The 12-Item Well-Being Questionnaire

An evaluation of its validity and reliability in Dutch people with diabetes

FRANÇOIS POUWER, MSC
HENK M. VAN DER PLOEG, PHD
HERMAN J. ADÈR, PHD
ROBERT J. HEINE, MD, PHD
FRANK J. SNOEK, PHD

OBJECTIVE — The objective of this study was to investigate the validity and reliability of the short-form 12-Item Well-Being Questionnaire (W-BQ12). The 12 items were used to construct the three 4-item subscales Negative Well-Being (NWB), Energy (ENE), and Positive Well-Being (PWB), and the 12-item overall scale General Well-Being (GWB).

RESEARCH DESIGN AND METHODS — A total of 1,472 patients with diabetes completed the W-BQ12, the Hospital Anxiety and Depression scale, and the State Trait Anxiety Inventory. Statistics covered Cronbach's α, Pearson's correlation, *t* tests, and logistic regression. Test-retest reliability was studied in a sample of 202 patients who twice completed the W-BQ12, which was supplemented with the Center for Epidemiological Studies Depression scale and the Short Form (SF)-36 Health Survey.

RESULTS — Of the tested subjects, 739 were defined as having type 1 diabetes and 701 as having type 2 diabetes. Cronbach's α proved to be high and stable across sex and type of diabetes for all W-BQ12 scales. Test-retest reliability ranged from 0.66 (PWB) to 0.83 (GWB), with a mean interval of 66 ± 14 days. Convergent validity of the W-BQ12 scales was supported by high correlations with other measures of affect. Of all scales of the first measurement, ENE proved to have the strongest association with self-reported chronic fatigue. NWB and trait anxiety both had the strongest associations with self-reported depression and current treatment by a psychologist/psychiatrist.

CONCLUSIONS — The W-BQ12 appeared to be a reliable and valid measure of psychological well-being. This short instrument is easy to administer and may be considered a useful tool for both clinicians and researchers to assess the psychological well-being of patients with diabetes.

Diabetes Care 22:2004–2010, 1999

The prevalence of depression is considered to be about three times higher among people with diabetes compared with the general population (1,2). It is recognized that psychopathological conditions, such as depression and anxiety, cannot only have a negative impact on the quality of life of people with diabetes, but also on their treatment adherence and glycemic control (3,4). Depression can be effectively treated in patients with diabetes, but its accurate recognition is often hampered in clinical practice (4–6). One way to facilitate the identification of people with serious psychological problems is to use standardized psychological questionnaires. In 1994, a working group of the World Health Organization/International Diabetes Federation advised using the Well-Being Questionnaire (W-BQ, 22 items) to monitor psychological well-being of patients with diabetes as part of the clinical routine (7).

The complete 22-item version of the W-BQ consists of four subscales labeled Depression, Anxiety, Energy, and Positive Well-Being (8). In the development of the W-BQ, physical indicators of psychological disturbance were not included (e.g., decreased libido and weight loss), since these symptoms can also be a sign of chronic complications of diabetes or can indicate hyper- or hypoglycemia (8,9).

Several studies have evaluated the psychometric qualities of the W-BQ. In one study, the W-BQ was regarded as a one-dimensional scale that could be reduced to a 10-item overall well-being scale (10). However, this 10-item scale contained only one item describing negative well-being ("downhearted and blue"), while the 22-item W-BQ contained eight such items. Hence, the balance of content of this 10-item scale does not reflect that of the original W-BQ, and it is argued that the 10-item scale is an inadequate short-form measure of the original W-BQ (11). The original four-factor structure with 22 W-BQ items was not replicated using exploratory factor analyses (12,13) or confirmatory factor analyses (13,14). This finding is probably because this four-factor model was based on exploratory factor analyses that were performed using only 6–10 W-BQ items in each factor analysis (8). Yet, factor analyses that are conducted simultaneously on all 22 W-BQ items are necessary to draw conclusions about the latent structure of the 22-item W-BQ as a whole (14).

A 12-item short form of the Well-Being Questionnaire (W-BQ12) was developed consisting of three 4-item subscales: Negative Well-Being (NWB), Energy (ENE), and Positive Well-Being (PWB). The 12 items can also be used to construct an overall

From the Department of Endocrinology (R.J.H.), Academic Hospital Vrije Universiteit; the Department of Medical Psychology (F.P., F.J.S., H.M.v.d.P.), the Department of Clinical Epidemiology and Biostatistics (H.J.A.), and the Research Institute for Endocrinology, Reproduction and Metabolism (F.P., F.J.S., R.J.H.), Vrije Universiteit, Amsterdam, the Netherlands.

