the items, and higher Cronbanch's α within the constructs, might have shown direct influences of attitude, self-efficacy, and health threat.

Our intervention protocols of the general practitioners and the study dietician contained items concerning attitude, self-efficacy, and health threat. We therefore expected these scores to be more positive in patients in the intervention group than in the control group. Yet there was only an interaction term between treatment group and self-efficacy (the ability to resist certain foods). In contrast to our expectations, self-efficacy scores were (non-significantly) lower in the intervention group than in the control group. The low self-efficacy values in the intervention group can possibly be explained by the disappointments and difficulties patients may have experienced in maintaining a low-fat diet. It is possible that the intervention effect on attitude, subjective norm, and health threat had attenuated during the 9 months between the last counselling session with the dietician and the measurement of the psychosocial behavioural determinants. It is also possible that the intervention never resulted in differences in determinants scores between the intervention group and the control group.

Most studies (including ours) have been cross-sectional. Therefore, we only have knowledge about the psychosocial determinants at fixed time points. Furthermore, most studies generally rely on the simultaneous measurement of attitudes, intentions, habit, and later behaviour (Verplanken *et al.*, 1998; Keenan *et al.*, 1999), whereas conclusions concerning causality tend to be based on the observed statistical relationships between the measured constructs (Neil & Godlee, 1995). Finally, although Gollwitzer and Brandstätter (1997) argue that implementation intentions might strengthen the relation between intention and behaviour, Verplanken *et al.* (1998) argued that intention is related to behaviour only when habit is absent or weak. Future longitudinal research should therefore focus on habit and the stability and change of psychosocial determinants of intention and behaviour during health promotion activities. For practice, this study indicates that subjective norm and habit (in interaction with other psychosocial determinates) should be thoroughly addressed in an attempt to change people's intention and behaviour.

4

Stage-matched nutrition guidance: Stages of change and fat consumption in Dutch patients at elevated cardiovascular risk in general practice

Firmness in decision is often merely
a form of stupidity. It indicates an
inability to think the same thing out twice.
HL Mencken

ABSTRACT

Objective. To assess the effects of stage-matched nutrition counselling on stages of change and fat intake.

Design. Controlled clinical trial.

Setting. 9 general practices in a General Practice Network.

Participants. 143 patients at elevated cardiovascular risk, aged 40-70.

Intervention. Intervention patients received stage-matched counselling by their general practitioner and a dietician. Control patients received usual care.

Main outcome measures. Stages of change and fat intake were measured at baseline, and after six and twelve months.

Analysis. T-tests, Chi-square tests, and regression analyses (α=0.05) were conducted.

Results. More patients in the intervention group than in the control group were in the post-preparation stage after six months (70% versus 35%, $p<0.01$), but not after twelve months (70% versus 55%, $p=0.10$). Between 0 and 12 months, reduction in total fat intake (-5.6 %kcal versus –2.4 %kcal) was largest in the intervention group.

Conclusions and implications. Stage-matched nutrition counselling increases movement through stage of change, resulting in a reduced fat intake. Our results partly support stages of change as a tool for behaviour change. Movement across stages of change was not an intermediating factor in the intervention effects. Research should focus on feasible ways to keep patients in the post-preparation stage.

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In press as. Verheijden MW, Van der Veen JE, Bakx JC, Akkermans RP, Van den Hoogen HJM, Van Staveren WA &Van Weel C. Stage-matched nutrition guidance: Stages of change and fat consumption in Dutch patients at elevated cardiovascular risk in family practice. *Journal of Nutrition Education and Behavior, in press.*

Since excessive consumption of (saturated) fat increases the risk for cardiovascular diseases (Tzonou *et al.*, 1993; Hu *et al.*, 1997), a change in nutrition behaviour is very important, particularly for patients at elevated cardiovascular risk. The general practice setting has a high potential for continuity of care and individual health education. As a consequence, it provides an ideal framework in which patients at increased risk can be detected and treated, and in which the necessary dietary changes can be boosted over time (Van Weel & Knottnerus, 1999; Van Weel, 1999). To facilitate behaviour change in a population, the Stages of Change Model provides a theoretical framework (Prochaska & DiClemente, 1992; Prochaska *et al.*, 1992). The model postulates that individuals can be allocated to different stages of readiness to change, namely precontemplation, contemplation, preparation, action, and maintenance. Longitudinal studies have shown that behaviour change is not a linear movement through these stages. Instead, it is progressive, regressive, spiralling or static (Prochaska *et al.*, 1992; Prochaska *et al.*, 1994). Although several studies have shown differences in fat intake across stages of change (Curry *et al.*, 1992; Campbell *et al.*, 1994; Greene & Rossi, 1998; Horwath, 1999), stages of change should not be confused with measures of nutrient intake. Instead, they are based on peoples' perceptions of their fat intake and on their interest in future behaviour changes. When stages of change are indeed seen as reflection of interest to change on which counselling strategies will be based, there is no need to combine a stages of change algorithm with dietary intake data (Kristal *et al.*, 1999).

The little work that has been done on movement across stages of change and actual dietary change is not conclusive. Data from the Working Well Trial and the Next Step Trial showed that dietary change was related to stage at follow-up, while a study in primary care also showed that being in later stages at baseline predicted larger intervention effects (Kristal *et al.*, 1999; Beresford *et al.*, 1997). While straightforward interpretation of stages of change leads to the expectation that movement across stages of change predicts change in total fat intake, this could not be shown in the Working Well Trial and the Next Step Trial (Beresford *et al.*, 1997). Still, the supposed effectiveness of tailored interventions is based on the idea that tailored interventions will improve people's readiness to change and, therefore, eventually behaviour. The relative contribution of stages of change in intervention effects with respect to dietary fat intake is unknown. Using data from our study published by Van der Veen *et al.* (2002), we examined 1) whether more patients moved through the stages of dietary change as a result of the intervention than as a result of the usual care. Given the non-linear nature of the Stages of Change Model, we examined these results after six and after twelve months, to be able to detect possible regression through the Stages of Change Model over time. Furthermore, we examined 2) if the extent to which patients changed their total and saturated fat intake, varied over the different patterns of movement through stages of change. To our knowledge, this is the first study to address changes in total fat intake simultaneously with changes in saturated fat intake in relation to changes in stage of readiness to change. This is crucial given the relative importance of saturated fat intake for cardiovascular risk.

METHODS

Design

We conducted a controlled clinical intervention study in which individual dietary counselling based on the Stages of Change Model was given. Practice level was taken as the level of randomization to avoid contamination of information in the intervention and control groups (Van Houwelingen, 1998). The design of the study, which was approved by the Medical Ethical Committee of the Division of Human Nutrition and Epidemiology of Wageningen University, has been extensively described elsewhere Van der Veen *et al* ., 2002). Written informed consent was obtained from all patients.

Sample

The study was conducted within nine practices of the Nijmegen Department of Familiy Medicine Practice Network (CMR/NMP) in The Netherlands (Van Weel *et al.*, 2000). Patients aged 40-70 years (n=143) were eligible to participate when they had diagnosed hypertension (n=131), type II diabetes mellitus (n=9) or both (n=3). All patients were selected to have a total serum cholesterol level ≥ 6.2 mmol/L (240 mg/dL), based on 2 measurements with a one-week time interval. Total fat intake had to be ≥ 37 percent of energy (%kcal) and/or saturated fat intake ≥ 12 %kcal.

Measures

A 4-item algorithm based on measures in previous studies (Curry *et al.*, 1992) was used to classify patients into one of the stages of change for reduction of fat intake (precontemplation, contemplation, preparation, action or maintenance). The questionnaire by Curry *et al.* (1992) was translated into Dutch and wording was altered slightly to include more details (e.g., it was specified that people should not only think of the main meals, but also of snacks, when filling in the algorithm). Patients reporting to eat a diet normal or (very) high in fat, who would A) definitely not or B) probably not reduce their fat intake within the next six months were classified in precontemplation. Those who would C) perhaps or D) probably reduce their fat intake within the next six months were classified in contemplation and those who would E) definitely reduce their fat intake, were classified into the preparation stage. Patients reporting to eat a diet (very) low in fat, who had been doing so for less than six months, were classified in the action stage. Patients who had been doing so for over six months were classified in the maintenance stage.

Intake of energy, total fat, and cholesterol in the past four weeks were assessed by a self-administered food frequency questionnaire (FFQ). This FFQ was validated (Feunekes *et al.*, 1993) and revised according to the Dutch National Food Survey, 1992 (Netherlands Nutrition Centre, 1993).

The measures after six months reflected the initial change, and the measures after twelve months reflected the long-term change. At baseline, we also assessed demographic and health status characteristics.

Intervention

Patients assigned to the control group received usual care from their general practitioner. For patients with diagnosed hypertension, type II diabetes mellitus or both, the Dutch practice guidelines for general practitioners include nutrition counselling (Thomas *et al.*, 1996). The general practitioners in the control group did not receive any training from the study team. They were asked to continue to see and treat their patients as usual. Patients in the intervention group received nutrition counselling based on their stage of change with respect to reduction of total fat intake (**Figure 4.1**). When appropriate, the relative contribution of saturated fat to the total fat intake was also addressed. The study manuals for the general practitioners and the study dietician were pre-tested and discussed by general practitioners and the dietician in a pre-study group session.

We assumed that practical guidelines on how to reduce fat intake would be of benefit to patients who wanted to reduce their fat intake within the next month (preparation) and to patients who had started to reduce their fat intake within the past six months (action). Therefore, patients in the preparation and action stages were treated equally in the intervention phase of the study (i.e., were referred to the study dietician, who was trained to give action-oriented counselling).

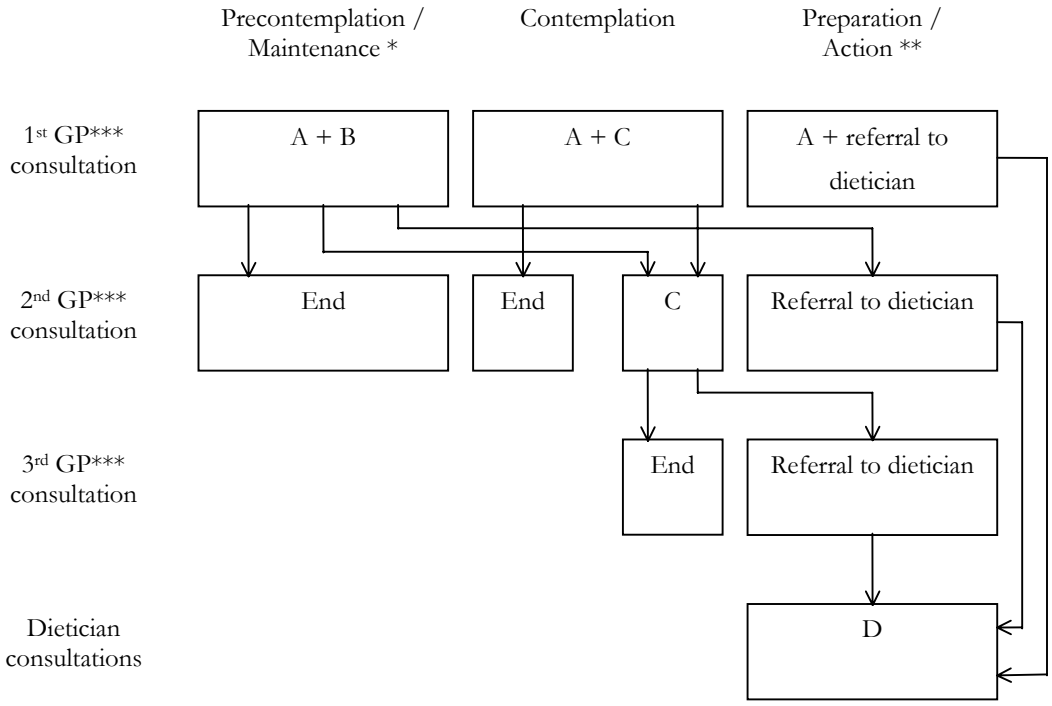
At baseline, many patients were in the maintenance stage. However, all patients were selected to have elevated fat intakes, so none of the patients in maintenance actually met the required behavioural criteria (i.e., the behaviour must meet criteria professionals and scientist agree is sufficient to reduce risk for disease (Prochaska & Velicer, 1997)). For that reason, patients who were in the maintenance stage at baseline were treated equally to patients in precontemplation and were made aware of their elevated fat intakes.

In the intervention group, a maximum of three consultations of approximately 10 minutes each were provided by the general practitioner. The results from the stages of change algorithm were used during the first consultation to tailor the intervention. During subsequent consultations, stage of change was re-assessed using a series of questions in the general practitioner manual. These questions closely resembled the stages of change algorithm. The focus of the general practitioner was to raise consciousness (in the precontemplation stage) and to motivate patients to reduce their fat intake (in the contemplation stage). Patients were provided with feedback on their baseline values for dietary intake, serum lipids, and anthropometrics. Advantages and disadvantages of dietary change were discussed and tools such as a self-test for fat consumption and a variation list (i.e., a list describing food groups and products that should be consumed daily, occasionally, or rarely) were used. Consultations with the general practitioner were discontinued if patients did not progress through the stages, or if they reached the preparation or action stage. Patients who reached the preparation or the action stage were referred to the study dietician. All patients who were referred to the study dietician but one had a series of three consultations. The first consultation with the study dietician lasted 30-40 minutes, and the subsequent two lasted 10-15 minutes. All recommendations were in line with the Dutch national dietary guidelines. The first consultation was used to assess patients' dietary habits. Patients' individual situations with respect to home, work, family, etc, that were relevant for the nutrition counselling were also assessed.

For overweight and obese participants, the focus was also on reduction of energy intake. The second consultation with the dietician was used to discuss progress and possible barriers. The results of the measurement after six months were available at the time of the third consultation. These results were discussed, also in combination with longer-term strategies. The processes of change (Greene & Rossi, 1998) were used in the development of both the general practitioners' and the dietician's manuals.

Analyses

To prevent small numbers for analyses, we divided patients into either the pre-action or the post-preparation stages (Beresford *et al.*, 1997; Finckenor & Byrd-Bredbenner, 2000). The precontemplation, contemplation, and preparation stages were grouped in the pre-action stages. The action and maintenance stages were collapsed into the post-preparation stages. Based on these categories we also determined whether patients had moved forward or backward, or not at all between the pre-action and post-preparation stages. Differences between groups were tested with t-tests or Chi-square tests. We conducted (multilevel) regression analyses looking at change in fat intake in relation to changes in stage of change (Kleinbaum *et al.*, 1998). Because randomization was conducted on a general practice level while measurements were conducted at a patient level, the regression analyses were adjusted for possible effects related to general practitioners' and general practice characteristics. Different analyses were run for changes in total fat and saturated fat and for all time periods (between baseline and 6 months, between 6 months and 12 months, and between baseline and 12 months). To assess if changes in fat consumption as a result of the intervention varied for people who moved forward or backward or not at all between pre-action and post-preparation, the interaction between treatment group (i.e. the intervention group or the control group) and movement between pre-action and post-preparation was of particular interest. For some participants, no complete data could be obtained, for example as a result of missing values in the questionnaire. As a result, numbers of participants vary for different analyses. P-values less than 0.05 were considered to be significant. All statistical analyses were preformed using the SAS program version 6.12 (SAS Institute Inc., Cary, NC, USA).



* All patients were selected to have elevated fat intakes. Patients who reported to be in maintenance were made aware of their elevated intake levels and subsequently treated as patients in precontemplation.
** Patients in preparation and action were given an action-oriented intervention.
*** GP= general practitioner

Organization of consultations.
General practitioners' consultations lasted ± 10 minutes each, with 2-week time intervals. The intervention stopped if no progress across stages of change was made. The 1st dietician consultation lasted 30-40 minutes. The final two consultations lasted 10-15 minutes each. The time intervals for dietician consultations were 2 and 8 weeks, respectively.

Classification of stages of change for reduction of total fat intake.
Before the 1st general practitioner consultation: algorithm. At the beginning of the 2nd and 3rd consultation: using questions in the general practitioner's manual.

