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Patients' and partners' illness perceptions in screendetected versus clinically diagnosed type 2 diabetes: partners matter!

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Background. In type 2 diabetes, educational interventions that target differences between patients' and partners' illness perceptions have been advocated.

Objective. To investigate how the route to diagnosis of type 2 diabetes (through screening versus clinical symptoms) affects illness perceptions of patients and their partners.

Methods. In a cross-sectional study, we enrolled patients aged 40–75 years from general practices in the Netherlands with a new diagnosis of type 2 diabetes (≤3 years), detected by either screening (n = 77) or clinical symptoms (n = 32). Patients and their partners each completed a postal Brief Illness Perception Questionnaire (Brief IPQ), and up-to-date clinical data were obtained from their GP. The Brief IPQ scores of the screening and clinical diagnosis groups were compared for both patients and partners, and multiple variable linear regression models with Brief IPQ scores as outcomes were developed.

Results. The route to diagnosis did not appear to have a strong influence on patients' illness perceptions but did influence illness perceptions of their partners. Partners of patients diagnosed through screening perceived greater consequences for their own life, had a stronger feeling that their patient-partners had control over their diabetes, were more concerned about their partners'

diabetes, and believed that their patient-partners experienced more diabetes symptoms, compared with partners of patients who were diagnosed through clinical symptoms.

Conclusions. The route to diagnosis of type 2 diabetes has a greater impact on the illness perceptions of partners than that of patients. Professionals in diabetes education and treatment should consider these differences in their approach to patient care.

INTRODUCTION

Screening for type 2 diabetes is recommended because it may reduce the risk of vascular complications. [1-4] Some questions remain unresolved, however, in particular regarding the psychological consequences of early detection and treatment of type 2 diabetes.[5] Although the psychological impact of a screening-based diagnosis of type 2 diabetes on patients is generally limited,[6] intensive treatment following screen-detected diabetes has been shown to lead to higher levels of anxiety and lower self-efficacy in the first year after diagnosis, without an accompanying improvement in self-care.[7] Similarly to other chronic diseases, patients with type 2 diabetes must take personal responsibility for the management of their illness.[8] Patients need to do exercise and change their diet, take oral medications and may eventually require insulin injections, involving selfmonitoring of blood glucose and insulin adjustments.[1,9] Although education provides the required knowledge, self-care behaviours are also influenced by beliefs− so-called illness perceptions−regarding type 2 diabetes.[10] Illness perceptions include the following cognitive illness representations: consequences (beliefs about effects and impact), timeline (course and duration), personal control (own control over management), treatment control (outcome expectancies of treatment and recommended advice), identity (symptoms and label attributed to illness) and cause (perceived cause of the illness). Emotional representations (concern and emotions) and illness coherence (overall understanding) are also considered to be illness perceptions.[11] Perceptions of personal control and an understanding of diabetes appear to be particularly important: studies have shown that an increased appreciation of these factors by patients are associated with better adherence to diet, exercise and medications, and with better blood glucose control, lower interference with social and personal functioning, fewer negative feelings and a more positive attitude towards diabetes.[12,13] Evidence exists to support the contention that illness perceptions can be improved through targeted intervention and that these changes may also impact on glycaemic control.[11] As most type 2 diabetes self-care occurs at home, illness perceptions of family members, in particular the partner, play an important role in adaptation to the disease and in disease outcome.[14] Patients with type 2 diabetes feel greater personal control compared with their partners but show a poorer understanding of their condition.[15] Partners generally perceive diabetes as being more serious and as having a greater impact on daily life, whereas patients are often unaware of this heightened concern and have a more relaxed approach to living with the disease.[16] Gender can also affect illness perceptions of chronic diseases, an example of which is that male patients with coronary heart disease often attribute their condition to risk behaviours, whereas