Address correspondence and reprint requests to F. Pouwer, MSc, Department of Medical Psychology, Vrije Universiteit, Van der Boechorststraat 7, 1081 BT, Amsterdam, the Netherlands. E-mail: f.pouwer.psychol@med.vu.nl.

Received for publication 11 May 1999 and accepted in revised form 5 August 1999.

Abbreviations: CES-D, Center for Epidemiological Studies Depression; D-FISQ, Diabetes Fear of Injecting and Self-Testing Questionnaire; DVN, Diabetes Vereniging Nederland (Dutch Organization of People with Diabetes); ENE, 4-Item Energy; GWB, 12-Item General Well-Being; HADS, Hospital Anxiety and Depression Scale; NWB, 4-Item Negative Well-Being; PAID, Problem Areas in Diabetes; PWB, 4-Item Positive Well-Being; SF-36, Short Form 36; STAI, State Trait Anxiety Inventory; W-BQ, Well-Being Questionnaire (22 items); W-BQ12, short-form Well-Being Questionnaire (12 items).

A table elsewhere in this issue shows conventional and Système International (SI) units and conversion factors for many substances.

Table 1—*Self-reported sample characteristics*

Marital status	
Married/living together	75 (1,103)
Not married	15 (218)
Widowed	7 (97)
Divorced	3 (48)
Highest completed education	
Primary school	12 (171)
Lower vocational	19 (259)
General secondary	20 (277)
Senior secondary/senior general secondary	26 (363)
Higher vocational/ university	23 (318)
Duration of diabetes (years)	
0–9	35 (504)
10–19	33 (483)
20–29	18 (256)
≥30	14 (204)
Number of complications	
0	59 (879)
1	21 (313)
≥2	20 (269)
Diabetes complications	
Retinopathy	25 (372)
Nephropathy	4 (65)
Cardiovascular	10 (154)
Diabetic foot	10 (154)
Neuropathy	11 (165)

Data are % (*n*). *n* = 1,472. Numbers do not add up to 1,472 because of missing values.

scale labeled General Well-Being (GWB). In a recent study that investigated the same large data-set as the present study, the latent structure of the W-BQ was studied with exploratory and powerful confirmatory factor analyses (14). Only the aforementioned three-factor solution was supported and appeared to be stable across type of diabetes, sex, and level of education, with robust confirmatory fit indexes ≥0.90 (14).

Except for the factor structure, no other psychometric characteristics of the W-BQ12 have been reported yet. Therefore, we investigated the validity and reliability of the short-form Well-Being Questionnaire in Dutch patients with diabetes.

RESEARCH DESIGN AND METHODS

— A booklet of questionnaires, two accompanying letters explaining the goals and procedures of the study, and a prestamped response envelope were mailed to 3,000 members of the Dutch Organization of People with Diabetes (Diabetes Vereniging Nederland [DVN]). Subjects were randomly selected by the DVN, using a computer file that contained all ~40,000 diabetic adult members of the DVN. Subjects were requested to fill out a set of questionnaires and additional questions concerning their sex, age, marital status, highest level of education, medication, glycemic control, age at onset of diabetes, complications of diabetes, comorbidity, and current treatment by a psychiatrist or psychologist. The following response options were used to assess psychopathological comorbidity: depression, anxiety, eating disorder, schizophrenia, and chronic fatigue. Subjects were invited to give their name and address if they were willing to participate in a follow-up study. From the response group, 250 patients were selected by taking every fifth questionnaire that was returned (number 5, 10, 15, etc.). To investigate the test-retest reliability of the W-BQ12, a second set of questionnaires was sent ~2 months after the first assessment to 213 of the 250 patients (85%) who gave us their names and addresses.

