The Problem Areas in Diabetes Scale

An evaluation of its clinical utility

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OBJECTIVE — To evaluate the reliability and concurrent and discriminant validity of the Problem Areas in Diabetes (PAID) scale, a new measure of emotional functioning in diabetes.

RESEARCH DESIGN AND METHODS — A battery of questionnaires, including the PAID, was completed by 256 volunteer diabetic outpatients. In our analyses, we examined the PAID's internal structure and compared mean IDDM and NIDDM treatment group scores in regression analyses to explore its discriminant validity. We also evaluated concurrent validity from the correlations between the PAID and diabetes-specific measures of coping and health attitudes and HbA_{1c}.

RESULTS — Principal component analyses identified a large emotional adjustment factor, supporting the use of the total score. Significant sizable correlations were found between the PAID and a range of selected health attitudinal measures. There were significant differences (with small-to-moderate effect sizes) in PAID scores between IDDM and NIDDM patients and between IDDM and NIDDM insulin- and tablet-treated subgroups; no differences were found between NIDDM insulin- and tablet-treated subgroups.

CONCLUSIONS — The study findings provided support for the construct validity of the PAID, including evidence for discriminant validity from its ability to detect differences between IDDM and NIDDM treatment groups expected to differ in the emotional impact of life with diabetes. Future studies should explore the PAID's performance in nonspecialist treatment settings as well as its responsiveness to clinical change.

Diabetes is a chronic medical illness that requires careful adherence to a daily treatment regimen that can be complex and demanding. For patients with diabetes, treatment can have a significant impact on many aspects of quality of life. Work, interpersonal relationships, social functioning, and physical and emotional well-being can be substantially impacted by diabetes and its treatment. Diabetes patients need to not only integrate treatment regimens into their daily lives but also cope with the threat or actual onset of diabetes complications as they manage ongoing age-specific developmental tasks unrelated to diabetes (e.g., development of autonomy and separation from the family in adolescence, development of family and work roles in adulthood) (1,2).

It is not surprising, therefore, that some patients experience emotional distress and significant motivational problems over the course of their diabetes management. Feelings of guilt and discouragement, of being overwhelmed or burned-out may be reported. For some patients, overt psychiatric disorders known to be linked to markedly poor blood glucose control (e.g., major depression, eating disorders) may develop (3–5). The adjustment process to life with diabetes has been well documented in the clinical literature (e.g., 1,2,6–10).

Polonsky et al. (11) recently introduced the Problem Areas in Diabetes (PAID) scale, a 20-item measure of emotional adjustment to life with diabetes that appears potentially useful to diabetes clinicians. Based on data from 451 insulin-requiring women with IDDM and NIDDM, the PAID showed high internal reliability, sound concurrent validity in terms of the pattern of correlations with a number of theoretically related measures (e.g., hypoglycemia fear, psychiatric symptoms), and evidence of predictive validity for adherence to treatment and blood glucose control.

To date, however, no examination has been reported of PAID score differences that might be expected between patients differing in the complexity of their treatment regimen. This could prove a particularly valuable evaluation of the discriminant validity of the PAID. In the present study, we hypothesized that patients with IDDM would report higher PAID scores (indicating greater distress) than NIDDM patients, based on the expectation that IDDM patients would experience greater physical, psychological, and social demands associated with earlier illness onset and a more complicated treatment regimen (involving more intensive exogenous insulin treatment, hypoglycemia management, and blood glucose testing). We also hypothesized that PAID scores among NIDDM patients would be lowest for those treated by diet and exercise treatment alone, higher for those on oral hypoglycemic tablets, and highest for those who had progressed to insulin.

In addition, given the association between diabetes emotional functioning and health-related cognitions (e.g., 1,7,8), we also examined the relationship of PAID scores to a range of diabetes-specific health attitudes to evaluate the PAID's convergent validity. The health attitudes included four different coping strategies previously described for diabetes (12,13), a measure of diabetes treatment-related social support, and a measure of health beliefs based on the Health Belief Model (14) and self-efficacy theory (15). We hypothesized that higher PAID scores would predict poorer attitudinal adjustment, as measured by the diabetes health attitude measures, and perceptions of less social support. Finally, we examined sex differences in mean PAID scores (a comparison not previously done), and examined the internal structure of the PAID using principal components analysis to extend earlier reliability analyses (11).

