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Questionnaire for Impulsive-Compulsive Disorders in Parkinson's Disease—Rating Scale

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Abstract

Impulse control disorders and related disorders (hobbyism-punding and dopamine dysregulation syndrome) occur in 15% to 20% of Parkinson's disease (PD) patients. We assessed the validity and reliability of the Questionnaire for Impulsive-Compulsive Disorders in Parkinson's Disease—Rating Scale (QUIP-RS), a rating scale designed to measure severity of symptoms and support a diagnosis of impulse control disorders and related disorders in PD. A convenience sample of PD patients at a movement disorders clinic self-completed the QUIP-RS and were administered a semistructured diagnostic interview by a blinded trained rater to assess discriminant validity for impulse control disorders ($n = 104$) and related disorders ($n = 77$). Subsets of patients were assessed to determine interrater reliability ($n = 104$), retest reliability ($n = 63$), and responsiveness to change ($n = 29$). Adequate cutoff points (both sensitivity and specificity values $>80\%$ plus acceptable likelihood ratios) were established for each impulse control disorder and hobbyism-punding. Interrater and retest reliability (intraclass correlation coefficient r) were >0.60 for all disorders. Participants in an impulse control disorder treatment study who experienced full ($t = 3.65$, $P = .004$) or partial ($t = 2.98$, $P = .01$) response demonstrated significant improvement on the rating scale over time, while nonresponders did not ($t = 0.12$, $P = .91$). The QUIP-RS appears to be

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valid and reliable as a rating scale for impulse control disorders and related disorders in PD. Preliminary results suggest that it can be used to support a diagnosis of these disorders, as well as to monitor changes in symptom severity over time.

Keywords

dopamine agonists; impulse control disorder; Parkinson's disease

Psychiatric symptoms in Parkinson's disease (PD) are common and associated with numerous adverse outcomes, so it is important that PD patients in routine clinical care or engaged in clinical research be assessed and undergo ongoing monitoring for a range of psychiatric disorders. This is true even for PD trials that focus on motor symptoms, as many of the pharmacologic and nonpharmacologic treatments for PD have been reported to have varied results on psychiatric symptoms.

Impulse control disorders (ICDs) (including compulsive gambling, buying, sexual behavior, and eating) and related disorders (including hobbyism, punding, and dopamine dysregulation syndrome [DDS]), are relatively common in PD patients. A recent large study found that ICDs occur in approximately 15% of PD patients, but this study did not assess for related disorders.¹ ICDs may lead to significant impairments in psychosocial functioning, interpersonal relationships, physical health, and quality of life. Patients and informed others may not report such behaviors to a treating physician, perhaps due to embarrassment, not suspecting an association with PD treatment, or ambivalence regarding ceasing the behavior. Hence, there is evidence that ICDs are underrecognized in routine clinical PD care.²

There are limited options in terms of assessment instruments for ICDs and related disorders in PD. Diagnostic criteria exist for problem and pathological gambling as defined in the Diagnostic and Statistical Manual of Mental Disorders Fourth Edition, Text Revision (DSM-IV-TR),^{3,4} and DSM-IV style criteria for compulsive sexual behavior,⁵ compulsive shopping,⁶ binge-eating disorder,³ and DDS⁷ have been applied, but not validated, in PD patients. The Minnesota Impulsive Disorders Interview (MIDI)⁸ is a global instrument that includes questions for compulsive gambling, buying, and sexual behavior (as well as other disorders not reported to occur in PD). However, it is not formatted in the style of DSM-IV-TR and does not have clear instructions on how to administer or score the instrument. Disorder-specific screening instruments used in PD include the South Oaks Gambling Screen (SOGS),⁹ the Buying Questionnaire,¹⁰ a clinician-designed hypersexuality questionnaire,⁵ and a punding questionnaire.¹¹

However, published research on the use of rating scales to measure the severity of ICD and related symptoms in PD patients is almost nonexistent. Recently, a global screening instrument titled the Questionnaire for Impulsive-Compulsive Disorders in Parkinson's Disease (QUIP)¹² was developed and validated to assess ICDs and related disorders (punding, hobbyism, and DDS) in PD.¹² While the QUIP was found to be valid as a screening instrument, it does not assess the severity of these behaviors, which is important to establish optimal diagnostic cutoff points as well as to monitor changes in symptoms over time. Therefore, the Questionnaire for Impulsive-Compulsive Disorder in Parkinson's Disease-Rating Scale (QUIP-RS), based on the QUIP, was developed.