Instruments (first and second assessment)

To study the validity of the W-BQ12, the first booklet contained the Dutch versions of the W-BQ (14,15), the Hospital Anxiety and Depression Scale (HADS) (16), and the trait scale of the State Trait Anxiety Inventory (STAI) (17–19). It has been suggested that positive and negative affect are two unipolar dimensions (19): items designed to measure positive affect (e.g., I enjoy things) do not simply measure the opposite of negative affect (e.g., I feel depressed). Therefore, 10 positively worded STAI items were also used to construct a positive affect scale, while the 10 STAI items with a negative content were used to construct a scale measuring negative affect. To validate the Diabetes Fear of Injecting and Self-Testing Questionnaire (D-FISQ) and the Problem Areas in Diabetes (PAID) scale for the Dutch population, this first booklet also contained the Dutch versions of the D-FISQ (20), the PAID scale (21), the Diabetes Quality of Life Measure (22), the Diabetes Coping Measure (23), and the Fear of Hypoglycemia Survey (24).

Besides the W-BQ12, the second booklet contained the Center for Epidemiological Studies Depression (CES-D) scale to measure symptoms of depression during the last week (25,26). The overall Depression scale and the following CES-D subscales were calculated: Somatic-Retarded Activity, Depressed Affect, Positive Affect, and Interpersonal Affect (25,27). The Short Form (SF)-36 Health Survey (28) was used as a generic measure of health status encompassing eight dimensions of health: Physical Functioning, Social Functioning, Role Limitations (physical problem), Role Limitations (emotional problem), Mental Health, Vitality, Pain, and General Health Perception. For each dimension, item scores were coded, summed, and transformed to a scale from 0 (worst health) to 100 (best health) (28).

Statistical analysis

SPSS 7.5 for Windows (SPSS, Chicago) was used to perform statistical analyses (29). A cross-validation design was used to avoid capitalization on chance: the total sample was randomly divided into two equal groups labeled A and B. To assess the homogeneity of the scales, we calculated Cronbach's α (30), the item-total correlations, and the inter-item correlations in eight subgroups (31). Group A and B were split into groups A_1 and B_1 (men with type 1 diabetes), A_2 and B_2 (women with type 1 diabetes), A_3 and B_3 (men with type 2 diabetes), and A_4 and B_4 (women with type 2 diabetes). Pearson's correlation coefficient was used to investigate the convergent and discriminant validity (in group A and B), as well as the test-retest reliability of the W-BQ12 scales. For internal consistency, it is stated that an α of 0.70–0.80 is desirable and that the item-total correlations should be >0.20 (31). Correlation coefficients of 0.70–0.80 are considered to be an indication of sufficient test-retest reliability (31). Convergent validity was also investigated with *t* tests and logistic regression analyses in the whole sample. In view of the high number of statistical tests in the correlational analyses, only *P* values ≤0.001 were considered significant. Likewise, 99% CIs were calculated for each odds ratio. To make comparisons among different possible scales, individual scale scores were transformed to *z* scores before *t* tests, and logistic regression analyses were performed. For each subject, a maximum of one missing W-BQ12 value was estimated by calculating the mean of the remaining items of the same scale. Cases with more than one missing W-BQ12 value were deleted.

RESULTS

— The questionnaire was filled out and returned by 1,472 people with diabetes (49% response rate). Sex was

Table 2—*Reliability of the W-BQ12 scales in groups $A_{1–4}$ and $B_{1–4}$*

			NWB			ENE			PWB			GWB		
Group	Type, sex	*n*	α	Range r_{ii}	Range r_{ir}	α	Range r_{ii}	Range r_{ir}	α	Range r_{ii}	Range r_{ir}	α	Range r_{ii}	Range r_{ir}
A_1	Type 1, M	195	0.78	0.30–0.73	0.41–0.67	0.82	0.40–0.67	0.52–0.69	0.81	0.43–0.62	0.57–0.66	0.89	0.17–0.74	0.46–0.72
B_1	Type 1, M	187	0.73	0.20–0.64	0.38–0.59	0.81	0.46–0.63	0.56–0.68	0.81	0.47–0.66	0.58–0.68	0.88	0.15–0.66	0.39–0.70
A_2	Type 1, F	179	0.81	0.41–0.60	0.58–0.67	0.84	0.48–0.63	0.63–0.73	0.80	0.43–0.67	0.53–0.67	0.89	0.11–0.68	0.55–0.71
B_2	Type 1, F	167	0.82	0.43–0.72	0.61–0.69	0.81	0.44–0.60	0.61–0.66	0.82	0.49–0.66	0.62–0.67	0.88	0.11–0.72	0.49–0.64
A_3	Type 2, M	166	0.81	0.42–0.75	0.54–0.73	0.79	0.33–0.64	0.47–0.67	0.80	0.30–0.71	0.49–0.76	0.89	0.20–0.75	0.48–0.69
B_3	Type 2, M	162	0.84	0.48–0.63	0.62–0.75	0.80	0.41–0.65	0.54–0.66	0.81	0.46–0.67	0.59–0.67	0.89	0.22–0.66	0.53–0.68
A_4	Type 2, F	141	0.79	0.44–0.61	0.56–0.64	0.87	0.53–0.74	0.67–0.75	0.82	0.46–0.61	0.63–0.67	0.91	0.23–0.74	0.56–0.74
B_4	Type 2, F	189	0.78	0.32–0.68	0.46–0.68	0.77	0.29–0.66	0.48–0.62	0.83	0.48–0.71	0.60–0.71	0.88	0.12–0.72	0.46–0.68

