ORIGINAL RESEARCH

Validation and Functional Relevance of the Short Form of the Perceived Deficits Questionnaire for Depression for Japanese Patients with Major Depressive Disorder

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Purpose: To validate the five-item version of the Perceived Deficits Questionnaire for Depression (PDQ-D-5) for assessing subjective cognitive function in Japanese patients with major depressive disorder (MDD) using data from the PERFORM-J study.

Patients and Methods: A total of 518 Japanese outpatients diagnosed with MDD were assessed on severity of depressive symptoms, cognitive function, social and work function, and quality of life (QoL) over 6 months following initiation of antidepressant therapy. This post hoc analysis evaluated the internal consistency and convergent validity of the PDQ-D-5 in relation to the original PDQ-D-20. Correlations of scores on these measures were examined at each time point and over time. The same set of analyses was explored between PDQ-D-5 and the Patient Health Questionnaire–nine-item (PHQ-9), Montgomery–Asberg Depression Rating Scale (MADRS), Digit Symbol Substitution Test (DSST), five-level version of EQ-5D (EQ-5D-5L), Sheehan Disability Scale (SDS), and Work Productivity and Activity Impairment (WPAI) questionnaire.

Results: PDQ-D-5 scores showed good internal consistency. Strong positive correlations were observed between PDQ-D-5 and PDQ-D-20 at each time point (correlation coefficient: baseline, 0.94; month 1, 0.94; month 2, 0.96; month 6, 0.96) and over time (0.92) (all p < 0.0001). Longitudinally, there were positive correlations between PDQ-D-5 scores versus those on the PHQ-9, MADRS, and SDS. Similarly, negative correlations were noted between PDQ-D-5 scores and EQ-5D-5L and DSST scores to a variable degree. There were moderate positive correlations over time between PDQ-D-5 and all WPAI subscale scores except those on absenteeism.

Conclusion: PDQ-D-5 scores rated in Japanese patients with MDD were found to adequately represent scores on the PDQ-D-20. The short version also showed associations with several measures of functional outcome, depression severity and QoL. This validates the PDQ-D-5 as a feasible and clinically reliable tool to assess subjective experience on cognition, which is applicable to time-limited consultations.

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Keywords: PDQ-D-20, PDQ-D-5, cognition, functional impairment, major depressive disorder

Introduction

Major depressive disorder (MDD) is a common mental disorder with an estimated 12-month prevalence of 2.2% in Japan.[1] MDD may negatively impact cognitive function, quality of life (QoL), and work productivity.[2] Although cognitive disturbances are related to poor social function and reduced work capacity, they are only evaluated on limited occasions owing to a lack of simple assessment scales appropriate for the short consultation times typically seen in Japan.[3]

The Perceived Deficits Questionnaire for Depression (PDQ-D) is a self-reported scale for monitoring cognitive dysfunction in patients with MDD. The PDQ-D is a modified version of the original PDQ, which was developed to assess cognitive symptoms in patients with multiple sclerosis.[4] The original PDQ-D (PDQ-D-20) consists of 20 questions covering the cognitive domains of attention/concentration, retrospective memory, prospective memory, and planning/ organization.[5] Convergent validity of the PDQ-D-20 has been established based on significant correlations with scores on the Sheehan Disability Scale (SDS; self-rated psychosocial function), the Work Productivity and Activity Impairment (WPAI) questionnaire (self-rated impact of disease on productivity), and the Patient Health Questionnaire–nine-item (PHQ-9; self-rated depression severity).[6] The PDQ-D-5 is an abbreviated (five-item) version of the PDQ-D-20, and has been proposed as a more feasible measure to assess cognitive dysfunction in the limited time available in daily clinical practice.[7,8] Limited analyses have been conducted in Europe to assess the validity of the PDQ-D-5 and investigate its association with other functional outcome measures in patients with MDD.[9,10] To our knowledge, the clinical characteristics of the PDQ-D-5 based on the Japanese population have not yet been examined.