female patients often identify stress as the cause.[17] The psychological adjustment of female rheumatoid arthritis patients is improved when a husband shares optimistic beliefs regarding personal control, illness coherence and consequences.[18] The considerations above suggest that interventions targeting differences and aiming to improve congruence in the illness perceptions of patients and partners, together with the development of a personalized plan to improve diabetes management, may be important in diabetes education and treatment.[19] In this exploratory study, we hypothesized that the route to diagnosis of type 2 diabetes−by screening in asymptomatic individuals or by clinical signs or symptoms− may affect the illness perceptions of patients and partners, and thus may be an important factor to consider in diabetes education programmes. We therefore compared data from type 2 diabetes patients and their partners detected by screening with data from type 2 diabetes patients and their partners detected by clinical signs or symptoms in the same study period and setting.
In addition, we explored the interaction between gender and screening.

METHODS

Participants and setting

We invited individuals aged 40–75 years, who were diagnosed with type 2 diabetes within the last 3 years and were married or living together with a partner, to participate in this cross-sectional questionnaire study.
Couples were recruited via general practitioners in one of two ways: initially, a subset of respondents was recruited using leaflets and posters sent to a random sample of 875 general practices throughout the Netherlands (60 couples responded). To improve response, we recruited additional couples from general practices participating in a practice-based research network (n = 47 couples, response rate 44%)[20,21] and from general practices participating in a diabetes research centre (n = 28 couples, response rate 30%).[6] Patients with type 2 diabetes were treated in line with the Dutch general practice guidelines in all practices.[1] Following completion of their participation form, each couple received both a 'patient' and a 'partner' postal questionnaire.
We excluded 17 couples because either the patient or the partner did not wish to participate or failed to return the questionnaire. We excluded an additional seven couples because of an unclear route to diagnosis and a further two because the partner also had diabetes.
In total, 109 heterosexual couples were enrolled in the study.

Questionnaire

The questionnaire included demographic items (e.g.
age, sex and educational level), questions regarding the disease (e.g. time since diagnosis, treatment) and questions about the participants' relationship (e.g. duration of marriage).
The patient questionnaire also included a question on the route to diagnosis. Depending on the answer, the couples were divided in two groups: (i) asymptomatic type 2 diabetes detected by (opportunistic) targeted screening (subsequently referred to as 'screening') or (ii) clinically diagnosed type 2 diabetes based on signs or symptoms (subsequently referred to as 'clinical diagnosis').

Illness perceptions were measured in patients and partners using questions from the Brief Illness Perception Questionnaire (Brief IPQ), a shorter version of the popular Revised Illness Perception Questionnaire (IPQ-R).[11] The Brief IPQ is a validated questionnaire for rapid assessment of illness perceptions and was developed for use with ill or elderly people.[22] It has nine single items without a total score (Box 1): items 1–8 are individually rated using a 0-to-10 visual response scale, with higher scores reflecting a stronger belief in or perception of the item, and item 9 probes the causes of diabetes by an open-ended question, asking the respondent to list up to three factors in rank order which he or she believes to have caused their diabetes.

[FIGURE 1]

For partners, the questions were reformulated to address their specific perspectives. The partner questionnaire's Cronbach's alpha, a measure of internal reliability, was an acceptable 0.65.

Clinical data

To compare baseline characteristics, we obtained recent clinical data from the patients' own GP. These data were extracted from the electronic medical records by the GPs and included information derived from physical examination (body mass index and blood pressure), laboratory testing (hemoglobin A_{1c} and cholesterol), and glucose-lowering treatment (diet, oral agents, insulin).

Statistical analysis

Differences between the screening and the clinical diagnosis groups were analysed in both patients and partners. Demographic and clinical characteristics were compared using the chi-square test for categorical data and the t-test for means.

Descriptive statistics were used to calculate the mean Brief IPQ scores for patients and partners in both the screening and the clinical diagnosis groups. Responses to the causal item were grouped into categories, followed by a kappa measure of agreement within couples (generally ranging from 0 to 1.0, where larger numbers mean better agreement) and categorical analysis using chi-square tests.