Methods

Participants for Validation Process

A convenience sample of 104 participants (see Table 1 for demographic and clinical characteristics) with idiopathic PD were assessed either as part of participation in an ICD clinical trial or through convenience sampling at the Parkinson's Disease and Movement Disorders Center at the University of Pennsylvania between January 2010 and April 2011. The Institutional Review Board (IRB) at Penn approved the study, and written consent was obtained from participants prior to study participation. Disease severity was assessed with the Unified Parkinson's Disease Rating Scale (UPDRS) and Hoehn and Yahr stage,¹³ and levodopa and dopamine agonist dosages were converted to levodopa equivalent daily dosages (LEDDs).¹⁴

QUIP-RS Description and Validation Process

As with the QUIP, the QUIP-RS has 4 primary questions (pertaining to commonly reported thoughts, urges/desires, and behaviors associated with ICDs), each applied to the 4 ICDs (compulsive gambling, buying, eating, and sexual behavior) and 3 related disorders (medication use, punning, and hobbyism). It uses a 5-point Likert scale (score 0–4 for each question) to gauge the frequency of behaviors, and instructs patients to answer questions based on behaviors that occurred in the preceding 4 weeks (or any 4-week period in a designated time frame). The QUIP-RS is administered with an instruction sheet that provides examples of the behaviors being assessed and a brief description of the Likert scale categories for frequency (ie, never [0] = not at all, rarely [1] = infrequently or 1 day/week, etc.). Scores for each ICD and related disorder range from 0 to 16, with a higher score indicating greater severity (ie, frequency) of symptoms. Due to overlap, hobbyism and punning were combined in the validation process to form a single diagnosis (hobbyism-punning), with a total score ranging from 0 to 32 for the combined disorder. The total QUIP-RS score for all ICDs and related disorders combined ranges from 0 to 112. (See Supporting Information for QUIP-RS and Instruction Sheet.)

To determine discriminant validity of the self-completed QUIP-RS (n = 104) participants were administered a semistructured diagnostic interview for compulsive gambling,³ buying,¹⁰ sexual behavior,⁵ and eating,³ and a subset of participants (n = 77) was also administered a diagnostic interview for hobbyism,¹⁵ punning,⁷ and DDS.⁷ A diagnosis of compulsive gambling included those patients with either problem or pathological gambling.⁴ The DSM-IV-TR research criteria for binge eating disorder were modified to include general overeating in addition to discrete binge eating episodes.

To determine interrater reliability (n = 104), each participant completed a self-administered QUIP-RS and one administered by a trained research staff member who was blinded to the results of the self-administered QUIP-RS. A subset of patients (n = 63) provided data for retest (ie, test-retest) reliability, self-completing the QUIP-RS at 2 time points, the second being at least 1 week after the initial assessment. Responsiveness to change was analyzed for a subset of participants (n = 29) who were involved in a clinical trial for the treatment of ICDs (ClinicalTrials.gov identifier: NCT01052831) and completed the QUIP-RS at baseline and study completion. For responsiveness to change, the rater (D.W.) who assessed response in the context of the clinical trial was blinded to the results of the QUIP-RS.