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DCM, Diabetes Coping Measure; HBM, Health Belief Model; PAID, Problem Areas in Diabetes scale.

RESEARCH DESIGN AND METHODS

Patients

The study sample comprised consecutive outpatients who volunteered to take part in the study and sign informed consent forms at the time of clinic visit. Patients were excluded if they were under age 18 years, experiencing severe visual problems, unable to complete the study questionnaires, pregnant, or if HbA_{1c} data were not obtained (i.e., newly diagnosed patients, some NIDDM diet-treated patients). Patients were defined as IDDM if diabetes onset was ≤40 years of age and they were on permanent insulin therapy within 2 years of diagnosis (16). The remainder were classified into 3 groups: NIDDM treated by insulin, NIDDM treated by tablet, and NIDDM treated by diet and exercise (see Table 1 for clinical and demographic characteristics of these IDDM and NIDDM groups).

Measures

Demographic and clinical variables. Age, onset and duration of diabetes, years of completed education, sex, marital status, diabetes type, and HbA_{1c} value were recorded. Total HbA_{1c} was measured by an agar gel electrophoretic method (17); the normal range in our laboratory was 5.4–7.4%. The coefficient of variation was 4.42%. HbA_{1c} and random blood glucose were drawn on the day of the completion of study questionnaires.

Emotional distress. The PAID is a 20-item measure of diabetes-specific emotional distress that measures a wide range of feelings related to living with diabetes and its treatment, including guilt, anger, depressed mood, worry, and fear. Earlier research showed that the PAID had high internal reliability (coefficient alpha = 0.95), correlated strongly with a standardized measure of general psychological distress ($r = 0.63$), moderately with HbA_{1c} ($r = 0.30$), and weakly with age ($r = -0.11$). PAID scores were significantly related to perceived treatment adherence and blood glucose control in separate analyses controlling for age, diabetes duration, and general emotional distress. The PAID has been rescaled since its first introduction for greater ease of interpretation. It is scored 0–100, with higher scores indicating greater emotional distress.

Attitudinal coping styles. The ATT39 (12,13) and the Diabetes Coping Measure (DCM; 18) together assess four separate diabetes-specific coping styles. The ATT39 provides a 19-item subscale on diabetes integration. A low score indicates the patient views diabetes as burdensome and intrusive and has poorly integrated diabetes into his or her life. The ATT39 was developed empirically following item writing based on clinical experience and a review of the diabetes literature.

The 23-item DCM provides three coping subscales (tackling spirit, avoidance-distraction, and passive-acceptance). These subscales were developed from clinical themes described in previous research on coping with chronic medical illness (19,20) and subsequent empirical analyses (18). Patients scoring high on passive-resignation coping are helpless and hopeless in their attitude to diabetes (e.g., "I just feel like giving in to my diabetes"). Patients scoring high on avoidance-distraction coping use distraction and avoidance coping techniques to reduce worry about diabetes (e.g., "When I am uncomfortable thinking about diabetes, I distract myself by doing something else"). Patients scoring high on tackling spirit are actively involved in their treatment, can see a positive side to diabetes, and are generally positive in their outlook (e.g., "Most people would be a lot healthier if they followed a diabetic diet"; "Clinical research is continually improving the treatments available for diabetes"). The ATT39 diabetes integration scale and the three DCM coping scales have been shown to have adequate internal reliability; support for their construct validity comes from factor analyses and studies of concurrent and discriminant validity (12,13,18). The subscales are scored 0–100, with higher scores indicating greater use of the coping strategy.

Diabetes Social Support scale. This scale assesses perceptions of diabetes-related social support by measuring the perceived discrepancy between desired and received support from health care providers, family, and friends in four separate support domains identified from previous theoretically grounded research (21). This eight-item measure comprises four subscales: treatment activities (i.e., help patient with practical diabetes treatment tasks [e.g., making meals, buying diabetes supplies, driving to hospital clinic]), treatment information (i.e., advise patient on changing diet or medication or interpreting blood glucose results), empathic listening (i.e., listen to patient regarding feelings and concerns about diabetes), and approval for treatment efforts (i.e., give positive feedback to the patient that he or she is doing a good job and making the right self care-choices). The internal consistencies of the four subscales are 0.75, 0.68, 0.63, and 0.74, respectively. Each of the eight items is scored from 0 to 10, and a "desired support" minus "received support" score is calculated for the four social support domains.