α, Cronbach's coefficient; r_{ii}, inter-item correlation; r_{ir}, corrected item-total correlation.

equally distributed; 722 subjects (49%) were female. Mean age was 51 ± 16 years, ranging from 18–82 years. Most subjects (75%) were married and/or lived together with a partner (Table 1). Almost half of the subjects completed senior (general) secondary education, higher vocational education, or university-level education.

Subjects who were younger than 40 years when their diabetes was diagnosed, and who thereby required insulin therapy from diagnosis onward, were classified as having type 1 diabetes. Those who did not meet these criteria were regarded as patients with type 2 diabetes. Therefore, 739 subjects were defined as having type 1 diabetes (51%), 199 as having type 2 diabetes treated with diet/oral hypoglycemic agents (14%), and 502 as having type 2 diabetes treated with insulin (35%). Because of missing data, the type of diabetes of 32 patients could not be determined. Self-reported most recent HbA_{1c} was 7.7 ± 1.5% for type 1 patients, 7.6 ± 1.6% for patients with type 2 diabetes treated with tablets and/or diet, and 7.9 ± 1.5% for patients with type 2 diabetes treated with insulin. Mean known duration of diabetes was 16 ± 12 years. There were 582 subjects (41%) who reported having one or more diabetes complications, of which 64% suffered from retinopathy. The number of complications did not differ across sex.

Of the patients, 60 (4%) reported to be under treatment of a psychologist/psychiatrist at the time of the first assessment. There were 128 subjects (9%) who reported to suffer from chronic fatigue and 85 subjects (6%) who responded that they were depressed. Of the 60 patients who responded as being under the treatment of a psychologist/psychiatrist, 23 (38%) also answered as suffering from a depression, 7 (12%) as suffering from anxiety, and 5 (8%) as suffering from an eating disorder (not specified). None of the respondents reported to have schizophrenia. In the whole sample, 29 subjects (2%) had one missing W-BQ12 value, and 57 subjects (4%) had more than one missing value on this instrument. For all W-BQ12 items, the percentages of subjects with a missing value ranged from 2.8% for item 12 (cope with problems) to 3.3% for items 3 (feel afraid) and 6 (feel dull). The skewness and kurtosis of the W-BQ12 scales were –0.7 and 0.2 (PWB), −0.6 and −0.3 (ENE), 1.3 and 1.1 (NWB), and −0.7 and 0 (GWB).

Reliability

The internal consistency was sufficient for all W-BQ12 subscales in group $A_{1–4}$ and $B_{1–4}$ (Table 2). Moreover, all corrected item-total correlations exceeded 0.20. In all eight subgroups, the α coefficient proved to be very high (>0.88) for the GWB scale. The W-BQ12 was completed for a second time by 202 subjects (response rate 81%) on average 66 ± 14 days after the first assessment. Pearson's product moment correlations between corresponding scales at the first and the second assessment were 0.77 (NWB), 0.80 (ENE), 0.66 (PWB), and 0.83 (GWB).

Sex differences

Untransformed mean scores on the W-BQ12 subscales are shown for both sexes, separately for patients with type 1 and type 2 diabetes (Table 3). As can be seen in Table 3, women had significantly higher scores on NWB and Anxiety (HADS, STAI) and also scored significantly lower than men on the ENE and GWB scales. A trend was found among women scoring lower on PWB and higher on HADS Depression in both groups of patients.