Content of nutrition counselling packages.
A. Feedback on baseline values (dietary intake, serum lipids, and anthropometrics).
B. Focus on consciousness raising of dietary behaviour. Disadvantages for eating less fat mentioned by the patient were discussed and advantages were emphasized. A self-test for dietary fat consumption was used to further increase awareness.
C. Focus on motivation to change dietary behaviour. Patients were given a variation list with healthy alternatives for products high in saturated fat.
D. Focus on practical implications to change dietary behaviour. Counselling to reduce saturated fat intake and to increase unsaturated fat intake. Nutrition counselling on reduction of energy and total fat intake for overweight and obese participants. 1st consultation: living and nutritional habits are assessed to enable nutrition counselling to be tailored to the patient's individual situation. Worked out with the patient using example menus for one day. 2nd consultation: discussion of progress and possible barriers. 3rd consultation: discussion of results of measurements after six months, barriers, and expectations.

Figure 4.1 Nutrition counselling intervention strategy for Dutch patients at elevated cardiovascular risk in general practice.

RESULTS

Subject characteristics

A total of 71 intervention and 72 control patients were recruited. After six months, 1 patient in the intervention group and 5 patients in the control group were lost to follow-up. After twelve months these numbers were 4 and 9, respectively. Counselling for 11 patients in the intervention group was discontinued, as they did not progress through the stages of change. At baseline, no differences between the intervention group and the control group were found in age, sex distribution, body mass index (BMI), or total fat intake (**Table 4.1**). The percentages of patients in each of the five stages of change (p=0.16) did not differ significantly between the intervention group and the control group. In both groups, very few patients were classified in the action stage (0% in the control group and 3% in the intervention group, **Table 4.1**).

Table 4.1 Baseline age, sex, body mass index, stages of change and percentage of energy derived from fat (%kcal) of Dutch patients at elevated cardiovascular risk in general practice participating in a nutrition counselling intervention trial.

	Intervention group			Control group			p-value
	n	mean	SD	n	mean	SD	
Age (year)		60	7.1		60	6.9	0.83
Sex (% male)		24			29		0.57
Body mass index (kg/m^2)		28.1	4.3		29.2	4.8	0.15
Total fat intake (%kcal)	71	42.1	6.2	71	42.6	5.2	0.64
Precontemplation	10	42.5	5.0	17	43.3	5.9	
Contemplation	11	45.5	6.4	17	43.1	4.7	
Preparation	22	41.5	6.9	18	43.8	4.8	
Action	2	38.6	1.0	0	-	-	
Maintenance	26	41.4	6.1	19	40.5	5.1	

Stages of change after six months

After the first six months of the study, the highest percentages of people in the intervention group were in the post-preparation stages, and in the control group in the pre-action stages (**Table 4.2**). After six months 61% of the patients in the control group and only 29% of the patients in the intervention group were still in the pre-action stages. In the intervention group 1% of the patients regressed from post-preparation to pre-action; 31% progressed, and 68% did not move between pre-action and post-preparation. In the control group these numbers were 4%, 14% and 82%, respectively. The difference in movement through stages of change between the intervention group and the control group was significant (p=0.03). This resulted in a significant difference in distribution across stages of change between the intervention and the control group after six months (p<0.0001). Seventy percent of the patients in the intervention group and 35% of the patients in the control group were in the post-preparation stages.

Table 4.2 Movement across stages of change between baseline and 6 months after enrolment in the nutrition counseling study (n=70 intervention, n=66 control), between 6 and 12 months after enrolment (n=67 intervention, n=62 control), and between baseline and 12 months after enrolment (n=67 intervention, n=62 control). Participants were Dutch patients at elevated cardiovascular risk in general practice.

	Intervention group				Control group			
	Stage after 6 months				Stage after 6 months			
	Pre-action		Post-preparation		Pre-action		Post-preparation	
Stage at baseline	n	%	n	%	n	%	n	%
Pre-action	20	29	22	31	40	61	9	14
Post-preparation	1	1	27	39	3	4	14	21
	Stage after 12 months				Stage after 12 months			
	Pre-action		Post-preparation		Pre-action		Post-preparation	
Stage after 6 months	n	%	n	%	n	%	n	%
Pre-action	12	18	8	12	22	35	19	31
Post-preparation	8	12	39	58	6	10	15	24
	Stage after 12 months				Stage after 12 months			
	Pre-action		Post-preparation		Pre-action		Post-preparation	
Stage at baseline	n	%	n	%	n	%	n	%
Pre-action	17	25	23	34	22	35	26	42
Post-preparation	3	5	24	36	6	10	8	13

Note: The precontemplation, contemplation and preparation stages were collapsed to form the pre-action stages. The action and maintenance stages were collapsed to form the post-preparation stages.

Stages of change after twelve months

Between six and twelve months, when patients in the intervention group had only one consultation with the study dietician, 12% of the patients in the intervention group regressed and 12% progressed between pre-action and post-preparation. In 76% of the patients no movement between pre-action and post-preparation was observed. In the control group these numbers were 10%, 31% and 59%, respectively (**Table 4.2**). Between six and twelve months, there was a significant difference (p=0.03) in movement between pre-action and post-preparation between the intervention group and the control group.

Between baseline and twelve months, in the intervention group, 5% of patients regressed, 34% progressed, and 61% did not move between pre-action and post-preparation. These numbers were 10%, 42%, and 48%, respectively for the control group. The difference in movement across stages of change between the intervention group and the control group in the period between baseline and the measurement after twelve months was not significant (p=0.26).

At twelve months after baseline, there was no significant difference (p=0.07) in distribution across the pre-action and post-preparation stages between the intervention group and the control group. Forty five percent of the patients in the control group and 30% of the patients in the intervention group were in the pre-action stages.

Table 4.3 Movement between the pre-action stages and post-preparation stages, and change in percentage of energy derived from total fat (%Kcal) and saturated fat (%Kcal) for Dutch patients at elevated cardiovascular risk in general practice.

	Intervention group				Control group				p-value*
	Total fat % Kcal				Total fat % Kcal				
	n	%	Mean	SD	n	%	mean	SD	
0-6 months									
Regression	1	1	-1.5	-	3	5	-0.4	2.1	-
No movement	46	67	-6.8	6.1	51	81	-2.8	5.3	<0.001
Progression	22	32	-10.5	6.8	9	14	-2.5	5.1	<0.005
6-12 months									
Regression	8	12	2.5	7.1	6	10	-0.2	4.2	0.43
No movement	50	76	2.5	6.1	35	59	-0.03	7.2	0.08
Progression	8	12	0.6	4.0	18	31	1.6	6.7	0.70
0-12 months									
Regression	3	5	-2.3	11.4	6	10	1.1	6.5	0.58
No movement	41	62	-6.3	5.9	29	47	-2.1	5.5	<0.005
Progression	22	33	-4.9	8.0	26	43	-3.2	9.4	0.50
	Saturated fat % Kcal				Saturated fat % Kcal				
	n	%	Mean	SD	n	%	mean	SD	
0-6 months									
Regression	1	1	-2.9	-	3	5	-0.9	1.8	-
No movement	46	67	-3.0	2.7	51	81	-1.0	2.7	<0.001
Progression	22	32	-4.2	2.6	9	14	-1.2	1.8	<0.005
6-12 months									
Regression	8	12	0.9	2.6	6	10	0.9	3.0	0.99
No movement	50	76	0.9	2.1	35	59	-0.07	2.2	0.04
Progression	8	12	0.03	1.5	18	31	0.14	1.9	0.88
0-12 months									
Regression	3	5	-1.39	4.4	6	10	1.4	1.2	0.40
No movement	41	62	-2.5	2.8	29	47	-0.8	2.1	<0.01
Progression	22	33	-2.9	2.4	26	43	-2.0	4.1	0.36

* p-value for significance of difference between the intervention group and the control group

Table 4.4 Parameter estimates (SE) of multilevel regression models addressing changes in total fat intake and saturated fat intake in Dutch patients at elevated cardiovascular risk in general practice. Treatment group (intervention group versus control group in the nutrition counselling trial) and movement between pre-action and post-preparation were used as independent variables.

	Intercept	Treatment group	Movement	Treatment X Movement	Explained variance
Total fat intake					
0-6 months					
Model 1	-2.48 (0.74)	-5.43 (1.03)			18%
Model 2*[1]	-2.44 (0.73)	-4.72 (1.04)	-2.44 (1.10)		22%
Model 3	-2.63 (0.74)	-4.11 (1.10)	-0.44 (1.71)	-3.38 (2.20); p=0.13	23%
6-12 months					
Model 1	0.37 (0.87)	1.94 (1.23)			1%
Model 2*[2]	0.40 (0.93)	1.92 (1.29)	0.17 (1.04)		< 1%
Model 3	0.21 (0.95)	2.10 (1.30)	1.07 (1.38)	-2.06 (2.10); p=0.33	< 1%
0-12 months					
Model 1	-2.42 (0.92)	-3.21 (1.27)			4%
Model 2*[3]	-1.94 (1.04)	-3.41 (1.38)	-0.93 (1.07)		5%
Model 3	-2.24 (1.00)	-3.45 (1.50)	-0.02 (1.26)	0.23 (1.75); p=0.89	4%
Saturated fat intake					
0-6 months					
Model 1	-1.03 (0.40)	-2.33 (0.57)			17%
Model 2*[4]	-1.01 (0.41)	-2.09 (0.60)	-0.80 (0.48)		19%
Model 3	-1.06 (0.40)	-1.95 (0.62)	-0.27 (0.77)	-0.87 (0.99); p=0.38	19%
6-12 months					
Model 1	-0.01 (0.30)	0.83 (0.41)			3%
Model 2*[5]	0.14 (0.32)	0.69 (0.45)	-0.30 (0.35)		7%
Model 3	0.12 (0.33)	0.71 (0.45)	-0.20 (0.47)	-0.24 (0.72); p=0.73	7%
0-12 months					
Model 1	-1.21 (0.46)	-1.32 (0.67)			4%
Model 2*[6]	-0.78 (0.50)	-1.42 (0.71)	-1.13 (0.42)		8%
Model 3	-1.01 (0.49)	-1.41 (0.74)	-0.60 (0.51)	-0.34 (0.70); p=0.62	5%

*1-*6: Parameter estimates of treatment group changed by 13%, 1%, 6%, 10%, 17%, and 8 %, respectively, when compared to model 1. Absolute changes however, were too small to be clinically relevant.

Stages of change and fat intake

After six months, fat intake had decreased for all movement patterns. Decreases in total fat intake (-6.8 %kcal vs -2.8 %kcal; $p<0.001$) and saturated fat intake (-3.0 %kcal vs -1.0 %kcal; $p<0.001$) were larger in the intervention group than in the control group for patients who had not moved from pre-action to post-preparation. Similar effects were found for patients who had moved forward. Between baseline and 12 months, the decrease in total fat intake (-6.3 %kcal vs -2.1% kcal; $p<0.005$) was larger in the intervention group than in the control group for patients who had not moved from pre-action to post-preparation. Changes in saturated fat intake showed a similar pattern (**Table 4.3**).

When movement between pre-action and post-preparation was added (Model 2) to the crude models in which change in fat intake was related only to treatment group (Model 1), the effect sizes of treatment group changed 1-17% (**Table 4.4**). These changes reflect a maximum difference between the intervention group and the control group in change in fat consumption of 0.7 %kcal and were thus not clinically relevant. Movement between pre-action and post-preparation was not an intermediate factor in the effects of the intervention on changes in fat intake (p-values of the interaction term: 0.13-0.89, Model 3). This indicates that the intervention effects were similar for patients who had regressed, progressed, or not moved between the pre-action and post-preparation stages. The crude effects of movement between pre-action and post-preparation were similar to those of stage of change at follow-up. Stage of change at baseline was correlated much weaker to dietary change (data not shown). The predictive value of the models ranged from < 1% to 23%; predictive values were higher for changes between baseline and six months than for changes in the other periods (**Table 4.4**).

DISCUSSION

This study showed that six months after enrolment in the study, a higher percentage of patients (31%) had moved from pre-action to post-preparation as a result of stage-matched nutrition counselling than as a result of the usual care (14%). This resulted in a significant difference between the two groups in distribution across stages of dietary change ($p<0.0001$) after 6 months. The difference in distribution across stages of change did not remain significant 12 months after enrolment in the study ($p=0.07$) although more patients in the intervention group than in the control group were in the post-preparation stages. The differences in fat intake between the intervention group and the control group we found in previous analyses, showed a similar pattern (i.e., similar levels at baseline, significantly lower levels in the intervention group after 6 months, and similar levels after 12 months) (Van der Veen *et al.*, 2002). Decreases in fat intake were larger in the intervention group than in the control group, but movement between pre-action and post-preparation did not alter these effects. Getting people engaged in (thinking about) behaviour change apparently results in changes in fat intake, irrespective of people's precise path through the spiral behaviour change process. The results of our study are not conclusive, but suggest that changes in fat intake (Van der Veen *et al.*, 2002) are at least partly attributable to movement from pre-action to post-preparation as a result of tailoring.

To our knowledge this is the first study in which a general practitioner and a dietician have worked together to counsel patients at elevated cardiovascular risk. Previous studies with positive outcomes have addressed tailored nutrition education by means of a self-help booklet, computer-tailored messages or counselling given by practice nurses (Campbell *et al.*, 1994; Beresford *et al.*, 1997; Steptoe *et al.*, 1999). General practitioners have a high-perceived expertise and reach nearly all segments of the population. However, lack of time and specific nutrition education can lead to inadequate nutrition guidance by general practitioners (Hiddink *et al.*, 1995; Kushner, 1995; Hiddink *et al.*, 1997b). In the current study, patients were referred to a dietician for nutrition counselling. In this way, the motivational skills of the general practitioner and the specific nutrition knowledge and skills of the dietician can be optimally used.

Nutrition counselling and regular health checks are integrated in the Dutch general practice guidelines for patients with diagnosed hypertension, type II diabetes mellitus or both and should thus be part of usual care (Thomas *et al.*, 1996). Furthermore, the intervention manual was designed in cooperation with practicing general practitioners and the importance of a feasible intervention strategy in busy general practice was continuously stressed. As a result, we expect that additional time efforts required to conduct the intervention will have been limited. We have therefore assumed that the intervention effects are related to the content of the intervention rather than to a possible difference in contact time between the intervention group and the control group. We have no data on intensity of health care use in the control group to confirm or reject our assumption.

Within the intervention group, there were also different amounts of contact time. This was caused predominantly by the fact that the intervention was discontinued for patients who did not progress through the stages of change. To a smaller extent, the required number of general practitioner consultations before patients could be referred to the study dietician, played a role. Discontinuation was based on the pragmatic idea that to optimize staff time, the Stages of Change Model can be applied to target interventions at patients who are most likely to change (Ashworth, 1997). This practice may have attenuated the observed intervention impact. In future intervention protocols, more attention could be focused on procedures to engage individuals who initially seemed unwilling to change. This approach was not included in the current study protocol as the general practitioners who were involved in designing the intervention, repeatedly expressed their concerns about its feasibility and affordability in general practice. Some participants needed one, and others needed two general practitioner consultations before they reached the preparation or action stage and could be referred to the dietician. This approach was chosen to achieve similar levels of awareness and motivation in all patients who were referred to the study dietician. Different numbers of general practitioner consultations thus led to decreased rather than increased differences between patients. Therefore, we expect the influence of different amounts of contact time on the observed relation between movement across stages of change and change in dietary fat consumption to be limited.

To adequately assess stage of dietary change, it is necessary to date previous changes with precision (Reed *et al.*, 1997; Greene & Rossi, 1998). A change in fat intake requires multiple behaviour

changes that may be difficult to locate on a time line, in contrast to watershed events such as smoking cessation. This problem is particularly relevant for the post-preparation stages. For example, a substantial number of people reported to have moved from the precontemplation stage to the maintenance stage during the first six months of the study (data not shown). This is theoretically impossible, since people can only be in the maintenance stage if they have successfully maintained their behaviour for longer than 6 months (Prochaska & DiClemente, 1992; Prochaska *et al.*, 1992). Common misconceptions about fat consumption (Brug *et al.*, 1994) can also result in people classifying themselves into action or maintenance, even when they have relatively high-fat diets. The value of the stages of change construct as a representation of actual fat consumption is thus unclear. However, because the stages of change construct reflects peoples' perceptions of their current behaviour and their intentions to change in the future (Kristal *et al.*, 1999), it still is a useful tool to tailor interventions to individuals' needs.

