Validation of the Korean Version of the Questionnaire for Impulsive-Compulsive Disorders in Parkinson’s Disease Rating Scale

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**INTRODUCTION**

Impulse-control disorder (ICD) and compulsive repetitive behaviors such as hobbyism/punding and dopamine dysregulation syndrome (DDS) are common in Parkinson’s disease (PD). The prevalence of ICD and related behaviors in PD patients has been reported to be 10–20%. A recent study found that the 5-year cumulative incidence of ICD and related behaviors in PD was 46%. It is important to assess ICD and related behaviors because these behavioral disturbances can lead to devastating financial problems, emerging problems with online gambling or shopping, and impaired quality of life in both patients and their caregivers.

The Questionnaire for Impulsive-Compulsive Disorders in Parkinson’s Disease (QUIP) has been developed for screening pathological gambling, hypersexuality, excessive buying, overeating, hobbyism/punding, and DDS in PD patients. However, it cannot be used to assess the severity of these behavioral disturbances, nor monitor changes in these behaviors. The Questionnaire for Impulsive-Compulsive Disorders in Parkinson’s Disease Rating Scale (QUIP-RS) is a self-reported tool for assessing the severity of ICD and related behaviors that uses a 5-point Likert scale based on frequency.

The present nationwide multicenter prospective study aimed to validate the Korean Version of the Questionnaire for Impulsive-Compulsive Disorders in Parkinson’s Disease Rating Scale (K-QUIP-RS) and to determine the correlations between the severity of impulsive-compulsive behaviors and clinical features and the quality of life in the Korean PD population.

**METHODS**

**Background and Purpose** Impulse-control disorder is an important nonmotor symptom of Parkinson’s disease (PD) that can lead to financial and social problems, and be related to a poor quality of life. A nationwide multicenter prospective study was performed with the aim of validating the Korean Version of the Questionnaire for Impulsive-Compulsive Disorders in Parkinson’s Disease Rating Scale (K-QUIP-RS).

**Methods** The K-QUIP-RS was constructed using forward and backward translation, and pretesting of the prefinal version. PD patients on stable medical condition were recruited from 27 movement-disorder clinics. Participants were assessed using the K-QUIP-RS and evaluated for parkinsonian motor and nonmotor statuses and for PD-related quality of life using a predefined evaluation battery. The test–retest reliability of the K-QUIP-RS was assessed over an interval of 10–14 days, and correlations between the KQUIP-RS and other clinical scales were analyzed.

**Results** This study enrolled 136 patients. The internal consistency of the K-QUIP-RS was indicated by a Cronbach’s α coefficient of 0.846, as was the test–retest reliability by a Guttman split-half coefficient of 0.808. The total K-QUIP-RS score was positively correlated with the scores for depression and motivation items on the Unified PD Rating Scale (UPDRS), Montgomery-Asberg Depression Scale, and Rapid-Eye-Movement Sleep-Behavior-Disorders Questionnaire. The total K-QUIP-RS score was also correlated with the scores on part II of the UPDRS and the PD Quality of Life-39 questionnaire, and the dopaminergic medication dose.

**Conclusions** The K-QUIP-RS appears to be a reliable assessment tool for impulse-control and related behavioral disturbances in the Korean PD population.

**Key Words** parkinson disease, impulsive behavior, compulsive behavior, rating scale, validation study.
ward translation of the original QUIP-RS. After expert panels had reviewed the draft of the K-QUIP-RS, it was applied to four Korean PD patients to confirm its validity prior to this study. The final version of the K-QUIP-RS is provided as supplementary data.

Assessment
Clinical assessments were performed using the following components: the total daily levodopa equivalent dose (total LED) and the agonist LED from the doses of dopamine agonists only,26 the Hoehn and Yahr (H&Y) stage,27 the Unified Parkinson’s Disease Rating Scale (UPDRS) parts I, II, and III,28 the Korean Version of the Mini Mental State Examination (K-MMSE),29 the Korean Version of the Montreal Cognitive Assessment (MoCA-K),30 the Korean Version of the Montgomery-Asberg Depression Scale (K-MADS),31 the Korean Version of the 39-item Parkinson’s Disease Questionnaire (K-PDQ39),32 and the Korean Version of the Rapid-Eye-Movement Sleep-Behavior-Disorders Screening Questionnaire (K-RBDQ).33,34 The test–retest reliability was measured by performing K-QUIP-RS assessments twice within 10–14 days after the first assessment, which allowed sufficient time to minimize learning effects.

