Nutrition guidance in Dutch family practice: behavioral determinants of reduction of fat consumption[1–4]

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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 these 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, 53 control) patients who participated in a family practice–based tailored nutrition counseling intervention study for lowering cardiovascular risk. Fat intake 15 mo 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 who 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 (ie, whether patients had been in the intervention group or the 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. *Am J Clin Nutr* 2003;77(suppl):1058S–64S.

KEY WORDS Habit, psychosocial factors, health education, behavior change, fat-restricted diet, adults

INTRODUCTION

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 (1–9). These programs are likely to be more effective if they are based on both theory and practice of changing health-related behaviors, and of understanding determinants of fat consumption (10–12). Several theories are commonly used in understanding and predicting such human health behavior as the reduction of fat intake. The terms used for the psychosocial determinants of behavior differ for the various theories. Nevertheless, there is substantial overlap among the underlying constructs (13–20). 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 behavior and current or future behavior (11, 21–29).

Most contemporary social psychological models of human behavior emphasize the conscious nature of behavior choice (30–32). It is argued, however, that repeated activities (eg, food choice, fat consumption) become a habitual rather than a conscious and reasoned action (30, 33). They are therefore less likely to be controlled solely by the behavioral determinants involved in conscious decision making. This led Triandis in 1977 to the first inclusion of habit as a determinant in a behavior model (34). Since then, the importance of habit for the prediction of current or future behavior has been shown several times (30, 31, 33, 35, 36). However, it is still questionable whether previous behavior influences behavior directly, or through feedback that influences attitudes, self-efficacy, subjective norm, and health threat (30–32, 35).

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 family practice. We paid special attention to the relation of habit to the other determinants.

SUBJECTS AND METHODS

Subjects and design

Within 9 family practices of the Nijmegen Department of Family Medicine Practice Network in the Netherlands (37), a randomized controlled intervention study was conducted. The

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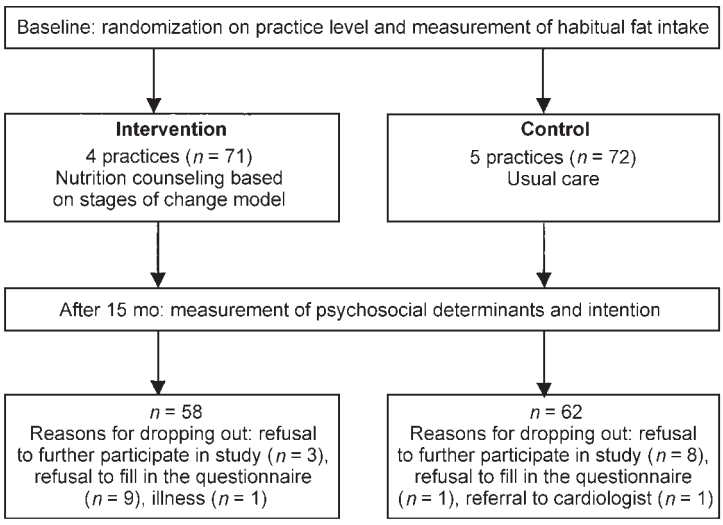

FIGURE 1. Flow of participants.

study, which lasted 1 y, aimed at reducing fat consumption in adult men and women (38). One hundred forty-three Dutch patients at elevated cardiovascular risk (diagnosed hypertension, n = 131; type 2 diabetes mellitus, n = 9; both, n = 3) were recruited. At family practice level (39), the patients were randomly assigned to either the intervention group or the control group. Patients in the intervention group received nutrition counseling based on the Stages of Change Model (17) from their family physician and from a study dietitian. Patients in the control group received the usual care from their family physician, which according to existing guidelines for hypertension and type 2 diabetes mellitus includes nutrition counseling (40, 41). At baseline, after 6 mo, and after 12 mo, patients filled out a food frequency questionnaire (FFQ) and a stages of change algorithm. The present cross-sectional 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 case 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 1**). The design of this study has been described extensively elsewhere (38). 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 behavior (22) 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 (42) and revised according to the Dutch National Food Survey, 1992 (43).

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 1**) corresponding to those in previous studies (44–49). 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 labeled. The questionnaire was pretested in a convenience sample of 10 Dutch students and slightly modified. The questionnaire was sent to the patients ≈15 mo after the baseline measurements with a covering letter from their family physician and the evaluation questionnaire of the entire intervention study (38).

Attitude was defined as the patients' evaluations of the expected consequences of reducing fat consumption (11, 22, 28). Self-efficacy was defined as the belief or confidence patients have in their ability to successfully adopt the behaviors needed to eat a low-fat diet (18, 21). Subjective norm was defined as the patients' perceptions of how important others expect them to behave with respect to fat consumption (18). Health threat was defined as patients' beliefs that they are personally susceptible to dietary fat-related chronic diseases, that the diseases are of at least moderate severity if developed, and that eating less fat will reduce the risk of getting these diseases (21). Attitude was measured by means of 8 propositions; self-efficacy, subjective norm, and health threat were measured by means of 3 propositions each.