In this study, 91% of patients completed the intervention study, with dropout rates being 5.6% in the intervention group and 12.5% in the control group. Steptoe *et al.* (1999) previously conducted a study with similar goals in which dropout rates were 47% and 38%, respectively. A particular strength of our data in comparison to the Working Well Trial and the Next Step Trial is the high completion rate of the intervention study, which limits the potential effects of selective response. Consistent with our findings, Steptoe *et al.* found less promising results after twelve months than on the shorter term. High numbers of dropout in the intervention group of the study conducted by Steptoe *et al.* were possibly the result of the demanding and time-consuming nature of the intervention (1999). To effectively target a population at elevated risk of cardiovascular disease, developing a feasible intervention entailing a high compliance and low dropout rate is of utmost importance. Our study has therefore made a relevant contribution to the implementation of nutrition counselling in general practice.

The distribution across stages of change at baseline in our study, differed from the values reported in other studies (Glanz *et al.*, 1994; Greene *et al.*, 1994; De Graaf *et al.*, 1997; Herrick *et al.*, 1997; Doherty *et al.*, 1998; Laforge *et al.*, 1999). Most of these studies found higher percentages of patients in the action stage, although considerable differences between them were also found. The use of different algorithms may have contributed to differences in distribution across stage of dietary change (Greene *et al.*, 1994; Reed *et al.*, 1997). Since there is no 'correct' model or gold standard to which algorithms can be compared, there is no clear-cut way to judge their validity (Reed *et al.*, 1997). Differences in stage distribution may also be explained by differences in population characteristics (Glanz *et al.*, 1994; Doherty *et al.*, 1998), or they may represent actual differences in levels of motivation.

Our positive finding that during the intervention phase, more patients from the intervention group than from the control group moved from pre-action to post-preparation is consistent with other studies (Glanz *et al.*, 1998; Kristal *et al.*, 1999; Kristal *et al.*, 2000; Steptoe *et al.*, 2001). However, between six and twelve months, when the intensity of the intervention was low, differences between both groups disappeared. Overall, between baseline and twelve months, even more patients in the control

group than in the intervention group had moved forward through the stages of change. This suggests that interventions should attempt both to try to move people out of pre-action stages and to keep people in action and maintenance stages (Glanz *et al.*, 1998).

In summary, in our controlled clinical intervention study, movement through the stages of change for fat reduction could explain part of the change in fat intake at six months after enrolment in the study. Between six and twelve months, small changes in the intervention group and the control group led to the disappearance of differences in distribution across stages of change. This partly explains the absence of a difference in reported fat intake we found in previous analysis (Van der Veen *et al.*, 2002). These findings, along with findings of Greene *et al.* (1998) suggest that continuity of care for patients at elevated cardiovascular risk is essential for changing dietary behaviour and for keeping people in the action or maintenance stage for fat reduction.

IMPLICATIONS FOR RESEARCH AND PRACTICE

Stage-matched nutrition interventions can increase the rate of movement from pre-action to post-preparation stages of dietary change. These changes result in lower reported fat intakes. This may result from socially desirable answers in the FFQs due to increased awareness of patients of their fat consumption and/or actual changes in behaviour.

Our study shows that a general practitioner and a dietician can successfully work together in working toward behaviour change in patients at elevated cardiovascular risk. These results support the Stages of Change construct as an intervention tool in achieving sustainable health behaviour change. Further research should focus on feasible ways to ensure continuity of care in general practice to move people from the pre-action stages and to keep them in the action or maintenance stages.

5

General practitioners' assessment of patients' readiness to change diet, activity and smoking

Stil zijn is voor een huisarts
dikwijls de meest effectieve
manier om met een patiënt
te praten.
Jozien Bensing

ABSTRACT

Background. The Stages of Change Model is increasingly used for lifestyle counselling. In general practice, the use of algorithms to measure stage of change is limited, but for successful counselling it is important to know patients' readiness to change.

Aim. To assess the accuracy of the assessment of patients' readiness to change fat consumption, physical exercise, and smoking by general practitioners and general practice registrars (registrars).

Design of study. Cross-sectional questionnaire-based survey.

Setting. 199 patients at elevated cardiovascular risk aged 40-70y, 24 general practitioners, and 21 registrars in Dutch general practices.

Methods. Patients were asked to complete an algorithm to measure their motivation to change fat consumption, physical exercise, and smoking. General practitioners and registrars were given descriptions of the stages of change for the three lifestyles, and were asked to indicate the description that matched their patient. Cohen's Kappa was calculated as measure of agreement between patients and general practitioners/registrars.

Results. Registrars' patients were younger, and less often overweight and hypertensive than general practitioners' patients. Cohen's Kappa for smoking was moderate (0.50, CI 0.34-0.67 for general practitioners and 0.47, CI 0.27-0.68 for registrars). Agreement for fat and activity was poor to fair. No differences in accuracy were observed between general practitioners and registrars (p=0.07-0.83).

Conclusions. Low accuracy indicates that counselling in general practice is often targeted at the wrong people at the wrong time. Improvements can possibly be achieved by making registration of lifestyle parameters in patient records common practice, and by simply asking patients where they stand in respect to lifestyle change.

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Tailoring lifestyle counselling messages to patients' individual motivational characteristics increases program effectiveness. It is therefore important to accurately assess patients' motivation, especially as general practitioners are not only an important source for lifestyle counselling themselves, but also the gatekeeper to many other sources. This cross-sectional study shows moderate accuracy for smoking cessation and large systematic errors for reduction of dietary fat intake and increase of physical activity. Higher levels of accuracy can possibly be achieved by simply asking patients for their motivation.

INTRODUCTION

The Stages of Change Model is frequently suggested as a basis for tailored intervention programs (Ashworth, 1997). The model was originally developed for smoking cessation, but has since then also been used for behaviour change programs in diet and physical activity (Prochaska *et al.*, 1994). The Stages of Change Model postulates that individuals can be classified in one of five stages of readiness to change health behaviour. In the *precontemplation* stage, people do not intend to change their behaviour in the next 6 months because they are unaware of the problem behaviour or because they are demoralized by unsuccessful previous behaviour change attempts. In the *contemplation* stage, people are aware of the need for behaviour change. They intend to take action within the next six months, but lack commitment to actually start changing. In the *preparation* stage, people have decided to take action in the immediate future, usually measured as the next month. They often have a concrete plan of action, such as: taking up sports, joining a health education program, or buying a self-help book. In the *action* stage, people have made specific overt modifications in their lifestyle within the past six months. In the *maintenance* stage, people have shown the desired behaviour for over six months and are working to prevent relapse. Theoretically, people can only be in the action and maintenance stages if they have made behaviour changes that are sufficient to reduce risks for disease (Prochaska & Velicer, 1997). The classification of the stages of change therefore depends heavily on people's self-perception. Unfortunately, this self-perception is often inaccurate. For dietary fat intake, for example, studies have shown actual intake levels to be much higher than self-perceived intake levels (Brug *et al.*, 1994). This makes the stages of change reflect people's perception of their current behaviour and their motivation to change, rather than their actual behaviour (Kristal *et al.*, 1999).

The Stages of Change Model can help identify patients who are positively interested or, on the other hand, absolutely unwilling to change their health behaviour (Ashworth, 1997). The effectiveness of interventions can be increased by tailoring counselling to individuals' levels of knowledge, awareness, and motivation (i.e. their stage of change) (Steptoe *et al.*, 1999; Steptoe *et al.*, 2001; Van der Veen *et al.*, 2002). Furthermore, excluding unmotivated individuals from counselling programs can save general practitioners considerable amounts of time.

To use the Stages of Change Model as basis for counselling, it is necessary to accurately assess individuals' readiness to change. In research, this is often done using single question or multiple-item algorithms that are filled in by patients. In practice, however, the use of these algorithms is limited and

it is reasonable to assume that general practitioners often act upon their perception of patients' readiness to change. General practitioners likely use their background knowledge and the content of the consultation to determine whether or not the patient would be interested in and benefit from lifestyle advice. In many countries, general practitioners are health care coordinators and the gatekeepers to other types of health care, such as dieticians and diabetes counsellors (Rutgers & Berkel, 1990; Bodenheimer *et al.*, 1999). The importance of general practitioners' accurate assessments of motivation for lifestyle change is evident, as inaccuracy would lead to referral of unmotivated patients.

To our knowledge, nothing is known about the accuracy of general practitioners' assessment of patients' readiness to change. Our study among Dutch home care dieticians showed a striking overestimation of patients' readiness to change (Verheijden *et al.*, 2002a). The relative success of a structural stages-of-change-approach in comparison to usual care in general practice (Steptoe *et al.*, 1999; Steptoe *et al.*, 2001; Van der Veen *et al.*, 2002) suggests that general practitioners also overestimate patients' readiness to change.

The current study was designed to evaluate the accuracy of general practitioners' assessment of their patients' readiness to change dietary fat intake, physical activity, and smoking behaviour. We hypothesized that prolonged general practitioner-patient interaction within the continuity of care framework of general practice would increase the accuracy. Therefore, we also included general practice registrars (registrars) who have yet had little time to build on their relationship with the patients, in our study. As a result of their experience and long-term contact with the patients, we expected the general practitioners to have a higher accuracy than the registrars.

MATERIALS AND METHODS

Study population and procedure

Hundred thirteen general practitioners and hundred thirteen registrars affiliated with the Department of General Practice of the University Medical Centre Nijmegen, The Netherlands were invited to participate in the current cross-sectional study. Despite repeated follow-up by the research team, eleven general practitioners and nine registrars could not be contacted, and two general practitioners and two registrars never returned their consent forms. Seventy-seven percent of the general practitioners and 81% of the registrars refused to participate, mostly because of lack of interest or time (**Figure 5.1**). All practitioners (both general practitioners and registrars) were asked to invite a maximum of ten of their patients (40-70 years) at elevated cardiovascular risk to join the study. Only patients who came in for a consultation during the study period, were invited for participation. Elevated cardiovascular risk was defined on an operational level as one or more of the following: type II diabetes mellitus, hypertension, dyslipidemia, obesity, and a personal or family history of cardiovascular diseases.

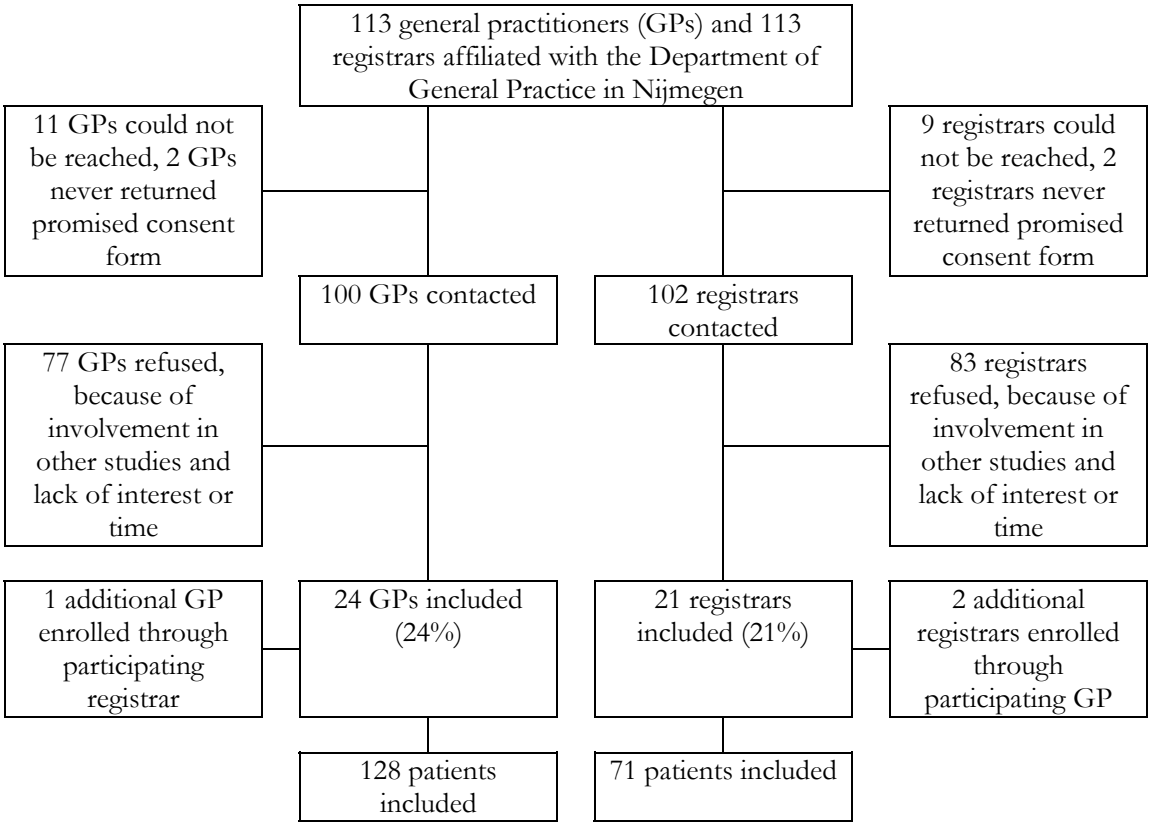

Figure 5.1 Recruitment of general practitioners (GPs), general practice registrars (registrars) and their respective patients at elevated cardiovascular risk.

For each individual patient, the practitioners were provided with a set of patient and practitioner questionnaires with matching identification numbers. At the end of the consultations, patients were asked to report their sex, age, height, weight, and the number of years they had been registered in the general practice. They were also asked to fill in stages of change algorithms for dietary fat consumption, physical activity, and smoking. The algorithms were a translation into Dutch from the algorithm by Curry *et al.* (1992). Slight changes were made to make questions applicable to each of the individual health behaviours. The patients were asked to fill in the questionnaire immediately after the consultation, and to hand it in to the receptionist in a sealed envelope.

The practitioners also filled in their questionnaire immediately following the consultation. They were asked to record the presence of the risk factors used to defined elevated cardiovascular risk. Using a five-point scale reflecting the stages of the Stages of Change Model, they were also asked to assess their patient's readiness to change dietary fat consumption, physical activity, and smoking. Finally, they recorded whether or not general dietary habits, dietary fat consumption, physical activity, and smoking had been discussed during the consultation. For the general practitioners and registrars, information on age, sex, number of years working/in training was collected. Additional information on the number of

patients registered in the practice of each of the general practitioners was obtained from the database of the Department of General Practice, Nijmegen.

Statistical analysis

Descriptive statistics were used to describe the population of patients, general practitioners, and registrars. Cohen's Kappa (Cohen, 1960) was calculated to assess the accuracy of general practitioners' and registrars' assessment of patients' readiness to lower their fat intake, to increase their physical activity levels, and to quit smoking. Kappas between 0 and 0.19, 0.20 and 0.39, 0.40 and 0.59, 0.60 and 0.79, and 0.8-1.0 indicate poor, fair, moderate, substantial, and almost perfect agreement, respectively (Landis & Koch, 1977). We also tested for differences in Kappa between the general practitioners and registrars. The presence of any systematic errors in general practitioners and registrars assessments of patients' readiness to change was assessed using Wilcoxon Rank Order Test.

Only complete sets of questionnaires were used in analyses. Analyses for physical activity and smoking cessation were based on a lower number of observations as we excluded patients who were unable to perform physical activity because of physical limitations, and patients who had never smoked. All analyses, except for the agreement between registrars and patients with respect to smoking cessation included sufficient observations to calculate Cohen's Kappa (more than two times the squared number of response categories, i.e. > 50) (Cicchetti, 1976). The analyses were conducted using the SAS system (SAS Institute Inc., Cary, NC, USA) and p-values less than 0.05 were considered significant.

RESULTS

Study participants

The recruitment of GPs and registrars, and their patients is shown in **Figure 5.1**. Twenty-four general practitioners (79% male) and 21 registrars (86% female) were included in the study. General practitioners' mean age was 50 years. General Practitioners had been working as general practitioners for a mean of 20 years and practice sizes varied between 1500 and 3100 patients. Fifty-two percent of the registrars were in their first year of training; the others were in their third (final) year. Hundred twenty-eight patients were recruited into the study by general practitioners and seventy-one patients by registrars. Patient characteristics are described in **Table 5.1**. Patients recruited into the study by general practitioners were significantly older (58 versus 53 years) and more often overweight (45% versus 26%) than patients recruited by registrars. Hypertension was also more prevalent (70% versus 56%). For dietary fat reduction and smoking cessation, most patients were in the maintenance stage. For increasing physical activity, however, most patients were in the precontemplation stage.