PERFORM-J (Prospective Epidemiological Research on Functioning Outcomes Related to MDD in Japan; UMIN000024320) was a 6-month, prospective, multicenter, observational study on MDD-related functional outcomes, conducted in 48 psychiatric institutions (mainly clinics) located in various regions of Japan.[11,12] Eligible patients were assessed for severity of depressive symptoms, cognitive function (including the PDQ-D-20), social and work function, and QoL at four visits over 6 months. Using the PERFORM-J cohort data, the primary aim of this post hoc study was to determine the correlation between the PDQ-D-5 and the PDQ-D-20 to assess the convergent validity of the two scales and evaluate the internal consistency of the PDQ-D-5 in comparison with the PDQ-D-20. We also aimed to assess the relationship between the PDQ-D-5 and the other physician-rated or patient-reported functionality scores used in the PERFORM-J study. Further, the present study evaluated whether the PDQ-D-5 scores, a measure of subjective cognition, are correlated with performance on a test of attention/processing speed, a domain of objective cognition. We hypothesized that the PDQ-D-5 would provide a feasible and valid assessment tool to examine subjective cognitive function in patients with MDD.

Materials and Methods
Study Design and Patient Population
PERFORM-J enrolled 523 Japanese patients with MDD between September 2016 and June 2017. After new antidepressant monotherapy was initiated, patients were monitored for physician-rated and patient-reported outcomes over a 6-month period. Detailed methods for the PERFORM-J study have been published previously.[13] The present report describes a post hoc analysis of data from the PERFORM-J study, which aimed to validate the PDQ-D-5 against the PDQ-D-20, and examine its associations with other functional outcome measures.

The analysis population for the current study was the 518 patients enrolled in the PERFORM-J study (five patients were excluded post enrollment).[11,12] Briefly, eligible participants were Japanese outpatients aged 18–65 years with a recurrent or new diagnosis of MDD (according to the Diagnostic and Statistical Manual of Mental Disorders, 4th Edition, Text Revision).[14] The diagnosis was confirmed using the Mini International Neuropsychiatric Interview.[15] In these patients, new antidepressant monotherapy was started either as a first-line treatment or a switch of medication, as part of their routine medical care. Demographics and baseline characteristics of participants have been described previously.[12] The mean (standard deviation [SD]) age was 37.3 (11.2) years, and 55.6% were female. Mean (SD) baseline Montgomery–Asberg Depression Rating Scale (MADRS; physician-rated depression severity), Digit Symbol Substitution Test (DSST; psychomotor speed), and PDQ-D total scores were 27.0 (8.8), 72.4 (19.2), and 32.2 (15.8), respectively.[11,12]

Outcome Assessments
In the PERFORM-J study, assessments were made at baseline and at month 1, month 2, and month 6. For this post hoc analysis, primary outcomes were the PDQ-D-5 and PDQ-D-20 total and subscale scores. The PDQ-D-20 scale comprises 20 items in four cognitive domains: attention/concentration, retrospective memory, prospective memory, and organization/planning.[4] Patients report on each of the 20 items over the past 7 days, on a scale of 0 (never) to 4 (very often – more than once a day). As each domain consists of five items, the combined subscales result in a total score of 0–80. Items for the PDQ-D-5 were selected from

the PDQ-D-20, as previously described.[4] The total score for the PDQ-D-5 is the sum of the raw scores for these five items, and ranges from 0 to 20. For both scales, higher scores reflect a worse perceived cognitive deficit. The PDQ-D-20 scores were used as a quantitative variable at each study visit.

