

Original Article
Neurology



Validation of the Korean Version of the Scales for Outcomes in Parkinson's Disease-Sleep

OPEN ACCESS

Received: Jul 11, 2017
Accepted: Sep 24, 2017

Address for Correspondence:

Tae-Beom Ahn, MD, PhD
Department of Neurology, Kyung Hee University College of Medicine, 23 Kyungheedae-ro, Dongdaemun-gu, Seoul 02447, Korea.
E-mail: taebeom.ahn@khu.ac.kr

*Young-Hee Sung and Hee Jin Kim contributed equally to this work.

© 2018 The Korean Academy of Medical Sciences.

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<https://creativecommons.org/licenses/by-nc/4.0/>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ORCID iDs

Young-Hee Sung
<https://orcid.org/0000-0002-2840-1338>
Hee Jin Kim
<https://orcid.org/0000-0003-1554-2657>
Seong-Beom Koh
<https://orcid.org/0000-0002-9411-4863>
Joong-Seok Kim
<https://orcid.org/0000-0001-8087-7977>
Sang Jin Kim
<https://orcid.org/0000-0001-7240-2154>
Sang-Myung Cheon
<https://orcid.org/0000-0001-5905-2188>
Jin Whan Cho
<https://orcid.org/0000-0002-9145-6729>
Yoon-Joong Kim
<https://orcid.org/0000-0002-2956-1552>

Young-Hee Sung ^{1,*}, Hee Jin Kim ^{2,*}, Seong-Beom Koh ³, Joong-Seok Kim ⁴, Sang Jin Kim ⁵, Sang-Myung Cheon ⁶, Jin Whan Cho ⁷, Yoon-Joong Kim ⁸, Hyeo-Il Ma ⁸, Mee Young Park ⁹, Jong Sam Baik ¹⁰, Phil Hyu Lee ¹¹, Sun Ju Chung ¹², Jong-Min Kim ¹³, In-Uk Song ¹⁴, Han-Joon Kim ¹⁵, Ji-Young Kim ¹⁶, Do Young Kwon ¹⁷, Jae-Hyeok Lee ¹⁸, Jee-Young Lee ¹⁹, Ji Seon Kim ²⁰, Ji Young Yun ²¹, Jin Yong Hong ²², Mi-Jung Kim ³, Jinyoung Youn ⁷, Ji Sun Kim ⁷, Eung Seok Oh ²³, Hui-Jun Yang ²⁴, Won Tae Yoon ²⁵, Sooyeoun You ²⁶, Kyum-Yil Kwon ²⁷, Hyung-Eun Park ⁴, Su-Yun Lee ⁶, Younsoo Kim ²⁸, Hee-Tae Kim ²⁹ and Tae-Beom Ahn ³⁰

- ¹Department of Neurology, Gachon University Gil Hospital, Incheon, Korea
- ²Department of Neurology, Konkuk University School of Medicine, Seoul, Korea
- ³Department of Neurology, Korea University Guro Hospital, Korea University College of Medicine, Seoul, Korea
- ⁴Department of Neurology, Seoul St. Mary's Hospital, The Catholic University of Korea College of Medicine, Seoul, Korea
- ⁵Department of Neurology, Inje University Busan Paik Hospital, Inje University College of Medicine, Busan, Korea
- ⁶Department of Neurology, Dong-A University College of Medicine, Busan, Korea
- ⁷Department of Neurology and Neuroscience Center, Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul, Korea
- ⁸Department of Neurology, Hallym University College of Medicine, Anyang, Korea
- ⁹Department of Neurology, Yeungnam University College of Medicine, Daegu, Korea
- ¹⁰Department of Neurology, Inje University Sanggye Paik Hospital, Inje University College of Medicine, Seoul, Korea
- ¹¹Department of Neurology, Severance Hospital, Yonsei University College of Medicine, Seoul, Korea
- ¹²Department of Neurology, University of Ulsan College of Medicine, Asan Medical Center, Seoul, Korea
- ¹³Department of Neurology, Seoul National University Bundang Hospital, Seoul National University College of Medicine, Seongnam, Korea
- ¹⁴Department of Neurology, Incheon St. Mary's Hospital, The Catholic University of Korea, Incheon, Korea
- ¹⁵Department of Neurology, Seoul National University Hospital, Seoul National University College of Medicine, Seoul, Korea
- ¹⁶Department of Neurology, Inje University Seoul Paik Hospital, Seoul, Korea
- ¹⁷Department of Neurology, Korea University Ansan Hospital, Korea University College of Medicine, Ansan, Korea
- ¹⁸Department of Neurology, Pusan National University Yangsan Hospital, Yangsan, Korea
- ¹⁹Department of Neurology, Seoul Metropolitan Government-Seoul National University Boramae Medical Center, Seoul National University College of Medicine, Seoul, Korea
- ²⁰Department of Neurology, Chungbuk National University Hospital, Chungbuk National University School of Medicine, Cheongju, Korea
- ²¹Department of Neurology, Ewha Womans University School of Medicine and Ewha Womans University Mokdong Hospital, Seoul, Korea
- ²²Department of Neurology, Yonsei University Wonju College of Medicine, Wonju, Korea
- ²³Department of Neurology, Chungnam National University Hospital, Chungnam National University School of Medicine, Daejeon, Korea
- ²⁴Department of Neurology, Ulsan University Hospital, University of Ulsan College of Medicine, Ulsan, Korea
- ²⁵Department of Neurology, Kangbuk Samsung Hospital, Sungkyunkwan University School of Medicine, Seoul, Korea
- ²⁶Department of Neurology, Keimyung University School of Medicine, Daegu, Korea
- ²⁷Department of Neurology, Soonchunhyang University Seoul Hospital, Soonchunhyang University School of Medicine, Seoul, Korea
- ²⁸Department of Neurology, Changwon Samsung Hospital, Changwon, Korea
- ²⁹Department of Neurology, Hanyang University College of Medicine, Seoul, Korea
- ³⁰Department of Neurology, Kyung Hee University College of Medicine, Seoul, Korea