Glycemic control and psychological well-being

For the total sample, self-reported HbA_{1c} showed low significant ($P < 0.001$) correlations with trait anxiety (0.12), HADS Depression (0.11), and ENE (−0.10), while displaying nonsignificant correlations with NWB (0.09), PWB (−0.01), and

Table 3—*Mean scores on the scales of the W-BQ12, the HADS, and the STAI for men and women with type 1 and type 2 diabetes*

	Type 1 diabetic patients			Type 2 diabetic patients		
Scale	Men	Women	Δ	Men	Women	Δ
n	388	346	—	349	354	—
NWB	1.2 ± 1.9	2.7 ± 2.8	−0.57†	1.6 ± 2.3	2.8 ± 2.8	−0.51†
ENE	8.6 ± 2.6	7.7 ± 2.8	0.34†	8.5 ± 2.7	7.5 ± 3.0	0.36†
PWB	8.6 ± 2.5	8.1 ± 2.6	0.18*	8.5 ± 2.6	8.1 ± 2.9	0.16*
GWB	27.9 ± 5.9	25.1 ± 6.8	0.42†	27.4 ± 6.4	24.7 ± 7.5	0.40†
HADS Anxiety	4.2 ± 3.4	5.3 ± 3.4	−0.33†	4.4 ± 3.4	5.8 ± 3.9	−0.40†
HADS Depression	3.0 ± 3.1	3.1 ± 3.3	−0.03	3.8 ± 3.6	4.4 ± 4.1	−0.17*
STAI Trait Anxiety	33.7 ± 10.0	38.3 ± 10.4	−0.42†	34.8 ± 10.7	38.7 ± 11.4	−0.36†

Data are means ± SD. Comparisons are based on *t* tests. *$P < 0.05$; †$P < 0.001$. Δ, Mean *z* score of men minus mean *z* score of women.

Table 4—*Mean scores on the scales of the W-BQ12, the HADS, and the STAI of patients with and without long-term complications in groups of subjects with type 1 and type 2 diabetes*

	Type 1 diabetic patients			Type 2 diabetic patients		
Scale	Complications	No complications	Δ	Complications	No complications	Δ
n	266	458	—	349	354	—
NWB	2.1 ± 2.7	1.8 ± 2.3	0.14	2.7 ± 2.9	1.9 ± 2.4	0.33†
ENE	7.7 ± 2.8	8.4 ± 2.6	−0.25†	7.5 ± 3.0	8.3 ± 2.8	−0.31†
PWB	7.9 ± 2.7	8.6 ± 2.4	−0.29†	7.6 ± 2.8	8.7 ± 2.7	−0.39†
GWB	25.4 ± 7.0	27.3 ± 6.1	−0.28†	24.4 ± 7.2	27.2 ± 6.8	−0.41†
HADS Anxiety	5.2 ± 3.3	4.4 ± 3.3	0.22*	5.8 ± 4.0	4.7 ± 3.5	0.30†
HADS Depression	3.8 ± 3.6	2.6 ± 2.9	0.34†	5.0 ± 4.1	3.5 ± 3.7	0.41†
STAI Trait Anxiety	38.1 ± 11.5	34.6 ± 9.6	0.32†	38.7 ± 11.5	35.4 ± 10.8	0.30†

Data are means ± SD. Comparisons are based on *t* tests. *$P < 0.01$; †$P < 0.001$. Δ, Mean *z* score of subjects with complications minus mean *z* score of subjects without diabetes-related complications.

HADS Anxiety (0.07). In both groups of patients with type 1 and type 2 diabetes, these correlations were in the same direction and range but were no longer significant (data not shown).

Long-term complications of diabetes and psychological well-being

Using *t* tests, we compared psychological well-being scores of patients with and without one or more self-reported long-term complications of diabetes in the same way we compared men and women. Of the patients with type 2 diabetes, subjects with long-term complications reported significantly lower psychological well-being on all scales compared with subjects without long-term complications (Table 4). HADS Depression, PWB, and GWB appeared to be the best discriminators between both groups. Of the subjects with type 1 diabetes, those without complications reported better psychological well-being than patients having long-term complications on all scales, except NWB and HADS Anxiety.