The participants also took part in the following assessments: the MADRS, DSST, five-level version of EuroQol five-dimension quality of life questionnaire (EQ-5D-5L; self-rated QoL), SDS, WPAI, and PHQ-9. The MADRS comprises 10 items (reported sadness, apparent sadness, inner tension, reduced sleep, reduced appetite, concentration difficulties, lassitude, inability to feel, pessimistic thoughts, and suicidal thoughts) with a 7-point scale for each, from 0 (normal; not at all ill) to 6 (extremely ill), giving a total score of 0–60.[16] The MADRS item and total scores were used as continuous variables at each visit. The DSST was used to measure speed of psychomotor performance requiring visual perception, spatial decision-making, and motor skills. Its continuous scores range from 0 to 133, with a higher score indicating better performance. The DSST assessments were conducted at baseline, month 2, and month 6. The EQ-5D-5L consists of a descriptive system of five dimensions (mobility, self-care, usual activities, pain/discomfort, and anxiety/depression). These dimensions and the utility index of the EQ-5D-5L were used as continuous variables at each visit. The SDS includes three self-rated domains designed to measure work/school, social life/leisure activities, and evaluate whether family life/home duties are impaired by current psychiatric symptoms. Each domain corresponds to a discretized 10-point visual analog scale (VAS) from 0 (no disability) to 10 (extreme disability), with the sum of scores providing a single measure of global functional impairment (ranging from 0 [unimpaired] to 30 [highly impaired]). The three subscale scores and the total score were used as continuous variables at each visit. The WPAI consists of six questions related to the number of hours missed from work and usual activities, as well as the degree to which work or regular daily activities were limited over the past 7 days. The questionnaire yields quantitative scores for absenteeism, presenteeism, overall work impairment, and impairment of general activity, which are expressed as a percentage of impairment. The subscales of the WPAI were used as continuous variables at each visit. The PHQ-9 questionnaire has nine items (little interest or pleasure in doing things; feeling down, depressed, or hopeless; trouble falling or staying asleep or sleeping too much; feeling tired or having little energy; poor appetite or overeating; feeling bad about yourself — or that you are a failure or that you have let yourself or your family down; trouble concentrating on things, such as reading the newspaper or watching television; moving or speaking so slowly that other people could have noticed, or being so fidgety or restless that you have been moving a lot more than usual; and thoughts that you would be better off dead or of hurting yourself in some way). Ratings are reported by patients, with scores ranging from 0 (not at all) to 3 (nearly every day). The total score ranges from 0 (absence of depression) to 27 (severe depression), with the total score studied as a continuous outcome. The PHQ-9 was rated at all visits.

Statistical Analyses

Overall, 518 participants were included in this analysis; this provides 80% power to detect a Pearson correlation of at least 0.12 (weak correlation) between the PDQ-D-20 and PDQ-D-5. Standard descriptive statistics were used to characterize the distribution of PDQ-D-20 and PDQ-D-5 scores at each time point. All statistical comparisons were made using two-sided tests at $\alpha = 0.05$ significance level (unless stated otherwise), with the null hypothesis of no difference between groups. The repeated measures correlation (rmcorr) calculation was performed using R version 4.0.5 (R Core Team and R Foundation for Statistical Computing, Vienna, Austria), and SAS (version 9.4 or later) (SAS Institute, North Carolina, USA) was used to analyze data.

Validity of the PDQ-D-5 vs the PDQ-D-20

The correlation of the PDQ-D-20 with the PDQ-D-5 at each time point was assessed using Pearson correlations, where a correlation coefficient with an absolute value > 0.7 indicates a strong correlation, 0.4–0.7 indicates a moderate correlation, and < 0.4 indicates a weak correlation. To integrate all visits in the analyses, rmcorr was used to account for non-independence among repeated measures, where the rmcorr coefficient is bounded by −1 to 1 and represents the strength of the linear association between two variables.

Reliability of the PDQ-D-5 and the PDQ-D-20

Respective measures of the reliability of the PDQ-D-5 and PDQ-D-20 were computed at each time point using the Cronbach's alpha coefficients (where < 0.7 indicates poor reliability, 0.7–0.8 indicates moderate reliability, 0.8–0.9 indicates good reliability, and > 0.9 indicates excellent reliability).

Validity of the PDQ-D-5 by Comparison with Other Measures

Pearson correlations were used to explore the direction and magnitude of associations between PDQ-D-5 total scores and those of other assessment scores at each time point. Correlations between PDQ-D-5 scores and those of the MADRS, EQ-5D-5L, SDS, DSST, and PHQ-9 were calculated and placed in a 6×6 matrix. To integrate the longitudinal nature of the data, rmcorr was used to account for non-independence among repeated measures. Scores for each WPAI subscale were calculated as follows: absenteeism, *Question* 1/(*Question* 1 + *Question* 3); presenteeism, *Question* 4/*Question* 10; overall work impairment, *Question* 1/(*Question* 1 + *Question* 3) + [1 − *Question* 1/(*Question* 1 + *Question* 3)] × *Question* 4/10; impairment of general activity, *Question* 5/10, where WPAI questions were as follows (based on the past 7 days) (condensed version): Question 1: How many hours did you miss from work because of your health problems? Question 2: How many hours did you miss from work because of any other reason? Question 3: How many hours did you actually work? Question 4: How much did your health problems affect your productivity while you were working? Question 5: How much did your health problems affect your ability to do your regular daily activities, other than work at a job?