Hyeo-Il Ma 
<https://orcid.org/0000-0001-6733-9779>
 Mee Young Park 
<https://orcid.org/0000-0002-5683-1634>
 Jong Sam Baik 
<https://orcid.org/0000-0002-5300-203X>
 Phil Hyu Lee 
<https://orcid.org/0000-0001-9931-8462>
 Sun Ju Chung 
<https://orcid.org/0000-0003-4118-8233>
 Jong-Min Kim 
<https://orcid.org/0000-0001-5723-3997>
 In-Uk Song 
<https://orcid.org/0000-0002-0181-0844>
 Han-Joon Kim 
<https://orcid.org/0000-0001-8219-9663>
 Ji-Young Kim 
<https://orcid.org/0000-0002-0666-927X>
 Do Young Kwon 
<https://orcid.org/0000-0002-5414-0397>
 Jae-Hyeok Lee 
<https://orcid.org/0000-0002-4274-7415>
 Jee-Young Lee 
<https://orcid.org/0000-0002-9120-2075>
 Ji Seon Kim 
<https://orcid.org/0000-0002-8117-5114>
 Ji Young Yun 
<https://orcid.org/0000-0001-9648-9450>
 Jin Yong Hong 
<https://orcid.org/0000-0002-2476-3737>
 Mi-Jung Kim 
<https://orcid.org/0000-0001-9097-2759>
 Jinyoung Youn 
<https://orcid.org/0000-0003-3350-5032>
 Ji Sun Kim 
<https://orcid.org/0000-0003-3669-9151>
 Eung Seok Oh 
<https://orcid.org/0000-0003-2068-3235>
 Hui-Jun Yang 
<https://orcid.org/0000-0002-3593-1134>
 Won Tae Yoon 
<https://orcid.org/0000-0002-7026-3899>
 Sooyeoun You 
<https://orcid.org/0000-0003-4753-4491>
 Kyum-Yil Kwon 
<https://orcid.org/0000-0001-5443-0952>
 Hyung-Eun Park 
<https://orcid.org/0000-0003-4000-1051>
 Su-Yun Lee 
<https://orcid.org/0000-0003-1072-8452>
 Younsoo Kim 
<https://orcid.org/0000-0002-0292-1538>
 Hee-Tae Kim 
<https://orcid.org/0000-0002-7722-4841>
 Tae-Beom Ahn 
<https://orcid.org/0000-0002-7315-6298>

ABSTRACT

Background: Sleep problems commonly occur in patients with Parkinson's disease (PD), and are associated with a lower quality of life. The aim of the current study was to translate the English version of the Scales for Outcomes in Parkinson's Disease-Sleep (SCOPA-S) into the Korean version of SCOPA-S (K-SCOPA-S), and to evaluate its reliability and validity for use by Korean-speaking patients with PD.

Methods: In total, 136 patients with PD from 27 movement disorder centres of university-affiliated hospitals in Korea were enrolled in this study. They were assessed using SCOPA, Hoehn and Yahr Scale (HYS), Unified Parkinson's Disease Rating Scale (UPDRS), Parkinson's Disease Sleep Scale 2nd version (PDSS-2), Non-motor Symptoms Scale (NMSS), Montgomery Asberg Depression Scale (MADS), 39-item Parkinson's Disease Questionnaire (PDQ39), Neurogenic Orthostatic Hypotension Questionnaire (NOHQ), and Rapid Eye Movement Sleep Behaviour Disorder Questionnaire (RBDQ). The test-retest reliability was assessed over a time interval of 10–14 days.