Table 5.1 Personal characteristics of patients at elevated risk for cardiovascular diseases in consultations with general practitioners (GPs) and general practice registrars (registrars), respectively.

	GPs Mean ± SD* N=128	registrars Mean ± SD* N=71	p-value
Age (years)	58 ± 10	53 ± 10	0.002
Sex (% male)	43	52	0.30
Self-reported Body Mass Index (kg/m^2)	29.1 ± 5.3	28.4 ± 5.9	0.40
Risk factors for cardiovascular disease			
Type II diabetes mellitus (%)	23	23	1.0
hypertension (%)	70	56	0.05
dyslipidemia (%)	34	29	0.54
overweight (%)	45	26	0.008
family history (%)	21	27	0.40
Registration in the general practice (years)	19.7 ± 14	17.7 ± 12	0.32
Stage of change for dietary fat reduction			
Precontemplation (%)	19	26	0.34
Contemplation (%)	8	3	
Preparation (%)	11	5	
Action (%)	12	15	
Maintenance (%)	50	51	
Stage of change for increase of physical activity			
Precontemplation (%)	41	37	0.92
Contemplation (%)	12	16	
Preparation (%)	19	22	
Action (%)	5	5	
Maintenance (%)	23	20	
Stage of change for smoking cessation			
Precontemplation (%)	12	30	0.26
Contemplation (%)	30	18	
Preparation (%)	5	6	
Action (%)	7	9	
Maintenance (%)	46	37	

* Unless otherwise specified

Agreement between general practitioners and registrars, and patients

For dietary fat reduction as well as for increasing physical activity, and for both general practitioners and registrars, Cohen's Kappa's were below the cut-off for moderate agreement (0.40)(**Table 5.2**). Agreement for smoking cessation was moderate. No significant differences were observed between general practitioners' and registrars' assessment of patients' readiness to change (p=0.07-0.83). Registrars systematically underestimated patients' readiness to reduce their dietary fat intake. Both general practitioners and registrars systematically overestimated patients' readiness to increase their physical activity. There was no systematic error in the estimation of patients' readiness to quit smoking.

Table 5.2 Agreement between patients and general practitioners and general practice registrars, respectively, for motivation to reduce dietary fat intake, to increase physical activity, and to quit smoking.

	underestimation %	correct %	overestimation %	Kappa [CI]	p[a]
Fat reduction					
General practitioners	31	46	23	0.25 [0.14-0.36]	0.07
General practice registrars	51	31	18[b]	0.10 [-0.03 – 0.22]	
Physical activity					
General practitioners	18	36	46[c]	0.16 [0.06-0.26]	0.68
General practice registrars	25	38	37[c]	0.20 [0.05-0.34]	
Smoking cessation					
General practitioners	17	67	16	0.50 [0.34-0.67]	0.83
General practice registrars	18	61	21	0.47 [0.27-0.68]	

[a] p-value for difference between kappa for general practitioners and general practice registrars.
[b] Systematic underestimation of patients' motivation to change.
[c] Systematic overestimation of patients' motivation to change.

DISCUSSION

This cross-sectional study in Dutch family practices showed poor to moderate agreement between patients' self reported, and general practitioners' and registrars' assessment of patients' motivation to change dietary fat consumption, physical activity, and smoking behaviours. To our knowledge, this is the first study looking at the assessment of motivation to change in general practice. Our study among Dutch home care dieticians also showed disagreements between patients' and health workers' assessment.

Response rates among general practitioners and registrars were low at 24% and 21%, respectively. This includes one general practitioner and two registrars who were not included in the original recruitment but contacted the research team and requested to participate in the study. Participating general practitioners and registrars were possibly more interested in lifestyle and more involved in lifestyle counselling than non-participants. Previous research has shown that such a positive attitude towards the role of general practitioners in prevention is associated with increased frequency of body weight checks and the discussion of lifestyle habits (López-de-Munain *et al.*, 2001). Furthermore, it is very well possible that general practitioners and registrars selected a sample of patients whose lifestyle they were relatively familiar with for participation. This leads us to the assumption that the levels of agreement found in our study overestimate the true agreement in every day's general practice.

For all three lifestyles, agreement failed to rise above the level of substantial agreement (0.60). The striking difference in agreement between smoking, and dietary fat consumption and physical activity, may partly be explained by the fact that the Stages of Change Model was originally developed based on people's experiences with smoking cessation (Prochaska *et al.*, 1994). It may also be caused by

the fact that only smoking status is generally recorded in patient charts (Pringle *et al.*, 1995). Registration is positively correlated with the frequency of preventive activities such as: body weight checks, and the discussion of smoking habits and physical activity (López-de-Munain *et al.*, 2001). Increased frequency of preventive activities may lead to increased knowledge of patients' motivation to change. We hypothesize that practitioners' view on patients' smoking cessation motivation was based on knowledge rather than estimation. Careful analyses in our study failed to show a difference in agreement between consultations in which the lifestyles were discussed as opposed to consultations in which they were not discussed (data not shown). However, small numbers of patients, particularly in the registrars group, limit the reliability of these outcomes, and care should be taken in interpreting these findings.

In contrast to our expectations, there was no difference between general practitioners' and registrars' assessment of patients' readiness to change. Even in patients in earlier risk stages for cardiovascular disease, registrars were able to achieve similar levels of agreement. A prolonged practitioner-patient relationship may therefore not necessarily lead to accurate assessments of patients' motivation to change. Previous research has shown that female physicians discussed lifestyle more often than male physicians. (López-de-Munain *et al.*, 2001). It is therefore also possible that the high number of female registrars masked the effect of prolonged practitioner-patient relationship in favour of the predominantly male general practitioners.

Stage of readiness to change reflects people's perception of their current behaviour and their motivation to change in the future (Kristal *et al.*, 1999). Low agreement may thus be caused by a difference in perception of patients' current behaviour. Previous research showed that patients have in inaccurate self-perception; they frequently underestimate their dietary fat intake and overestimate their physical activity levels (Brug *et al.*, 1994; Ronda *et al.*, 2001). As national data that continue to show these phenomena are readily available in the Netherlands (Van Oers, 2002), we expected practitioners to have a more realistic view of patients' behaviour in reference to the guidelines. This would lead to low numbers of patients being classified in the action and maintenance stages by their practitioners, and a systematic underestimation of patients' motivation to change. For dietary fat consumption, the registrars indeed showed a systematic underestimation and a similar yet not significant effect was observed for the general practitioners. For increasing physical activity, however, a systematic overestimation of patients' readiness to change was observed. It is unclear what caused this effect. We speculate that insufficient acknowledgement by practitioners of the likelihood of relapse in lifestyle change may be part of the reason.

General practitioner acknowledge and support the potential role of lifestyle in primary prevention (Mirand *et al.*, 2002). Yet, as Yarnall *et al.* (2003) stated, 'time constraints limit the ability of physicians to comply with preventive services recommendations'. Tailoring interventions to individuals' levels of knowledge, awareness, and motivation may help to make best use of the limited time and resources available. However, the low accuracy of practitioners' assessment of patients' motivation to change, shows that current procedures are insufficient as a basis for tailoring. In the future, *asking* patients rather than *assuming* where they stand with respect to lifestyle change may lead to large improvements.

Structural repeated registration in patient records may also improve the level of preventive services and the accuracy of the motivational assessment, particularly for diet and exercise behaviours.

6

Internet use in general practice: practitioners' and patients' perspectives

Aangezien medische kennis in beginsel geautomatiseerd kan worden en een empathische houding niet, doet de huisarts er uit professionele overwegingen goed aan te investeren in de arts-patiënt relatie.
Jozien Bensing

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Internet has large potential for general practitioners, e.g., for guideline dissemination, continuing medical education, and fast access to medical journals. Internet has also made a plethora of health information available to the public; tele-consultations, web messaging, and online health promotion tools are now technically possible (Bodenheimer & Grumbach, 2003). While the effectiveness of computer-based health promotion has been shown (Revere & Dunbar, 2001), little is known about general practitioners' and patients' attitudes towards this.

We conducted an explorative study among 16 general practitioners working in one academic general practice and 70 patients aged ≥40y at elevated cardiovascular risk who had participated in a web-based nutrition counselling trial (Verheijden *et al.*, 2002). Desktop Internet access was available to all general practitioners and all patients were regular Internet users. General practitioners and patients were asked to give their opinion on the potentials and pitfalls of online health information using a self-administered questionnaire. Response rates were 88% (n=14) for the general practitioners and 80% (n=56) for the patients.

Half of the general practitioners had ever been approached by patients with information from the Internet. According to the general practitioners, this positively affected patient participation, but also increased the duration of almost all consultations. Seventy-one percent of the general practitioners stated that Internet is of added value to usual care for patients at elevated cardiovascular risk and 64% would therefore consider referring their patients to the Internet for health information. However, all general practitioners expressed their concerns about a potential information overload and the lack of quality control on online information. They advocated general practitioner involvement in the development of health related web sites and a quality label for sites with approved information.

One out of four of the patients indicated that information on the Internet can be particularly useful for information on serious and life threatening diseases. Important changes that would have to be made to interest patients in future web-based counselling applications were: improved access to computers with Internet connection or improved computer skills (45%), stronger indication of the benefits (25%) and improved privacy protection (20%). Little time and lack of general practitioner involvement were less important barriers. None of the patients in our study expressed concerns about the quality of online health information.

Both general practitioners and patients acknowledge the potential benefits of Internet, but report barriers that limit its actual use. These barriers need to be removed to exploit the full potential of Internet in general practice, e.g. by increasing computer literacy and Internet access and by assuring high-quality online information. In the latter case, reference lists for high-quality websites have netted positive results (Helwig *et al.*, 1999). Yet the ever changing content of websites and the questionable success of quality rating instruments (Gagliardi & Jadad, 2002), suggest that sites designed and administered in cooperation with general practitioners are the most feasible way to guarantee quality. As Internet density rates keep rising, Internet will be a helpful addition for regular health care and may reach people who do not usually attend clinics. It is therefore important that general practice and other

specialties make unbiased and relevant health information available – particularly because patients don't appear to question quality and reliability.

7

Randomised controlled trial of web-based targeted nutrition counselling and social support for patients at elevated cardiovascular risk in general practice

Loving kindness is a general moral precept
rather than a specific medical concept, but
it has direct and powerful therapeutic
application – no matter what medical
system is involved – anywhere in the world.
SKH Aung

ABSTRACT

Objective. To address the effectiveness of web-based nutrition counselling and social support for patients at elevated cardiovascular risk on social support, anthropometry, blood pressure, and serum cholesterol.

Design. Randomised controlled trial, with measurements at baseline and at 4 and 8 months.

Setting. Primary care.

Subjects. 146 patients at elevated cardiovascular risk.

Interventions. During 8 months, patients in both the intervention group and the control group received usual care. Patients in the intervention group also had access to a web-based nutrition counselling and social support tool (Heartweb). Site use during the study was monitored.

Results. Heartweb was used by 33% of the 73 intervention patients. There were no differences between the intervention group and the control group in changes in social support, anthropometry, and serum cholesterol levels. Heartweb users were younger ($p=0.03$), and had a larger decrease in systolic blood pressure ($p=0.02$) than intervention patients who did not use Heartweb.

Conclusions. This study did not show favourable effects of a web-based nutrition counselling and social support intervention on social support, anthropometry, blood pressure, and serum cholesterol. Improvement in access to and acceptance of web-based tools may increase the potential of web-based interventions.

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Cardiovascular diseases remain a major cause of avoidable morbidity and mortality in many parts of the world (World Health Organization, 2003). Disease prevention through lifestyle advice by physicians and other providers should therefore be an integral component of the management of risk factors for cardiovascular diseases (Reeder & Taylor, 1999; Erlinger *et al.*, 2000). The general practice provides an ideal setting in which lifestyle change can be initiated and encouraged. The large numbers of patients with lifestyle-related chronic conditions, however, make continuous counselling for each individual time-consuming. By specifically targeting individual patients at elevated risk for disease, general practitioners can spend their time on those people who might benefit most from health behaviour change. In dietary change, as well as in other health behaviours, the Stages of Change Model (also known as the Transtheoretical Model) has been used to help discriminate between patients at 5 different levels of knowledge, awareness, self-reported current behaviour, and intention to change in the future (Prochaska & DiClemente, 1992; Horwath, 1999). This concept of readiness to change may help health professionals identify appropriate counselling and treatment strategies for each individual, thus making their efforts more effective and efficient (Ashworth, 1997).

In the stages and processes of the Stages of Change Model, social support is important and previous work has shown that social support is a strong predictor of intention for dietary change (Verheijden *et al.*, 2003). Furthermore, two reviews show positive effects of social support on dietary change (Black *et al.*, 1990; Kelsey *et al.*, 1997). The incorporation of social support in health promotion is therefore promising. In practice, however, social support is hardly ever included in intervention programs. Support by health workers such as general practitioners may be most feasible, but repeated concerns have been expressed about the effectiveness of social support in the non-reciprocal relationship between health worker and patients (Hupcey & Morse, 1997). Internet may facilitate the exchange of support, as it provides a significant avenue by which peer interaction can take place (Gallienne *et al.*, 1993; Winzelberg *et al.*, 2000; Johnson *et al.*, 2001), for example by means of online patient groups, listservs, bulletin boards, and chat rooms.

General practice based lifestyle intervention programs have often not led to sustained behaviour change (Campbell *et al.*, 1994; Cupples & McKnight, 1994; Lindholm *et al.*, 1995; Mant, 1997; Hiddink *et al.*, 1997a; Van der Veen *et al.*, 2002). Apart from the low success rate, general practitioners experience other barriers that prevent them from giving face-to-face counselling to patients with chronic lifestyle related diseases, such as lack of time and lack of knowledge. A perceived lack of motivation from patients related to the self-inflicted nature of the high-risk lifestyles such as smoking, low physical activity levels, and a high dietary fat intake even further increases those barriers (Hiddink *et al.*, 1995; Hiddink *et al.*, 1997b). Using the Internet for lifestyle counselling may prove useful in overcoming some of these barriers (McKay *et al.*, 2001). A further benefit from innovative Internet based tools is that they require a one time only effort for design and implementation after which they may be useful for large groups of people. As with other technical advancements, it may take decades before the public fully adopts the medium. For another number of years, it will therefore be too early to draw definite conclusions on the true use of Internet interventions. However, current studies

addressing Internet in health care will provide useful information on the applicability, the potentials, and the pitfalls of Internet for health promotion activities.

We developed a web-based nutrition counselling program based on the Stages of Change Model, in which a bulletin board for social support was incorporated. The feasibility, acceptance, and effectiveness of this program were assessed in a randomised controlled intervention study in Canadian patients at elevated cardiovascular risk in general practice. Outcome measures were: anthropometry, blood pressure and serum cholesterol levels.

MATERIALS AND METHODS

Study participants and procedure

Fourteen general practitioners (including NMSG) with 7944 patients in the Queen's University General Practice Centre in Kingston (Canada) agreed to bring the study to the attention of their patients at elevated cardiovascular risk. The general practitioners sent letters to 876 patients aged 40 and over who appeared in the computerized billing system in the year prior to recruitment for at least one of the following: hypertension, type II diabetes mellitus, and dyslipidemia. To be eligible for the study, patients had to confirm the diagnosis of one or more of the aforementioned risk factors for cardiovascular disease and to report to use the Internet. Hundred forty-six patients were included in the intervention study. Conservative sample size calculations (power=0.90 and α=0.05) showed enough power to detect clinically relevant differences in change between the intervention group and the control group in anthropometry, blood pressure, and serum lipid levels.

Upon completion of baseline assessments (Sept 2002 – December 2002), an independent researcher assigned all 146 patients to either the intervention or the control group using a computerized table. Patients living at the same address and/or with the same surname were allocated to the same group to avoid contamination of the information in intervention and control groups. Both the control group and the intervention group contained 6 couples that were randomised together. Two follow-up assessments were scheduled 4 and 8 months after baseline. **Figure 7.1** provides details on the recruitment and flow of the participants. The randomisation procedure resulted in 73 patients in the intervention group and 73 patients in the control group. Upon completion of the 8-month study period, patients were asked to fill in an evaluation questionnaire. For patients in both groups, this questionnaire contained items on the organisation of the study and contact with the research team. For patients in the intervention group, additional questions on the use of Heartweb were included. The Human Research Ethics Board of Queen's University approved the study protocol and written informed consent was obtained from all participants.