Analyses

The area under the receiver operating characteristic curve (AUC) was calculated for each ICD and related disorder, as well as the sensitivity and specificity. As the study population was enriched with ICD patients to maximize the number of patients with a disorder, we did

not use positive (PPV) and negative predictive (NPV) values for each cutoff point to recommend screening and diagnostic cutoff points, instead presenting the positive and negative likelihood ratios (LR+ and LR-) for the optimal cutoff points. As the QUIP is designed to be a screening instrument, we envision that the QUIP-RS will be used primarily to support a diagnosis of an ICD or related disorder, so the optimal cutoff point was chosen as the score with both (1) sensitivity and specificity $\geq 80\%$ and (2) highest combined sensitivity and specificity. Interrater and retest reliability was measured by the intraclass correlation coefficient (ICC) with a 2-way mixed model for consistency ($r > 0.60$ acceptable¹⁶). For responsiveness to change, full responders ($n = 12$), partial responders ($n = 12$), and nonresponders ($n = 5$) based on Clinical Global Impression-Improvement (CGI-I)¹⁷ were assessed for change in QUIP-RS score using a paired t test for each sample. A multiple partial F test was used to examine the overall effect of responder status, and linear regression models controlling for baseline QUIP-RS score were utilized for between-responder group comparisons of change in QUIP-RS score over time. All analyses were performed with SPSS Statistics 19.0 software (IBM SPSS Inc. Chicago, IL).

Results

Participant Characteristics and ICD Frequencies

Based on the diagnostic interview, frequencies of ICDs were as follows: compulsive gambling (9.6%), buying (10.6%), sexual behavior (14.4%), and eating (22.1%) (Table 1). Approximately 15% of patients had comorbid ICDs. With regard to related behaviors, hobbyism-punding occurred in 24.7% of participants, and there were no cases of DDS.

QUIP-RS Scores

Mean QUIP-RS values are presented in Table 2. The mean (SD) total QUIP-RS score for the entire sample that received diagnostic testing was 19.32 (18.50). The mean total QUIP-RS score for individuals with a diagnosis of any ICD or hobbyism-punding based on the gold-standard interview was 29.13 (17.17), whereas that for individuals without a diagnosis was 8.51 (13.20).

Discriminant Validity

Sensitivity and specificity were calculated for each ICD, combined ICDs (ie, a diagnosis of any of the 4 ICDs), and hobbyism-punding (Table 3). The optimal cutoff point for individual ICDs (possible score 0–16 for each ICD) were as follows: gambling 6 (LR+ = 33.33, LR- = 0.00, AUC = 0.997); buying 8 (LR+ = 16.40, LR- = 0.19, AUC = 0.969); sex 8 (LR+ = 9.09, LR- = 0.00, AUC = 0.979); and eating 7 (LR+ = 4.35, LR- = 0.16, AUC = 0.913). For combined ICDs (possible score 0–64) the optimal cutoff point was 10 (LR+ = 5.38, LR- = 0.17, AUC = 0.907). Hobbyism-punding (possible score 0–32) had an optimal cutoff point of 7 (LR+ = 5.29, LR- = 0.12, AUC = 0.873). As no one in our sample was diagnosed with DDS, screening and diagnostic cutoff points could not be calculated for this disorder.

Responsiveness to Change

A subset of 29 patients involved in a clinical trial for the treatment of ICDs in PD provided data for responsiveness to change. Change in QUIP-RS score was examined in relationship to response status based on CGI-I score (full responder [score of 1 or 2; $n = 12$], partial responder [score of 3; $n = 12$], and nonresponder [score of 4–7; $n = 5$]). Using a paired t test, both full and partial responders had a significant change in QUIP-RS score over the course of the study, while nonresponders did not (Table 4). Given the intergroup differences in baseline QUIP-RS scores, we also used linear regression analyses entering baseline QUIP-

RS score as a covariate. In this model, overall response status based on CGI-I score predicted change in QUIP-RS score ($F = 7.97$, $df = [2, 25]$, $P = .002$), and there were significant differences in change in QUIP-RS score over time for both full ($B = -0.79$, $t = -3.95$, $P = .001$) and partial ($B = -0.64$, $t = -3.24$, $P = .003$) responders compared with nonresponders.