Statistical analysis
We used Cronbach’s α coefficient to check the internal consistency of the K-QUIP-RS with a criterion of ≥0.70. The test–retest reliability of the K-QUIP-RS was assessed using the Guttman split-half coefficient. Spearman’s correlation analysis was used to investigate correlations of the K-QUIP-RS score with other clinical scales. SPSS software (version 21.0, IBM Corp., Armonk, NY, USA) was used for statistical analysis, with the significance cutoff set at 0.05 (two-tailed).

RESULTS
This study enrolled 136 patients (65 males) aged 66.8±9.0 years (mean±SD) and with a PD duration of 47.3±46.8 months. The retest evaluation was completed in 133 of these patients. The demographic and clinical characteristics of the participants finally included in the analysis are summarized in Table 1.

K-QUIP-RS scores in the study population
The total K-QUIP-RS score was 2.5±5.0 (range, 0 to 28), and the total ICD items score—comprising the summation score in the domains of gambling, hypersexuality, buying, and eating—was 1.2±2.7 (range, 0 to 16). The frequencies of positive responders for the gambling, hypersexuality, buying, and eating items were 5.9%, 9.6%, 11.8%, and 20.6%, respectively. The frequency of positive responders for any of these

Table 1. Characteristics of the 136 patients included in this study

| Variable                      | Value               |
|-------------------------------|---------------------|
| Age, years                    | 66.8±9.0 (39–85)    |
| Sex, male                     | 65 (47.8)           |
| Disease duration, months       | 47.3±46.8 (1–252)   |
| Total LED, mg/day              | 654.8±473.4 (0–2250)|
| Agonist LED, mg/day            | 107.5±149.7 (0–825) |
| H&Y stage                     | 2.1±0.7 (1–5)       |
| UPDRS part I score            | 2.0±2.0 (0–8)       |
| UPDRS part II score           | 7.8±6.0 (0–29)      |
| UPDRS part III score          | 20.2±11.0 (0–54.5)  |
| K-MMSE score                  | 26.9±3.7 (4–30)     |
| MoCA-K score                  | 22.6±5.0 (1–30)     |
| K-MADS score                  | 10.3±9.6 (0–40)     |
| K-PDQ39 summary index         | 33.1±28.5 (0–123)   |
| K-RBDQ score                  | 3.3±2.9 (0–13)      |

Data are mean±SD (range) or n (%). values. H&Y: Hoehn and Yahr; K-MADS: Korean Version of the Montgomery-Asberg Depression Scale; K-MMSE: Korean Version of the Mini Mental State Examination; K-PDQ39: Korean Version of the Parkinson’s Disease Quality of Life–39; K-RBDQ: Korean Version of the Rapid-Eye-Movement Sleep-Behavior-Disorders Screening Questionnaire; LED: levodopa equivalent dose. MoCA-K: Korean Version of the Montreal Cognitive Assessment; UPDRS: Unified Parkinson’s Disease Rating Scale.

Table 2. Distribution of the K-QUIP-RS scores in the Parkinson’s disease patients included in this study

| K-QUIP-RS domain                | Mean±SD | Median (range) | n (%) for score ≥1 | n (%) for score ≥ suggested cutoff* |
|---------------------------------|---------|----------------|--------------------|-------------------------------------|
| Gambling                        | 0.3±1.3 | 0 (0–12)       | 8 (5.9)            | 1 (0.7)                             |
| Hypersexuality                  | 0.2±0.9 | 0 (0–7)        | 13 (9.6)           | 0 (0.0)                             |
| Buying                          | 0.2±0.8 | 0 (0–5)        | 16 (11.8)          | 0 (0.0)                             |
| Eating                          | 0.5±1.2 | 0 (0–8)        | 28 (20.6)          | 1 (0.7)                             |
| Hobbyism/punding                | 1.1±2.6 | 0 (0–18)       | 33 (24.3)          | 6 (4.4)                             |
| DDS                             | 0.2±1.2 | 0 (0–10)       | 6 (4.4)            | NA                                  |
| Summed score for ICD*           | 1.2±2.7 | 0 (0–16)       | 39 (28.7)          | 5 (3.7)                             |
| Total K-QUIP-RS score           | 2.5±5.0 | 0 (0–28)       | 47 (34.6)          | NA                                  |