To assess the external validity of our trial, a random sample of 146 patient records was drawn from the non-responders. These records were reviewed for blood pressure and lipid profile data from assessments between August 01, 2001 and August 01, 2002. Data were compared to baseline values of the study participants.

The intervention

Patients in both groups received two general brochures from the Heart and Stroke Foundation as well as the usual care from their general practitioner. They were also sent the results of the measurements at baseline, 4 months, and 8 months. In addition to that, patients in the intervention group were given a registration code for the password protected web-based nutrition counselling program that was specifically designed for the study (Heartweb) enclosed with their result sheet from the baseline measurements. They were also sent a reminder of the website and their registration code along with their result sheet for the measurements four months after baseline.

Heartweb was developed by a team consisting of dieticians, general practitioners, nutritionists and web designers. As was previously done in (web-based) intervention studies (Ni Mhurchu *et al.*, 1997; Hilton *et al.*, 1999; Finckenor & Byrd-Brenner, 2000; Van der Veen *et al.*, 2002), Heartweb included a procedure to target counselling messages to patients' readiness to lower their fat consumption. Dietary fat reduction was chosen because of its key role in cardiovascular risk reduction. We defined readiness to lower fat consumption on an operational level using the Stages of Change Model (Prochaska & DiClemente, 1992).

Once every month, Heartweb presented patients with a short assessment tool to determine their stage of change. Patients were then automatically presented with an information package for that particular stage of change. The targeted information packages were designed to create or enforce a positive attitude towards reducing fat consumption, to make people aware of the risks associated with elevated fat intakes, and to provide patients with practical advice on how to reduce fat consumption. Canada's Food Guide to Healthy Eating (Minister of Supply and Services Canada 1992; Cat. No. H39-252/1992E) and existing web-based and non-web-based materials were used during the development of the web-based targeted intervention packages that were used in Heartweb (Glasgow *et al.*, 1989; Turnin *et al.*, 1992; Kaplan & Keil, 1993; Bental *et al.*, 1999; Campbell *et al.*, 1999; Dijkstra & De Vries, 1999; Graber *et al.*, 1999; Lewis, 1999; Steptoe *et al.*, 1999; Block *et al.*, 2000; De Bourdeaudhuij & Brug, 2000; Riva *et al.*, 2000; Demiris *et al.*, 2001; McKay *et al.*, 2001; Ploughmann *et al.*, 2001; Steptoe *et al.*, 2001; Ferguson, 2002; Van der Veen *et al.*, 2002).

Independent of peoples' stage of change, we included a self-assessment tool for dietary fat intake provided by the Nutrition Promotion Program of the Kingston, Frontenac and Lennox & Addington Health Unit to increase patients' awareness of their dietary behaviour (Oenema *et al.*, 2001). To increase peoples' confidence in their ability to adopt a low-fat diet, we added four heart-healthy recipes provided by the Dieticians of Canada to the web site. For more healthy recipes, patients were referred to web sites of the Canadian Heart and Stroke Foundation, and the Dieticians of Canada. Heartweb also consisted of a bulletin board enabling patients to post messages for social support. To encourage the use of the bulletin board, the information packages for each of the stages of change concluded by referring participants to the bulletin board. Using a patient entry, we posted messages on the discussion board to get the online conversation started and to keep it going when it slowed down. The research team only participated in the online discussion when specifically asked for by the participants.

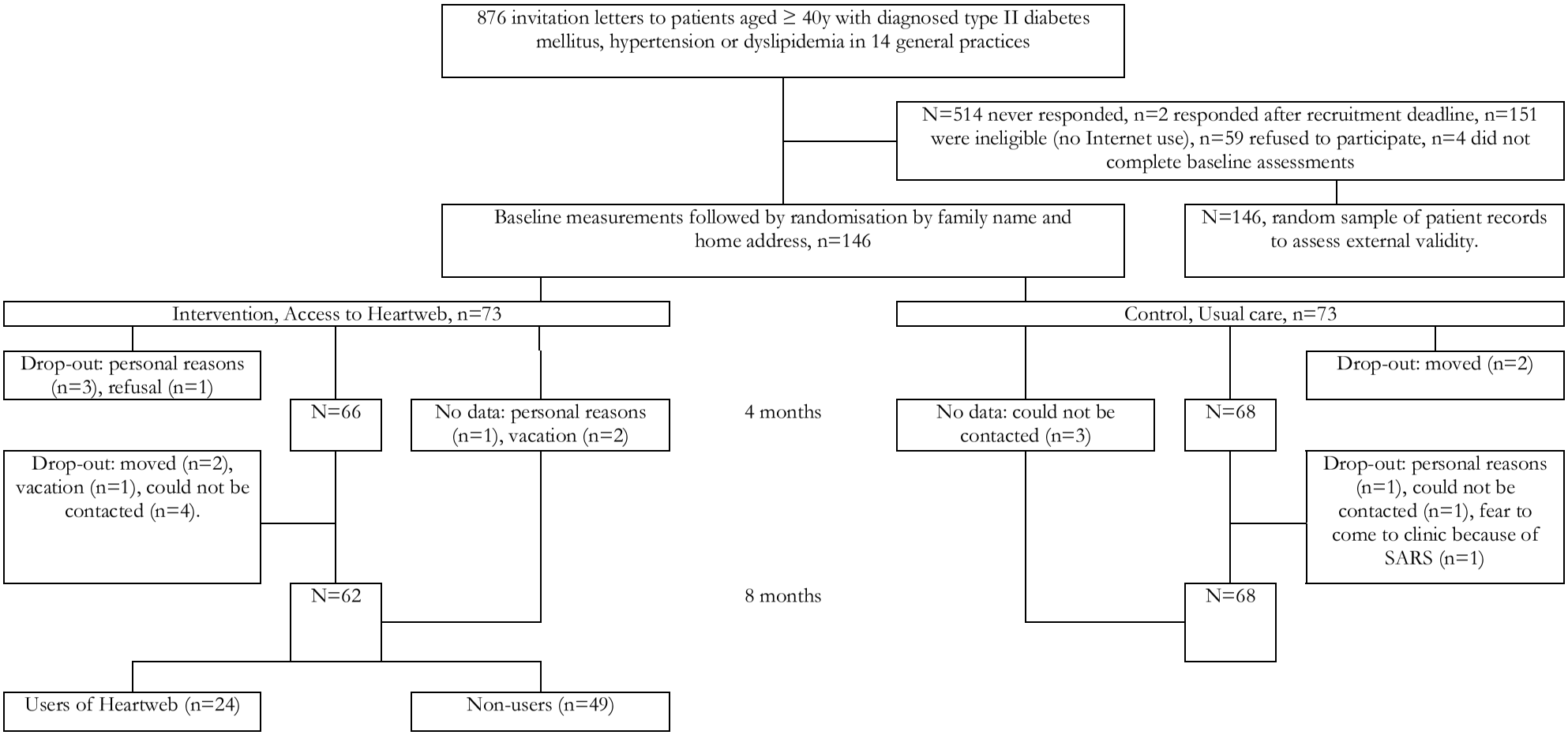


Figure 7.1 Selection and flow of participants.

Data on date, time, and duration of site use, as well as the answers to the online Stages of Change questionnaire and the self-assessment tool for dietary fat intake were stored on the website, and were accessible to the research team only.

Outcome measures

Participants were asked to fill in a questionnaire consisting of a general section including items on demographic data, smoking status, physical activity, and medications. Stage of readiness to change for reduction of fat intake was assessed with an algorithm (Van der Veen *et al.*, 2002). The social support section consisted of a version of the 16-item social support scale used by Winzelberg *et al.* (2000) measuring perceived social support that was adapted to be applicable for a heart healthy diet. The questionnaire included specific items on the exchange of online support. The availability and use of a social support network was measured using the 7-item National Population Health Survey social support scale (Raina *et al.*, 1999). The introduction to this scale specifically requested patients to report personal, phone, mail, and email contact.

We measured body weight (to the nearest kg), and body height, waist circumference and hip circumference (to the nearest cm). All measurements were conducted without shoes or heavy clothing. Body mass index (BMI, kg/m^2) and waist-to-hip circumference ratio were calculated. Blood pressure was measured in the sitting position four times on each occasion using an auto inflate blood pressure monitor (UA-767 by A&D engineering). Readings were conducted on the same arm for baseline and follow-up measures. The mean of the last three readings was used for analyses.

We measured fasting serum total cholesterol, high-density lipoprotein cholesterol (HDL), and triglyceride levels in two blood samples taken with a one-week interval. The mean of the two samples was used for analyses. All analyses were conducted at the laboratory of the Kingston General Hospital (Kingston, Canada) using the Roche Modular System manufactured and supplied by Roche Diagnostics a division of Hoffmann-La Roche. Low-density lipoprotein cholesterol (LDL) was calculated using the formula of Friedewald *et al.* (1972). When triglyceride levels exceeded 4.52 mmol/L, no LDL levels were calculated. All measurements were conducted at baseline and after four and eight months.

Analyses

Baseline differences between groups were tested using two-sample t-tests, and χ^2 or Fisher's exact tests. Descriptive statistics were used to present data on frequency and duration of site use. We conducted longitudinal data analysis (PROC MIXED, Verbeke & Molenberghs, 2000) using a compound symmetry covariance structure to assess differences between the intervention group and the control group in changes in outcome variables during the 8-month study period. All changes were adjusted for age and sex. Because of clustering of patients within general practices, the intra cluster correlation coefficients (ICC) of the baseline values of anthropometry, blood pressure, and cholesterol levels were calculated. All ICCs were below 0.001, indicating that the average correlation between outcome variables measured in patients in the same general practices was not different from the average

correlation between outcome variables measured in patients in different general practices (Hox, 2002). The longitudinal analyses were therefore conducted without a random statement for general practice. In addition to the analyses in which all randomised patients were included (intention to treat), we also conducted longitudinal analyses within the intervention group looking at the differences in effects between the users and the non-users of the intervention tool. Because the ICCs were sufficiently low (<0.0002), these analyses too were conducted without a random statement for general practice. All analyses were conducted using the SAS system (SAS Institute Inc., Cary, NC, USA) and p-values less than 0.05 were considered significant.

RESULTS

Participant characteristics

Figure 7.1 shows the selection and flow of participants. Fifty-five percent of the participants were male and the participants' mean age was 63 years. Medication use was much less prevalent for type II diabetes mellitus (15% of participants) and dyslipidemia (33%) than for hypertension (67%). The majority of the participants were in the maintenance stage of change **(Table 7.1)**. In comparison to the non-responders **(Figure 7.1)**, there was a higher percentage of men among the participants. Participants also had statistically and clinically significant higher HDL cholesterol and lower systolic blood pressure levels (data not shown).

At four months, data were available on 66 participants in the intervention group and 68 patients in the control group **(Figure 7.1)**. Reasons for drop-out included: illness of participant, death or illness of a family member, refusal to further participate, or movement outside the Kingston area. In the intervention group, three participants provided no data at 4 months because they were on vacation (n=2) or for personal reasons (n=1). In the control group, three participants could not be contacted for the measurements after 4 months. In the intervention group, 90% and 84% of the participants completed the assessments after 4 months and 8 months, respectively. In the control group data were obtained for 93% of the participants at both time points. Of the patients who completed the measurements after 8 months, 92% of the patients in the intervention group and 80% in the control group returned the evaluation questionnaire.

Heartweb use and users

By and large, Internet use among the participants was highest at home (98% of the patients) and at work (27% of the participants). Internet use at friends or family, in the library, and at other locations was much lower (9%, 5%, and 2% of the participants, respectively). At randomisation, none of the patients reported to use the Internet to contact other people with hypertension, type II diabetes mellitus and/or dyslipidemia. The evaluation questionnaires showed that 93% of the participants in the intervention group could recall receiving the result sheet for the baseline measures, but only 71% could recall receiving the registration code for Heartweb, which was sent along with the result sheet. For the measurements after four months, these numbers were 88% and 52%.

Table 7.1 Baseline characteristics of 146 Canadian patients at elevated cardiovascular risk in general practice. Values are percentages unless otherwise specified.

	Intervention group n=73	Control group n = 73	P-value
Demographics			
Age (years, mean SD)	62 (11)	64 (10)	0.13
Sex (male)	52	59	0.51
Education level			
Low (≤ high school level)	21	18	0.14
Intermediate	42	30	
High (> BSc level)	37	52	
Lifestyle			
Smoking			
Never smoker	35	39	0.60
Ex smoker	51	52	
Current smoker	14	9	
Alcohol (> 3 glasses per week)	56	54	0.87
Exercise (> 3 times per week)	63	61	0.81
Medication use for			
Hypertension	67	67	1.00
Dyslipidemia	35	31	0.72
Type II diabetes mellitus	13	18	0.47
Stage of change			
Precontemplation	15	16	0.21
Contemplation	3	5	
Preparation	1	7	
Action	13	4	
Maintenance	68	68	

Seventeen of the 73 participants (23%) visited Heartweb at least once before the measurements after four months. Between four and eight months, seven additional people visited the site. The 24 Heartweb users visited the site 95 times (range 1 – 36 times per user, median=1). The median visit time was 9 minutes and 31 seconds and median cumulative visit time was 16 minutes and 56 seconds. Peaks in site use were observed immediately after the results sheets had been sent, and in the days immediately before patients were scheduled for their appointments after four and eight months. In total, 33% of the patients in the intervention group used Heartweb. Posting of messages to the bulletin board during the study was limited. The majority of the messages on the bulletin board contained requests for factual information directed to the research team. Hardly any patient-patient interaction occurred.

The patients in the intervention group who used Heartweb were significantly younger than those who did not (58 ± 9 versus 64 ± 11 years, p=0.03). At baseline, there were no differences between the users and the non-users in sex (p=0.32) or in the following anthropometrical and biochemical outcomes: BMI (p=0.35), waist-hip ratio (p=0.24), systolic or diastolic blood pressure (p=0.77, p=0.51), and total cholesterol (p=0.24), HDL cholesterol (p=0.40), LDL cholesterol (p=0.33) and triglyceride concentrations (p=0,62).

Effectiveness of the intervention

At baseline, there were no differences between the intervention group and the control group in social support, anthropometry, blood pressure, and cholesterol levels (**Table 7.2**). We observed no differences between the intervention group and the control group in change between baseline, and the measurements after four and eight months, respectively. There were no significant differences in change over all three time-points between the intervention group and the control group. Subgroup analyses comparing the users of Heartweb, who were exposed to the actual intervention, to the other patients in the intervention group, showed slightly different results (**Table 7.3**). Between baseline and four months, reductions in BMI and systolic blood pressure were larger in the users than in the non-users (BMI -0.26 versus 0.26 kg/m^2, p=0.04; Systolic blood pressure -6.3 versus 2.8 mmHg, p=0.01). The reduction in total cholesterol between baseline and eight months was larger in the non-users (-0.19 versus 0.12, p=0.04). Over all three time-points combined, the only significant difference between users and non-users was in systolic blood pressure. There was a larger reduction in the users (p=0.02).

DISCUSSION

This randomised controlled intervention study did not show any favourable results of a web-based targeted nutrition counselling intervention with a social support component on social support, anthropometry, blood pressure, and serum cholesterol levels. A possible explanation for this may lie in the generally low effects of lifestyle counselling on clinical outcomes (Tang *et al.*, 1998), combined with the fact that only 33% of the participants in the intervention group used the website. Another explanation may lay in the fact that at baseline the study participants were relatively healthy in comparison to the non-responders. Furthermore, a large proportion of the study population took medication to control their type II diabetes mellitus, dyslipidemia, and hypertension. As current practice guidelines recommend lifestyle counselling before the prescription of medication, it is reasonable to assume that most participants already had a history of lifestyle counselling. This may have limited the effects of our intervention. Subgroup analyses comparing the users of the online intervention tool to the non-users, showed results that were more in favour of the intervention.

