Public Health Nutrition: 16(7), 1321–1331 doi:10.1017/S1368980012003564

Determinants of Dutch general practitioners' nutrition and physical activity guidance practices

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Submitted 22 November 2011: Final revision received 2 April 2012: Accepted 17 June 2012: First published online 31 July 2012

Abstract

Objective: General practitioners (GP) are uniquely placed to guide their patients on nutrition and physical activity. The aims of the present study were to assess: (i) the extent to which GP guide on nutrition and physical activity; (ii) the determinants that cause GP to give guidance on nutrition and physical activity; and (iii) the extent to which these guidance practices have the same determinants.
Design: Cross-sectional study, mail questionnaire.
Setting: Dutch general practice.
Subjects: Four hundred and seventy-two GP in practice for 5–30 years.
Results: Our study showed that the majority of GP had similar practices for both nutrition and physical activity guidance. Fair associations were found between nutrition and physical activity guidance practices. More than half of the explained variance in the models of physical activity guidance practices was improved by the inclusion of nutrition guidance practices in the models. Moreover, GP reported higher frequencies of physical activity guidance practices than nutrition guidance practices. Nutrition guidance practices predicted the same physical activity guidance practices.
Conclusions: The majority of GP had similar practices for nutrition and physical activity guidance. GP were more inclined to guide their patients on physical activity than on nutrition. Self-efficacy was found to be a determinant in most models for guidance practices. Guidance practices proved to be a mix of prevention and treatment components. Consequently, we advise raising the self-efficacy of GP by training in medical school and in continuing medical education. We also recommend the combination of both nutrition and physical activity guidance in general practice.

Keywords
Nutrition
Physical activity
General practice
Questionnaire

Nutrition has a role in the prevention and treatment of many chronic diseases[1,2]. Several studies indicate that being physically active is beneficial for people's health and/or well-being[3,4]. Promotion of nutrition and physical activity is important to slow down the increase of overweight in the population[2]. In the Netherlands, the percentage of overweight people has increased from 33% in 1981 to about 45% today[5].

General practitioners (GP) are in a unique position to communicate with their patients about nutrition because of their high referral score, high perceived expertise and reach to nearly all segments of the population[6]. Several studies have shown that patients expect their GP to provide nutrition education[6,7]. Other research has shown that GP are seen as credible and preferred sources of information to make recommendations about physical activity[8].

Evidence-based guidelines are often not implemented effectively with the effect that best health outcomes are not achieved[9,10]. This highlights the importance of studies assessing what GP actually do in their busy practice. Some studies have assessed the nutrition guidance practices of GP by means of self-reports[11–21]. A limited number of self-report surveys about their physical activity guidance practices have also been conducted[8,15–17,22–28]. Although observational measures provide more accurate indicators of actual practices than self-reports, observational studies are even scarcer[29–32].

A high number of studies focus on perceived barriers to nutrition guidance[12,13,20,21,33–36] and physical activity guidance[8,22,23,25–28,36,37], but, increasingly, positive factors for guidance practices have also been unravelled in determinant studies, in addition to the negative factors (such as barriers). The task perception determinant is defined as the belief that it is the role of the GP to help patients change their health behaviour[38]. Task perception has been included in several studies about nutrition guidance practices[12–14,18,20,21,39,40], but only in a few

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studies about physical activity guidance practices[23,28,41]. Another determinant, self-efficacy, refers to one's belief in one's ability to succeed in specific situations[42]. Several studies have included self-efficacy of GP in relation to nutrition guidance[11,13,18,19,21,34,36,43], but only a few studies have looked at their self-efficacy expectations about physical activity guidance[8,25,27,34,36]. So, only a few studies have considered determinants of nutrition as well as physical activity guidance practices.

The aims of the present study were to assess: (i) the extent to which GP guide on nutrition and physical activity; (ii) the determinants that cause GP to give guidance on nutrition and physical activity; and (iii) the extent to which these guidance practices have the same determinants. In the light of obesity prevention, it seems obvious that GP should combine both nutrition and physical activity guidance practices. To our knowledge, no study has been undertaken on the integration of both guidance practices in general practice. The findings about the extent of their coexistence are valuable for the development of medical education programmes and for governmental and non-governmental organizations that want to involve GP in obesity prevention. Furthermore, our study reveals whether GP are more likely to guide their patients on one of these practices rather than the other. Consequently, similarities and differences between nutrition and physical activity guidance practices are studied. Finally, determinants of both guidance practices are measured and compared.