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 consumption did not differ in determinant scores 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

TABLE 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)	45	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 before the study (% of energy)	15.7 ± 2.2	15.1 ± 2.6
Attitude (score)		
1. If I eat less (saturated) fat, I feel 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 piece of cake or a sausage.	0.7 ± 1.3	0.7 ± 1.3
Health threat (score)		
1. I'm afraid I'll get ill if I eat 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 (saturated) 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] $\bar{x}$ ± SD.
[2] Significantly different from low, $P < 0.05$.

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 (≤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 (50). 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 (11, 22). 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 (48, 51, 52), sex (45, 52, 53), 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 (38), 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.

TABLE 2
Results of backward logistic regression analysis with intention to reduce fat consumption as the dependent variable in Dutch patients at elevated cardiovascular disease 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

RESULTS

All variables assessed in the analyses are presented in Table 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 = 0.014) 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 diseases and cancer.

Backward elimination with these significant variables (both main effects and the interaction terms) led to the final model presented in **Table 2**. The only main effect in this model that was not also part 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 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.

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 in intention. Our findings indicate that to increase their effectiveness, intervention programs in family 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 (10, 12, 21, 44, 54). In this study we recruited patients at elevated cardiovascular risk in family 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 (55). Therefore, this study can provide a useful starting point for understanding factors concerning success and failure of future intervention programs.

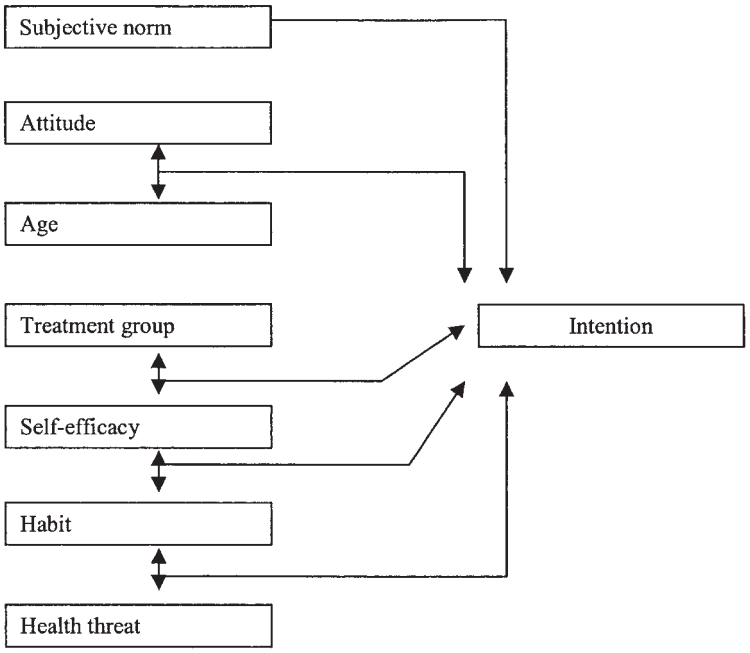

FIGURE 2. Determinants of intention to reduce fat consumption in Dutch patients at elevated cardiovascular disease risk in family practice who participated in a nutrition counseling intervention study. Double-sided arrows indicate statistical interaction.

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 1992, Stafleu et al (11) reviewed 15 models predicting intention. These models explained 0.2–49% of the variance in behavior. In none of these models was habit included as an independent variable. In 1999, Baranowski et al (18) reviewed the literature on models predicting (intention to reduce) fat intake. Most of these models accounted for ≈30% of the variability in (intention to change) behavior (12, 18). 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 modeling (levels of dietary intake of people important to the patient), are addressed as well.

Habit is often defined at an operational level as "prior behavior" (22, 30, 31, 35). 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 behavior (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 mo before the data collection on psychosocial 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 behavior (11, 18, 31). Our findings regarding the influence of habit correspond to the results of a study conducted by Aarts et al (30). They also showed that a measure of past behavior or habit improves the prediction of later behaviors, after the variance in the behavior 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 behavior. These results support the idea of Ajzen (32) that habit predominantly influences intention through interaction with psychosocial determinants. However, there are also studies showing a direct influence of habit on intention (31, 35).

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 (11, 12, 47). The importance of subjective norm can be explained by the fact that a change in nutrition behavior of one family member often requires simultaneous changes for other family members as well. To achieve sustainable changes in intention and behavior, it is therefore essential to create social support during an intervention program.

Psychosocial determinants of nutrition behavior were related to stage of dietary change in previous studies on fat consumption and fruit and vegetable consumption (21, 54, 56). In our study, stage of dietary change was used to define intention to reduce fat consumption. Therefore, we expected psychosocial behavioral 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 Cronbach's α within the constructs, might have shown direct influences of attitude, self-efficacy, and health threat.

Our intervention protocols of the family practitioner and the study dietitian 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 (nonsignificantly) lower in the intervention group than 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 mo between the last counseling session with the dietitian and the measurement of the psychosocial behavioral determinants. It is also possible that the intervention never resulted in differences in determinant 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 behavior (33, 44), whereas conclusions concerning causality tend to be based on the observed statistical relationships between the measured constructs (30). Finally, although Gollwitzer and Brandstätter (57) argue that implementation intentions might strengthen the relation between intention and behavior, Verplanken et al (33) argue that intention is related to behavior 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 behavior during health promotion activities. For practice, this study indicates that subjective norm and habit (in interaction with other psychosocial determinants) should be thoroughly addressed in an attempt to change people's intention and behavior.

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