To calculate the effect of a screening-based diagnosis versus clinical diagnosis on illness perceptions, we developed multiple variable linear regression models.

In each model, we applied one of the Brief IPQ items (except item 9) as the dependent variable and the method of diagnosis as the independent variable.

The unstandardized regression coefficient (β), with matching 95% confidence interval (CI) and P value, was considered to be the absolute effect on the mean Brief IPQ score. Analyses were controlled for the additional independent variables such as age, sex, educational level, duration of diabetes, duration of marriage and insulin use.

All analyses were carried out using SPSS 16.0 for Windows (SPSS Inc., Chicago, IL), all were two sided and we considered a P value less than 0.05 to be significant.

RESULTS

Our study included 109 patients with a new diagnosis of type 2 diabetes, of whom 77 were detected by screening and 32 diagnosed by clinical signs or symptoms (Table 1). Although the two patient groups did not differ significantly in age or gender, clinically diagnosed patients were more often male. Partners in the screening group

were more likely to be male, and partners in the clinical diagnosis group were significantly younger.
Statistically significant differences in educational level and duration of marriage between the screening and clinical diagnosis patient groups included a mainly secondary educational level in the screening group, and more equally distributed educational level and a shorter duration of marriage in the clinical diagnosis group. Body mass index and the use of glucose-lowering tablets and insulin were higher in the clinical diagnosis group but the differences were not statistically significant. All other characteristics were similar between the two groups.

[TABLE 1]

With the exception of educational level, which was more often at primary or tertiary level in clinically diagnosed males than in females, no significant differences were found between male and female patients (data not shown).
Brief IPQ mean scores and the results of linear regression models (with the adjusted absolute effect (β) of screening compared with clinical diagnosis on scores) are shown in Table 2. Brief IPQ mean scores within patients were comparable between the two groups, and no statistically significant effect of screening was found for any of the scores. Patients in both groups tended to recognize few effects on their own life and to believe that they were in control of their diabetes, reporting perceptions of symptoms, concern and emotional impact as low.
As for partners, however, significantly higher scores were found on four items in the screening group compared with the clinical diagnosis group: on the one hand, partners of screen-detected patients perceived greater consequences for their own life and had a stronger sense that their patient-partner was in control of his or her diabetes, but on the other hand, they were more concerned about their patient-partner's diabetes and believed that their patient-partner experienced more symptoms of diabetes (Table 2). Significant differences appeared to be mainly caused by younger age (<60 years; Appendix 1) and by a longer duration of diabetes (>6 months since diagnosis; Appendix 2).
Respondents' answers to the open-ended question (causes of diabetes) could be categorized into three main, but not mutually exclusive, causes: lifestyle, hereditary factors and older age. Couples showed some agreement regarding these causes (kappa 0.35, 0.42 and 0.31, respectively; data not shown). Comparing the study groups, the screening group was less likely to identify lifestyle as the cause of diabetes (70.6% versus 87.9%, respectively, P = 0.01) and more likely to believe that hereditary factors also played a causal role (47.8% versus 31.0% in the clinical diagnosis group, P = 0.03). Older age as a cause of the disease was identified equally (24.3% of the screening group and 25.9% of the clinical diagnosis group, P = 0.81).
The results of linear regression models by gender are presented in Table 3. Female patients detected by screening had a significantly greater belief in the effect of treatment compared with those in the clinical diagnosis group, whereas Brief IPQ scores within male patients were not significantly affected by the route to diagnosis.

[TABLE 2]

Female partners in the screening group were more concerned by their patient-partner's diabetes and believed that their patient-partner experienced more diabetes symptoms following diagnosis, but they were optimistic about the duration of their partner's diabetes. Male partners' illness perceptions were comparable with male patients and showed no significant effect due to screening, although they appeared to perceive greater consequences for their own life and experience a higher emotional impact.