Methods

Study population

Our study population consisted of Dutch GP. In 1992, a nationwide random sample of 1000 Dutch GP, with 5–15 years of practice experience, stratified by gender and type of practice, was taken from the database of the Netherlands Institute for Health Services Research (NIVEL). In 2007, all 488 eligible participants from 1992 were asked to fill in a mail questionnaire. In total, 255 GP (in practice now for 20–30 years) returned the questionnaire. The response rate was 52 %. Additionally, a new cohort of GP in practice for 5–20 years was sampled with similar criteria and asked to fill in the questionnaire, resulting in another 217 GP (response rate 37 %). Both samples were representative of the overall population with respect to gender, type of practice (solo practice, dual practice, group practice or health centre) and degree of urbanity. Four reminders were sent to GP who had not returned the questionnaire. The last reminder also included a non-response questionnaire.

Overall, the total sample of the cross-sectional 2007 study consisted of 472 GP: 343 men (73 %) and 129 women (27 %). Of this total, 164 were working in a solo practice (35 %), 155 in a dual practice (33 %) and 153 in a group practice or health centre (32 %). The sample was representative of gender and type of practice.

Questionnaire

The Wageningen GPs Nutritional Practices Questionnaire[39] was developed on the basis of qualitative research (focus group discussions and in-depth interviews) and the tailored design method[44], and has proved to be beneficial in research[13,14,21,39]. Self-reported nutrition and physical activity guidance practices, task perceptions, self-efficacy expectations and perceived barriers regarding these practices were assessed in the questionnaire. Our hypothesis is that the determinants of nutrition and physical activity guidance practices are partly the same.

The dependent variables about guidance practices reflect the self-reported advice behaviours of GP regarding nutrition and physical activity. These variables were operationalized by the percentage of patients who have been given nutrition or physical activity advice. Data were available for specific patients, namely overweight patients, patients at risk of CVD, patients with CVD and patients with diabetes. All items were scored on a four-point scale, ranging from 0–25 % to 76–100 %. Two factors were constructed for overall nutrition and physical activity guidance practices, with Cronbach's $\alpha = 0{\cdot}86$ and 0·88, respectively.

The independent variables in the study concern task perception, self-efficacy and barriers. The PRECEDE–PROCEED model was used as the framework[45].

Task perception, defined as the GP's own perception of his/her role in nutrition and physical activity advice, was measured with several items. Task perception concerning both nutrition and physical activity guidance was measured using one proposition for each of them on a five-point Likert-type scale. Next, task perception on both nutrition and physical activity guidance on the curative–preventive continuum was assessed on a scale from 1 to 10. In addition, task perception for primary, secondary and tertiary prevention was measured with three items. The variable, task perception preventive nutrition guidance, was constructed on the basis of the items about secondary and tertiary prevention ($\alpha = 0{\cdot}70$). Inclusion of the item, primary prevention, did not improve the factor. In the same way, a variable for task perception preventive physical activity guidance was constructed ($\alpha = 0{\cdot}64$). Moreover, there were two items for task perception nutrition guidance for prevention and treatment of relevant illnesses, respectively, and likewise two items for task perception physical activity guidance, each using a five-point scale. Furthermore, task perception was measured with one item about interest in the influence of nutrition and physical activity, respectively, on health, using a five-point scale.

Self-efficacy, defined as the GP's own ability to provide nutrition and physical activity advice, was assessed with several items. Self-efficacy was first operationalized with an item about the perception of the role of nutrition behaviour and physical activity behaviour, respectively,

https://doi.org/10.1017/S1368980012003564 Published online by Cambridge University Press

on health, assessed on a ten-point scale. Another operationalization of self-efficacy concerned the perception of the GP's own model behaviour on nutrition and physical activity, respectively, assessed with one proposition each on a five-point scale. Another item relating to self-efficacy is the perception about the adoption of health behaviour and nutrition and physical activity, respectively (five-point scale); this concerns the GP's perceptions about whether patients find it easy to change their habits. Likewise, the self-efficacy factor, GP's perception of own influence on patients' health and nutrition and physical activity behaviour, respectively, was measured with one proposition each on a five-point scale. Another four self-efficacy variables were constructed on the basis of four propositions on a five-point scale, which were operationalized as perception of own capacity to give nutrition and physical activity guidance, respectively, for prevention of relevant illnesses; and perception of own capacity to give nutrition and physical activity guidance, respectively, for treatment of relevant illnesses.