Results

Validity of the PDQ-D-5 vs the PDQ-D-20

Figure 1 shows the median and distribution of the PDQ-D-5 and PDQ-D-20 scores at baseline and at 1, 2, and 6 months after the initiation of antidepressant medication. For both assessments, the scores (median) and variability (Q1, Q3) were greater at baseline (PDQ-D-5, 8.0 [5.0, 11.0]; PDQ-D-20, 32.0 [20.0, 42.0]) than at month 6 (PDQ-D-5, 4.0 [2.0, 7.0]; PDQ-D-20, 17.0 [9.0, 28.0]), indicating an improvement in subjective cognitive function over time. At each time point,
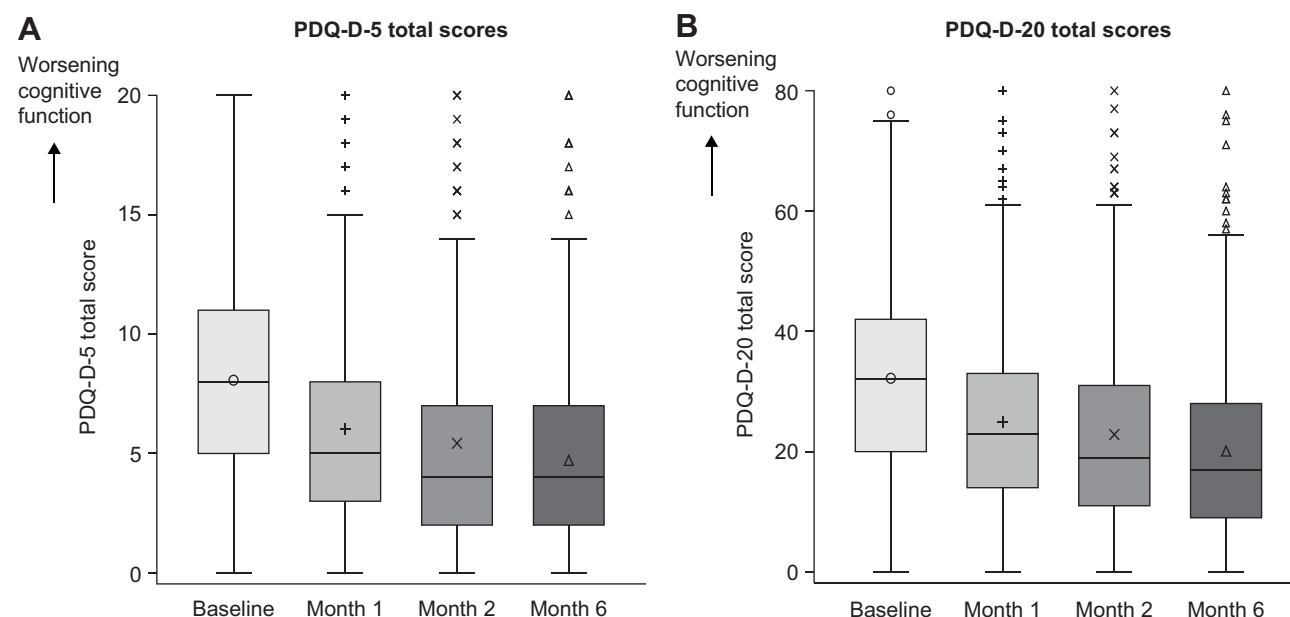

Figure 1 Total scores of (**A**) PDQ-D-5 and (**B**) PDQ-D-20 at baseline and over the 6 months following initiation of antidepressant medication. Data show the median and interquartile range (IQR) scores at baseline and at 1, 2, and 6 months after the initiation of antidepressant medication. The additional symbol inside the box shows the mean score at each time point. The upper error bar shows (Q3 [max]) at each time point. If outliers are present (shown as symbols above Q3), the upper error bar will be (Q3; Q3 + 1.5 × IQR), where IQR = Q3 − Q1. The lower error bars show (Q1 [min]).
Abbreviations: IQR, interquartile range; max, maximum; min, minimum; PDQ-D-5, Perceived Deficits Questionnaire for Depression–five-item; PDQ-D-20, Perceived Deficits Questionnaire for Depression–20-item; Q, quartile.

strong positive correlations were observed between total scores on the PDQ-D-5 and those on the PDQ-D-20 (correlation coefficient: baseline, 0.94; month 1, 0.94; month 2, 0.96; month 6, 0.96; all p < 0.0001) (Figure 2). A strong positive correlation was also seen when rmcorr was used to integrate all visits in the analyses (rmcorr, 0.92, p < 0.0001). Together, these results indicate that the PDQ-D-5 scores are highly correlated with those of the PDQ-D-20.