Health Belief Model and self-efficacy attitudes. This 5-item scale assesses the key components of the Health Belief Model (HBM [14,15,22]; i.e., perceptions of the importance of health, vulnerability to diabetes complications, severity of diabetes complications, and effectiveness of treatment) and self-efficacy theory (i.e., perceptions of the ability to carry out treatment recommendations successfully). HBM and self-efficacy theory have been widely applied in the prediction of preventive health care behaviors and adherence to treatment. Applying these theories to diabetes, patients who are well adjusted to diabetes would believe that *1*) good health is important; *2*) diabetes complications are serious potential problems; *3*) they will be personally vulnerable to diabetes complications if blood glucose control remains poor; *4*) available treatment is effective; and *5*) they have the ability to carry out treatment recommendations. In diabetes studies to date, consistencies in the relationships among HBM variables, self-care, and blood glucose control have emerged (6,23). The HBM scale used in this study has sound internal reliability (coefficient alpha 0.73). It correlates significantly with avoidance-distraction coping ($r = 0.18$; $P < 0.003$), passive-resignation coping ($r = -0.35$; $P < 0.0001$), tackling spirit coping ($r = 0.36$; $P < 0.0001$), diabetes integration ($r = 0.39$; $P < 0.0001$), and HbA_{1c} ($r = -0.21$, $P < 0.0001$). The measure is scored 0–100, with higher scores indicating a greater endorsement of positive health attitudes.

Statistical analyses

Reliability. Internal reliability of the PAID was examined by calculating item-to-total correlations, using principal component analysis to confirm that a large general factor underpinned the 20 PAID items, and calculating Cronbach's coefficient alpha for estimation of internal consistency. It was expected that *1*) individual PAID items would correlate at least 0.30 with the total score; *2*) a large general factor would be identified in the first unrotated principal component obtained from a principal components analysis, with all PAID item load-

Table 1—*Clinical and demographic characteristics of IDDM and NIDDM treatment groups*

	IDDM group	NIDDM groups		
		Insulin-treated	Tablet-treated	Diet-treated
n	135	85	28	8
Sex				
Male	40.7	50.6	67.9	62.5
Female	59.3	49.4	32.1	37.5
Age (years)	41.6 ± 14.8	63.2 ± 10.9	63.9 ± 10.0	66.6 ± 10.3
Age onset diabetes (years)	22.1 ± 12.7	52.5 ± 11.4	55.2 ± 9.5	49.5 ± 9.7
Duration diabetes (years)	19.2 ± 14.7	10.9 ± 8.2	8.9 ± 8.1	20.5 ± 7.1
HbA_{1c}	10.1 ± 1.9	10.2 ± 1.7	9.4 ± 1.6	8.1 ± 1.6
Education (years)	14.7 ± 1.9	13.6 ± 2.4	14.1 ± 2.0	13.6 ± 3.1

Data are means ± SD or %.

ings greater than 0.30; and 3) Cronbach's alpha would be 0.80 or better for the total test (24).

Concurrent validity. To examine the concurrent validity of the PAID, correlations were calculated (separately for IDDM and NIDDM tablet-treated patients) between the PAID and the four diabetes coping subscales, the HBM attitudes scale, and the Diabetes Social Support scale. We expected significant positive correlations between the PAID and diabetes integration coping, tackling spirit coping, and the HBM attitudes scale. We expected significant negative correlations between the PAID and passive-resignation coping, avoidance-distraction coping, and the Diabetes Social Support scale. Finally, we calculated the correlations between the PAID and a range of important clinical variables separately for the IDDM and NIDDM samples: age, diabetes duration, and HbA_{1c}.

Discriminant validity. Multiple regression analyses were used to examine the unique contributions of diabetes treatment group status (i.e., IDDM versus NIDDM, IDDM versus NIDDM insulin-treated, IDDM versus NIDDM tablet-treated, and NIDDM insulin-treated versus NIDDM tablet-treated) to the total PAID score, adjusting for sex, age of diabetes onset, and diabetes duration. In these analyses, we analyzed between-group mean differences, applying both traditional statistical significance testing as well as a test of clinical significance using a standardized effect size (25,26), expressed in pooled SD units to determine the magnitude of the differences found. A standardized effect size represents a difference in group, where 0.2 is typically considered a small effect size, 0.5 a moderate effect size, and 0.8 a large effect size (26). We hypothesized that *1*) the mean PAID score would be higher (i.e., emotional adjustment would be poorer) among IDDM patients than among NIDDM patients and NIDDM insulin- or tablet-treated subgroups, and 2) among NIDDM patients, mean PAID scores would be poorer among the insulin-treated subsample than among the tablet-treated subsample. Given that the PAID data have previously been reported only for female patients, we also examined whether mean PAID scores differed by sex.