*Cutoffs from the original American Version of the QUIP-RS: gambling, ≥6; hypersexuality, ≥8; buying, ≥8; eating, ≥7; hobbyism/punding, ≥7; and summed score for ICD, ≥10. *Summed score for ICD domains includes gambling, hypersexuality, buying, and eating. DDS: dopamine dysregulation syndrome; ICD: impulse-control disorder; K-QUIP-RS: Korean Version of the Questionnaire for Impulsive-Compulsive Disorders in Parkinson’s Disease Rating Scale; NA: not available.
four ICD domains was 28.7%. Based on a recommended cutoff of the total ICD items score of ≥10 for diagnosing ICD in PD,20 3.7% of the participants were classified as having ICD. The scores and frequencies in the individual domains and for the total K-QUIP-RS score are presented in Table 2.

**Internal consistency and test–retest reliability of the K-QUIP-RS**

Cronbach’s a coefficient for the total K-QUIP-RS was 0.846, and it was also ≥0.70 in each K-QUIP-RS domain. The scores in each domain of the K-QUIP-RS were correlated with the total K-QUIP-RS score (Spearman’s rank correlation coefficient = 0.392–0.887, p<0.001 in all) (Table 3). The Guttman split-half coefficient for the total K-QUIP-RS score was 0.808, and it was also ≥0.70 for the sum of the ICD items and for the score in all except two ICD domains: hypersexuality (0.079) and DDS (0.347) (Table 3).

**Correlation between the K-QUIP-RS score and other clinical measures**

The total K-QUIP-RS score and the summed score for ICD items were not correlated with age, PD duration, parkinsonian motor severity (H&Y stage and UPDRS part III score), or global cognition (K-MMSE and MoCA-K scores). However, the total K-QUIP-RS score was positively correlated with the UPDRS part I score, specifically for depression and motivation items (r=0.176 and 0.239, and p=0.041 and 0.005, respectively), and with the UPDRS part II score (r=0.214 and p=0.012). Both the total K-QUIP-RS score and the summed scores for ICD domains were positively correlated with scores on the K-MADS (r=0.224 and 0.230, and p=0.009 and 0.007, respectively), K-RBDQ (r=0.220 and 0.216, and p=0.010 and 0.012), and K-PDQ39 (r=0.223 and 0.171, and p=0.009 and 0.048) (Fig. 1). The total K-QUIP-RS score was also correlated with the total and agonist LEDs (r=0.209 and 0.181, and p=0.019 and 0.043, respectively) (Fig. 1). The results obtained in the correlation analysis are summarized in Table 4.

**DISCUSSION**

This nationwide multicenter study has demonstrated that the K-QUIP-RS has good consistency and reliability in the Korean PD population. Cronbach’s a coefficient was 0.846 for the total K-QUIP-RS and also ≥0.70 in every K-QUIP-RS domain. The test–retest reliability was good for the total K-QUIP-RS and in four of the six K-QUIP-RS domains, and suboptimal for the hypersexuality (0.079) and DDS (0.347) domains (based on the Guttman split-half coefficient).