DISCUSSION

Summary of main findings

Patients diagnosed with type 2 diabetes shared similar illness perceptions, which appeared to be little affected by the route to diagnosis.
In contrast, the partners of patients who were detected by screening perceived greater effects on their own life compared with partners of patients identified by clinical diagnosis. However, partners in the screening group also showed a stronger belief in the ability of their patient-partner to control his or her diabetes and tended to overestimate ability to successfully perform self-care. Female partners in the screening group were especially concerned about their partner's diabetes and perceived more symptoms in their patient-partner.
Couples showed some agreement when identifying the causes of diabetes, the screening group primarily focusing on hereditary factors and the clinical diagnosis group focusing on lifestyle factors.

Strengths and limitations

The major strength of this study is that our findings are based on patient and partner data from regular general practices, rather than from a trial setting. Patients were diagnosed with type 2 diabetes in general practice and participants were recruited by their own GP. It therefore seems likely that the patterns found in this study are generally representative for primary care patients with type 2 diabetes. Additional strengths derive from the use of a validated questionnaire and an acceptable internal reliability of the questionnaire when adapted for partners. Furthermore, as our analyses were controlled for age, sex, educational level, duration of marriage, duration of diabetes and insulin use, findings cannot be attributed to any of these variables.

[TABLE 3]

A limitation of the study may be the relatively small number of participants, resulting in a statistical power that may not have been sufficient to detect very small differences in illness perception scores among patient groups. Nevertheless, we were able to detect significant differences among partners, and the distribution of participants (screening group 71%, clinical diagnosis group 29%) was comparable with an earlier and larger study (n = 565; screening 64% versus clinical diagnosis 36%).[23] Although many of our participants were recruited from general practices with an interest in diabetes and research, these practices are normal community practices with a population and diabetes prevalence rates representative of the general Dutch population.

A selection bias due to a selective allocation to one study group is unlikely because patients were not randomized to a group but selected by the route to diagnosis. Patients in both study groups were all treated according to the same practice guidelines during usual care.[1] Volunteer or self-selection bias cannot be entirely ruled out, however, because response rates were low and some baseline characteristics differed between the study groups. We adjusted our data analyses for these differences so as to account for any possible bias.

Another possible limitation is that three quarters of the patients participating in our study had a diagnosis older than 6 months, by which time many had already received education and treatment. However, time of diagnosis was comparable between the screen-detected and clinically diagnosed patient groups and similar low mean hemoglobin A_{1c} values reflected good glycaemic control in both groups. Nevertheless, and as stated in the section "Introduction", dissimilarities in illness perceptions should still be targeted in order to improve self-care.

Comparison with existing literature

This study is the first to explore the effects of the route to diagnosis of type 2 diabetes (through screening versus clinical diagnosis) on both patients' and partners' illness perceptions.

The patients' Brief IPQ scores in our study were comparable with those reported in literature.[22] Furthermore, our findings that patients with a recent screening-based diagnosis of type 2 diabetes tend to report low emotional distress, low threat perceptions and a strong belief in personal control also agrees with previous studies.[6,7] In addition, we found that illness perceptions were similar following a recent clinical diagnosis.

Our data confirm that compared with patients, partners generally perceive diabetes as a more serious disease and as having a greater impact on daily life[16] but indicate that these beliefs are especially prevalent following a screening-based diagnosis.

In an earlier study of illness perceptions that used the IPQ-R, patients with type 2 diabetes reported a greater sense of control over their diabetes than was the case with their partners.[15] This contrasts with our findings, which showed that partners in the screening group had a stronger sense that their patient-partners were in control of their diabetes than that felt by the patients themselves. However, although the Brief IPQ and the IPQ-R are broadly comparable, the Brief IPQ personal control item was significantly associated with diabetes self-efficacy, in contrast to the IPQ-R personal control item, suggesting that the Brief IPQ may have an advantage in the area of control.[22] Finally, prospective research has shown that patients' illness perceptions develop in the early stages of disease and that unless directly challenged by treatment or change in clinical state, they are likely to remain constant.[24] In our study, significant differences in the Brief IPQ scores of partners appeared to be related to a longer diabetes duration in their patient-partners, perhaps indicating that partners' illness perceptions may be less stable.