Results: The internal consistency (Cronbach's α -coefficients) of K-SCOPA-S was 0.88 for nighttime sleep (NS) and 0.75 for daytime sleepiness (DS). Test-retest reliability was 0.88 and 0.85 for the NS and DS, respectively. There was a moderate correlation between the NS sub-score and PDSS-2 total score. The NS and DS sub-scores of K-SCOPA-S were correlated with motor scale such as HYS, and non-motor scales such as UPDRS I, UPDRS II, MADS, NMSS, PDQ39, and NOHQ while the DS sub-score was with RBDQ.

Conclusion: The K-SCOPA-S exhibited good reliability and validity for the assessment of sleep problems in the Korean patients with PD.

Keywords: Parkinson's Disease; Scales for Outcomes in Parkinson's Disease-Sleep; SCOPA-Sleep; Validation

INTRODUCTION

Sleep disturbance, which is one of the most common non-motor symptoms of Parkinson's disease (PD), increases in frequency with advancing disease.¹ A community-based study reported that 60% of patients with PD (144 of 239 patients) had sleep problems, compared with 33% of healthy age- and sex-matched controls (33 of 100 healthy participants).² A study on prevalence, using a non-motor symptoms questionnaire, demonstrated daytime sleepiness (DS) in 31% of patients with PD, insomnia in 46%, restless legs in 42%, vivid dreams in 34%, and acting out during dreams in 36%.³ Sleep problems have a significant negative impact on the quality of life of patients and their caregivers.^{4,5} Therefore, recognition and appropriate management of sleep problems are vitally important in PD treatment.

The Scales for Outcomes in Parkinson's Disease-Sleep (SCOPA-S) evaluates sleep problems using a self-administered questionnaire.⁶ The nighttime sleep (NS) section, which addresses sleep problems during the night in the prior month, consists of five items with four response options (i.e., 0 [not at all] to 3 [a lot]), with a maximum score of 15. The DS section evaluates sleepiness during the daytime in the prior month, and includes six items with four response options (i.e., 0 [never] to 3 [often]), with a maximum score of 18. Additionally, overall sleep quality (SQ) is also assessed with seven response options (i.e., 0 [slept very well] to 6 [slept very badly]).

In the present study, we translated SCOPA-S into Korean and evaluated its reliability and validity for use in Korean patients with PD.

Funding

This study was supported by a grant from Samil Pharmacy Company.

Disclosure

The authors have no potential conflicts of interest to disclose.

Author Contributions

Conceptualization: Koh SB, Kim JS, Kim SJ, Cheon SM, Ahn TB. Data curation: Sung YH, Kim HJ, Ahn TB. Formal analysis: Kim HJ. Investigation: Sung YH, Kim HJ, Koh SB, Kim JS, Kim SJ, Cheon SM, Cho JW, Kim YJ, Ma HI, Park MY, Baik JS, Lee PH, Chung SJ, Kim JM, Song IU, Kim HJ, Kim JY, Kwon DY, Lee JH, Lee JY, Kim JS, Yun JY, Hong JY, Kim MJ, Youn J, Kim JS, Oh ES, Yang HJ, Yoon WT, You S, Kwon KY, Park HE, Lee SY, Kim Y, Kim HT, Ahn TB. Methodology: Koh SB, Kim JS, Kim SJ, Cheon SM, Ahn TB. Writing - original draft: Sung YH, Kim HJ. Writing - review & editing: Ahn TB.

METHODS**Study design and setting***Study participants*

We recruited patients with PD, aged above 39 years, from 27 movement disorder centres of university-affiliated hospitals in Korea. The diagnosis of PD was made according to the clinical diagnostic criteria of the United Kingdom Parkinson's Disease Society Brain Bank.⁷

The exclusion criteria were as follows; diagnosis of secondary Parkinsonism or symptoms suggesting Parkinson plus syndrome, history of psychiatric illness, and current or past use of antidepressants or medication that can cause drug-induced Parkinsonism.

Translation

The following steps were taken to translate the original English version of SCOPA-S⁶ (**Appendix 1**) into Korean: forward translation and backward translation, expert committee review, pretest of the pre-final version, and development of the final Korean version.

First, two independent bilingual translators translated the English version of SCOPA-S into Korean, literally. A panel consisting of five authors (Ahn TB, Cheon SM, Kim JS, Kim SJ, and Koh SB) reviewed the translations to form a single forward translation. Another bilingual translator translated the Korean version draft of SCOPA-S back into English. The panel then evaluated discrepancies between the original English form and the first draft of the Korean translation. Interview with four patients was performed to test the interpretation of the translation. Thereafter, we generated the final Korean version of SCOPA-S (K-SCOPA-S) (**Appendix 2**).