Convergent and discriminant validity

Table 5 displays correlations between the W-BQ12 and other measures of affect. NWB correlated between −0.57 and −0.51 with PWB and ENE, while PWB and ENE showed correlations of 0.62 and 0.66. The overall GWB correlated between ½0.80½and ½0.88½with the W-BQ12 subscales. The correlations among NWB, HADS Anxiety, and STAI trait anxiety all exceeded 0.70. The correlations between NWB and HADS Depression were lower (0.54, 0.60). The correlation between ENE and Vitality was 0.85 (Table 6), and PWB correlated highly with Positive Affect (0.65, 0.68) and somewhat lower with Negative Affect (−0.61, −0.55). The correlations for the W-BQ12 with Mental Health ranged from ½0.58½(ENE) to ½0.75½(GWB), and from ½0.15½to ½0.35½with Physical Functioning, Physical Role Limitations, Pain, and General Health Perception (Table 6). Logistic regression analyses were performed to investigate which scales were the most useful in discriminating between 60 subjects who reported being under treatment of a psychologist/psychiatrist and a randomly selected sample of 100 subjects who did not report being under such treatment at the time of assessment. To compare the relative importance of potential determinants, all logistic regression analyses were conducted using one scale in each analysis. The interpretation of the odds ratios of scales that showed a negative association with the dependent variable was facilitated by the calculation of the inverse of these odds ratios (1/odds ratio). Forward stepwise selection was used. Sex, income, type of diabetes, and level of education were initially entered into the equation; each of the aforementioned scales was entered in a second step. The likelihood-ratio test was performed to determine which variables would be removed from the model.

As can be seen in Table 7, all scales were significantly related to all three dependent variables. The highest odds ratios with self-reported treatment by a psychologist/psychiatrist were found for Trait anxiety, GWB, NWB, ENE, and HADS Depression, ranging from 3.1 to 3.4. Odds ratios for PWB and HADS Anxiety were lower (2.6 and 2.4, respectively). NWB had the highest odds ratio with self-reported depression (5.5), followed by Trait Anxiety (5.4) and GWB (5.3). ENE was by far the best cross-sectional determinant of self-reported chronic fatigue (odds ratio 4.2). In the equation with chronic fatigue as the dependent variable and PWB as the independent variable, the odds ratio was corrected for the influence of sex.

CONCLUSIONS — The W-BQ12 is a brief easy-to-administer questionnaire that consists of 12 items designed to acquire information about different aspects of the psychological well-being of subjects, including patients with diabetes. The present study is the first evaluation of the validity and reliability of the Dutch version of the W-BQ12 as it applies to a large sample of male and female individuals with type 1 and type 2 diabetes. Our data suggest that the Dutch version of the W-BQ12 is indeed a valid and reliable instrument that can be used to assess the psychological well-being of people with diabetes. Sufficient internal consistencies and high item-total correlations, which were all stable across sex and

Table 5—*Pearson's product moment correlations between W-BQ12 scales and measures of anxiety and depression in group A* (n = 736) *and B* (n = 736)

	ENE		NWB		PWB		GWB	
Scale	A	B	A	B	A	B	A	B
NWB	−0.57	−0.52	—	—	—	—	—	—
PWB	0.66	0.62	−0.57	−0.51	—	—	—	—
GWB	0.88	0.86	−0.83	−0.80	0.87	0.85	—	—
HADS Depression	−0.61	−0.60	0.60	0.54	−0.69	−0.61	−0.74	−0.69
HADS Anxiety	−0.61	−0.54	0.72	0.71	−0.63	−0.56	−0.76	−0.72
STAI Trait Anxiety	−0.69	−0.64	0.72	0.72	−0.71	−0.67	−0.82	−0.80
STAI Positive Affect	0.64	0.63	−0.64	−0.61	0.68	0.65	0.76	0.75
STAI Negative Affect	−0.61	−0.52	0.67	0.70	−0.61	−0.55	−0.73	−0.70

$P < 0.001$ for all correlations.