Implications for practice and research

We have shown that the screening route to the diagnosis of type 2 diabetes mainly impacts on the illness perceptions of patients' partners. Partners of patients diagnosed through screening not only have greater negative beliefs regarding diabetes but also perceive enhanced personal control in their patient-partners. After 3

years, partners of screen-detected patients still appear to be more overwhelmed by the diagnosis than partners of clinically diagnosed patients and tend to believe, inaccurately, that their patient-partners have a high level of control over their diabetes.

Our study yielded new and unexpected findings and stresses the importance of the partner's role in diabetes education and treatment in daily primary care, especially following a screening-based diagnosis of type 2 diabetes. However, the exploratory, cross-sectional study design and the small sample size did not provide enough evidence for a well-defined explanation of our findings. For example, it remains unclear why a diagnosis resulting from screening appears to be more distressing for partners than that for patients.

Additional qualitative research may provide further insights.

In patients with poorly controlled type 2 diabetes, a psychological family-based intervention targeting negative or inaccurate illness perceptions recently reported improvements both in glucose control and in beliefs regarding diabetes, well being, diet, exercise and family support.[25] A similar approach may be useful in the treatment of patients with diabetes detected by screening and further study is needed on the effects of interventions that target illness perceptions in patients and their partners following a screening-based diagnosis.

Future studies should be larger, prospective in design and show a greater focus on changes in illness perceptions in the first years after diagnosis.

In conclusion, the illness perceptions of partners are the most influenced by the route to diagnosis of type 2 diabetes. Professionals involved in diabetes education and treatment should focus on and target the illness perceptions of partners, especially where screening is concerned. The Brief IPQ is a simple and effective tool with which to investigate these illness perceptions in daily practice.

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DECLARATION

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[APPENDIX 1] [APPENDIX 2]

TABLES, FIGURES AND APPENDIXES

figure 1

Box 1 The Brief IPQ items with matching questions, adjusted for diabetes and partners (0–10 response scale, except item 9)[a]

1. Consequences	How much does your (partner's) diabetes affect your life? (0 = no affect at all, 10 = severely affects my life)
2. Timeline	How long do you think your (partner's) diabetes will continue? (0 = a very short time, 10 = forever)
3. Personal control	How much control do you feel you have (your partner has) over your (his/her) diabetes? (0 = absolutely no control, 10 = extreme amount of control)
4. Treatment control	How much do you think the treatment can help your (partner's) diabetes? (0 = not at all, 10 = extremely helpful)
5. Identity	How much do you (does your partner) experience symptoms from diabetes? (0 = no symptoms at all, 10 = many severe symptoms)
6. Concern	How concerned are you about your (partner's) diabetes? (0 = not at all concerned, 10 = extremely concerned)
7 Understanding	How well do you feel you understand your (partner's) diabetes? (0 = don't understand at all, 10 = understand very clearly)
8. Emotional response	How much does diabetes affect you emotionally? (e.g. does it make you angry, scared, upset or depressed?) (0 = not at all affected emotionally, 10 = extremely affected emotionally)
9. Causal representation	Please list in rank order the three most important factors that you believe caused your (partner's) diabetes. The most important causes for me are: 1. 2. 3.

[a]Cognitive illness representations: items 1–5; emotional representations: items 6 and 8; illness comprehensibility: item 7; causal representation: item 9.