Assessment

Clinical assessment was conducted using the following tools: modified Hoehn and Yahr Scale (HYS),⁸ Unified Parkinson's Disease Rating Scales part I, II, and III (UPDRS I, II, and III),⁹ the Korean version of the SCOPA-cognition, autonomic, and psychosocial, the Korean version of the Mini-Mental Status Examination (K-MMSE),¹⁰ the Korean version of the Montreal Cognitive Assessment (MoCA-K),¹¹ the Korean version of the Montgomery-Asberg Depression Scale (K-MADS),¹² the Parkinson's Disease Sleep Scale 2nd version (PDSS-2),¹³ the Korean version of the 39-item Parkinson's Disease Questionnaire (K-PDQ39),¹⁴ the Korean version of the Non-motor Symptoms Scale (K-NMSS),¹⁵ the Rapid Eye Movement Sleep Behavior Disorders Screening Questionnaire (RBDQ),¹⁶ and the Neurogenic Orthostatic Hypotension Questionnaire (NOHQ).¹⁷

For the test-retest reliability, K-SCOPA-S assessments were repeated twice, with an interval of 10–14 days, allowing sufficient time to minimize learning effect.

Statistical analysis

The quality of data was considered satisfactory if more than 95% of the scale data were fully computable. Reliability was tested for internal consistency and stability of measures. Internal consistency was analyzed using the Cronbach's α -coefficient (criterion value for α : ≥ 0.70). The item homogeneity (mean of the inter-item correlation coefficients, criterion value: ≥ 0.30) and corrected item-total correlations (without contribution of the tested item, criterion value: ≥ 0.40) were determined to ascertain the internal consistency of K-SCOPA-S.

The test-retest reliability was assessed using intraclass correlation coefficient (ICC). Correlation values of 0.70 or greater were considered satisfactory. Comparison of baseline and follow-up scores was performed using a Wilcoxon's test. In addition to identifying the association between variables, the Spearman's rank correlation coefficients (r_s) were used to analyze the construct validity with other scales. All statistical analyses were performed using SPSS 17.0 (SPSS, Inc., Chicago, IL, USA).

Ethics statement

The Institutional Review Board at each hospital reviewed and approved this study protocol (Kyung Hee University Medical Center, IRB No. 2014-12-204). Informed consent was submitted by all subjects when they were enrolled.

RESULTS

Demographic features

Among the 136 patients who were enrolled in this study, 133 patients completed the retest step. The study cohort comprised 65 men and 71 women, with a mean age of 66.8 ± 9.0 years. The median HYS was 2 (19 patients at stage 1, 7 at stage 1.5, 55 at stage 2, 32 at stage 2.5, 21 at stage 3, 1 at stage 4, and 1 at stage 5). The demographic and clinical characteristics are summarized in **Table 1**.

Validation results

The mean sub-scores of K-SCOPA-S were 3.8 for NS and 2.6 for DS. The median score of K-SCOPA-S SQ was 2. Descriptive data and acceptability parameters of K-SCOPA-S are shown in **Table 2**.

Table 1. Demographics and clinical characteristics

Characteristics	Mean	SD	No. of patients
Age, yr	66.76	9.03	136
Education, yr	3.08	1.72	136
Disease duration, mon	47.25	46.81	136
HYS	2.14	0.67	136
UPDRS I	2.00	1.99	136
UPDRS II	7.77	6.00	136
UPDRS III	20.19	11.03	135
K-MMSE	26.90	3.70	134
MoCA-K	22.60	5.04	134
K-MADS	10.26	9.61	136
K-NMSS	35.89	28.03	136
K-PDQ39 SI	33.07	28.45	135
K-SCOPA cognition	22.08	7.36	131
K-SCOPA autonomic	16.78	9.70	135
K-SCOPA psychosocial	6.43	6.96	136
RBDQ	3.32	2.94	136
NOHQ	22.27	19.16	136

SD = standard deviation, HYS = Hoehn and Yahr Scale, UPDRS = Unified Parkinson's Disease Rating Scale, K-MMSE = Korean version of the Mini-Mental Status Examination, MoCA-K = Korean version of the Montreal Cognitive Assessment, K-MADS = Korean version of the Montgomery-Asberg Depression Scale, K-NMSS = Korean version of the Non-motor Symptoms Scale, K-PDQ39 SI = Korean version of the 39-item Parkinson's Disease Questionnaire summary index, K-SCOPA = Korean version of Scales for Outcomes in Parkinson's Disease, RBDQ = Rapid Eye Movement Sleep Behavior Disorders Screening Questionnaire, NOHQ = Neurogenic Orthostatic Hypotension Questionnaire.

Table 2. Descriptive statistics, and acceptability parameters of the K-SCOPA-S

K-SCOPA-S (n = 136)	Fully computable, %	Mean	Median	SD	Range
NS		3.77	3	3.72	0–15
Item 1	100	0.69	0	0.92	0–3
Item 2	100	0.80	1	0.93	0–3
Item 3	100	0.79	1	0.89	0–3
Item 4	100	0.78	0	0.93	0–3
Item 5	100	0.71	0	0.88	0–3
SQ	100	2.14	2	1.66	0–6
DS		2.57	2	2.55	0–15
Item 1	100	0.57	0	0.71	0–3
Item 2	100	0.65	0.5	0.79	0–3
Item 3	100	0.84	1	0.79	0–3
Item 4	100	0.11	0	0.42	0–3
Item 5	100	0.30	0	0.64	0–3
Item 6	100	0.08	0	0.32	0–2

K-SCOPA-S = Korean version of Scales for Outcomes in Parkinson's Disease-Sleep, SD = standard deviation, NS = nighttime sleep, SQ = sleep quality, DS = daytime sleepiness.