The variable barriers, defined as perceived individual obstacles to providing advice about nutrition and physical activity, was measured with four different items, namely lack of time, lack of knowledge, lack of skills and lack of training. On the basis of the last three items, two factors were constructed, called barriers to giving nutrition guidance ($\alpha = 0{\cdot}65$) and barriers to giving physical activity guidance ($\alpha = 0{\cdot}69$). In neither case did lack of time improve the factor, and therefore it was taken as a single item into analysis.

Statistical analysis

The data were analysed with the statistical software package SPSS Statistics version 19·0. Principal component analyses with varimax rotation were performed to construct scales. Scales were verified with reliability analysis. To explore the nutrition and physical activity guidance variables, descriptive statistics were used. Cross-tabulation was performed to reveal similarities in the frequency of guidance practices. Furthermore, Pearson correlation coefficients were computed for relationships between the different nutrition and physical activity guidance variables. Additionally, univariate variance tests were performed to identify similarities and differences between subgroups. Finally, multiple linear regression analysis was conducted to analyse the most important determinants of both guidance practices. Forward and backward procedures were applied, using the Bonferroni correction[46].

Results

Descriptive statistics

In the present study, multiple items were used to construct comprehensive variables that all had a relatively high Cronbach's α, varying between 0·64 and 0·88. Table 1 provides descriptive data about nutrition and physical activity guidance practices. Generally, significantly higher scores were found for physical activity compared with nutrition with respect to items about guidance practices, except for patients with diabetes. In-depth analysis showed that the scores for both items about patients with diabetes appeared not to be normally distributed and showed negative skewness. Moreover, in general Table 1 reveals significantly higher scores for physical activity guidance than for nutrition guidance with respect to all items about task perception, whereas on the other hand significantly lower scores on all items about barriers were found for physical activity guidance. Mean scores for self-efficacy revealed mixed results: about half of the items showed higher scores for physical activity guidance than for nutrition guidance, but, for the other half, scores were nearly the same. Although all items about task perception, self-efficacy and barriers appeared to be normally distributed, a few items – such as task perception concerning nutrition guidance, task perception nutrition guidance for treatment of relevant illnesses and perception of role of nutrition behaviour on health – displayed positive kurtosis. The same holds for the corresponding items about physical activity.

Cross-tabulation revealed similarities in the frequency of guidance practices: about 80 % of GP who reported the highest frequency of overall nutrition guidance practices (namely 76–100 % of patients with relevant illnesses) also reported the highest frequency of overall physical activity guidance practices. However, only about 5 % of GP who reported the lowest frequency of overall nutrition guidance practices (namely 0–25 % of patients) also reported the lowest frequency of overall physical activity guidance practices. Next, about a fifth of GP who claimed to guide 26–50 % of patients on nutrition, scored the same on physical activity, but the rest reported an even higher frequency for overall physical activity guidance practices. Of all GP who reported guiding 51–75 % of patients on nutrition, about half also guided on physical activity and about 45 % guided even more than 75 % of patients. GP guided more on physical activity than on nutrition, probably because they had higher self-efficacy expectations with respect to physical activity guidance than to nutrition guidance.

Association between nutrition and physical activity guidance

Table 2 shows the correlation coefficients between corresponding nutrition and physical activity guidance items. A high positive relationship was found between perception of own model behaviour of nutrition and physical activity. Correlations for the perception of own capacity to give nutrition and physical activity guidance were very low for both prevention and treatment.

Differences in nutrition and physical activity guidance by gender

Although male GP scored slightly higher on physical activity guidance practices than female GP, these differences were

https://doi.org/10.1017/S1368980012003564 Published online by Cambridge University Press

Table 1 Mean scores and standard deviations for corresponding items about nutrition and physical activity guidance among Dutch general practitioners (*n* 472), 2007