Interrater and Retest Reliability

For interrater reliability the ICC r value was >0.90 for each individual ICD behavior, total ICD score, and total QUIP-RS score (Table 5). For hobbyism-punding and DDS the ICC r values were 0.88 and 0.79. Regarding retest reliability, the ICC r value was 0.90 for gambling, sex, and total ICD score, and > 0.80 for buying, eating, and total QUIP-RS score. For hobbyism-punding and DDS the retest ICC r values were 0.68 and 0.77.

Discussion

The QUIP-RS is a brief, self-completed or rater-administered rating scale to assess the severity of symptoms of ICDs and related behaviors reported to occur in PD. In this initial validation study we found the scores to have good validity and reliability, suggesting that it is appropriate for use in both clinical care and clinical research involving PD patients.

In contrast to its predecessor the QUIP, a screening questionnaire that provides a dichotomous choice (yes or no) as a response for each question, the QUIP-RS uses a 5-point Likert scale that requires individuals to rate the severity of each symptom based on its frequency. The potential advantages to using a rating scale include detection of subsyndromal behaviors, establishment of clear cutoff points with a good balance between sensitivity and specificity, and the ability to monitor changes in symptoms over time.

Regarding validity, adequate cutoff points (ie, both sensitivity and specificity $\geq 80\%$) were determined for all 4 ICDs and hobbyism-punding. The high positive likelihood ratios for nearly all disorders (>5 for all disorders except compulsive eating) signify a moderate-large increase in the odds of having the disorder with a positive test. The low negative likelihood ratios for all disorders (<0.2) signify a moderate-large decrease in the odds of having the disorder with a negative test. As no patient met criteria for DDS, cutoff points for this disorder could not be established. This finding is consistent with previous research suggesting that DDS may not be common in some PD populations.¹²

In preliminary findings examining the sensitivity of the QUIP-RS to change in severity of ICD symptoms over time, we found that for ICD patients who were participants in an ongoing 8-week ICD treatment study, full (45.4% decrease in QUIP-RS score) and partial (33.5% decrease) responders had a significant mean decrease in QUIP-RS score over the course of the study, whereas the mean scores for nonresponders essentially stayed the same (1.4% increase).

Both interrater and retest reliability for the QUIP-RS were good. The interrater reliability results suggest that the QUIP-RS can be administered both as a self-administered instrument, making it practical for use in clinical care, and as a rater-administered instrument, which may be desirable for some clinical research studies. We did not determine agreement on the QUIP-RS between patients and informed others as part of this study, but in previous research with the QUIP we found that agreement is good when ICD symptoms are significant enough that patients meet criteria for a disorder.¹⁸

The QUIP-RS may be applicable to other patient populations treated with dopaminergic therapies. For instance, individuals with restless leg syndrome¹⁹ and fibromyalgia,²⁰ who

are treated with dopamine agonists, are reported to be at increased risk of developing ICDs similar to those reported to occur in patients with PD. Additional research is needed to determine if the QUIP-RS is valid and reliable in other patient populations.

There are limitations to note. First, the sample size for individual ICDs and for responsiveness to change was relatively small. Second, a convenience sample of PD patients treated at a movement disorders center was used, so it is not known if the QUIP-RS would have performed differently in a community-based or random sample of patients. Third, as no one in the sample had DDS, screening and diagnostic cutoff points for this disorder could not be established.

The initial validation findings presented here suggest that the QUIP-RS is valid and reliable as a rating scale for ICDs and related behaviors reported to occur in PD patients and other populations treated with dopaminergic therapies. Future studies need to replicate these findings in different PD populations, follow larger samples of ICD and non-ICD patients long-term in the context of epidemiological and intervention studies, and examine its use in non-PD populations.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