Table 6—*Pearson's product moment correlations between W-BQ12 scales and measures of anxiety, depression, and health status in the retest sample*

Scales	NWB	PWB	ENE	GWB
CES-D Depression (total)	0.67	−0.68	−0.66	−0.80
CES-D Somatic Retarded Activity	0.64	−0.66	−0.69	−0.78
CES-D Depressed Affect	0.76	−0.58	−0.58	−0.74
CES-D Positive Affect	−0.48	0.66	0.54	0.66
CES-D Interpersonal Affect	0.42	−0.41	−0.30	−0.44
SF-36 Physical Functioning	−0.34	0.22	0.33	0.35
SF-36 Social Functioning	−0.43	0.42	0.40	0.49
SF-36 Role Limitations Physical	−0.26	0.21	0.31	0.31
SF-36 Role Limitations Emotional	−0.43	0.53	0.45	0.56
SF-36 Mental Health	−0.70	0.62	0.58	0.75
SF-36 Vitality	−0.58	0.61	0.85	0.82
SF-36 Pain	−0.15	0.30	0.30	0.30
SF-36 General Health Perception	−0.22	0.29	0.31	0.32

$n = 202$. $P < 0.001$ for all correlations.

type of diabetes, indicated homogeneity of the scales and thereby supported the reliability of the W-BQ12. Correlations between scales that are designed to measure the same construct are generally expected to fall in the range from 0.4 (moderate) to 0.8 (high) (31). Because all correlations between W-BQ12 scales and other measures of affect were >0.50, the results of the present study supported the convergent validity of the W-BQ12. Lower correlations (ranging from |0.21| to |0.56|) between the W-BQ12 scales and Physical Functioning, Physical Role Limitations, and Pain and General Health Perception (SF-36) can be interpreted as evidence for the discriminant validity of the W-BQ12. Cronbach's α ranged from 0.88 to 0.91 for the GWB scale, thereby suggesting item redundancy. However, for scales consisting of more than 10 items, a Cronbach's α >0.90 is not uncommon, since this index of internal consistency tends to increase with a greater number of items in a scale (31). Test-retest reliabilities of most scales were high (≥0.77) and somewhat lower for the PWB scale (0.66). This lower correlation may be interpreted as an indication of greater sensitivity to small changes in positive psychological well-being, yet further research is needed to test this hypothesis.

There are some limitations that need to be mentioned. First, the present study was conducted in a Dutch sample of patients with diabetes, who were all members of a patient organization. The majority of the subjects was also highly educated and may have been more inclined to take care of their diabetes. These sample characteristics may have biased our results. Hence, further research is needed to test whether our results can be replicated in population-based and non-Dutch samples. Second, the biomedical data were based on self-reports by the subjects. As a result, the number of complications has probably been underestimated. Concerning glycemic control, we found that self-reported HbA_{1c} showed only weak negative associations with psychological well-being. Interestingly, these results corroborated the findings of other studies that used independent measures of glycemic control (8,12,32,33). The consistently low correlation between the psychological well-being scales and glycemic control might be because general well-being is affected by a variety of factors apart from glycemic control (32). We found lower levels of psychological well-being in patients with self-reported complications of diabetes. These results are in line with the results of other studies, showing that diabetes-related complications were associated with lower positive well-being, poorer mental health, and lower quality of life (2,32,34,35). Only one study (8) reported that subjects with retinopathy or foot ulcers had higher psychological well-being scores than respondents without this condition.

The PWB and ENE scales are perhaps the most innovative features of the W-BQ12. Most instruments that are developed to assess (aspects of) psychological well-being lack such scales, since they are focused on negative affect. As investigations concerning the utility of the W-BQ12 continue, it will be valuable to examine how the W-BQ12 scales relate to different aspects of psychological well-being (e.g., self-acceptance, positive relations with others and autonomy). For this purpose,

Table 7—*W-BQ12, HADS, and STAI scales as determinants of self-reported current psychological/psychiatric treatment, depression, or chronic fatigue after adjustment for sex, income, type of diabetes, and level of education*