Items about nutrition guidance (range)	Mean	SD	Items about physical activity guidance (range)	Mean	SD
Guidance practices			Guidance practices		
Nutrition guidance practices for overweight patients (1–4)	2·7	1·0	Physical activity guidance practices for overweight patients (1–4)	3·3	0·8
Nutrition guidance practices for patients at risk of CVD (1–4)	2·9	0·9	Physical activity guidance practices for patients at risk of CVD (1–4)	3·3	0·7
Nutrition guidance practices for patients with CVD (1–4)	3·1	0·9	Physical activity guidance practices for patients with CVD (1–4)	3·4	0·7
Nutrition guidance practices for patients with diabetes (1–4)	3·5	0·9	Physical activity guidance practices for patients with diabetes (1–4)	3·5	0·7
Overall nutrition guidance practices for patients with relevant illnesses (1–4)	3·1	0·8	Overall physical activity guidance practices for patients with relevant illnesses (1–4)	3·5	0·7
Task perception			Task perception		
Task perception concerning nutrition guidance (1–5)	3·9	0·7	Task perception concerning physical activity guidance (1–5)	4·2	0·6
Task perception nutrition guidance on a curative–preventive continuum (1–10)	5·3	1·8	Task perception physical activity guidance on curative–preventive continuum (1–10)	5·9	1·7
Task perception preventive nutrition guidance (1–4)	3·2	0·5	Task perception preventive physical activity guidance (1–4)	3·3	0·5
Task perception primary preventive nutrition guidance (1–4)	2·6	0·7	Task perception primary preventive physical activity guidance (1–4)	2·9	0·7
Task perception nutrition guidance for prevention of relevant illnesses (1–5)	3·9	0·7	Task perception physical activity guidance for prevention of relevant illnesses (1–5)	4·1	0·7
Task perception nutrition guidance for treatment of relevant illnesses (1–5)	4·0	0·7	Task perception physical activity guidance for treatment of relevant illnesses (1–5)	4·2	0·6
Interest in the influence of nutrition on health (1–5)	4·0	0·6	Interest in the influence of physical activity on health (1–5)	4·1	0·7
Self-efficacy			Self-efficacy		
Perception of role of nutrition behaviour on health (1–10)	7·8	1·1	Perception of role of physical activity behaviour on health (1–10)	8·1	1·2
Perception of own model behaviour on nutrition (1–5)	3·5	1·0	Perception of own model behaviour on physical activity (1–5)	3·5	1·0
Perception adoption of healthy behaviour and nutrition (1–5)	2·2	0·8	Perception adoption of healthy behaviour and physical activity (1–5)	2·2	0·7
Perception of own influence on health and nutrition behaviour (1–5)	3·2	0·8	Perception of own influence on health and physical activity behaviour (1–5)	3·2	0·8
Perception of own capacity to give nutrition guidance for prevention of relevant illnesses (1–5)	3·4	0·8	Perception of own capacity to give physical activity guidance for prevention of relevant illnesses (1–5)	3·6	0·7
Perception of own capacity to give nutrition guidance for treatment of relevant illnesses (1–5)	3·4	0·8	Perception of own capacity to give physical activity guidance for treatment of relevant illnesses (1–5)	3·5	0·7
Barriers			Barriers		
Barrier lack of time to give nutrition guidance (1–2)†	71 %		Barrier lack of time to give physical activity guidance (1–2)†	54 %	
Barriers to giving nutrition guidance (1–2)†	46 %		Barriers to giving physical activity guidance (1–2)†	23 %	

†Since these are yes–no questions, percentages are presented instead of mean scores.

Table 2 Correlation between items about nutrition guidance and corresponding items about physical activity guidance among Dutch general practitioners (*n* 472), 2007

Item about nutrition guidance	Correlation with corresponding item about physical activity guidance
Guidance practices	
Nutrition guidance practices for overweight patients	0·36***†
Nutrition guidance practices for patients at risk of CVD	0·41***
Nutrition guidance practices for patients with CVD	0·44***
Nutrition guidance practices for patients with diabetes	0·38***
Overall nutrition guidance practices for patients with relevant illnesses	0·41***
Task perception	
Task perception concerning nutrition guidance	0·57***
Task perception nutrition guidance on curative–preventive continuum	0·58***
Task perception preventive nutrition guidance	0·61***
Task perception primary preventive nutrition guidance	0·65***
Task perception nutrition guidance for prevention of relevant illnesses	0·69***
Task perception nutrition guidance for treatment of relevant illnesses	0·64***
Interest in the influence of nutrition on health	0·50***
Self-efficacy	
Perception of role of nutrition behaviour on health	0·60***
Perception of own model behaviour on nutrition	0·95***
Perception adoption of healthy behaviour and nutrition	0·67***
Perception of own influence on health and nutrition behaviour	0·81***
Perception of own capacity to give nutrition guidance for prevention of relevant illnesses	0·23***
Perception of own capacity to give nutrition guidance for treatment of relevant illnesses	0·30***
Barriers	
Barrier lack of time to give nutrition guidance	0·51***
Barriers to giving nutrition guidance	0·38***

Significant correlation: ***$P < 0·001$.
†That is, the correlation between nutrition guidance practices for overweight patients and physical activity guidance practices for overweight patients is 0·36.