Reliability of the PDQ-D-5 and the PDQ-D-20

From baseline to month 6, the PDQ-D-20 data showed excellent internal consistency (Cronbach's alpha: baseline, 0.94; month 1, 0.95; month 2, 0.96; month 6, 0.96). The PDQ-D-5 scores also showed good internal consistency (Cronbach's alpha: baseline, 0.80; month 1, 0.83; month 2, 0.85; month 6, 0.87), with consistency scores from both assessments improving over the 6-month period (data not shown).
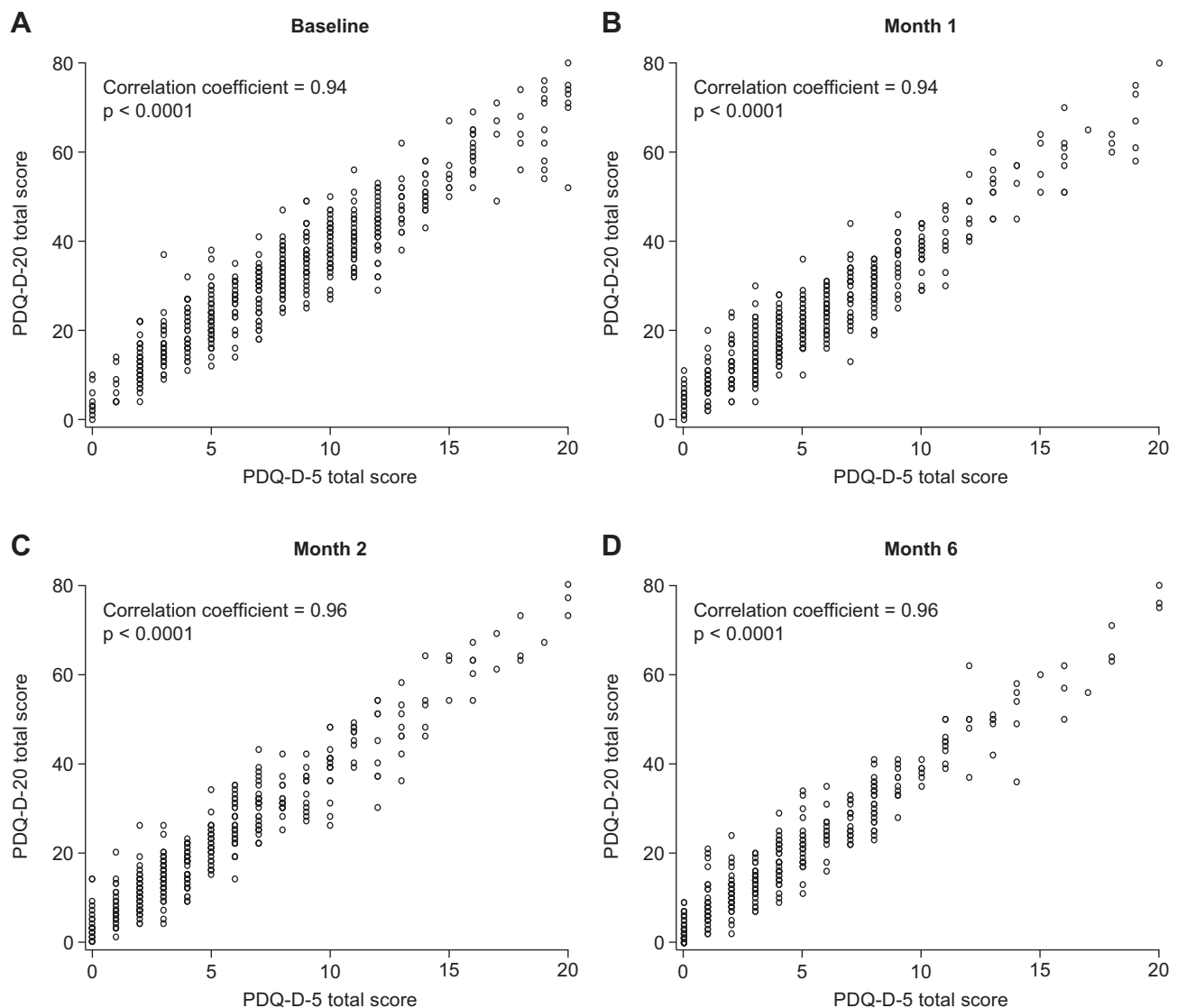