Table 3. Internal consistency and test-retest reliability of the K-SCOPA-S for PD

K-SCOPA-S (n = 136)	Cronbach's α	Item homogeneity	Corrected item-total correlation	Cronbach's α if item deleted	ICC (n = 133)
NS	0.876	0.59	N/A	N/A	0.88
Item 1		0.34–0.68	0.65	0.86	0.85
Item 2		0.53–0.72	0.74	0.84	0.83
Item 3		0.53–0.72	0.81	0.82	0.84
Item 4		0.34–0.58	0.58	0.88	0.84
Item 5		0.58–0.70	0.77	0.83	0.84
SQ	N/A	N/A	N/A	N/A	0.85
DS	0.749	0.34	N/A	N/A	0.85
Item 1		0.15–0.52	0.54	0.70	0.77
Item 2		0.17–0.63	0.65	0.66	0.81
Item 3		0.23–0.63	0.57	0.69	0.81
Item 4		0.27–0.55	0.52	0.72	0.66
Item 5		0.23–0.55	0.43	0.73	0.63
Item 6		0.15–0.32	0.32	0.76	0.80

K-SCOPA-S = Korean version of Scales for Outcomes in Parkinson's Disease-Sleep, PD = Parkinson's disease, ICC = intraclass correlation coefficient (using mixed model, type consistency, averaged measures), NS = nighttime sleep, N/A = not applicable, SQ = sleep quality, DS = daytime sleepiness.

Internal consistency

Table 3 displays data on internal consistency of K-SCOPA-S. The Cronbach's α -coefficients were 0.88 and 0.75 for the NS and DS subscales, respectively. The corrected item-total correlations ranged from 0.58 to 0.81 for the NS subscale and from 0.32 to 0.65 for the DS subscale. The corrected item-total correlations for all items, except K-SCOPA DS item 6, were ≥ 0.40 . The inter-item correlation coefficient was 0.59 and ranged from 0.34 (items 1 and 4) to 0.72 (items 2 and 3) for the NS subscale, and was 0.34 and ranged from 0.15 (items 1 and 6) to 0.63 (items 2 and 3) for the DS subscale.

Test-retest reliability

There was no significant difference between initial and follow-up scores ($P > 0.05$, Wilcoxon's test). Test-retest reliability of K-SCOPA-S, which was determined in 133 patients who performed the test twice, was 0.88 (ranged from 0.83 to 0.85) for the NS subscale, 0.85 for single-item on SQ, and 0.85 (ranged from 0.63 to 0.81) for DS (**Table 3**). The ICCs for all the items, except DS items 4 (0.66) and 5 (0.63) were ≥ 0.70 .

Construct validity

The correlation coefficient between K-SCOPA-S SQ and NS section was 0.66 ($P < 0.001$), whereas there was no significant correlation between K-SCOPA-S SQ and DS section. The SQ and NS sub-scores of K-SCOPA-S were significantly correlated with PDSS-2 item 1 (the overall quality of your night's sleep is), PDSS-2 total score, and sleep/fatigue sub-score of the K-NMSS (Table 4). Among the PDSS-2 items, item 2 (difficulty falling asleep) had the highest correlation ($r_s = 0.64$; $P < 0.001$) with K-SCOPA-S NS subscale (Table 4). There was a significant, but weak correlation between the DS sub-score, and the PDSS-2 total score ($r_s = 0.29$; $P < 0.001$) and sleep/fatigue sub-score of K-NMSS ($r_s = 0.26$; $P < 0.001$).

Correlation between K-SCOPA-S and other clinical variables

Correlation coefficients of K-SCOPA-S sub-scores with the PD-related scales are shown in Table 5. The correlations of K-SCOPA-S DS and NS sub-scores with HYS, UPDRS I, and UPDRS II were significant. The DS sub-score of K-SCOPA-S was significantly correlated with UPDRS III, while SQ and the NS sub-scores of K-SCOPA-S were not. K-MMSE and MoCA-K scores were not correlated with K-SCOPA-S scores.

The K-SCOPA-S DS sub-score had a moderate correlation with the cognitions sub-score of K-PDQ39 ($r_s = 0.48$). The SQ sub-score was moderately correlated with K-MADS score ($r_s = 0.44$), while the NS and DS sub-scores were weakly correlated ($r_s = 0.32$ and 0.27 , respectively). All the sub-scores of K-SCOPA-S had a significant correlation with the K-NMSS total, the K-PDQ39, the K-SCOPA autonomic and psychosocial, and the NOHQ scores. The DS sub-score of K-SCOPA-S was significantly correlated with RBDQ, while SQ and the NS sub-score of K-SCOPA-S was not.