Table 3 Differences in nutrition and physical activity guidance between male (*n* 343) and female (*n* 129) Dutch general practitioners (GP), 2007 (df = 470)

Item (range)	*t*	*P*	Mean, male GP	Mean, female GP
Task perception				
Task perception concerning nutrition guidance (1–5)	2·2	0·03	3·8	4·0
Task perception primary preventive nutrition guidance (1–4)	2·1	0·04	2·6	2·7
Self-efficacy				
Perception adoption of healthy behaviour and nutrition (1–5)	2·7	0·01	2·2	2·4
Perception of own capacity to give nutrition guidance for prevention of relevant illnesses (1–5)	3·0	0·00	3·4	3·6
Perception of own capacity to give nutrition guidance for treatment of relevant illnesses (1–5)	1·9	<0·05	3·4	3·5
Perception of own capacity to give physical activity guidance for treatment of relevant illnesses (1–5)	−3·0	0·00	3·6	3·4

not significant. In addition, no significant differences were found in nutrition guidance practices between both sexes.

Nevertheless, significant univariate differences in determinants of nutrition and physical activity guidance were found between male and female GP (Table 3; Student's *t* test, df = 470, all $P < 0·05$). Female GP perceived nutrition guidance as their own task more often than male GP. Significantly more female GP than male GP perceived their task on nutrition guidance to be primary preventive. With respect to self-efficacy, female GP were more convinced than male GP that people with health problems could adjust their nutrition habits. Significantly more female GP than their male colleagues perceived higher capacity to give nutrition guidance for both prevention and treatment of relevant illnesses. Conversely, male GP scored higher than female GP on their own capacity to give physical activity guidance for treatment of relevant illnesses. Finally, gender differences in perceived barriers proved not to be significant.

Differences in nutrition and physical activity guidance by practice experience

GP with more than 20 years of practice experience reported higher scores on nutrition guidance practices than GP with less practice experience. However, these differences were not significant. No significant differences in physical activity guidance practices were found between GP who differed in practice experience.

Our study showed that GP with 5–20 years of practice experience perceived their task on nutrition guidance to be primary preventive significantly more often than GP

https://doi.org/10.1017/S1368980012003564 Published online by Cambridge University Press

Table 4 Differences in nutrition and physical activity guidance between Dutch general practitioners (GP) with 5–20 years of practice experience (*n* 217) and with more than 20 years of practice experience (*n* 255), 2007 (df = 470)

Item (range)	*t*	*P*	Mean, GP with 5–20 years of practice experience	Mean, GP with more than 20 years of practice experience
Task perception				
Task perception primary preventive nutrition guidance (1–4)	2·1	0·03	2·7	2·6
Task perception physical activity guidance for prevention of relevant illnesses (1–5)	2·0	<0·05	4·1	4·0
Self-efficacy				
Perception of own influence on health and physical activity behaviour (1–5)	−2·0	<0·05	3·1	3·3
Perception of own capacity to give physical activity guidance for treatment of relevant illnesses (1–5)	−2·4	0·02	3·5	3·7
Barriers				
Barrier lack of time to give physical activity guidance (1–2)†	2·1	0·04	59 %	49 %

†Since these are yes–no questions, percentages are presented instead of mean scores.

with more than 20 years of practice experience. They also perceived physical activity guidance as their task for prevention of relevant illnesses significantly more than GP with more experience. Furthermore, GP with more years of practice experience were more often convinced than GP with less practice experience that they could influence physical activity habits of people with health problems. GP with more practice experience also had a higher perceived capacity than GP with less experience to give physical activity guidance for prevention of relevant illnesses. Lastly, GP with less experience perceived lack of time as a barrier to giving physical activity guidance more often than GP who had worked longer in practice (Table 4; Student's *t* test, df = 470, all $P < 0{\cdot}05$).

Regression models for nutrition and physical activity guidance practices

First, we analysed the models for different nutrition guidance practices on the basis of the nutrition guidance variables only (Table 5). Next, regression models were composed for different physical activity guidance practices, built with physical activity guidance variables only (Table 5). Our study showed in general that task perception, self-efficacy and barriers were better predictors for nutrition guidance practices than for physical activity guidance practices. The explained variance of the models varied between 9 and 20 %. Only 9 % of physical activity guidance in overweight patients could be explained by model 5, as against 15 % for nutrition guidance in overweight patients in model 1.