Related studies by Tate *et al.* (2001) and Oenema *et al.* (2001) showed larger improvements than our study in body weight and self-rated fat intake. Those studies, however, were conducted in a much younger population. Furthermore, high exposure to the intervention was guaranteed by recruiting volunteers through email invitations and by installing the intervention program on a local hard disk to assure that people would be using the program rather than surfing to other web sites. The unique contribution of our study is therefore that it is the first randomised controlled trial in which the true effectiveness of a nutrition counselling and social support intervention via a new medium like Internet is studied in older patients at elevated cardiovascular risk, using clinical outcome measures. An important strength of the study was the low dropout; for 91% of the participants, data on two or more time points were available. This was likely the result of the fact that patients were recruited

Table 7.2 Baseline measures and changes after 4 and 8 months in anthropometry, blood pressure, and cholesterol levels in Canadian patients at elevated cardiovascular risk in general practice. Data are presented for the intervention group (n=73) and the control group (n=73), separately.

	baseline					Change after 4 months[a]			Change after 8 months[b]			
	Intervention (I)		Control (C)			I	C		I	C		
	mean	SD	mean	SD	p-value[c]	mean	mean	p-value[d]	mean	mean	p-value[e]	p-value[f]
Social support[g]												
Perceived support	5.7	1.3	5.7	1.2	0.87	0.11	-0.08	0.29	-0.16	-0.07	0.61	0.30
Social network	3.5	0.5	3.5	0.5	0.35	-0.06	0.04	0.21	0.02	0.07	0.50	0.46
Anthropometry												
BMI (kg/m^2)	29.5	5.2	29.2	4.5	0.73	0.08	-0.21	0.07	-0.02	-0.01	0.98	0.12
Waist/hip ratio	0.91	0.08	0.92	0.07	0.25	-0.02	-0.01	0.63	-0.004	-0.01	0.33	0.35
Blood pressure (mmHg)												
Systolic blood pressure	134	14	136	18	0.42	-0.4	-2.1	0.46	-1.9	-5.2	0.16	0.36
Diastolic blood pressure	81	9	80	11	0.61	-0.2	-1.4	0.44	-2.5	-3.3	0.58	0.72
Cholesterol (mmol/L)												
Total cholesterol	5.5	0.9	5.4	1.2	0.56	0.03	-0.06	0.41	-0.08	-0.11	0.79	0.70
HDL cholesterol	1.56	0.44	1.47	0.39	0.21	0.04	0.02	0.59	-0.01	0.01	0.28	0.27
LDL cholesterol	3.2	0.9	3.1	1.0	0.68	0.06	-0.10	0.09	-0.07	-0.10	0.73	0.20
Triglycerides	1.9	1.9	1.9	0.8	0.90	-0.21	-0.04	0.16	-0.02	-0.09	0.58	0.15

[a] Age and sex adjusted change between baseline and 4 months
[b] Age and sex adjusted change between baseline and 8 months
[c] T-test P value for difference between the intervention group and the control group at baseline
[d] Proc Mixed P value for difference between the intervention group and the control group in change between baseline and 4 months
[e] Proc Mixed P value for difference between the intervention group and the control group in change between baseline and 8 months
[f] Proc Mixed P value for difference between the intervention group and the control group in change between baseline, 4 months, and 8 months
[g] The range for perceived support is 1 to 7, the range for social network is 1 to 5. A higher score indicates higher support levels

Table 7.3 Baseline measures and changes after 4 and 8 months in anthropometry, blood pressure, and cholesterol levels in Canadian patients at elevated cardiovascular risk in general practice. Data are presented for the users (n=24) and non-users (n=49) of Heartweb in the intervention group, separately.

	baseline					Change after 4 months[a]			Change after 8 months[b]			
	Users (U)		Non-users (NU)			U	NU		U	NU		
	mean	SD	mean	SD	p-value[c]	mean	mean	p-value[d]	mean	mean	p-value[e]	p-value[f]
Social support[g]												
Perceived support	5.7	1.4	5.7	1.3	0.80	0.03	0.2	0.61	0.05	-0.2	0.40	0.43
Social network	3.6	0.5	3.5	0.6	0.46	-0.02	-0.1	0.72	-0.01	0.1	0.39	0.47
Anthropometry												
BMI (kg/m^2)	30.4	6.3	29.1	4.7	0.35	-0.26	0.26	0.04	-0.29	0.13	0.09	0.08
Waist/hip ratio	0.89	0.06	0.91	0.09	0.24	-0.01	-0.02	0.57	0.004	-0.009	0.31	0.60
Blood pressure (mmHg)												
Systolic blood pressure	134	16	133	14	0.77	-6.3	2.8	0.01	-5.3	-0.16	0.13	0.02
Diastolic blood pressure	82	10	80	8	0.51	-2.5	0.9	0.10	-4.7	-1.3	0.12	0.18
Cholesterol (mmol/L)												
Total cholesterol	5.3	0.7	5.6	0.9	0.24	0.05	0.01	0.78	0.12	-0.19	0.04	0.09
HDL cholesterol	1.49	0.32	1.59	0.48	0.40	0.06	0.03	0.40	0.02	-0.03	0.25	0.48
LDL cholesterol	3.1	0.8	3.2	0.9	0.33	0.04	0.07	0.84	0.04	-0.13	0.18	0.26
Triglycerides	1.8	1.0	2.0	2.2	0.62	-0.1	-0.3	0.37	-0.05	-0.1	0.63	0.66

[a] Age and sex adjusted change between baseline and 4 months
[b] Age and sex adjusted change between baseline and 8 months
[c] T-test P value for difference between the users and the non-users at baseline
[d] Proc Mixed P value for difference between the users and the non-users in change between baseline and 4 months
[e] Proc Mixed P value for difference between the users and the non-users in change between baseline and 8 months
[f] Proc Mixed P value for difference between the users and the non-users in change between baseline, 4 months, and 8 months
[g] The range for perceived support is 1 to 7, the range for social network is 1 to 5. A higher score indicates higher support levels

through their respective general practitioners, and shows the feasibility of the intervention protocol.

We had anticipated social support to be a key factor in the intervention. Yet, despite the fact that previous studies have shown both positive and negative effects of Internet interventions on social support we found no difference in change in social support during our study period (Gallienne *et al.*, 1993; Kraut *et al.*, 1998; Johnson *et al.*, 2001; Barrera *et al.*, 2002). It has been suggested that peer support may not at all be appropriate for older people because strengthening their natural support networks may be more helpful than adding peers to their network (Heller *et al.*, 1991). It is also possible that people were reluctant to ask for or provide others with social support for partly self-inflicted conditions such as being overweight. Mittelman *et al.*, (1995) suggested that long-term stressors, such as risk factors for cardiovascular disease, require long-term interventions. Our 8-month study may have been too short to achieve changes in social support. The absence of effects may also have been due to the lack of general practitioner involvement, or the use of a random group of peers rather than peers matched on personal characteristics such: as age, sex, level of education, religious beliefs, and the type of stressor (Stein, 1991).

In our study, site use was limited to 33% of the patients in the intervention group. Tate *et al.*, (2001) reported higher numbers of visits to their web-based counselling tool and showed that weight change was correlated to the number of visits. Given the low percentages of people who are motivated to change their behaviour (De Graaf *et al.*, 1997), however, a reach of 33% is promising and higher than the predicted 22% for targeted web products. Although the estimated reach of print brochures is twice as high, the estimated impact is much lower (0-4% instead of 10-20%) (Cowdery *et al.*, 2002). Adapting content, procedures, or design more to users' wishes can possibly increase the reach of web-based interventions. Improved access to computers and Internet, improved computer skills, a stronger indication of the potential benefits, and improved privacy protection of online information have also been suggested as enabling factors in computer-based health promotion (Harvey-Berino *et al.*, 2002; Verheijden *et al.*, submitted for publication)

To our knowledge, Heartweb is the first Internet-based nutrition counselling program in general practice. Because risk factors for cardiovascular disease occur frequently in older people (Erlinger *et al.*, 2000), the elderly are a large target group for lifestyle interventions. However, as far fewer older people use the Internet than young people, it is understandable that older people in particular are somewhat hesitant to these innovative approaches. Along with the narrowing digital divide, this attitude will likely change over time, thus increasing the potential of Internet-based interventions (Brodie *et al.*, 2000; Kraut & Kiesler, 2003). Cautious interpretation of our study results is also necessary, because use of Heartweb in a real life situation is different from study participation. Patients who were in principal interested in computer-based approaches may have been discouraged by the burden of the study questionnaires and appointments that are not necessary if Internet-based interventions are applied in real life. The median cumulative site visit time of over 16 minutes therefore stresses the potential of Internet-based tools in addition to the short practitioner-patient contact during regular health checks.

Approaches to keep patients engaged and involved in interventions over a longer period of time are therefore necessary.

The lack of controlled trails on the feasibility and effectiveness of the thousands of health education web sites indicates the need for research in this area (Krishna *et al.*, 1997). It is very well possible that the users of computerized patient education are already the most compliant selection of patients with practitioner-directed care. However, Internet-based tools can only be exploited to their full extent, if they also get through to patients who are otherwise hard to reach and possibly undertreated in regular primary care. People with a low socio-economic status, for example, are usually at higher risk, but hard to reach in health promotion programs. They would benefit from the individualized pace of instruction and the non-threatening learning that can occur with a computer-based learning program (Lewis, 1999; Pomerleau *et al.*, 1997). Future research should therefore help identify characteristics of the users of web-based interventions with respect to compliance and regular care. Similarly, little is known about the factors that determine whether people are likely to be attracted to and benefit from a support group (Helgeson & Gottlieb, 2000).

Altering patients' lifestyle in a sustainable way has repeatedly been shown to be difficult to achieve. As of yet, computer-based interventions have not been the magical breakthrough they were hoped to be. However, computers can partly take over the burden of continuous care for patients with chronic diseases (Bard, 2000). We therefore believe that real-life based Internet-based interventions in the future have a true potential, particularly since the continuous contact that is necessary for long-term behaviour change is difficult because of time constraints for both patient and clinician. To make full use of the possibilities of both face-to-face and computer-based interaction we strongly advocate that the World Wide Web should never fully replace consultations and clinical examinations by general practitioners or other health professionals.

8

Discussion

Begin with the end in mind.
Stephen Covey

This thesis describes studies on nutrition counselling based on the Stages of Change Model for patients at elevated cardiovascular risk in general practice. This final chapter will integrate the studies that have been described in the previous chapters and conclusions will be drawn on these integrated results.

As discussed in *Chapter 1*, general practitioners can play an important role in nutrition counselling. They are perceived by large groups of people to be the number one source of nutrition information (Hiddink *et al.*, 1997a). Furthermore, general practitioners reach nearly all segments of the population. This is particularly important given the relatively low interest of people in the lower socio-economic classes in lifestyle counselling. Unfortunately, general practitioners perceive many barriers to nutrition counselling practices, such as lack of nutrition education and training, lack of time, and lack of skills (Hiddink *et al.*, 1997b). Therefore, as was also suggested by Drenthen (1997), it is questionable if general practitioners should indeed fully execute the prevention activity by themselves. For dietary counselling, collaboration with dieticians, who do have the necessary detailed theoretical and practical skills, could help to remove some of the barriers that are perceived by general practitioners (Van Binsbergen, 1997). In this cooperation, general practitioners could very well use their authority position (Drenthen, 1997) to make people aware of their problem behaviour and motivate them to change. They could subsequently refer motivated patients to a dietician for detailed personal dietary advice.

The Stages of Change Model that was discussed in *Chapter 1*, distinguishes five different levels of (awareness of) current behaviour and motivation to change. Using this model for lifestyle counselling has been shown to increase overall program effectiveness (Steptoe *et al.,* 1999; Steptoe *et al.*, 2001). The Stages of Change Model can also be used as a structural framework to divide the tasks between general practitioners and dieticians when they cooperate to give nutrition counselling. People who are unaware of their unhealthy diets and/or who are unmotivated to change (i.e. precontemplation stage), for example, need to be motivated to change before referral to a dietician will be of any benefit. People who are starting to make dietary changes (i.e. preparation and action stages), by contrast, need detailed technical information about the specific foods, food groups, and dietary components that can lead to health benefits.

The study by Van der Veen *et al.* (2002), integrated these ideas. Patients at elevated risk for cardiovascular disease were counselled by their own general practitioner and subsequently by a study dietician. General practitioners gave their patients nutrition counselling based on the Stages of Change Model. They selectively referred patients who were in the preparation or action stages to the study dietician. Self-reported dietary behaviour change was successful immediately after the intervention. This was also reflected in reduced body weight. Differences in self-reported dietary behaviour were sustained 6 months later, but no improvements in anthropometrics and serum blood lipids were observed. The attenuation of the short-term success was the basis for the research described in this thesis.

Where total abstinence is required in smoking cessation, no contemporary guidelines recommend total abstinence of any food products or food groups. As a result, dietary behaviour change is a

complex issue that involves patients' continuous focus and attention. This very fact complicates dietary change interventions. Besides initiating behaviour change, attention needs to be focused on providing patients with sufficient knowledge, expertise, self-confidence, and skills to maintain the desired behaviour. In their overview of assessment and treatment of tobacco use and obesity, Mercer *et al.* (2003) therefore specifically included health the professional's role in the prevention of relapse. However, patients also need encouragement after the intensive contact with the general practitioner is over. Social support unmistakably plays an important role when patients have to maintain their desired behaviour without continuous positive feedback from general practitioners and other health workers (Lloyd *et al.*, 1995). Another key factor in the successful maintenance of change is the extensive use of modern media (Van der Veen *et al.*, 2002). This may facilitate contact between general practitioners and patients in the maintenance stages and thereby increase chances of successful maintenance.

SUMMARY OF MAIN FINDINGS

The research described in this thesis shows that the Stages of Change Model can indeed be a useful tool for the screening and treatment of patients at elevated cardiovascular risk in general practice. A key factor in the implementation of this tool is the continuous assessment and recording of patients' motivation to change. Social support is a second key factor, particularly to achieve long-term health behaviour change. Internet interventions may have large potential in the future, but as of yet, the public's use of computers and Internet for health information is limited.

Both our systematic review (*Chapter 2*) and new empirical data (*Chapter 3*) showed the importance of social support in successful lifestyle change. *Chapter 4* showed that the 12-month stage-matched nutrition counselling intervention program designed by Van der Veen *et al.* (2002) increased progression through the stages of change and larger reductions in fat consumption in comparison to usual care. Movement across stages of change, however, was not an intermediate factor in the intervention effects. *Chapter 5* showed that current counselling efforts to reduce dietary fat intake and increase physical activity in primary care are often targeted at the wrong people at the wrong time. Approaches to increase general practitioners' accuracy were suggested. *Chapter 6* discussed general practitioners' and patients' perspectives on the use of Internet in lifestyle counselling. In contrast to general practitioners, patients appear not to question the quality and reliability of the available online health information. *Chapter 7* finally presented the promising results of a randomised controlled trial in primary care in which web-based social support and stage-matched nutrition counselling were combined.

STUDY PARTICIPANTS

Recruitment procedures of all the experimental studies described in this thesis were aimed at patients at elevated cardiovascular risk. We selected this group because these patients constitute a large proportion of the patients in Dutch general practices. Unfortunately, refusal to participate in most types of health

research is especially common in those who are less healthy and less educated (Van 't Hof *et al.*, 1991). In our studies, elevated cardiovascular risk was most often operationalised by including only patients with one or more of the following: hypertension, dyslipidemia, and (to a lesser extent) type II diabetes mellitus. Another reason for recruiting patients at elevated cardiovascular risk is that they would benefit most from behaviour change. The National Service Framework in the UK even recommends that patients with a greater than 30% risk of developing coronary heart disease in the following 10 years should be treated with similar priority to patients with established disease (Department of Health, 2000). Data from the study described in *Chapter 7* show that non-responders were less healthy than the study participants. This is a shame from a public health perspective, as those who are most in need of lifestyle counselling were not reached. However, by targeting relatively healthy study populations, the results found in our study (as well as in many other studies) likely represent an underestimation rather than an overestimation of the potential public health effects of lifestyle interventions. We therefore believe that our conclusions will be very relevant, despite the possible selection bias.

In both intervention trials described in this thesis, attrition rates were lower than in most other trials in lifestyle change research. Reasons for drop-out were mostly unrelated to the nature of intervention or to the health of the participants. Low attrition rates were most likely the result of the fact that participants were recruited by their own general practitioner. The low attrition rates do not only increase the external validity of our study results; they also indicate the feasibility and acceptability of the intervention approaches.