DISCUSSION

We translated the SCOPA-S into Korean using a standard method to overcome the language barrier. We found K-SCOPA-S to be a reliable and valid instrument applicable to a Korean-

Table 4. Convergent validity of the K-SCOPA-S for PD

PDSS-2	K-SCOPA-S		
	NS	Overall SQ	DS
Item 1	0.58 ^a	0.69 ^a	-0.03
Item 2	0.64 ^a	0.56 ^a	0.01
Item 3	0.60 ^a	0.53 ^a	0.20 ^b
Item 4	0.24 ^a	0.22 ^b	0.13
Item 5	0.34 ^a	0.32 ^a	0.16
Item 6	0.21 ^b	0.22 ^b	0.13
Item 7	0.15	0.08	0.19 ^b
Item 8	0.24 ^a	0.11	0.23 ^a
Item 9	0.29 ^a	0.19 ^b	0.16
Item 10	0.29 ^a	0.24 ^a	0.10
Item 11	0.27 ^a	0.33 ^a	0.16
Item 12	0.19 ^b	0.15	0.09
Item 13	0.09	0.18 ^b	0.16
Item 14	0.42 ^a	0.37 ^a	0.19 ^b
Item 15	0.20 ^b	0.17 ^b	0.23 ^a
PDSS-2 total	0.63 ^a	0.58 ^a	0.29 ^a
K-NMSS sleep/fatigue	0.42 ^a	0.52 ^a	0.26 ^a

K-SCOPA-S = Korean version of Scales for Outcomes in Parkinson's Disease-Sleep, PD = Parkinson's disease, NS = nighttime sleep, SQ = sleep quality, DS = daytime sleepiness, PDSS-2, Parkinson's Disease Sleep Scale 2nd version, K-NMSS = Korean version of the Non-motor Symptoms Scale.

^a $P < 0.01$ by Spearman correlation; ^b $P < 0.05$ by Spearman correlation.

Table 5. Correlation of the K-SCOPA-S for PD with clinical variables

Variables	K-SCOPA-S		
	NS	Overall SQ	DS
Age, yr	-0.02	-0.09	0.01
Disease duration, mon	0.04	0.02	0.24 ^a
HYS	0.18 ^b	0.11	0.25 ^a
UPDRS I	0.27 ^a	0.31 ^a	0.27 ^a
UPDRS II	0.24 ^a	0.21 ^b	0.21 ^b
UPDRS III	0.02	0.03	0.19 ^b
K-MMSE	-0.12	-0.17	0.03
MoCA-K	-0.07	-0.08	-0.06
K-MADS	0.32 ^a	0.44 ^a	0.27 ^a
K-NMSS	0.34 ^a	0.40 ^a	0.33 ^a
Cardiovascular	0.12	0.14	0.16
Sleep/fatigue	0.42 ^a	0.52 ^a	0.26 ^a
Mood	0.20 ^b	0.35 ^a	0.18 ^b
Perceptual problems	0.01	0.04	0.23 ^a
Attention/memory	0.30 ^a	0.25 ^a	0.32 ^a
Gastrointestinal	0.06	0.12	0.23 ^a
Urinary	0.23 ^a	0.20 ^a	0.32 ^a
Sexual function	0	0.06	0.16
Miscellaneous	0.11	0.18 ^a	0.28 ^a
K-PDQ39 SI	0.30 ^a	0.33 ^a	0.30 ^a
Mobility	0.26 ^a	0.24 ^a	0.24 ^a
Activities of daily living	0.16	0.21 ^b	0.17 ^b
Emotional well-being	0.26 ^a	0.35 ^a	0.22 ^b
Stigma	0.22 ^a	0.26 ^a	0.08
Social support	0.16	0.22 ^a	0.27 ^a
Cognitions	0.29 ^a	0.32 ^a	0.48 ^a
Communication	0.17 ^b	0.19 ^b	0.29 ^a
Bodily discomfort	0.15	0.22 ^b	0.38 ^a
K-SCOPA cognition	-0.08	-0.13	-0.01
K-SCOPA autonomic	0.31 ^a	0.30 ^a	0.31 ^a
K-SCOPA psychosocial	0.34 ^a	0.34 ^a	0.28 ^a
RBDQ	0.10	0.07	0.28 ^a
NOHQ	0.26 ^a	0.28 ^a	0.35 ^a

K-SCOPA-S, Korean version of Scales for Outcomes in Parkinson's Disease-Sleep, PD = Parkinson's disease, NS = nighttime sleep, SQ = sleep quality, DS = daytime sleepiness, HYS = Hoehn and Yahr Scale, UPDRS = Unified Parkinson's Disease Rating Scale, K-MMSE = Korean version of the Mini-Mental Status Examination, MoCA-K = Korean version of the Montreal Cognitive Assessment, K-MADS = Korean version of the Montgomery-Asberg Depression Scale, K-NMSS = Korean version of the Non-motor Symptoms Scale, K-PDQ39 SI = Korean version of the 39-item Parkinson's Disease Questionnaire summary index, K-SCOPA = Korean version of Scales for Outcomes in Parkinson's Disease, RBDQ = Rapid Eye Movement Sleep Behavior Disorders Screening Questionnaire, NOHQ = Neurogenic Orthostatic Hypotension Questionnaire.