In this study population, the frequency of positive responders for any of four ICD domains in the K-QUIP-RS was 28.7%, and for any of all six domains was 34.6%. However, the prevalence of ICD in this study population was estimated to be 3.7% when we applied the suggested cutoff.20 This was lower than the range of reported prevalence rates of ICD (5–20%),1,3,5-7,9-16 and also much lower than those reported for the French QUIP-RS study (12.5%) and the Mexican QUIP-RS study (4.6%) with the same cutoff applied.16,35

The scores in four ICD domains in this study were also lower than those in the original report on an American population and in reports from other countries including France, Mexico, Germany, and Philippines.16,35-37 These discrepancies might be related to the low proportion of users of high-dose dopamine agonist in this study, because dopamine agonist is a strong risk factor for ICD in PD, which is dose-dependent.5,17,18 In addition, our study population included patients who were much older at the onset of PD and included a lower proportion of males than the other studies, and both of these factors are negatively associated with the risk of ICD.3,18 In line with this, the inclusion of only a small number of early-onset PD patients in our study might have contributed to the relatively low ICD prevalence in the study population. Previous studies found that the susceptibility to ICD was higher in patients with parkin or PINK1 mutations,38-41 and that the ICD scores of the QUIP-RS were higher in PD/ICD with parkin mutation than in gene-negative early-onset PD/ICD.41 However, the genetic predisposition to develop ICD was not investigated in the present validation study. Moreover, the lower severity of ICD in the present population might have also been related to the tendency of Korean patients to underreport their behaviors on self-reported questionnaires. Influences of variations in ethnic characteristics and cultural
backgrounds might result in the optimal cutoff for ICD of the QUIP-RS differing between populations. In a German validation study, the optimal cutoff was 3 points lower than that in the original QUIP-RS developed in the US. Further investigations of the K-QUIP-RS are deemed necessary to confirm whether the suggested cutoff from the original version is reliable in the Korean PD population.

The low test–retest reliability found for the hypersexuality domain of the K-QUIP-RS in this study might be explained by the characteristics of Confucian culture in Korea. Confucian culture emphasizes concealing sexual desire or being ashamed to be revealed as having abnormal sexual behavior, which could contribute to the tendency of Korean PD patients to underreport hypersexuality more than other ICD behaviors, and could also result in greater variations in their reported values during repeated screening. Another possibility is that the questionnaire for hypersexuality is not sufficiently sensitive to detect this type of ICD in Korean PD patients. An intriguing finding of this study was that the most-frequent and severe ICD type was eating, whereas a previous
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Table 4. Coefficients for the correlations between the K-QUIP-RS score and clinical variables

| Variable                   | Summed score | Total QUIP-RS score |
|----------------------------|--------------|---------------------|
| Age                        | -0.063       | -0.160              |
| Disease duration           | 0.044        | 0.077               |
| Total LED                  | 0.134        | 0.209*              |
| Agonist LED                | 0.117        | 0.181*              |
| H&Y stage                  | 0.091        | 0.121               |
| UPDRS part I               | 0.091        | 0.200*              |
| Intellectual impairment    | 0.114        | 0.133               |
| Thought disorder           | 0.078        | 0.105               |
| Depression                 | 0.026        | 0.176*              |
| Motivation/initiative      | 0.152        | 0.239*              |
| UPDRS part II              | 0.114        | 0.214*              |
| UPDRS part III             | 0.058        | 0.084               |
| K-MMSE score               | -0.133       | -0.132              |
| MoCA-K score               | -0.028       | -0.044              |
| K-MADS score               | 0.230**      | 0.224*              |
| K-PDQ39 summary index      | 0.171*       | 0.223*              |
| Mobility                   | 0.110        | 0.160               |
| Activities of daily living | 0.139        | 0.171*              |
| Emotional well-being       | 0.145        | 0.213*              |
| Stigma                     | 0.040        | 0.122               |
| Social support             | 0.170*       | 0.219*              |
| Cognition                  | 0.259*       | 0.273*              |
| Communication              | 0.238**      | 0.264*              |
| Bodily discomfort           | 0.231**      | 0.302*              |
| K-RBDQ score               | 0.216*       | 0.220*              |

Summed score for ICD domains includes gambling, hypersexuality, buying, and eating. Spearman’s rank correlation test: *p<0.05, †p<0.01. H&Y: Hoehn and Yahr, ICD: impulse-control disorder, K-MADS: Korean Version of the Montgomery-Asberg Depression Scale, K-MMSE: Korean Version of the Mini Mental State Examination, K-PDQ39: Korean Version of the Parkinson’s Disease Quality of Life-39, K-QUIP-RS: Korean Version of the Questionnaire for Impulsive-Compulsive Disorders in Parkinson’s Disease Rating Scale, K-RBDQ: Korean Version of the Rapid-Eye-Movement Sleep-Behavior-Disorders Screening Questionnaire, LED: levodopa equivalent dose, UPDRS: Unified Parkinson’s Disease Rating Scale.