TOTAL FAT INTAKE VERSUS SATURATED FAT INTAKE

The focus in the studies described in this thesis has predominantly been on reducing total fat intake. The choice to target total fat intake was made as initial evidence suggested that high total fat intakes increased the risk for cardiovascular diseases. Later research showed that this relation was largely the result of confounding by smoking and other dietary factors such as low fibre intakes (Ascherio, 2002). The replacement of saturated or trans-unsaturated fats by monounsaturated or n-6 polyunsaturated fats rather than a reduction of total fat intake was therefore suggested (Sacks & Katan, 2002). For overweight individuals, however, reduction of energy through a reduction of fat intake can lead to enormous health improvements (Walker & O'Dea, 2001). Given the fact that the vast majority of the participants in our trials were overweight or obese, we feel that targeting total fat intake was an appropriate approach to lower cardiovascular risk in this population. Furthermore, patients with increased saturated fat intake levels received counselling on saturated fat intake in addition to the overall focus on total fat intake.

It has also been suggested that increasing or reducing the consumption of specific foods, food groups, and dietary components can lead to cardiovascular health benefits (Sacks & Katan, 2002). Incorporating this in nutrition counselling messages makes sense as people's everyday life evolves around food products and not macronutrients. During counselling, dieticians therefore often use variation lists differentiating healthy from less healthy food choices, and patients receive detailed

practical suggestions (these practical plans are also referred to as implementation intentions, see Gollwitzer & Brandstätter, 1997). It is questionable, however, if patients in the earlier stages of the behaviour change process contemplate on change with a similar level of detail. Most likely, intentions to change health behaviour are initially somewhat broad and abstract (e.g., 'I really should start to improve my dietary habits') and become concrete as soon as people start acting upon their intentions (e.g. next time I go shopping, I will buy no-fat dairy instead of full-fat dairy). A general algorithm on overall fat intake will therefore distinguish between patients in the earlier stages of change (ideally made aware and motivated by general practitioners) and patients who would benefit from counselling by a dietician. Assessing patients' readiness to change for each of the different food products and product categories would result in impractically long stages of change questionnaires, and is therefore not feasible in general practice.

METHODOLOGICAL ISSUES IN USING THE STAGES OF CHANGE MODEL FOR DIETARY CHANGE

This paragraph discusses some of the methodological choices that were made in the studies described in this thesis. As discussed in *Chapter 1*, dietary change is in many ways different from smoking cessation, for which the Stages of Change Model was originally developed.

The most important problem is caused by a lack of awareness of dietary intake levels and dietary guidelines and recommendations (Brug *et al.*, 1994; Glanz *et al.*, 1997). As a result, people who classified themselves in the action and maintenance stages may feel to meet the appropriate behavioural criteria. Reclassifying these so-called pseudo-maintainers to the pre-action stages has frequently been suggested. Yet, Ôunpuu (1996) showed that cognitive profiles and use of the processes of change among pseudo-maintainers were more similar to those among people who correctly believed their behaviour was consistent with the guidelines (true maintainers) than to those among people who correctly believed their behaviour was inconsistent with the guidelines (true precontemplators). This added to the body of evidence arguing against reclassification. Finally, reclassification counters an important benefit of the Stages of Change Model: the possibility to tailor interventions to individuals' readiness to change.

The ongoing discussion over reclassification has sometimes been interpreted as an indication to discontinue the use the Stages of Change Model in dietary change interventions. As discussed in *Chapter 1*, we feel this interpretation is inappropriate. Successful intervention programs in the studies by Steptoe *et al.* (1999, 2001) and Van der Veen *et al.* (2002) involved stage-matched behavioural counselling in general practice. Stage of change classification in those studies was conducted based on people's self-report of whether or not they were eating a low-fat diet. To best meet individuals' cognitive needs, people's self-perception of their behaviour, rather than their actual behaviour was used as a basis for the counselling. Theoretically, people in the action and maintenance stages meet the appropriate behavioural criteria. Intervention approaches in these stages should thus be aimed at encouraging people to continue the desired behaviour. Naturally we do agree with the critics that it would be unfit to encourage pseudo-maintainers to continue their unhealthy behaviours. Instead, the

studies by Steptoe *et al.* (1999, 2001) and Van der Veen *et al.* (2002) therefore included procedures to make patients' aware of their unhealthy behaviour. As a result of this increased awareness, patients would no longer classify themselves in the action and maintenance stages.

NUTRITON COUNSELLING IN PRIMARY CARE

The research described in this thesis leads to several suggestions that may improve nutrition counselling in general practice. As Mant (1997) fittingly stated: 'drugs are not a desirable solution for the unhealthy diets of healthy people'. It is therefore important that general practitioners indeed acknowledge and support their potential role in cardiovascular risk reduction (Mann & Putnam, 1989; Mirand *et al.*, 2002). In practice, unfortunately, the level of preventive services usually lags behind the guidelines and recommendations (Cohen *et al.*, 1994; Yarnall *et al.*, 2003). This may be due in part by the fact that some people have adopted the fatalistic viewpoint that nutrition counselling in general practice does not help (Price *et al.*, 2000). Several studies, however, have shown the opposite (Lindholm *et al.*, 1995; Mant, 1997; Pritchard *et al.*, 1999; Steptoe *et al.*, 1999; Steptoe *et al.*, 2001; Van der Veen *et al.*, 2002). The search for affordable and effective large-scale nutrition counselling approaches in general practice, for example by tailoring counselling strategies to patients' level of readiness to change, is therefore evident. While scientists may continue to argue over the exact use of the Stages of Change Model for nutrition counselling, it undeniably makes sense to try to spend the limited time and staff resources on patients who are interested in change to begin with. Furthermore, it is widely accepted that people tend to pick up only those parts of a message that fit their personal expectations, interests, and desires. The Stages of Change Model provides an ideal framework to deal with this.

The applicability of the Stages of Change Model in general practice depends to a large extent on the ease and accuracy of the assessment of patients' readiness to change. As was shown in *Chapter 5*, general practitioners' assessment of patients' readiness to reduce their dietary fat intake was poor. A striking difference was observed with the moderate assessment of patients' readiness to quit smoking. This difference may be explained by the fact that only smoking status is generally recorded in patient charts (Pringle *et al.*, 1995). As registration is positively correlated with the frequency of preventive activities, structural registration of dietary habits in patients' records may increase the quality of nutrition counselling in the prevention of cardiovascular disease (López-de-Munain *et al.*, 2001). Furthermore, simply asking patients where they stand with respect to lifestyle change may also lead to large improvements. To make this common practice, this procedure could be included in the recommended treatment and control regimes of the Dutch NHG standards.

A final strategy for improvement that needs to be emphasized is the collaboration with dieticians. The study by Van der Veen *et al.* (2002) showed the feasibility and effectiveness of structural collaboration between general practitioners and dieticians in dietary counselling. Unfortunately, Australian research recently confirmed earlier findings that general practitioners give lower priority to referring motivated patients to dieticians, than dieticians consider appropriate. General practitioners report lack of patient desire and long waiting lists as important barriers for referral (Nicholas *et al.*,

2003). Furthermore, general practitioners and dieticians disagree on the level of autonomy dieticians should have in the decision making process around patients' nutrition care (Gaare *et al.*, 1990). As was also suggested by Truswell *et al.* (2003), general practitioners' sharing patients' nutrition management with dieticians can be facilitated when dieticians are allied to primary care settings, thus ensuring regular communication with the general practitioners. Improvements in reimbursement for both general practitioners' and dieticians' nutrition management efforts would also make a positive difference.

In many ways, changing the preventive services behaviour of general practitioners is similar to changing patients' dietary behaviour. Not surprisingly, the Stages of Change Model has also been suggested as a basis for general practitioners' behaviour change (Cohen *et al.*, 1994). The research described in this thesis hopefully contributes to the initiation, extension, and prolongation of structural nutrition counselling initiatives in general practice. However, as was also mentioned by Drenthen (1997), it is important to note that the extended implementation of prevention practices in general practice needs to be introduced in gradual steps.

COMPUTERS AND INTERNET IN PRIMARY CARE

Technological advancements have made computers and Internet access available to large groups of people worldwide. As a result, more and more general practices replace their paper-and-pencil patient records for electronic medical records. While true concerns about privacy of the electronic records remain (Barrows & Clayton, 1996; Pendrak & Ericson, 1998; Mackay, 2004), success stories are increasingly getting the overhand (Safran, 1994; Safran *et al.*, 1999). Furthermore, evidence shows that computerized reminder prompts can improve physician performance and patient outcomes (Bodenheimer & Grumbach, 2003). Van Binsbergen & Drenthen (1999, 2003) discussed the potential of a computerized consult-supporting system on nutrition They also presented the first positive experiences with patient information letters and indicated the advantages of having immediate electronic access to nutrition information that is relevant for the diagnosis of individual patients.

As another result of the widespread computer and Internet access, much of the health-related information that used to be available only to health workers has now become easily accessible for the general public. Although the number of people presenting to their general practitioners with information from Internet is still limited (Malone *et al.*, 2004), Internet has the potential to play a leading role in empowering patients to take care of their own health. This potential is reduced to a large extent by the fact that general practitioners fear for their own status. Indeed, the increasing use of Internet will have its influence on the patient-general practitioner relationship. The challenge is for practitioners to work with this newly found relationship to make it a win-win situation. Accepting that patients are becoming more knowledgeable and that they want to be involved in the decision-making process is an important step in this process (Ford, 2000).

Abidi & Goh (2000) suggested that 'healthcare information should be personalized according to each individual's healthcare needs and it should be pro-actively delivered, i.e., pushed towards the individual'. We agree that a pro-active approach in lifestyle counselling may help to reach people that

are unaware of their problem behaviour, or unmotivated to change. The feasibility of such a pro-active approach through the Internet is yet uncertain as people would have to make the effort to register, to log on to health web sites, or to read their personalized text messages for example via email, PDA's, and cell phones. While current Internet users predominantly have a high education level and a high socio-economic status, Internet may also be extremely powerful in reaching people with lower education and socio-economic status levels. They would particularly benefit from the individualized pace of interactive instruction and learning that can be guaranteed through Internet-applications. The potential engagement of people with a lower socio-economic status is especially relevant as they are less healthy than their higher socio-economic class counterparts, but usually hard to reach with lifestyle programs (Lewis, 1999). Prospects are that Internet will cease to be available only for the relatively rich, and that consequently, it will increasingly become part of our everyday life.

As patients appear not to question the quality and reliability of online health information, primary care providers should start helping their patients to identify and use the most reliable information sources (see also Malone *et al.*, 2004). They could also collaborate with regional dieticians to develop new nutrition counselling websites that will likely prove to be a valuable addition to the generic information on cardiovascular health that is readily available online, for example through the websites of the Netherlands Heart Foundation and the Netherlands Nutrition Centre. An important benefit of these new general practice-based websites is that they can contain specific information that is relevant for high-risk patients. Furthermore, linking patients' electronic medical records to these new websites can help to make the online counselling more personally relevant for the individual. At the same time, this enables the general practitioner to keep an overview of the treatment of the patient.

Truswell *et al.* (2003) also stressed the importance of computers and Internet in future nutrition counselling in primary care. They concluded by expressing the need for research on (amongst others) the development of computer-transmitted materials, on tailored nutrition counselling, and on general practice-based counselling interventions with objective outcomes. Two of the studies described in this thesis (*Chapters 6 and 7*) were designed to meet the needs for research that were expressed by Truswell *et al.* (2003). These chapters present the potentials and pitfalls, as well as the effectiveness of Internet in lifestyle counselling in primary care. While the results in *Chapter 7* do not yet fully support the use of web-based interventions for lifestyle counselling in primary care, the promising results in the patients who used the website are an important step forward in the proof of principle.

PUBLIC HEALTH AND INDIVIDUAL APPROACHES IN CARDIOVASCULAR RISK REDUCTION

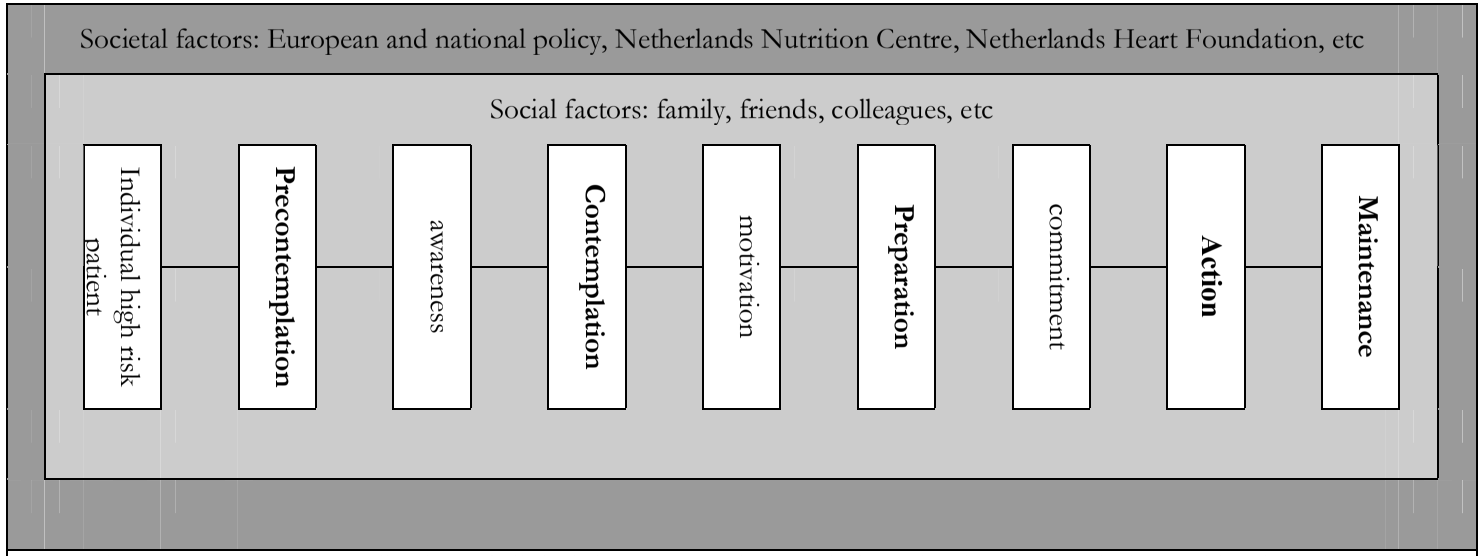
Public health strategies usually aim at all members of the population at large (sometimes with special attention for vulnerable groups such as people in the lower socio-economic classes). The high-risk strategy, which is typical for general practice, by contrast focuses on individuals with a history of (or risk factors for) cardiovascular diseases. Despite this seeming difference, the aims in public health and clinical medicine are the same: to prevent disease and suffering, and to promote health and wellbeing.

Furthermore, while doctors may predominantly target high-risk individuals, they serve the vast majority of the population and therefore contribute to a large extent to the populations' health status (see also Worsley, 1999). Historically, many important public health initiatives have been led by doctors (e.g., the role of John Snow in the understanding and control of the London cholera outbreaks between 1831 and 1854). Combining public health and individual approaches in cardiovascular risk reduction is therefore evident. In the province of Limburg in The Netherlands, for example, key stakeholders have combined forces to achieve behaviour change through a combination of high-risk and population based approaches (This project is known as Hartslag Limburg). The preliminary promising results recently made front-page news in the Dutch national press, and thereby contributed to increasing the public's attention for lifestyle change (Ronda, 2003). A Dutch health insurance company (VGZ) recently also got media attention for their contribution to the fight against obesity. VGZ decided to start an experimental project involving group counselling, exercise, and peer support for weight loss among obese people with non-insulin dependent diabetes mellitus on medication. Participants will receive a full refund of the course fee if they attend at least 90% of the meetings and if they loose 7.5 percent or more of their initial body weight. The media attention for these initiatives contributes to the public's knowledge and awareness of the need for action for the individuals involved.

Finally, it is interesting to review Maynard's (1997) arguments in relation to the possible competing interests between individual and public health. General practitioners, like all other medical professions, are taught to 'care for the individual patient and to enhance their welfare'. In this view, the use of statins to lower individual patients' cholesterol levels is a likely choice of therapy (Amarenco *et al.*, 2004; Heart Protection Study Collaborative Group, 2004; Jones, 2004). Lifelong use of statins, however, is a burden on any country's finite health budget. Indeed, a survey among general practitioners showed that concerns about cost were among the most important limiting factors for statin treatment (Kedward & Dakin, 2003). To achieve maximum efficiency (maximum health gain per unit of resource), Maynard (1997) thus argued that treatment choice should not only depend on a systematic review on the relative effectiveness of the competing interventions, but also on treatment costs. In Maynard's reasoning, relatively cheap web-based nutrition counselling interventions can be offered to larger groups of people and may therefore well be preferred over a drug treatment that benefits only the individual.