RESULTS — Table 1 shows the demographic and clinical characteristics of the four patient groups that participated in the study (n = 256). Mean age for the total sample was 52.3 ± 12.4 years; mean diabetes duration, 15.1 ± 2.1 years; mean HbA_{1c}, 9.9 ± 1.8%; and random blood glucose, 122 ± 134 mg/dl. The group comprised 47.7% male and 52.3% female patients. Mean PAID score was 29.2 ± 20.9. The predominant clinical group was IDDM (n = 135, 52.7%). In the NIDDM group, 85 patients (33.2%) used insulin and 28 (10.9%) used tablets. The remaining 8 (3.1%) NIDDM patients were treated with diet and exercise. Approximately 70% of patients approached agreed to participate in the study. A sample of nonresponders (n = 37) was obtained for selected data collection days. This sample was 45% male

Table 2—*Principal components analysis showing PAID item loadings for first three principal components*

	PC1	PC2	PC3
Worrying about the future and the possibility of serious complications	74*	−18	−06
Feeling guilty or anxious when you get off track with your diabetes management	73*	−16	06
Feeling scared when you think about living with diabetes	80*	−16	11
Feeling discouraged with your diabetes regimen	73*	21	33
Worrying about low blood sugar reactions	60*	−03	−25
Feeling constantly burned-out by the constant effort to manage diabetes	87*	13	−13
Not knowing if the mood or feelings you are experiencing are related to your blood glucose	73*	−10	−04
Coping with complications of diabetes	73*	05	−20
Feeling that diabetes is taking up too much mental and physical energy	79*	18	−16
Feeling constantly concerned about food	77*	−15	16
Feeling depressed when you think about living with diabetes	83*	−19	−13
Feeling angry when you think about living with diabetes	84*	−12	−19
Feeling overwhelmed by your diabetes regimen	89*	−03	−09
Feeling alone with diabetes	77*	13	−22
Feelings of deprivation regarding food and meals	64*	−33	40*
Not having clear and concrete goals for your diabetes care	58*	21	53*
Uncomfortable interactions around diabetes with family/friends	59*	−14	21
Not accepting diabetes	68*	00	03
Feeling that friends/family are not supportive of diabetes management efforts	58*	35	−26
Feeling unsatisfied with your diabetes physician	38*	75	18
Amount of variance explained by each factor	52.4%	5.7%	4.9%

Factor loadings are multiplied by 100 and rounded to the nearest integer. *Significant loadings (i.e., >0.40). PC, principal component.

and 55% female, had a mean age of 52 years, and a mean diabetes duration of 10.3 years. Mean HbA_{1c} was 10.4%, compared with 9.9% obtained for the total study sample (i.e., a small-to-medium effect size = 0.30, NS).

The results of the internal reliability analyses for the PAID showed that all 20 PAID items correlated 0.30 or higher with the total score using item-to-remainder correlations, and that Cronbach's alpha was high (0.95) for the total test. Principal component analyses of the PAID showed high item loadings (>0.30) for all 20 items on the first principal component, accounting for 52.4% of the variance (see Table 2). The second principal component, by contrast, accounted for only 5.7% of the variance, and the third, for 4.9% of the variance. This pattern of loadings confirmed the presence of a large general factor representing diabetes emotional functioning, and supported the summation of the 20 PAID items into a total score.