	Psychological/psychiatric treatment*			Depression†			Chronic fatigue‡		
Variable	B ± SEM	OR (99% CI)	1/OR	B ± SEM	OR (99% CI)	1/OR	B ± SEM	OR (99% CI)	1/OR
NWB	1.16 ± 0.20	3.20 (1.9–5.4)	—	1.70 ± 0.26	5.50 (2.8–10.9)	—	0.75 ± 0.15	2.12 (1.4–3.1)	—
ENE	−1.14 ± 0.22	0.32 (0.2–0.6)	3.13	−1.17 ± 0.21	0.31 (0.2–0.5)	3.21	−1.44 ± 0.20	0.24 (0.1–0.4)	4.22
PWB	−0.86 ± 0.18	0.43 (0.3–0.7)	2.36	−1.08 ± 0.19	0.34 (0.2–0.6)	2.96	−0.74 ± 0.15	0.48 (0.3–0.7)	2.09§
GWB	−1.21 ± 0.21	0.30 (0.2–0.5)	3.34	−1.66 ± 0.27	0.19 (0.1–0.4)	5.27	−1.19 ± 0.18	0.30 (0.2–0.5)	3.30
HADS Anxiety	0.97 ± 0.19	2.63 (1.6–4.3)	—	1.24 ± 0.21	3.45 (2.0–5.9)	—	0.68 ± 0.14	1.97 (1.4–2.9)	—
HADS Depression	1.14 ± 0.21	3.13 (1.8–5.4)	—	1.19 ± 0.20	3.28 (2.0–5.5)	—	0.85 ± 0.16	2.34 (1.6–3.5)	—
STAI Trait Anxiety	1.23 ± 0.23	3.41 (1.9–6.2)	—	1.69 ± 0.26	5.42 (2.8–10.7)	—	0.97 ± 0.17	2.64 (1.7–4.0)	—

Scales were all transformed to z scores. *60 patients with self-reported psychological/psychiatric treatment were compared with 100 randomly selected patients without such a treatment; †85 patients with self-reported depression were compared with 100 randomly selected patients without self-reported depression; ‡128 patients with self-reported chronic fatigue were compared with 150 randomly selected patients without self-reported chronic fatigue; §with male sex selected as a significant determinant in the equation. Statistics for sex: B ± SEM, −0.96 ± 0.31; OR (99% CI), 0.30 (0.2–0.8); 1/OR, 2.63. OR, odds ratio.

researchers can use the PWB inventory (36,37). This instrument is theory-based because it has been developed after a review of the considerable theoretical literature on the meaning of positive well-being (36). The findings of the present study underscore the importance of including separate items measuring positive affect. The absence of negative affect does not necessarily mean the presence of positive affect. It was shown that both scales (NWB and PWB) had different supplementary psychometric qualities.

In line with the literature on sex differences in psychological well-being (38), men had more favorable scores on PWB, NWB, and ENE than women in the present study. Yet, the NWB scale was the most sensitive in detecting differences in psychological well-being between both sexes, while the PWB scale discriminated the best between those with and without complications of diabetes. The NWB scale had its highest associations with anxiety scales and somewhat lower correlations with scales measuring depression. Therefore, the construct that was assessed by the NWB scale appeared to be more closely related to anxiety than to depression. The convergent validity of the ENE scale was supported by a high correlation between Energy and Vitality (SF-36). In the logistic regression analyses, this scale also showed by far the highest association with self-reported chronic fatigue.

All W-BQ12 subscales proved to be significant predictors of self-reported depression and psychological/psychiatric treatment. When the W-BQ12 subscales were compared with other measures of psychological well-being (HADS and STAI), it appeared that the Trait Anxiety, GWB, and NWB showed comparable odds ratios with current psychological/psychiatric treatment. Although not especially designed to identify cases of depression, NWB, GWB, and STAI Trait Anxiety had the highest associations with self-reported depression with odds ratios >5. The odds ratios in the logistic regression analyses are probably underestimated in the present study, since the group of subjects without current psychological/psychiatric treatment may well have contained patients who actually needed treatment, but in fact did not receive it.

It is recommended to use the Well-Being Questionnaire to identify patients with diabetes who have severe psychological difficulties (such as anorexia and other eating disorders, clinical depression, or destructive family relationships) (7). Yet, this recommendation is not evidence based: the sensitivity and specificity of this instrument in detecting patients with the aforementioned psychological problems are currently unknown. Although the present study provided some evidence for the clinical utility of the W-BQ12 by showing that the NWB and GWB scale were strongly associated with self-reported depression, future research is needed to determine the usefulness of the W-BQ12 as a monitoring instrument and to compare it further with other generic and diabetes-specific instruments (e.g., the SF-36 and the PAID scale).

In summary, the results of the present study have provided convincing evidence that supports the reliability and validity of the Dutch version of the W-BQ12 in men and women with type 1 and type 2 diabetes.

Acknowledgments — This work was financially supported by the Dutch Diabetes Research Foundation (Diabetes Fonds Nederland [DFN]), project number 95.805.

The authors wish to express their gratitude to the board and members of the Dutch Organization of People with Diabetes (DVN) for their kind cooperation in this study.

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