Figure 2 Correlation between the PDQ-D-20 and PDQ-D-5 total scores at baseline and over the 6 months following the initiation of antidepressant medication. Data show PDQ-D-20 total scores against PDQ-D-5 total scores plotted for each patient at (**A**) baseline, (**B**) month 1, (**C**) month 2, and (**D**) month 6. The correlation coefficients between the PDQ-D-20 and PDQ-D-5 are shown at each time point, where an absolute value > 0.7, 0.4–0.7, or < 0.4 indicates a strong, moderate, or weak correlation, respectively.
Abbreviations: PDQ-D-5, Perceived Deficits Questionnaire for Depression–five-item; PDQ-D-20, Perceived Deficits Questionnaire for Depression–20-item.

Validity of the PDQ-D-5 by Comparison with Other Measures

The PDQ-D-5 correlated most strongly with the PHQ-9 (rmcorr, 0.69, p < 0.0001; Table 2). There were also moderate positive correlations between PDQ-D-5 scores and the MADRS (rmcorr, 0.60, p < 0.0001) and SDS (rmcorr, 0.56, p < 0.0001) scores. A moderate negative correlation was found between PDQ-D-5 and EQ-5D-5L scores (rmcorr, −0.57, p < 0.0001), while the correlation between PDQ-D-5 and DSST scores was weakly negative (rmcorr, −0.37, p < 0.0001). PDQ-D-5 scores showed a moderate correlation with the presenteeism (rmcorr, 0.56, p < 0.0001), overall work impairment (rmcorr, 0.58, p < 0.0001), and impairment of general activity (rmcorr, 0.63, p < 0.0001) subscale scores on WPAI, while the correlation with absenteeism scores was weak (rmcorr, 0.21, p < 0.004) (Table 1). As shown in Tables 1 and 2, the degree of association between the PDQ-D-5 and other measures tested in this study increased from baseline over the 6-month observation period.

Discussion

In the cohort of Japanese patients with MDD, the PDQ-D-5 showed strong convergent validity with the PDQ-D-20, supporting its prospective use as a clinically relevant and time-saving tool to assess subjective cognitive function.

Reported associations between modified PDQ scores and both subjective and objective measures of depressive symptoms in Japanese patients have indicated the importance of diagnosing both aspects of clinical symptoms when assessing patients with MDD.[12,17,18] It is also important to assess the patient's condition with both self-reported and physician-rated scales in terms of suicidality.[19] The correlations between the PDQ-D-5 and other subjective and objective measures of depressive symptoms presented in this study are consistent with these previous observations. The correlations seen between the PDQ-D-5 and the other clinical indices tested (eg, the MADRS and the PHQ-9) tended to become stronger over the 6-month study period. This may be due to a greater variance of data (eg, depressive symptoms) among participants at later time points.

The relationship between cognitive function and QoL in patients with MDD has been discussed previously.[2,11,18,20,21] In our study, PDQ-D-5 scores showed negative correlations with EQ-5D-5L scores at all time points. This finding is similar to results from previous studies, including the PERFORM-J study, which also reported negative associations between PDQ-D-20 scores and EQ-5D-5L scores.[11,18,21] Thus, data from the current study support an association between self-reported QoL and subjective cognitive function in depressed patients.

The negative impacts of MDD on work outcomes have been well described.[9,11,20–23] High PDQ-D-20 or PDQ-5 scores have been associated with decreased work productivity,[9,12,21] while other studies have suggested that cognitive impairment has a detrimental impact on work outcomes (eg, leading to increased presenteeism) in patients with MDD.[22,23] In the present study, PDQ-D-5 scores were moderately correlated with the presenteeism, overall work impairment, and impairment of general activity subscale scores of the WPAI; there was only a weak correlation with the absenteeism subscale. This may be due to the fact that permission to be absent from work is regulated not only by the severity of depressive and cognitive symptoms, but also by the employment environment, as has been proposed.[12] The link between PDQ-D-5 scores and most WPAI subscale scores reported here may help explain the impact of cognition on work efficiency in patients with MDD.