References

1. Weintraub D, Koester J, Potenza MN, et al. Impulse control disorders in Parkinson disease: A cross-sectional study of 3090 patients. *Arch Neurol*. 2010; 67:589–595. [PubMed: 20457959]
2. Weintraub D, Siderowf AD, Potenza MN, et al. Association of dopamine agonist use with impulse control disorders in Parkinson disease. *Arch Neurol*. 2006; 63:969–973. [PubMed: 16831966]
3. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*. 4. Washington, DC: American Psychiatric Association; 2000. Text Revision
4. Grant JE, Steinberg MA, Kim SW, Rounsaville BJ, Potenza MN. Preliminary validity and reliability testing of a structured clinical interview for pathological gambling. *Psychiatry Res*. 2004; 128:79–88. [PubMed: 15450917]
5. Voon V, Hassan K, Zurovski M, et al. Prevalence of repetitive and reward-seeking behaviors in Parkinson disease. *Neurology*. 2006; 67:1254–1257. [PubMed: 16957130]
6. McElroy SL, Keck PE, Pope HG, Smith JM, Strakowski SM. Compulsive buying: a report of 20 cases. *J Clin Psychiatry*. 1994; 55:242–248. [PubMed: 8071278]
7. Giovannoni G, O'sullivan JD, Turner K, Manson AJ, Lees AJL. Hedonistic homeostatic dysregulation in patients with Parkinson's disease on dopamine replacement therapies. *J Neurol Neurosurg Psychiatry*. 2000; 68:423–428. [PubMed: 10727476]
8. Christenson GA, Faber RJ, deZwaan M. Compulsive buying: descriptive characteristics and psychiatric comorbidity. *J Clin Psychiatry*. 1994; 55:5–11. [PubMed: 8294395]
9. Lesieur HR, Blume SB. The South Oaks Gambling Screen (SOGS): a new instrument for the identification of pathological gamblers. *Am J Psychiatry*. 1987; 144:1184–1188. [PubMed: 3631315]
10. Lejoyeux M, Tassain V, Solomon J, Adès J. Study of compulsive buying in depressed patients. *J Clin Psychiatry*. 1997; 58:169–173. [PubMed: 9164428]
11. Evans AH, Katzenschlager R, Paviour D, et al. Punding in Parkinson's disease: its relation to the dopamine dysregulation syndrome. *Mov Disord*. 2004; 19:397–405. [PubMed: 15077237]
12. Weintraub D, Stewart S, Shea JA, et al. Validation of the Questionnaire for Impulsive-Compulsive Behaviors in Parkinson's Disease (QUIP). *Mov Disord*. 2009; 24:1461–1467. [PubMed: 19452562]

13. Fahn, S.; Elton, RL. the UPDRS Development Committee. Unified Parkinson's disease rating scale. In: Fahn, S.; Marsden, CD.; Calne, D.; Goldstein, M., editors. Recent developments in Parkinson's disease. Florham Park, NJ: Macmillan Health Care Information; 1987. p. 153-163.
14. Hobson DE, Lang AE, Martin WR, Razmy A, Rivest J, Fleming J. Excessive daytime sleepiness and sudden-onset sleep in Parkinson disease: a survey by the Canadian Movement Disorders Group. JAMA. 2005; 287:455–463. [PubMed: 11798367]
15. Voon V, Fox SH. Medication-related impulse control and repetitive behaviors in Parkinson disease. Arch Neurol. 2007; 64:1089–1096. [PubMed: 17698698]
16. Bagby RM, Ryder AG, Schuller DR, Marshall MB. The Hamilton Depression Rating Scale: has the gold standard become a lead weight? Am J Psychiatry. 2004; 161:2163–2177. [PubMed: 15569884]
17. Guy, W. ECDEU Assessment Manual for Psychopharmacology-Revised, DHEW Publ No (ADM) 76-338. Rockville, MD: U.S. Department of Health, Education, and Welfare, Public Health Service, Alcohol, Drug Abuse, and Mental Health Administration, NIMH Psychopharmacology Research Branch, Division of Extramural Research Programs; 1976.
18. Papay K, Mamikonyan E, Siderowf AD, et al. Patient versus informant reporting of ICD symptoms in Parkinson's disease using the QUIP: validity and variability. Parkinsonism Relat Disord. 2011; 17:153–155. [PubMed: 21186135]
19. Ondo WG, Lai D. Predictors of impulsivity and reward seeking behavior with dopamine agonists. Parkinsonism Relat Disord. 2008; 14:28–32. [PubMed: 17702628]
20. Holman AJ. Impulse control disorder behaviors associated with pramipexole used to treat fibromyalgia. J Gambli Stud. 2009; 25:425–431. [PubMed: 19241148]