Table 3 shows that worry about the future and possibility of serious complications was most highly endorsed as a serious problem (i.e., a score of 5 or 6 on a scale from 1 "no problem" to 6 "serious problem") among the IDDM group and both the NIDDM insulin- and tablet-treated groups (45%, 34%, and 32% of patients, respectively). Being scared about living with diabetes was endorsed as a serious problem by over 20% of patients in all three groups. Other issues endorsed as serious by at least 20% of IDDM patients included feeling discouraged with diabetes treatment, worrying about low blood glucose reactions, being burned-out by the constant effort to manage diabetes, not knowing if mood is related to blood glucose or not, coping with complications, and feeling that diabetes is taking up too much mental and physical energy. For NIDDM insulin-using patients, not knowing if mood is related to blood glucose or not was endorsed by more than 20% of patients; for NIDDM tablet-treated patients, feeling constantly concerned about food was endorsed as serious by 28.6%, and feeling depressed living with diabetes as serious by 25%. For the small NIDDM diet- and exercise-treated group, not knowing if mood is related to blood glucose or not was endorsed as serious by 12.5%. No other item was endorsed as serious for this group.

Comparisons were made on mean PAID scores between IDDM and NIDDM patients first, then among the IDDM and the NIDDM insulin- and tablet-treated groups (see Table 4). IDDM patients scored significantly higher than NIDDM patients on the PAID total score (32.9 ± 20.2 vs. 25.0 ± 20.9; $P < 0.002$), with a small-to-medium effect size (ES = 0.4). Comparison of IDDM with NIDDM insulin-treated patients showed that they differed significantly (32.9 ± 20.2 vs. 26.4 ± 20.8; $P < 0.02$), with a small-to-medium effect (ES = 0.32). Comparison of IDDM with NIDDM tablet-treated patients also showed a significant difference (32.9 ± 20.2 vs. 24.9 ± 22.1; $P < 0.05$), involving a small-to-medium effect (ES = 0.39). In all three comparisons, simple regression analyses showed neither duration of diabetes nor sex to be significant predictors of PAID. Comparison of NIDDM insulin- with tablet-treated patients showed no difference (ES = 0.07). Male (n = 98) and female (n = 122) patients were significantly different in PAID score (25.9 ± 20.9 vs. 21.03, $P < 0.002$), although this significant difference did not remain when adjustment was made for age of diabetes onset. Women had diabetes onset earlier than the males (33.2 ± 19.4 vs. 39.5 ± 19.1 years) due to a higher proportion of IDDM patients in the female group (59.7% vs. 45.1%).

Concurrent validity of the PAID was evaluated from the pattern of correlations between the PAID and other tests measuring theoretically related constructs. Table 5 shows that the PAID correlated highly significantly (in the expected directions) with the four coping subscales, HBM scale, and the Diabetes Social Support measure in a moderate-to-strong range for the large majority of treatment group analyses. Correlations of the PAID with HbA_{1c} were made by diabetes treatment group and sex. Corre-

Table 3—*Percentage of patients in study treatment groups reporting a serious problem for individual PAID items*

	IDDM group	NIDDM groups: Insulin-treated	Tablet-treated	Diet-treated
Worrying about the future and the possibility of serious complications	45.2	34.1	32.1	0
Feeling guilty or anxious when you get off track with your diabetes management	29.6	28.2	10.7	0
Feeling scared when you think about living with diabetes	26.7	21.1	35.7	0
Feeling discouraged with your diabetes regimen	24.4	16.5	10.7	0
Worrying about low blood sugar reactions	24.4	12.9	7.1	0
Feeling constantly burned-out by the constant effort to manage diabetes	23.7	11.8	10.7	0
Not knowing if the mood or feelings you are experiencing are related to your blood glucose	23.7	22.4	14.3	12.5
Coping with complications of diabetes	20.0	10.6	10.7	0
Feeling that diabetes is taking up too much mental and physical energy	20.0	8.2	10.7	0
Feeling constantly concerned about food	19.3	12.9	28.6	0
Feeling depressed when you think about living with diabetes	18.5	16.5	25.0	0
Feeling angry when you think about living with diabetes	17.8	9.4	14.3	0
Feeling overwhelmed by your diabetes regimen	17.8	16.5	7.1	0
Feeling alone with diabetes	17.8	9.4	21.4	0
Feelings of deprivation regarding food and meals	14.1	18.8	17.9	0
Not having clear and concrete goals for your diabetes care	11.1	11.8	0	0
Uncomfortable interactions around diabetes with family/friends	10.4	11.8	0	0
Not accepting diabetes	7.4	7.1	10.7	0
Feeling that friends/family are not supportive of diabetes management efforts	5.9	8.2	7.1	0
Feeling unsatisfied with your diabetes physician	5.2	5.9	3.6	13