Table 1 Pearson Correlation Coefficients Between WPAI Subscale Scores and PDQ-D-5 Total Scores

WPAI Subscale	Baseline		Month 1		Month 2		Month 6		rmcorr (n)
	CC (n)	p value	CC (n)	p value	CC (n)	p value	CC (n)	p value	
Absenteeism	0.00 (347)	0.94	0.09 (222)	0.18	0.17 (219)	0.01	0.21 (177)	0.004	−0.04 (965)
Presenteeism	0.50 (290)	< 0.0001	0.63 (161)	< 0.0001	0.61 (168)	< 0.0001	0.56 (155)	< 0.0001	0.51 (774)
Overall work impairment	0.47 (285)	< 0.0001	0.55 (158)	< 0.0001	0.58 (167)	< 0.0001	0.58 (152)	< 0.0001	0.51 (762)
Impairment of general activity	0.43 (510)	< 0.0001	0.50 (400)	< 0.0001	0.62 (390)	< 0.0001	0.63 (329)	< 0.0001	0.54 (1629)

Notes: To integrate all visits in the analyses, rmcorr was used to account for non-independence among repeated measures. A correlation coefficient with an absolute value 0.4–0.7 represents a moderate correlation (blue), while < 0.4 (white) represents a weak correlation. n is the number of observations used for each correlation. P values are statistically significant at the level of 0.001.
Abbreviations: CC, correlations coefficient; rmcorr, repeated measures correlation; PDQ-D-5, Perceived Deficits Questionnaire for Depression–five-item; WPAI, Work Productivity and Activity Impairment.

Table 2 Correlation Matrices for PDQ-D-5, MADRS, EQ-5D-5L, SDS, DSST, and PHQ-9 Scores

(A) Baseline						
Assessment	**PDQ-D-5 (n)**	**MADRS**	**EQ-5D-5L**	**SDS**	**DSST**	**PHQ-9**
PDQ-D-5	I (512)					
MADRS	0.38 (512)	I				
EQ-5D-5L	−0.45 (510)	−0.47	I			
SDS	0.47 (437)	0.38	−0.57	I		
DSST	−0.08 (512)	−0.14	0.12	−0.08	I	
PHQ-9	0.63 (506)	0.53	−0.61	0.62	−0.09	I
(B) Month 1						
Assessment	**PDQ-D-5 (n)**	**MADRS**	**EQ-5D-5L**	**SDS**	**PHQ-9**	
PDQ-D-5	I (404)					
MADRS	0.46 (404)	I				
EQ-5D-5L	−0.62 (403)	−0.53	I			
SDS	0.54 (323)	0.57	−0.68	I		
PHQ-9	0.67 (396)	0.68	−0.73	0.73	I	
(C) Month 2						
Assessment	**PDQ-D-5 (n)**	**MADRS**	**EQ-5D-5L**	**SDS**	**DSST**	**PHQ-9**
PDQ-D-5	I (393)					
MADRS	0.53 (393)	I				
EQ-5D-5L	−0.66 (392)	−0.6	I			
SDS	0.67 (309)	0.62	−0.73	I		
DSST	−0.14 (391)	−0.25	0.23	−0.14	I	
PHQ-9	0.75 (389)	0.67	−0.76	0.77	−0.2	I
(D) Month 6						
Assessment	**PDQ-D-5 (n)**	**MADRS**	**EQ-5D-5L**	**SDS**	**DSST**	**PHQ-9**
PDQ-D-5	I (336)					
MADRS	0.61 (336)	I				
EQ-5D-5L	−0.70 (336)	−0.65	I			
SDS	0.71 (266)	0.65	−0.73	I		
DSST	−0.27 (333)	−0.24	0.3	−0.28	I	
PHQ-9	0.75 (331)	0.72	−0.81	0.82	−0.27	I
(E) Repeated Measures Correlation						

(*Continued*)

Table 2 (Continued).