IMPLICATIONS OF THE FINDINGS

As large groups of people still fail to meet the dietary recommendations set out by the Health Council, continuous efforts to improve the lifestyle of the population are needed. The general practice appears to be an excellent setting to initiate and encourage lifestyle change (see **Figure 8.1**). In this setting, the Stages of Change Model can be used as a basis for lifestyle counselling. It can help differentiate



General practitioner	Collection of clinical data (e.g., body mass index, blood pressure, cholesterol levels). **Repeated** check on individuals' motivation to change, when appropriate: referral to dietician. Clinical data and motivation to change should be entered in electronic medical record. Encourage maintenance.	
Dietician		Detailed technical information, often on product level.
Internet applications	General health information (e.g., link diet and disease, online self-assessment tools)	Online contact with peers for social support, potential to email dieticians with short technical questions, links to electronic patient record in general practice

Figure 8.1 Societal & social factors and the role of general practitioners, dieticians, and modern media in individual's dietary change.

between individuals with different levels of awareness and motivation. It can also provide the rationale for counselling strategies for each of these different levels. However, as behaviour change is a spiral process, patients often progress and regress through the Stages of Change. As a result, patients may have changed their stage of change from one consultation with their general practitioner to the next. Within the continuity of care framework, the general practitioner should therefore *repeatedly* focus on patients' readiness to change. Referring motivated patients to a dietician should be an integral part of the counselling strategy. Computers may also help to remove some of the barriers that limit nutrition counselling by general practitioners, for example through computerised reminders for preventive services, but also through web-based nutrition counselling and social support applications. An important concern that needs to be addressed before large-scale internet-based counselling applications will be implemented is the doubtful quality of online information. Cooperative efforts, for example of the national college of general practitioners, dieticians' associations, and patient interest organisations may lead to websites that are both attractive to the patients and a useful addition to the usual primary care.

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NOTE

For reasons of consistency the terms general practice and general practitioner rather than family practice and family physician were used throughout this thesis. UK English spelling was also used throughout this thesis.

SUMMARY

General practitioners can play an important role in nutrition counselling for individuals at elevated risk for cardiovascular diseases. Unfortunately, general practitioners perceive barriers to nutrition counselling practices, and the level of preventive services in practice therefore lags behind the guidelines and recommendations. Tailoring nutrition counselling efforts to the interests and needs of individual patients has been shown to improve the effectiveness. The studies described in this thesis therefore present data on the use of the Stages of Change Model to achieve long-term effectiveness of nutrition counselling in general practice.

Social support has been suggested as a key factor in the successful maintenance of lifestyle change. Our systematic review (*Chapter 2*) therefore discussed the mechanisms by which social support affects health, and provided a practical framework for social support in lifestyle interventions. The role of social support in the Stages of Change Model was particularly emphasized. Methodological considerations when designing social support research and interventions were also discussed. Particular emphasis was given to the importance of a positive perception of social support rather than the sheer availability of potential support-givers. This gives rise to concerns for intervention programs, as most programs intervene by adding health workers or peers to patients' support networks (i.e. extend people's networks) rather than by changing patients' perception of the available support (i.e. improve people's perception of support). The potential role general practitioners can play in the provision of social support may also be limited as a result of the non-reciprocal relationship they have with their patients. *Chapter 2* concluded by summarizing the promising results of the randomised controlled trials that have been conducted so far.

The Stages of Change Model can be used as an operationalisation for intention to change behaviour. Analysis of behavioural determinants and habitual behaviour (*Chapter 3*) supported the literature review on the role of social support by showing the importance of subjective norm for intention to reduce dietary fat intake. Habitual dietary fat intake (i.e. prior behaviour) was also a predictor of intention. Attitude, self-efficacy, and health threat were only predictive of intention to change in interaction with other determinants. To achieve sustainable changes in intention and behaviour, it is therefore necessary to create social support during and after an intervention.

In the study leading to the research described in this thesis, nutrition counselling was given based on a stages of change classification reflecting people's self-perception of whether or not they were having a low-fat diet (in contrast to the inclusion of objective measures). *Chapter 4* showed that the 12-month stage-matched nutrition counselling intervention program in our earlier study increased progression through the stages of change in comparison to usual care. Furthermore, larger reductions in fat consumption over time were observed in the intervention group than in the control group. Movement across stages of change, however, was not an intermediate factor in the intervention effects.

In most contemporary research, algorithms are used to assess patients' readiness to change (either alone or in combination with an objective measure of patients' behaviour). This is not common practice in general practice. *Chapter 5* therefore presented the accuracy of general practitioners' and general practice registrar's assessments of patients' readiness to reduce dietary fat intake, to increase

physical activity, and to quit smoking. It was expected that general practitioners would be able to effectively use their knowledge of their patients, and their patients' family and medical histories in their assessment of patients' readiness to change than general practice registrars. For dietary fat reduction, the accuracy of both general practitioners' and general practice registrars' estimation of patients' readiness to change was poor to fair. Similar results were observed for increasing physical activity. This low accuracy indicates that current counselling efforts in primary care are often targeted at the wrong people at the wrong time.

In addition to the usual face-to-face consultations in primary care, patients increasingly use the Internet to search for health information. To put this development into perspective, *Chapter 6* discussed general practitioners' and patients' perspectives on the use of Internet in lifestyle counselling. As was also shown in other studies, the number of patients presenting to their doctor with health information from the Internet is limited. As patients appear not to question the quality and reliability of the available online health information, primary care providers should start helping their patients to identify and use the most reliable information sources.

Chapter 7 finally presented results of a randomised controlled trial in primary care in which web-based social support and stage-matched nutrition counselling were combined. Frequency and duration of the use of the web-based intervention program were limited. Intention-to-treat analyses did therefore not show any favourable results of the intervention. Analyses on the patients who used the web-based intervention program showed favourable effects. This is particularly promising as many patients were already on medication and as the prescription of medication in most countries is only recommended after lifestyle counselling. With increasing Internet density rates, more and more people will be able to use web-based tools. It is therefore recommended that general practitioners embark on this development by collaborating with dieticians and other health professionals to create websites that contain understandable, relevant, and reliable health information.

The Stages of Change Model can be a useful tool for the screening and implementation of nutrition counselling for patients at elevated cardiovascular risk in general practice. In practice, large improvements may be achieved if general practitioners ask their patients how they feel about changing their lifestyles. However, as patients often progress and regress through the Stages of Change, last consultation's assessment of patients' readiness to change may no longer be valid at a new consultation. This indicates that lifestyle change needs general practitioner's continuous focus and attention. Collaborating with dieticians may remove some of the barriers that limit general practitioners' nutrition counselling practices. Computerised reminders for preventive services and web-based nutrition counselling programs may also prove to be helpful additions to current lifestyle counselling efforts in general practice.

SAMENVATTING

Huisartsen kunnen een belangrijke rol spelen bij het geven van voedingsvoorlichting aan individuele patiënten met een verhoogd risico op hart- en vaatziekten (bijvoorbeeld: een verhoogde bloeddruk, diabetes en een verhoogd cholesterolgehalte). Helaas wordt er in de huisartspraktijk vaak minder aan preventie gedaan dan zou moeten. Dit komt onder andere omdat huisartsen vinden dat ze niet voldoende kennis en tijd hebben om voedingsvoorlichting te geven. Bovendien hebben ze het gevoel dat patiënten niet voldoende gemotiveerd zijn voor leefstijlveranderingen. Het Stages of Change Model biedt aanknopingspunten om met dit laatste om te gaan. De studies die in dit proefschrift beschreven worden, bespreken vooral het gebruik van het Stages of Change Model om voedingsvoorlichting gericht op het verlagen van de (verzadigd) vetconsumptie in de huisartspraktijk vorm te geven.

Volgens het Stages of Change Model verloopt gedragsverandering via verschillende stadia van bewustwording en motivatie. Van belang is ook hoe patiënten denken over hun eigen vetconsumptie. Wanneer patiënten immers denken dat ze al weinig vet eten, zullen ze niet zo gemotiveerd zijn om nòg minder vet te gaan eten. Door aan te sluiten bij de stadia van gedragsverandering zouden huisartsen *voedingsvoorlichting op maat* kunnen geven. Er zijn diverse factoren die samen bepalen hoe gemotiveerd iemand is om zijn of haar gedrag te veranderen (met andere woorden: in welk stadium van het Stages of Change Model iemand zit). Een van deze factoren is sociale steun.. Op basis van de literatuur werd daarom in *Hoofdstuk 2* besproken hoe sociale steun invloed heeft op gezondheid, hoe sociale steun in gedragsinterventies opgenomen zou kunnen worden, hoe groot de effecten van sociale steun op gezondheid kunnen zijn en wat de rol van sociale steun kan zijn bij voedingsvoorlichting op maat. Verder werden suggesties gedaan voor het opzetten van onderzoek en interventies op het gebied van sociale steun in de toekomst. Een belangrijke les hierbij was dat de mate waarin mensen sociale steun *ervaren* veel meer bepalend is voor hun gedrag dan de mate waarin sociale steun *beschikbaar is*. Helaas wordt in interventies juist vooral aandacht besteed aan het uitbreiden van het sociale netwerk van mensen. De rol die huisartsen kunnen spelen bij het geven van sociale steun is overigens beperkt, doordat zij een niet-gelijkwaardige relatie met hun patiënten hebben.

Hoofdstukken 3 en 4 bespraken de resultaten van een gerandomiseerde gecontroleerde studie in de Nederlandse huisartspraktijk, waarin huisartsen en diëtisten samenwerkten bij het geven van voedingsvoorlichting op maat. *Hoofdstuk 3* bevestigde de belangrijke rol van sociale steun, naast voedingsgewoonten, de houding die mensen hebben ten aanzien van minder vet eten, hun vertrouwen in hun eigen mogelijkheden om minder vet te eten en de mate waarin mensen geloven dat minder vet eten hun kans op ernstige ziekten verkleint. Om blijvende veranderingen in motivatie en in daadwerkelijk gedrag te bereiken, is het dus onder andere noodzakelijk om te zorgen voor sociale steun tijdens en na voedingsvoorlichting. *Hoofdstuk 4* liet vervolgens zien dat als gevolg van voedingsvoorlichting op maat, meer patiënten gemotiveerd raakten om hun vetconsumptie te verlagen. Bovendien daalde de vetconsumptie sterker in de groep patiënten die voorlichting op maat had gekregen. Het maakte voor de daling in vetconsumptie echter niet uit, hoe groot de verandering in motivatie was.

In onderzoek worden vaak vragenlijsten gebruikt om de motivatie tot gedragsverandering van patiënten te meten. Dit is echter niet gebruikelijk in de huisartsenpraktijk. *Hoofdstuk 5* liet daarom zien hoe goed huisartsen en huisartsen-in-opleiding kunnen inschatten hoe gemotiveerd hun patiënten zijn om hun vetconsumptie te verlagen. Verwacht werd dat huisartsen door hun jarenlange contact met patiënten en hun families beter in staat zouden zijn om de motivatie tot gedragsverandering in te schatten. Voor het verlagen van de vetconsumptie was echter de inschatting van zowel de huisartsen als de huisartsen-in-opleiding slecht tot redelijk. De resultaten van deze studie laten zien dat de huidige voedingsvoorlichting in de huisartspraktijk aanmerkelijk beter kan.

In aanvulling op de gebruikelijke consulten in de huisartspraktijk, kunnen patiënten steeds makkelijker gebruik maken van het Internet voor het zoeken naar gezondheidsinformatie. Om deze ontwikkeling in perspectief te plaatsen, werden in *Hoofdstuk 6* de meningen van zowel huisartsen als patiënten over het gebruik van Internet voor leefstijlvoorlichting besproken. Zoals ook in eerder onderzoek werd gevonden, bespreekt slechts een beperkt aantal patiënten informatie van Internet met hun huisarts. De verwachting is dat dit aantal in de toekomst zal stijgen. Omdat patiënten zich geen zorgen lijken te maken over de kwaliteit van de informatie die ze via Internet vinden, zouden huisartsen hun patiënten moeten helpen bij het vinden van betrouwbare informatie.

Hoofdstuk 7 liet tenslotte de resultaten zien van een gerandomiseerde gecontroleerde studie in de Canadese huisartspraktijk waarin voedingsvoorlichting op maat en sociale steun aangeboden werden via een studie-website op het Internet. Het gebruik van de studie-website was beperkt. Als gevolg daarvan was er in de deelnemers die de mogelijkheid hadden om de studie-website te bekijken, geen effect te zien van de interventie. Bij de kleine groep patiënten die ook ècht gebruik hadden gemaakt van de studie-website, daalde de bloeddruk tijdens de studie. Er waren geen verbeteringen in lichaamsgewicht, of cholesterolgehalte. Omdat Internet voor steeds meer mensen toegankelijk wordt, verdient het de aanbeveling dat huisartsen op deze ontwikkeling inspelen. Zij kunnen bijvoorbeeld met diëtisten en andere professionals samenwerken bij het ontwikkelen van websites met relevante, begrijpelijke en betrouwbare informatie.

Bij het screenen van patiënten met een verhoogd risico op hart- en vaatziekten voor voedingsvoorlichting kan het Stages of Change Model een nuttig hulpmiddel zijn. In de praktijk kunnen grote verbeteringen worden behaald wanneer huisartsen hun patiënten vragen of zij gemotiveerd zijn om hun voedingspatroon te verbeteren. Omdat patiënten echter regelmatig wisselen in hun motivatie, is het noodzakelijk dat huisartsen met grote regelmaat navraag doen. Samenwerking met diëtisten neemt waarschijnlijk een deel van de barrières weg die huisartsen ervaren bij het geven van voedingsvoorlichting. Digitale herinneringen voor preventieve activiteiten en voedingsvoorlichting via Internet kunnen ook nuttige aanvullingen zijn op de huidige voedingsvoorlichtingsactiviteiten in de huisartspraktijk.

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Many hands and hearts and minds generally contribute to anyone's notable achievements.
Walt Disney

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LIST OF PUBLICATIONS

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ABOUT THE AUTHOR

Marieke Verheijden was born on November 25, 1978 in Gouda. In 1996, she graduated at the Eckartcollege in Eindhoven and received a VWO diploma. She started her university training in Human Nutrition at the former Agricultural University Wageningen that same year. She held several student positions in education and research. During her university training, she conducted research projects on nutrition counselling in general practice (in the Netherlands and in Australia), and on respiratory health in an Aboriginal community (in Australia). In March 2001, she received her MSc degree, after which she started working on the studies described in this thesis. She spent one year working in Canada at Queen's University's Centre for Studies in Primary Care.

Marieke represented the PhD fellows in the Education Committee of the former Division of Human Nutrition and Epidemiology. She joined the education programs of the Graduate School VLAG (advanced courses in Food Technology, Agrobiotechnology, Nutrition and Health Sciences) and of the Graduate School CaRe (Netherlands School of Primary Care Research) and followed several courses in epidemiology and biostatistics. She was selected to participate in the 10th European Nutrition Leadership Programme in Luxembourg in 2004.

In June 2004 she started working at TNO Work and Employment in Hoofddorp, the Netherlands.

TRAINING AND SUPERVISION PLAN

Courses

Afstudeervak organiseren en begeleiden
Capita selecta voedings- en gezondheidscommunicatie
Crash course English grammar
European nutrition leadership program
Geriatric nutrition
Methodologische en statistische aspecten van longitudinaal onderzoek
Nutrition and lifestyle epidemiology
Principles of academic writing
Systematic reviews: theory and practice
Scientific writing
The strategy of data analysis in epidemiologic and public health research

Conferences

3rd international workshop 'Nutrition Guidance of Family Doctors: Towards best practice'
8th International conference of Internet in medicine
Challenging old paradigms using the transtheoretical model
Digitaal gezond: nieuwe media in de voorlichting over ziekte, gezondheid en handicaps
Food choice X
Primary care research day
Symposium 'Gezonde voeding: van verbod naar genot'

Other

Annual meeting of research school CaRe 2002, 2003
CaRe introduction course
Family medicine centre rounds
Journal club division of Human Nutrition
Journal club department of General Practice
Oldsmobiles
PhD tour division of Human Nutrition 2001, 2003
VLAG PhD week
Wilhelmina Rouwenhorst lezing 2002, 2003

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