TABLE 1

Demographic and clinical information (N = 104)

Demographics	Mean (SD) or percentage
Age (years)	62.2 (9.6)
Gender (% male)	60.6
Race (% white)	94.2
Marital status (% married)	76.9
Education (years)	15.9 (2.9)
Clinical information	Mean (SD) or percentage
PD duration (years; n = 103)	7.9 (5.6)
UPDRS motor score (n = 102)	25.7 (11.5)
Hoehn and Yahr stage (n = 102)	2.2 (0.6)
Levodopa LEDD (mg/day)	562.3 (493.4)
Dopamine agonist LEDD (mg/day)	185.6 (171.8)
Total LEDD (mg/day)	747.0 (548.1)
Amantadine (% yes)	33.7
Antidepressant (% yes)	26.0
DBS (% yes)	14.4
ICD and related disorder diagnosis	n (%)
Compulsive gambling	10 (9.6)
Compulsive buying	11 (10.6)
Compulsive sex	15 (14.4)
Compulsive eating	23 (22.1)
More than 1 ICD	15 (14.4)
Hobbyism-punding (n = 77)	19 (24.7)
DDS (n = 77)	0 (0.0)

SD, standard deviation; PD, Parkinson's disease; UPDRS, Unified Parkinson's Disease Rating Scale; LEDD, levodopa equivalent daily dosage; DBS, deep brain stimulation; ICD, impulse control disorder; DDS, dopamine dysregulation syndrome.

TABLE 2

QUIP-RS subscores by disorder

	Range	QUIP-RS subscores or total score (mean [SD]) ^a	Number of participants with disorder/sample size	By disorder	
				QUIP-RS scores for participants with disorder (mean [SD])	QUIP-RS scores for participants without disorder (mean [SD])
Gambling	0–16	1.85 (3.73)	10/104	11.60 (2.95)	0.81 (1.79)
Buying	0–16	3.73 (4.61)	11/104	10.64 (3.70)	1.73 (2.43)
Sex	0–16	2.67 (3.77)	15/104	11.80 (2.31)	2.37 (3.32)
Eating	0–16	4.37 (4.81)	23/104	10.30 (3.81)	2.69 (3.57)
Total ICD score	0–64	12.63 (12.51)	43 ^b /104	22.53 (11.00)	5.64 (8.01)
Hobbyism-punding	0–32	4.82 (5.92)	19/77	11.21 (5.76)	2.72 (4.25)
Compulsive medication use	0–16	0.99 (2.38)	0/77	N/A	0.99 (2.38)
Total QUIP-RS score	0–112	19.32 (18.50)	54 ^c /103 ^d	29.13 (17.17)	8.51 (13.20)

^aFor participants who completed both the QUIP-RS and a diagnostic interview for said disorder(s).

^bParticipants with 1 or more ICD.

^cParticipants with 1 or more ICD or hobbyism-punding.

^dAll but 1 of the 27 participants without a diagnostic interview for hobbyism-punding had an ICD diagnosis and were included.

QUIP-RS, Questionnaire for Impulsive-Compulsive Disorders in Parkinson's Disease-Rating Scale; SD, standard deviation; ICD, impulse control disorder; N/A, not applicable.