Table 4—*Emotional and attitudinal measure scores for IDDM and NIDDM treatment groups*

	IDDM group	NIDDM groups		
		Insulin-treated	Tablet-treated	Diet-treated
n	135	85	28	8
PAID	32.9 ± 20.2	26.4 ± 20.8	24.9 ± 22.1	10.5 ± 12.8
Diabetes integration coping	60.4 ± 14.0	61.6 ± 15.9	62.3 ± 17.8	70.8 ± 17.9
Avoidance-distraction coping	52.6 ± 22.5	52.2 ± 24.7	59.8 ± 24.2	64.5 ± 23.4
Passive-resignation coping	68.0 ± 18.9	72.3 ± 17.8	72.6 ± 19.1	77.6 ± 23.6
Tackling spirit coping	69.4 ± 10.7	70.8 ± 9.4	69.1 ± 10.3	68.4 ± 8.1
Health Belief Model	69.9 ± 17.6	71.0 ± 17.3	67.8 ± 20.9	85.0 ± 7.6
Treatment social support				
Total	−1.9 ± 7.8	−0.9 ± 8.4	−2.1 ± 7.2	−0.7 ± 8.3
Activities	0.6 ± 2.6	0.8 ± 2.6	0.5 ± 3.1	1.1 ± 2.9
Information	−1.3 ± 2.9	−1.0 ± 3.1	−0.9 ± 2.9	−1.8 ± 2.3
Listening	−0.5 ± 2.9	0.0 ± 3.4	−0.5 ± 2.4	−0.0 ± 3.2
Approval	−0.7 ± 2.8	−0.7 ± 2.7	−1.2 ± 2.4	0.0 ± 1.8

lations for IDDM male and female patients were $r = 0.18$ and $r = -0.003$, respectively; NIDDM insulin-treated male and female patients, $r = 0.15$ and $r = 0.21$, respectively; NIDDM tablet-treated male and female patients, $r = 0.19$ and $r = 0.34$, respectively, and NIDDM diet-treated male and female patients, 0.65 and 0.66, respectively. These correlations were not statistically significant.

Table 6 shows a series of hierarchical multiple regression models that examined the relationship of the four diabetes coping styles to PAID scores. In these analyses, we aimed to identify those coping strategies that best predicted PAID scores. All four coping strategies independently explained a significant amount of PAID variance. Diabetes integration was clearly the most substantial contributor ($R^2 = 48\%$; $P < 0.001$). Passive-resignation contributed 32% of unique variance ($P < 0.001$); avoidance-distraction, 19% ($P < 0.001$); and tackling spirit, 6% ($P < 0.01$). Maximum PAID score variance was explained by entering diabetes integration and avoidance-distraction in the model together (accounting for 59% of PAID variance).

CONCLUSIONS — We report here further information on the reliability and clinical utility of the PAID, a new measure of emotional functioning in diabetes (11). The PAID is brief, easy to score, and provides information on emotional adjustment related to a wide range of diabetes management situations. The PAID was designed to be of potential value to health care providers collaborating with their patients to achieve behavioral change in patient self-care. In these circumstances, the PAID can be applied as part of the assessment and monitoring of the patient's emotional functioning. The PAID also has potential applicability as an outcome measure in clinical trials, augmenting traditional clinical and biomedical assessments (e.g., HbA_{1c} levels).

Clinically, we have used the PAID total score as an overall measure of the emotional burden of diabetes or "diabetes burnout," using an arbitrarily designated cutoff score that is 1 SD above the mean for our clinic patients. However, we also typically examine the pattern of individual PAID item scores to identify the specific sources of diabetes distress with which the patient is struggling. Here, individual items endorsed strongly by the patient can represent clinical "red flags" that can be the focus of more careful discussion. However, it should be noted that individual items in any given questionnaire have lower reliability than composite measures comprised of a number of similar items for each domain. This is one reason composite measures are developed. For this reason, we recommend that, although using a "red flag" approach with individual PAID items can be clinically useful, it should be considered as only a rough initial screen for identification of emotional problems in that area of management.