Self-efficacy, in particular perception of own capacity to give nutrition guidance for prevention of relevant illnesses, was the main determinant of all guidance practices, except for nutrition guidance for patients at risk of CVD and nutrition guidance for patients with diabetes. Task perception nutrition guidance for prevention of relevant illness and perception of own capacity to give nutrition guidance for treatment of relevant illnesses, respectively, were the main predictors in models 2 and 4.

The only similarity in the determinants of nutrition and physical activity guidance in overweight patients appeared to be perception of own capacity to give nutrition and physical activity guidance for prevention of relevant illnesses. No similarities were found in the determinants of nutrition and physical activity guidance in patients at risk of CVD (models 2 and 6), and the same was the case for patients with diabetes (models 4 and 8). Perception of own capacity to give nutrition and physical activity guidance for prevention of relevant illnesses acted as a determinant for nutrition and physical activity guidance for patients with CVD (models 3 and 7). The barrier, lack of time, was found as a determinant in only two models for nutrition guidance practices, and not at all for physical activity guidance practices. So the determinants of nutrition guidance practices were quite different from those of physical activity guidance practices.

The four different nutrition guidance practices were then included all together in the first step of the analysis for different physical activity guidance practices and the physical activity guidance practice variables in the next step (Table 6). After inclusion of the nutrition guidance practices in the model, the explained variance of physical activity guidance practices in overweight patients doubled to 18 % (model 5 *v.* model 9) and from 12 to 27 % in the case of physical activity guidance practices for patients with CVD (model 7 *v.* model 11). Total explained variances of the models in Table 6 ranged between 18 and 28 %. More than half of the variance could be explained by the nutrition guidance practices only, varying between 15 and 19 %. Similar nutrition guidance practices were predictive of their corresponding physical activity guidance practices. Remarkably, the item, nutrition guidance practices for patients with CVD, was also part of the other three models (model 9, 10 and 12). In the last model, nutrition guidance practices in patients with CVD appeared to be a better predictor for physical activity guidance practices for patients with diabetes than nutrition guidance practices for patients with diabetes

https://doi.org/10.1017/S1368980012003564 Published online by Cambridge University Press

Table 5 Regression models for nutrition guidance practices and physical activity guidance practices among Dutch general practitioners (*n* 472), 2007

Forward solution–backward solution nutrition guidance practices for…	β	*P*	Forward solution–backward solution physical activity guidance practices for…	β	*P*
Overweight patients (model 1)			Overweight patients (model 5)		
Perception of own capacity to give nutrition guidance for prevention of relevant illnesses	0·30	<0·001	Perception of own capacity to give physical activity guidance for prevention of relevant illnesses	0·24	<0·001
Task perception primary preventive nutrition guidance	0·20	<0·001	Task perception physical activity guidance for treatment of relevant illnesses	0·14	<0·01
Task perception concerning nutrition guidance	0·14	<0·01	Task perception physical activity guidance on curative–preventive continuum	0·12	<0·05
Barrier lack of time to give nutrition guidance	−0·12	<0·01			
	Multiple *r*	0·40		Multiple *r*	0·30
	Expl. var.	15 %		Expl. var.	9 %
Patients at risk of CVD (model 2)			Patients at risk of CVD (model 6)		
Task perception nutrition guidance for prevention of relevant illnesses	0·32	<0·001	Perception of own capacity to give physical activity guidance for prevention of relevant illnesses	0·28	<0·001
Perception of own capacity to give nutrition guidance for treatment of relevant illnesses	0·22	<0·001	Task perception preventive physical activity guidance	0·21	<0·001
Barrier lack of time to give nutrition guidance	−0·12	<0·01	Perception of role of physical activity behaviour on health	0·17	<0·001
	Multiple *r*	0·40		Multiple *r*	0·38
	Expl. var.	16 %		Expl. var.	15 %
Patients with CVD (model 3)			Patients with CVD (model 7)		
Perception of own capacity to give nutrition guidance for prevention of relevant illnesses	0·36	<0·001	Perception of own capacity to give physical activity guidance for prevention of relevant illnesses	0·25	<0·001
Task perception nutrition guidance for prevention of relevant illnesses	0·23	<0·001	Perception of own capacity to give physical activity guidance for treatment of relevant illnesses	0·20	<0·001
Perception of own influence on health and nutrition behaviour	0·14	<0·01	Perception of role of physical activity on health	0·15	<0·01
	Multiple *r*	0·45		Multiple *r*	0·35
	Expl. var.	20 %		Expl. var.	12 %
Patients with diabetes (model 4)			Patients with diabetes (model 8)		
Perception of own capacity to give nutrition guidance for treatment of relevant illnesses	0·30	<0·001	Perception of own capacity to give physical activity guidance for prevention of relevant illnesses	0·30	<0·001
Task perception nutrition guidance for prevention of relevant illnesses	0·23	<0·001	Task perception physical activity guidance for treatment of relevant illnesses	0·21	<0·001
			Perception of own influence on health and physical activity behaviour	0·11	<0·05
	Multiple *r*	0·37		Multiple *r*	0·37
	Expl. var.	14 %		Expl. var.	14 %