TABLE 1 *Characteristics of patients with newly diagnosed type 2 diabetes and their partners, for screening and clinical diagnosis groups*

	n (%), unless otherwise specified					
	Patients			Partners		
	Screening (*n* = 77)	Clinical diagnosis (*n* = 32)	*P*	Screening (*n* = 77)	Clinical diagnosis (*n* = 32)	*P*
Demographic factors, individual						
Age, mean (SD) years	61.4 (8.7)	59.3 (8.7)	0.26	61.6 (9.2)	56.9 (7.7)	0.01
Sex, male	42 (54.5)	22 (68.8)	0.17	35 (45.5)	10 (31.2)	0.17
Educational level						
Primary	8 (10.7)	10 (31.2)	0.002	9 (12.0)	5 (16.1)	0.85
Secondary	59 (78.6)	14 (43.8)		53 (70.7)	21 (67.8)	
Tertiary	8 (10.7)	8 (25.0)		13 (17.3)	5 (16.1)	
Employment status[a]						
Employed	24 (31.2)	9 (28.1)	0.92	26 (33.8)	8 (25.0)	0.29
Homemaker	13 (16.9)	6 (18.8)		22 (28.6)	12 (37.5)	
Unemployed	9 (11.7)	5 (15.6)		3 (3.9)	4 (12.5)	
Retired	30 (39.0)	11 (34.4)		25 (32.5)	7 (21.9)	
Demographic factors, couple						
Duration of marriage, mean (SD) years[b]	36.4 (10.7)	31.7 (11.2)	0.04			
Children <18 years old	6 (7.8)	2 (6.2)	0.78			
Clinical characteristics						
Diagnosis ≤6 months ago	16 (21.3)	7 (21.9)	0.95			
Glucose-lowering treatment[a]						
Diet only	26 (33.8)	6 (20.0)	0.16			
Oral agents	44 (57.1)	22 (73.3)	0.12			
Insulin	3 (3.9)	4 (13.3)	0.10			
BMI, mean (SD) kg/m²	28.6 (4.4)	30.7 (6.4)	0.05			
SBP, mean (SD) mm Hg	139 (18)	139 (15)	0.96			
HbA_{1c}, mean (SD) %	7.1 (1.7)	7.3 (1.4)	0.61			
HbA_{1c}, mean (SD) mmol/mol	54 (18)	56 (15)	0.61			
Total cholesterol, mean (SD) mmol/l	4.9 (1.1)	5.0 (1.7)	0.65			

BMI, body mass index; HbA_{1c}, hemoglobin A_{1c}; SBP, systolic blood pressure.
[a]Figures do not add up to 100% due to missings or combinations of treatment.
[b]Including duration of cohabitation if not (yet) married.

TABLE 2 *Brief IPQ mean (SD) scores[a] and the effect (β) of screening on these scores compared with clinical diagnosis*

Brief IPQ item	Patients				Partners			
	Screening ($n = 77$)	Clinical diagnosis ($n = 32$)	β (95% CI)[b]	*P*	Screening ($n = 77$)	Clinical diagnosis ($n = 32$)	β (95% CI)[b]	*P*
1. Consequences for own life	4.0 (2.8)	4.3 (2.8)	−0.56 (−1.98 to 0.86)	0.43	**6.4 (3.0)**	**5.1 (2.6)**	**1.53 (0.07 to 2.98)[c]**	**0.04**
2. Length of time diabetes will last	7.8 (3.5)	7.8 (3.6)	0.60 (−0.71 to 1.90)	0.36	8.8 (2.3)	9.5 (1.2)	−1.00 (−2.08 to 0.08)	0.07
3. Patient's ability to control his/her diabetes	6.7 (2.3)	6.1 (3.0)	0.62 (−0.71 to 1.95)	0.36	**8.0 (2.1)**	**6.6 (2.8)**	**1.49 (0.43 to 2.55)[c]**	**0.01**
4. Belief in effect of treatment	7.6 (1.9)	7.4 (2.6)	0.63 (−0.42 to 1.68)	0.24	7.3 (2.2)	7.7 (1.8)	−0.21 (−1.26 to 0.84)	0.69
5. Symptoms experienced by the patient	3.4 (3.1)	3.7 (2.8)	−0.94 (−2.35 to 0.47)	0.19	**6.3 (3.0)**	**5.0 (2.7)**	**1.86 (0.56 to 3.17)[c]**	**0.01**
6. Concern about patient's diabetes	4.1 (2.8)	4.3 (3.0)	−0.66 (−2.14 to 0.83)	0.38	**4.8 (3.0)**	**3.5 (2.4)**	**1.49 (0.11 to 2.87)[c]**	**0.04**
7. Understanding of patient's diabetes	7.2 (2.6)	7.2 (1.8)	0.27 (−0.89 to 1.43)	0.64	7.6 (2.3)	7.5 (1.8)	0.61 (−0.32 to 1.55)	0.19
8. Emotional impact, e.g. anger, fear, depression	3.5 (3.1)	3.3 (3.2)	−0.29 (−1.79 to 1.22)	0.71	7.1 (2.8)	5.8 (3.1)	1.13 (−0.34 to 2.60)	0.13