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TABLE 3

Discriminant validity (N = 104)

Disorder	6	7	8	9	10	11	12	13	14	15	16
Gambling (AUC = 0.997)											
Sensitivity	100 ^a	90	90	90	80	70	50	30	30	20	10
Specificity	97	98	99	99	100	100	100	100	100	100	100
Buying (AUC = 0.969)											
Sensitivity	82	82	82 ^a	73	73	73	46	18	18	18	9
Specificity	91	93	95	99	100	100	100	100	100	100	100
Sex (AUC = 0.979)											
Sensitivity	100	100	100 ^a	87	87	73	60	27	27	13	7
Specificity	79	81	89	94	99	99	99	99	99	99	99
Eating (AUC = 0.913)											
Sensitivity	91	87 ^a	74	65	57	48	44	26	17	17	17
Specificity	79	80	84	91	93	96	98	99	100	100	100
Combined ICDs (AUC = 0.907)											
Sensitivity	100	98	93	91	86 ^a	84	81	79	77	72	70
Specificity	64	69	72	75	84	84	84	84	84	85	87
Hobbyism and punning (AUC = 0.873)											
Sensitivity	90	90 ^a	74	63	58	53	37	37	37	26	26
Specificity	79	83	83	85	88	90	95	97	98	98	98

Values for sensitivity and specificity are percentages.

^aOptimal cutoff point: ie, score with both (1) sensitivity and specificity 80% and (2) highest combined sensitivity and specificity.

AUC, area under the receiver operating characteristic curve; ICD, impulse control disorder.

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TABLE 4

Responsiveness to change (N = 29)

Group	QUIP-RS score (mean [SD])			Statistic	
	Baseline	End-of-study	Change over time	Paired <i>t</i> test ^a	Linear regression model ^b
Full responders (n = 12)	29.3 (16.7)	16.0 (7.5)	-13.3 (12.7)	<i>t</i> = 3.65 (df = 11), <i>P</i> = .004	<i>B</i> = -0.79, <i>t</i> (25) = -3.95, <i>P</i> = .001
Partial responders (n = 12)	32.8 (14.5)	21.8 (10.0)	-11.0 (12.8)	<i>t</i> = 2.98 (df = 11), <i>P</i> = .01	<i>B</i> = -0.64, <i>t</i> (25) = -3.24, <i>P</i> = .003
Nonresponders (n = 5)	43.2 (25.8)	43.8 (25.7)	0.6 (11.2)	<i>t</i> = 0.12 (df = 4), <i>P</i> = .91	—

^aStatistic for within-group comparison of baseline versus end-of-study QUIP-RS score.

^bChange over time in QUIP-RS score is dependent variable, baseline QUIP-RS score and response status (both full responders and partial responders, with nonresponders as reference group) entered as covariates. Multiple partial F test showed that response status based on CGI-I score predicted change in QUIP-RS score (*F* [2, 25] = 7.97, *P* = .002).

QUIP-RS, Questionnaire for Impulsive-Compulsive Disorders in Parkinson's Disease-Rating Scale; SD, standard deviation; CGI-I, Clinical Global Impression-Improvement.

TABLE 5

Reliability (N = 104)

Disorder	Interrater reliability ^a	Retest reliability ^b
Gambling	0.97 (0.95–0.98)	0.97 (0.95–0.98)
Buying	0.93 (0.90–0.95)	0.83 (0.73–0.89)
Sex	0.94 (0.92–0.96)	0.92 (0.88–0.95)
Eating	0.92 (0.89–0.95)	0.85 (0.76–0.90)
Hobbyism and punting	0.88 (0.83–0.92)	0.68 (0.52–0.79)
DDS	0.79 (0.70–0.85)	0.77 (0.65–0.85)
Total ICD score	0.95 (0.92–0.96)	0.90 (0.83–0.94)
Total QUIP-RS score	0.93 (0.90–0.95)	0.87 (0.79–0.92)

Intraclass correlation coefficient (95% CI).

^aTrained rater versus self-rated.^bSelf-rated at both assessments.

DDS, dopamine dysregulation syndrome; ICD, impulse control disorder; QUIP-RS, Questionnaire for Impulsive-Compulsive Disorders in Parkinson's Disease–Rating Scale; CI, confidence interval.