Expl. var., explained variance.

Table 6 Regression models† for physical activity guidance practices including four nutrition guidance practices as explaining factors among Dutch general practitioners (*n* 472), 2007

Forward solution–backward solution physical activity guidance practices for…	*β*	*P*
Overweight patients (model 9)		
Nutrition guidance practices for overweight patients	0·36	<0·001
Nutrition guidance practices for patients with CVD	0·16	<0·01
Perception of own capacity to give physical activity guidance for prevention of relevant illnesses	0·18	<0·001
	Multiple *r*	0·42
	Expl. var.	18 %
Patients at risk of CVD (model 10)		
Nutrition guidance practices for patients at risk of CVD	0·41	<0·001
Nutrition guidance practices for patients with CVD	0·16	<0·05
Perception of own capacity to give physical activity guidance for prevention of relevant illnesses	0·22	<0·001
Perception of role of physical activity behaviour on health	0·18	<0·001
Task perception preventive physical activity guidance	0·14	<0·001
	Multiple *r*	0·52
	Expl. var.	28 %
Patients with CVD (model 11)		
Nutrition guidance practices for patients with CVD	0·44	<0·001
Perception of own capacity to give physical activity guidance for prevention of relevant illnesses	0·20	<0·001
Task perception preventive physical activity guidance	0·15	<0·001
Perception of role of physical activity behaviour on health	0·13	<0·01
	Multiple *r*	0·52
	Exp. var.	27 %
Patients with diabetes (model 12)		
Nutrition guidance practices for patients with CVD	0·38	<0·001
Nutrition guidance practices for patients with diabetes	0·22	<0·001
Perception of own capacity to give physical activity guidance for prevention of relevant illnesses	0·26	<0·001
Perception of role of physical activity behaviour on health	0·13	<0·01
	Multiple *r*	0·50
	Expl. var.	25 %

Expl. var., explained variance.
†Four different nutrition guidance practices were included in step 1 and physical activity guidance variables in step 2.

(explained variance 14 % and 3 %, respectively). Again, perception of own capacity to give physical activity guidance for prevention of relevant illnesses was included in all models. Other variables concerning task perception and self-efficacy were also discovered as determinants, but again barriers were not. The predictive models contained both prevention and treatment elements.

Discussion

The major aims of the present study were to assess: (i) the extent to which GP guide on both nutrition and physical activity; (ii) the determinants that cause GP to give guidance on nutrition and physical activity; and (iii) the extent to which these guidance practices have the same determinants. To our knowledge, our study is the first one about the coexistence of nutrition and physical activity guidance in general practice. To summarize, our results revealed that 80 % of GP with the highest frequency of nutrition guidance practices showed similar practices for physical activity guidance. Reasonable associations were found between nutrition and physical activity guidance practices. Task perception, self-efficacy and barriers were better predictors for nutrition guidance practices than for physical activity guidance practices. Inclusion of nutrition guidance practices in models of physical activity guidance practices significantly improved these models.

In the discussion below, we elaborate on four main conclusions: (i) the majority of GP had similar practices for nutrition and physical activity guidance; (ii) GP were more likely to guide their patients on physical activity than on nutrition; (iii) self-efficacy was the major determinant of most guidance practices; and (iv) guidance practices proved to be a mix of prevention and treatment components.

First, we conclude that the majority of GP had similar practices for nutrition and physical activity guidance. About 80 % of GP who reported that they guided 76–100 % of patients with relevant illnesses on nutrition, almost always guided on physical activity too. These preventive-oriented GP were likely to have a preventive attitude in general. Apart from this majority, a minority could be characterized as physical activity-oriented GP and a negligible number were nutrition-oriented GP. Just like Anis *et al.*[32], we found fair associations between nutrition and physical activity guidance practices. The results of multiple regression analysis also indicated overlap between both guidance practices. Inclusion of behavioural measures, such as nutrition guidance practices, in models for physical activity guidance practices considerably improved the explained variance. So, physical

https://doi.org/10.1017/S1368980012003564 Published online by Cambridge University Press

activity guidance practices follow the line taken by nutrition guidance practices. We interpret these results as emanating from the preventive attitude generally prominent among GP.