[a]Items are rated using a 0-to-10 response scale, with higher scores reflecting a stronger belief in or perception of the item.
[b]Adjusted for age, sex, educational level, duration of diabetes, duration of marriage and insulin use.
[c]Significantly ($P < 0.05$) relative to reference category (=clinical diagnosis group).

TABLE 3 *Effect of screening on Brief IPQ scores, compared with clinical diagnosis, by gender*

Brief IPQ item	Patients		Partners	
	Male patients	Female patients	Female partners	Male partners
	β (95% CI)[a]	β (95% CI)[a]	β (95% CI)[a]	β (95% CI)[a]
1. Consequences for own life	−0.96 (−2.77 to 0.86)	0.53 (−2.39 to 3.46)	1.29 (−0.55 to 3.13)	2.07 (−1.13 to 5.26)
2. Length of time diabetes will last	−0.05 (−1.79 to 1.68)	1.80 (−0.70 to 4.29)	**−1.44 (−2.77 to −0.10)[b]**	−0.03 (−2.20 to 2.15)
3. Patient's ability to control his/her diabetes	−0.15 (−1.87 to 1.58)	2.06 (−0.59 to 4.71)	1.32 (−0.04 to 2.67)	0.87 (−1.35 to 3.09)
4. Belief in effect of treatment	−0.38 (−1.73 to 0.97)	**2.17 (0.30 to 4.04)[b]**	−0.22 (−1.60 to 1.15)	−0.80 (−2.96 to 1.36)
5. Symptoms experienced by the patient	−0.88 (−2.57 to 0.80)	−0.89 (−4.17 to 2.39)	**2.31 (0.73 to 3.88)[b]**	0.14 (−2.70 to 2.98)
6. Concern about patient's diabetes	−0.34 (−2.25 to 1.56)	−1.74 (−4.83 to 1.35)	**1.82 (0.14 to 3.49)[b]**	0.40 (−2.66 to 3.45)
7. Understanding of patient's diabetes	0.98 (−1.42 to 1.62)	0.59 (−1.66 to 2.83)	0.63 (−0.56 to 1.82)	−0.13 (−1.56 to 1.31)
8. Emotional impact, e.g. anger, fear, depression	0.21 (−1.70 to 2.12)	−1.55 (−4.68 to 1.58)	0.71 (−1.05 to 2.47)	2.47 (−0.53 to 5.47)

[a]Adjusted for age, educational level, duration of diabetes, duration of marriage and insulin use.
[b]Significantly ($P < 0.05$) relative to reference category (=clinical diagnosis group).

Appendix 1:

Effect of screening on Brief IPQ scores, compared with clinical diagnosis, by age group.