It was interesting to note that nonresponders to our study (comprising 30% of patients attending for clinic visits) had poorer blood glucose control than did those who took part in the study (mean HbA_{1c} 10.4 vs. 9.9%, respectively). The effect size was small-to-moderate in magnitude, although statistically nonsignificant due to the small number of patients in this nonresponder sample. The data suggest that our nonresponders may represent patients with greater diabetes management problems, indicating that the PAID treat-

Table 5—*Correlations of PAID with clinical and psychosocial variables for IDDM and NIDDM treatment groups*

	IDDM group	NIDDM groups		
		Insulin-treated	Tablet-treated	Diet-treated
n	135	85	28	8
Age	−0.16	−0.58*	−0.44*	−0.85*
Disease duration	−0.17	−0.03	−0.12	−0.70*
HbA_{1c}				
Men	0.18	0.15	0.19	0.65
Women	0.003	0.21	0.34	0.66
Diabetes attitudes and beliefs				
Diabetes integration coping	−0.73*	−0.63*	−0.81*	−0.22
Avoidance coping	0.59*	0.48*	0.56†	−0.05
Passive resignation coping	0.45*	0.47*	0.70*	−0.01
Tackling spirit coping	−0.23†	−0.13	−0.47‡	−0.82†
Health Belief Model	−0.34*	−0.41*	−0.81*	−0.10
Treatment social support				
Total	−0.47*	−0.45*	−0.67*	−0.24
Activities	−0.09	−0.37*	−0.26	−0.53
Information	−0.29*	−0.19	−0.49†	−0.39
Listening	−0.51*	−0.36*	−0.62*	−0.17
Approval	−0.38*	−0.39*	−0.45‡	−0.56

*$P < 0.001$; †$P < 0.01$; ‡$P < 0.05$.

ment group mean data we have reported may underestimate the true group values.

As was found by Polonsky et al. (11) for insulin-using female patients, the IDDM and tablet-treated NIDDM groups in this study reported that worry about the future and the possibility of serious diabetes complications was the most pervasive emotional problem for them, with more than a third of patients endorsing this item strongly. Feeling scared, alone, discouraged, and depressed about living with diabetes, as well as being guilty about being off-track with diabetes management, were endorsed as serious problems by approximately 20% of patients. Interestingly, the small group of diet- and exercise-treated patients that took part in this study reported that almost none of the 20 problem areas assessed by the PAID represented serious issues for them. The large majority of patients seen at the Joslin Clinic are insulin-requiring or insulin-using patients. Future PAID studies should examine further PAID responses from NIDDM diet- and exercise-treated groups to explore further the very low rate of problem endorsement we found for them, which suggested an even lower impact of diabetes on their patient quality of life than we expected.

The results from our reliability and principal component analyses confirmed the earlier findings (11) that the PAID has high internal reliability. Our principal component analyses confirmed that a large general factor representing emotional adjustment underpins the 20 PAID items and supports the use of the total test score.

Empirical support for the concurrent validity of the PAID was found in the pattern of significant and sizable correlations between the PAID and attitudinal measures representing four separate diabetes coping strategies (diabetes integration, avoidance-distraction, passive-resignation, and tackling spirit). Further, a pattern of moderate-to-large significant correlations was found between the PAID and treatment-related social support and a measure of HBM and self-efficacy theory constructs (14,15). These represent two influential treatment adherence models in the field of behavioral medicine. Taken together, these concurrent validity results suggest the PAID is tapping into relevant diabetes-related health attitude dimensions.

Other analyses examined the association between HbA_{1c} and the PAID by treatment group and sex. It would be expected that diabetes emotional distress would have some indirect impact on blood glucose control through the disruption of patient self-care behaviors. The results of the current study and that of Polonsky et al. (11) showed weak or inconsistent correlations between diabetes emotional functioning as measured by the PAID and blood glucose control. However, this finding may be expected from the cross-sectional analyses conducted in these studies. For example, some patients may exercise very good control over themselves because they are emotionally distressed about long-term complications of diabetes, whereas other patients who exercise very poor control over themselves may be appropriately highly distressed about their future health. Alternatively, patients with previously poor, but improving metabolic control may feel less distressed, and patients with previously good, but deteriorating metabolic control may experience increased distress. It can be seen, therefore, that a clearer picture of the relationship between the PAID and blood glucose control will likely emerge when longitudinal studies are conducted that can provide careful tracking of emotional functioning and glycemic control over time.