Our second conclusion is that GP were more likely to guide their patients on physical activity than on nutrition. Our respondents reported higher frequencies of physical activity guidance practices than nutrition guidance practices, in line with a British study[15]. Our findings are in contrast to studies in the USA, in which the rates for nutrition guidance practices were higher[16,17,32]. Besides physical activity guidance practices, the scores of GP on task perception, barriers and self-efficacy for physical activity guidance were more favourable too. Task perceptions for physical activity guidance appeared to be more positive than for nutrition guidance. Moreover, GP perceived fewer barriers to physical activity guidance than to nutrition guidance. This was also the case in two other studies[33,36]. Although other studies[17,34,36] found higher self-efficacy expectations towards physical activity guidance than towards nutrition guidance, this finding was only partly confirmed by our study. We found that GP scored higher on three items about self-efficacy towards physical activity guidance, but on three other items their confidence in their ability to guide on physical activity seemed to be exactly the same as for nutrition guidance. Apparently, providing physical activity guidance is not always perceived as easy after getting started. A possible explanation for the overall higher scores for physical activity guidance items might be that nutrition behaviour is more complex, involving many settings and situations, and is influenced by many internal and external factors. Changes in nutrition behaviour depend on changes in specific behaviours that are practised consistently and over time[47]. However, we are aware that physical activity behaviour is also embedded in routine.

From this, we derived our third conclusion, namely that self-efficacy was the major determinant of most guidance practices. Our finding is in agreement with Guo *et al.*[17]. However, it contrasts with other studies, in which task perception appeared to be the best predictor[13,18,21]. Nevertheless, task perception added to the explained variance in those other studies on prediction. The barrier, lack of time, acted as a determinant in our models for nutrition guidance practices only. Lack of time has been ranked as the most important barrier in almost all studies about nutrition guidance[12,20,21,33–36], but only in a few studies about physical activity guidance[23,25–28]. Our finding that self-efficacy is the most important determinant may be explained by the fact that self-efficacy is rather closely associated with behaviour.

Finally, guidance practices in our study were a mix of both prevention and treatment components. The predictive models for different guidance practices contained both prevention and treatment elements. In some models, the prevention-related task perception was discovered as determinant; in other models, the treatment-related task perception was more predictive. The same holds for the predictive value of self-efficacy. Similar nutrition guidance practices were predictive of their corresponding physical activity guidance practices. As they concern guidance for patients with relevant illnesses, they can be perceived as treatment components. The mix of prevention and treatment components reflects the recent trend among GP towards health promotion, above and beyond their responsibility for providing curative services.

The current study has some limitations. First, the data are based on self-reports. Moreover, the cross-sectional design of the study does not allow assumptions to be made about causality between determinants and guidance practices. We intend to carry out longitudinal research on this topic to clarify and further expand this exploration.

On the basis of our results, we have formulated recommendations for practice. In the first place, our findings showed that self-efficacy partly explained guidance practices. It is advisable to raise self-efficacy of GP by incorporating nutrition and physical activity guidance training in medical school and in continuing medical education. Khan *et al.*[48] recently formulated ten practical steps to help GP to encourage patients to initiate and maintain a physically active lifestyle. Use of the 5A's (Ask, Advise, Assess, Assist and Arrange) seemed to influence patients to be more motivated to change[49]. Because obesity requires long-term prevention, GP should have the option of referring to dietitians[50,51]. Moreover, our study showed that GP had similar practices for both nutrition and physical activity guidance. Therefore, we recommend that GP who do not yet do so should combine both nutrition and physical activity guidance in their lifestyle advices. This idea is supported in other research[52–57]. Nutrition and physical activity guidance can form part of multiple behavioural risk factor interventions in general practice.

Acknowledgements

This research was supported by the Dutch Dairy Association. The authors declare that they have no competing interests. Ethical approval was not required. G.J.H. and C.M.J.v.W. were involved in the design of the study. S.M.E.v.D. designed the current analysis of the data, performed the statistical analysis and wrote the manuscript. All authors have read and contributed to previous versions of the manuscript and approved the final manuscript. The authors thank the market research office GfK for their collaboration and the GP for their participation in the study.

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