We found a low test–retest reliability for DDS (r=0.347) in this study. Previous studies of the QUIP-RS in other populations have also found low reliability in the DDS domain, with r values of 0.58 and 0.61 in French and German populations, respectively.32,36 DDS is usually accompanied by mood swings such as hypomanic, manic, or cyclothymic mood in the medication-on state, and withdrawal dysthymia or depression when dopaminergic medications are reduced.45-47 These fluctuating symptoms might affect the reliability of using the QUIP-RS to detect DDS. PD patients with DDS take more dopaminergic medications to alleviate the medication-off mood states and motor symptoms, but patients with DDS experience smaller improvements than PD patients without DDS when treated with the same medication.48 This might result in them underreporting their condition in such a self-reported questionnaire, or discriminating DDS from true dopaminergic medication use might be difficult when patients suffer dopa-responsive nonmotor medication-off symptoms based on the self-reports. On the other hand, the ICD severity was found to be lower when assessed in a self-reported questionnaire than in caregiver reports, and the assessment of ICD can be improved by using a clinician-rated scale.49,50

The total K-QUIP-RS score and the ICD-item summed scores were not related to the parkinsonian motor severity or global cognition, but they were correlated with depression, quality of life, and rapid-eye-movement sleep-behavior disorders (RBD). Other than dopaminergic drugs, the previously reported risk factors for ICD include being younger at PD onset, male,1,5,16-18 and having depression, alexithymia, anxiety, aggression, impulsivity, or obsessive-compulsiveness.51-54 Previous findings for the relationship between RBD and ICD in PD have been controversial, with some studies showing an association and others finding no significant relationship.55-57 According to a recent large population-based epidemiological study of RBD, the risk of RBD development is associated with male sex, alcohol use, smoking, antidepressant use for depression, and psychological distress,58 which are also shared risk factors for ICD.13,51,59 Our study supports the presence of associations between ICD and depression and RBD. However, since this study had a cross-sectional design, future longitudinal studies are needed that consider other risk factors for ICD including the history of smoking, alcohol use, and drug- and substance-use disorders.

This multicenter validation study has shown that the K-
QUIP-RS is a useful screening tool with good consistency and reliability for assessing ICD and related behavioral disturbances in the Korean PD population. However, further validation studies are needed to determine the optimal cutoff score of the K-QUIP-RS, how to implement a confirmative interview between the physician and both patients and caregivers, and how best to examine patients when ascertaining the presence of ICD, particularly for assessing hypersexuality and DDS.

Author Contributions

Conceptualization: Mee-Young Park, Jin Whan Cho, Jeewon Lee, Seong-Beom Ko, Tae-Beom Ahn. Data curation and Investigation: Ji-Hyun Choi, Jeewon Lee, Jin Whan Cho, Seong-Beom Ko, Tae-Beom Ahn, Sang Jin Kim, Sang-Myung Cheon, Joong-Seok Kim, Yoon-Joong Kim, Hyeo-II Ma, Jong Sam Baik, Phil Hyu Lee, Su Ju Chung, Jong-Min Kim, In-Uk Song, Han-Joon Kim, Young-Hee Sung, Do Young Kwon, Jae-Hyeok Lee, Ji-Young Kim, Ji Sun Kim, Ji Young Yun, Hee Jin Kim, Hee Jung Kim, Jong Sam Baik, Phil Hyu Lee, Yoonsoo Kim, Hye-Tae Kim, Mee Young Park. Methodology: Mee Young Park, Jin Whan Cho, Joong-Seok Kim. Writing—original draft: Ji-Hyun Choi, Jeewon Lee. Writing—review & editing: Mee Young Park, Jin Whan Cho.

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CONFLICTS OF INTEREST

The authors have no potential conflicts of interest to disclose.

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