Assessment	rmcorr (n)	p value
MADRS	0.60 (1645)	< 0.0001
EQ-5D-5L	−0.57 (1641)	< 0.0001
SDS	0.56 (1335)	< 0.0001
DSST	−0.37 (1237)	< 0.0001
PHQ-9	0.69 (1622)	< 0.0001

Notes: Parts A–D show Pearson correlation coefficients between PDQ-D-5, MADRS, EQ-5D-5L, SDS, DSST, and PHQ-9 scores, at baseline and over the 6 months following the initiation of antidepressant medication. Note that the DSST score was not measured at month 1. To integrate the longitudinal nature of the data, rmcorr was used to account for non-independence among repeated measures (Part E). A correlation coefficient with an absolute value > 0.7 indicates a strong correlation (green), while 0.4–0.7 (blue) or < 0.4 (white) indicates moderate and weak correlations, respectively. n is the number of observations used for each correlation. P values are statistically significant at the level of 0.001.
Abbreviations: DSST, Digit Symbol Substitution Test; EQ-5D-5L, EuroQol five-dimension, five-level quality of life questionnaire; MADRS, Montgomery–Asberg Depression Rating Scale; PHQ-9, Patient Health Questionnaire–nine-item; PDQ-D-5, Perceived Deficits Questionnaire for Depression–five-item; rmcorr, repeated measures correlation; SDS, Sheehan Disability Scale.

Cognitive function has been suggested to provide an estimate of current, as well as future, social consequences in patients with MDD.[9,11,21] Consistent with this concept, PDQ-D-5 scores were moderately correlated with SDS scores at month 1 in this study. Similar correlations have been reported with the Functioning Assessment Short Test, another indicator for social function.[24,25] Therefore, cognitive deficits measured by the PDQ-D-5 may predict several aspects of psychosocial function in patients with MDD.

Correlations between PDQ-D-5 and DSST scores were weak at all time points. Similarly, in a study with Chinese patients with MDD, there was no correlation between PDQ-D-20 scores and performance on the DSST.[26] The limited degree of correlation between these two functionality scores suggests that subjective and objective assessments evaluate different aspects of cognitive ability. This discordance highlights the importance of a comprehensive evaluation of cognitive difficulties associated with MDD, as patients with subjective, but not objective cognitive problems may underestimate their own cognitive ability, while patients with the opposite presentation may require greater support from caregivers.

There are limitations in this study. The study was uncontrolled and observational in nature, which does not enable the evaluation of cause-and-effect relationships. The study also recruited only outpatients, which may limit the generalization of the results to the wider population. The PDQ-D-5 results used in this study were based on items extracted from the PDQ-D-20, and did not reflect answers from an independent PDQ-D-5 questionnaire. Future evaluations should be conducted using a questionnaire consisting solely of the PDQ-D-5. In addition, as the PDQ-D-5 is part of the PDQ-D-20, this will have influenced the high correlation between the two measures and future assessments should correlate the PDQ-D-5 with questionnaires that do not include the PDQ-D-5 items. Patient responses in the PERFORM-J study may also have been influenced by the completion of several other depression instruments at the same time. Finally, it was not possible to calculate the content validity index and coefficient of variation ratio using the available data from the original PERFORM-J study; such calculations would have enhanced assessment of the content validity of the PDQ-D-5.

Conclusions

In conclusion, this study reports the validity of the PDQ-D-5 as a feasible measure of cognitive function in Japanese patients with MDD. The results also suggest that PDQ-D-5 scores predict key domains of functional outcome in these patients.

Abbreviations

CC, correlations coefficient; DSST, Digit Symbol Substitution Test; EQ-5D, EuroQol five-dimension quality of life questionnaire; EQ-5D-5L, EuroQol five-dimension, five-level quality of life questionnaire; IQR, interquartile range; MDD, major depressive disorder; MADRS, Montgomery–Asberg Depression Rating Scale; PDQ-D, Perceived Deficits Questionnaire for Depression; PDQ-D-5, Perceived Deficits Questionnaire for Depression–five-item; PDQ-D-20,

Perceived Deficits Questionnaire for Depression–20-item; PHQ-9, Patient Health Questionnaire–nine-item; QoL, quality of life; rmcorr, repeated measures correlation; SD, standard deviation; SDS, Sheehan Disability Scale; VAS, visual analog scale; WPAI, Work Productivity and Activity Impairment.

Data Sharing Statement

Takeda does not plan to share data supporting the results reported in this article. The study is part of a co-development program agreement which prevents Takeda from data sharing due to commercially confidential information and intellectual property.

Ethics Approval and Informed Consent

The study used anonymously processed information from PERFORM-J and was carried out in accordance with the ethical standards described in the Declaration of Helsinki and approved by the Ethics Review Committee of the Research Institute of Healthcare Data Science (Tokyo, Japan). Patients were required to provide written informed consent and were free to withdraw from the study at any time.

Acknowledgments

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

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