^aP < 0.01 by Spearman correlation; ^bP < 0.05 by Spearman correlation.

speaking PD population. The assessment was done in 27 different movement-disorder clinics by different investigators, which strengthened the impact of our study and the usefulness of K-SCOPA-S in clinical practice.

The mean NS and DS sub-scores of the K-SCOPA-S were lower in comparison to the results found using the Dutch and Thai versions of SCOPA-S.^{6,18} This discrepancy could be attributed to the milder severity and earlier stages of PD in patients in the current study cohort, compared to those in the original Netherlands study, or to the effect of weather (e.g., tropical night phenomenon) on SQ in Thailand. The mean NS and sub-scores of the current study were, however, similar to those reported using the Swedish version of K-SCOPA-S.¹⁹ The disease duration and severity in the Swedish patients with PD in that previous study was similar to those in the Korean patients with PD included in the current study.

Since a cut-off above 0.7 for Cronbach's α -coefficients is acceptable for internal consistency and reliability, the internal consistency of K-SCOPA-S was satisfactory, as Cronbach's α -coefficient was 0.876 and 0.749 for NS and DS, respectively. Test-retest reliability, which was 0.88 and 0.85 for NS and DS, respectively, when assessed by ICC, was also adequate. These results suggested that the K-SCOPA-S is a valid and reliable instrument to assess SQ in Korean patients with PD.

The SQ and NS sub-scores of K-SCOPA-S were significantly correlated with PDSS-2 item 1, PDSS-2 total score, and the sleep/fatigue sub-score of K-NMSS. However, the DS sub-score of K-SCOPA-S was only significantly correlated with the PDSS-2 total score and K-NMSS sub-score. This discrepancy may be related to the fact that PDSS-2 mainly evaluated NS (only 1 item assesses DS), whereas K-SCOPA-S evaluated both NS and DS in a more balanced way (5 and 6 items, respectively). The strength of SCOPA-S in the assessment of both nocturnal and daytime sleep problems was similarly addressed in a previous study comparing SCOPA-S and PDSS.²⁰

K-SCOPA-S was significantly correlated with scales for non-motor symptoms (namely, UPDRS I, K-NMSS, K-MADS, K-SCOPA autonomic, and K-SCOPA psychosocial), activities of daily living (UPDRS II), quality of life (K-PDQ39), neurogenic hypotension (NOHQ), and RBDQ (Table 5). The close correlations between sleep and mood/depression or quality of life in PD have been previously highlighted in other studies.²⁰⁻²⁷ This study showed that sleep problems measured by K-SCOPA-S were correlated with specific non-motor symptoms such as dysautonomia (K-SCOPA-autonomic and NOHQ) in addition to a general measure (K-NMSS) or psychosocial measure (K-SCOPA psychosocial). In line with these findings, it was reported that dysautonomia was more severe in those with sleep problems in PD.²⁸ Interestingly, the DS sub-score rather than the NS sub-score was significantly correlated with RBDQ. The importance of DS in rapid eye movement sleep behavior disorder (RBD) was previously reported. DS was higher in those with RBD than without RBD in PD and an important predictor for the conversion into neurodegenerative disorders in idiopathic RBD, suggesting that DS could be related to more severe pathologies in the brain including arousal system.^{29,30} Our study showed that K-SCOPA-S was useful in detecting sleep problems in PD and its clinical significance was substantiated by the close association with other non-motor scales, which was consistent with previous studies.

In the current study, specialized scales for cognition, such as K-MMSE, MoCA-K, and K-SCOPA cognition showed poor correlation with K-SCOPA-S, whereas sub-scores of K-NMSS (attention/memory) and K-PDQ39 (cognition) showed significant correlations. Previous studies showed that sleep disturbance exerted an adverse effect on cognitive function in patients with PD.³¹ According to a recent meta-analysis, sleep disorders in patients with PD were associated with memory and executive function.³² Patients with PD and RBD reported more cognitive dysfunction.³³ Thus, it is plausible that sleep problems have a significant effect on the cognition of patients with PD. Rather than directly measuring cognitive function, the questions on cognition of patients with PD, in the K-NMSS and K-PDQ39, are actually designed to identify practical problems related to cognitive dysfunction. Therefore, the significant correlation between K-SCOPA-S and the cognitive items in K-NMSS/K-PDQ39 may support the usefulness of these scales in the practical management of patients with PD.