Brief IPQ item	Patients		Partners	
	≤60 years	>60 years	≤60 years	>60 years
	β (95% CI)[a]	β (95% CI)[a]	β (95% CI)[a]	β (95% CI)[a]
1. Consequences for own life	**−2.01 (−4.00 to −0.02)[b]**	0.64 (−1.49 to 2.77)	**2.13 (0.20 to 4.05)[b]**	0.70 (−1.71 to 3.10)
2. Length of time diabetes will last	−0.27 (−1.63 to 1.10)	1.18 (−1.05 to 3.40)	**−1.67 (−3.28 to −0.05)[b]**	−0.46 (−1.92 to 0.99)
3. Patient's ability to control his/her diabetes	0.82 (−1.24 to 2.89)	0.23 (−1.74 to 2.20)	**2.09 (0.51 to 3.68)[b]**	1.14 (−0.42 to 2.70)
4. Belief in effect of treatment	0.23 (−0.98 to 1.45)	1.40 (−0.40 to 3.20)	−0.48 (−1.96 to 1.01)	−0.10 (−1.59 to 1.78)
5. Symptoms experienced by the patient	−1.79 (−3.89 to 0.32)	−0.25 (−2.38 to 1.88)	**3.05 (1.41 to 4.70)[b]**	0.60 (−1.40 to 2.59)
6. Concern about patient's diabetes	−1.61 (−3.75 to 0.53)	0.65 (−1.49 to 2.79)	1.32 (−0.37 to 3.02)	2.32 (−0.14 to 4.78)
7. Understanding of patient's diabetes	−0.03 (−1.60 to 1.54)	0.22 (−1.64 to 2.09)	0.04 (−1.44 to 1.53)	1.19 (−0.03 to 2.42)
8. Emotional impact, e.g. anger, fear, depression	−1.37 (−3.61 to 0.86)	0.95 (−1.25 to 3.15)	**1.85 (0.12 to 3.57)[b]**	0.58 (−2.05 to 3.20)

[a]Adjusted for sex, educational level, duration of diabetes, duration of marriage and insulin use.
[b]Significantly ($P < 0.05$) relative to reference category (=clinical diagnosis group).

Appendix 2:

Effect of screening on Brief IPQ scores, compared with clinical diagnosis, by time since diagnosis.

Brief IPQ item	Patients		Partners	
	<6 months	≥6 months	<6 months	≥6 months
	β (95% CI)[a]	β (95% CI)[a]	β (95% CI)[a]	β (95% CI)[a]
1. Consequences for own life	−0.45 (−3.00 to 2.10)	−0.75 (−2.50 to 0.99)	1.53 (−1.54 to 4.61)	1.59 (−0.22 to 3.41)
2. Length of time diabetes will last	0.99 (−2.98 to 4.96)	−0.08 (−0.66 to 2.25)	−0.44 (−2.88 to 2.00)	**−1.46 (−2.70 to -0.22)[b]**
3. Patient's ability to control his/her diabetes	−0.86 (−4.42 to 2.70)	0.80 (−1.74 to 2.20)	0.53 (−0.95 to 2.00)	**1.73 (0.34 to 3.12)[b]**
4. Belief in effect of treatment	1.59 (−0.79 to 3.96)	0.09 (−1.13 to 1.31)	−1.41 (−3.85 to 1.03)	0.15 (−1.06 to 1.35)
5. Symptoms experienced by the patient	−0.42 (−3.62 to 2.78)	−1.38 (−3.08 to 0.32)	3.01 (−0.18 to 6.20)	**1.83 (0.30 to 3.36)[b]**
6. Concern about patient's diabetes	0.51 (−2.79 to 3.82)	−1.10 (−2.86 to 0.66)	0.15 (−3.39 to 3.69)	**2.00 (0.38 to 3.62)[b]**
7. Understanding of patient's diabetes	−0.08 (−2.45 to 2.30)	0.28 (−1.10 to 1.67)	1.14 (−0.24 to 2.51)	0.43 (−0.76 to 1.62)
8. Emotional impact, e.g. anger, fear, depression	0.06 (−3.27 to 3.39)	−0.45 (−2.20 to 1.31)	−0.52 (−4.15 to 3.10)	1.58 (−0.13 to 3.29)

[a]Adjusted for age, sex, educational level, duration of marriage and insulin use.
[b]Significantly ($P < 0.05$) relative to reference category (=clinical diagnosis group).