We examined differences between IDDM and NIDDM treatment groups to provide evidence of the discriminant validity of the PAID. The results showed a significant difference, with a small-to-moderate effect size in PAID scores between IDDM and the combined group of all NIDDM patients. Subsequent analyses showed similar findings for the comparisons of the IDDM with the NIDDM insulin-treated group and the IDDM with the NIDDM tablet-treated group. Although it was expected that NIDDM insulin-treated patients would have higher mean PAID scores than NIDDM tablet-treated patients, based on the presumed increased treatment and lifestyle burden of the transition to insulin use, this result was not found. Patient drug dosage history was not the focus of this study, and these null findings may reflect the confounding influence of higher emotional distress among the subgroup of NIDDM tablet-treated patients at maximum oral dosages who were aware from discussions with their physician that insulin therapy would soon be required if elevated HbA_{1c} values were to be lowered (27). Future PAID studies could examine this transition phase to insulin among NIDDM patients more closely by tracking patient PAID scores prospectively as oral agent dosages are increased to a maximum, followed by the introduction of insulin.

Finally, the results of a series of multiple regression analyses established that a battery of attitudinal coping scales measur-

Table 6—*Linear regression models using attitudinal coping strategies to predict diabetes emotional adjustment (PAID) scores*

Regression models	R^2	*F* value
Prediction of PAID scores based on 1 coping strategy		
Diabetes integration	0.48	232.9
Passive-resignation	0.32	121.4
Avoidance-distraction	0.22	70.5
Tackling spirit	0.05	14.8
Prediction of PAID scores based on 2 coping strategies		
Diabetes integration + avoidance-distraction	0.59	121.9
Diabetes integration + passive-resignation	0.48	118.9
Diabetes integration + tackling spirit	0.48	116.1
Passive-resignation + avoidance-distraction	0.37	75.8
Passive-resignation + tackling spirit	0.32	60.9
Avoidance-distraction + tackling spirit	0.29	50.7
Prediction of PAID scores based on 3 coping strategies		
Diabetes integration + avoidance-distraction + passive-resignation	0.50	82.4
Diabetes integration + avoidance-distraction + tackling spirit	0.49	81.1
Diabetes integration + passive-resignation + tackling spirit	0.49	79.2
Passive-resignation + avoidance-distraction + tackling spirit	0.39	52.6
Prediction of PAID scores based on all 4 coping strategies		
Diabetes integration + passive-resignation + avoidance-distraction + tackling spirit	0.50	61.6

F-test: $P < 0.001$.

ing four different coping styles in diabetes were significantly related to the PAID, providing further support for the construct validity of the PAID. The amount of unique PAID variance accounted for ranged from 48% for diabetes integration coping, to 32% for passive-resignation, 19% for avoidance-distraction, and 6% for tackling spirit coping. Maximum explained PAID variance came from the inclusion of diabetes integration and avoidance-distraction coping in the regression model, suggesting that the use of the PAID and these two coping measures could provide a sound basis for briefly assessing diabetes emotional functioning and closely related attitudinal coping in busy clinical settings.

In summary, the study findings provided strong support for the reliability and concurrent validity of the PAID, and supporting evidence for discriminant validity in terms of detecting differences between IDDM and NIDDM treatment groups. It should be cautioned that the psychometric data we report here and earlier for a female insulin-using sample (11) both involved Joslin Diabetes Clinic patient volunteers attending for their regular checkups. Compared with community samples, patient samples from our clinic were highly selected (i.e., mostly white, medically insured, and well educated). Also, from a psychological standpoint, these patients were sufficiently motivated to both attend the clinic for their checkups and volunteer to participate in the study. Further, the large majority of our study patients used insulin (85.9%), including a majority of the NIDDM patients (70.2%). These figures reflect the typical patient case-mix bias of this clinic, but clearly are dramatically different in profile from that seen in general community treatment settings. Future research on the PAID should focus on patients from primary care and other nonspecialist settings to provide information from a variety of socioeconomic and ethnic backgrounds on the clinical utility of the PAID. In addition, other aspects of the PAID's clinical utility need to be examined, including its temporal reliability, other types of criterion-related validity (e.g., based on the number or severity of diabetes complications), classification and screening performance (i.e., sensitivity, specificity, and positive predictive value), and, perhaps most importantly from a clinical perspective, responsiveness to change in longitudinal, prospective studies involving interventions of known effectiveness.

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