The subscales of K-SCOPA-S, except SQ, were partly correlated with motor scales of PD (HYS and UPDRS III), although the correlation was not strong. A preliminary study of PDSS

reported a significant difference between advanced and early PD,³⁴ which was not confirmed by others.^{35,36} In other studies, sleep problems were associated with disease severity.^{37,38} Thus, sleep deteriorates with disease progression. Interestingly, an 8-year follow-up study showed a significant fluctuation of the severity of insomnia in a cohort of patients with PD.³⁹ Thus, sleep disorder in PD was not homogeneous along the course of the disease and its manifestation may not be determined by a simple factor (disease severity).³⁷⁻³⁹

A few limitations in our study must be noted. The majority of patients in the current cohort had a HYS score of 2.5 or less (81.8%), which could be a limitation. Since this study required two consecutive visits at an interval of 2 weeks, it was challenging to recruit patients with advanced PD. Nonetheless, the correlation between disease severity and K-SCOPA-S was only partial and weak, suggesting that disease severity was not a strong confounder. The second potential limitation of this study is the use of a self-questionnaire for data acquisition. However, the test-retest reliability of K-SCOPA-S was excellent enough to argue against the uncertainties associated with the subjective assessment of sleep problems.

In conclusion, the results of the current study demonstrated that K-SCOPA-S exhibited good reliability and validity to assess sleep problems in Korean patients with PD. Moreover, its clinical usefulness was substantiated by its significant correlation with other measures of clinical assessment.

REFERENCES

1. Dhawan V, Healy DG, Pal S, Chaudhuri KR. Sleep-related problems of Parkinson's disease. *Age Ageing* 2006;35(3):220-8.
[PUBMED](#) | [CROSSREF](#)
2. Tandberg E, Larsen JP, Karlsen K. Excessive daytime sleepiness and sleep benefit in Parkinson's disease: a community-based study. *Mov Disord* 1999;14(6):922-7.
[PUBMED](#) | [CROSSREF](#)
3. Martinez-Martin P, Schapira AH, Stocchi F, Sethi K, Odin P, MacPhee G, et al. Prevalence of nonmotor symptoms in Parkinson's disease in an international setting; study using nonmotor symptoms questionnaire in 545 patients. *Mov Disord* 2007;22(11):1623-9.
[PUBMED](#) | [CROSSREF](#)
4. Askenasy JJ. Sleep disturbances in Parkinsonism. *J Neural Transm (Vienna)* 2003;110(2):125-50.
[PUBMED](#) | [CROSSREF](#)
5. Pal PK, Thennarasu K, Fleming J, Schulzer M, Brown T, Calne SM. Nocturnal sleep disturbances and daytime dysfunction in patients with Parkinson's disease and in their caregivers. *Parkinsonism Relat Disord* 2004;10(3):157-68.
[PUBMED](#) | [CROSSREF](#)
6. Marinus J, Visser M, van Hilten JJ, Lammers GJ, Stiggelbout AM. Assessment of sleep and sleepiness in Parkinson disease. *Sleep* 2003;26(8):1049-54.
[PUBMED](#) | [CROSSREF](#)
7. Hughes AJ, Daniel SE, Lees AJ. The clinical features of Parkinson's disease in 100 histologically proven cases. *Adv Neurol* 1993;60:595-9.
[PUBMED](#)
8. Hoehn MM, Yahr MD. Parkinsonism: onset, progression and mortality. *Neurology* 1967;17(5):427-42.
[PUBMED](#) | [CROSSREF](#)
9. Movement Disorder Society Task Force on Rating Scales for Parkinson's Disease. The Unified Parkinson's Disease Rating Scale (UPDRS): status and recommendations. *Mov Disord* 2003;18(7):738-50.
[PUBMED](#) | [CROSSREF](#)
10. Kang Y, Na DL, Hahn S. A validity study on the Korean mini-mental state examination (K-MMSE) in dementia patients. *J Korean Neurol Assoc* 1997;15(2):300-8.

11. Lee JY, Cho SJ, Na DL, Kim SK, Youn JH, Kwon M, et al. Brief screening for mild cognitive impairment in elderly outpatient clinic: validation of the Korean version of the Montreal Cognitive Assessment. *J Geriatr Psychiatry Neurol* 2008;21(2):104-10.
[PUBMED](#) | [CROSSREF](#)
12. Ahn YM, Lee KY, Yi JS, Kang MH, Kim DH, Kim JL, et al. A Validation study of the Korean -version of the montgomery- asberg depression rating scale. *J Korean Neuropsychiatr Assoc* 2005;44(4):466-76.
13. Trenkwalder C, Kohonen R, Högl B, Metta V, Sixel-Döring F, Frauscher B, et al. Parkinson's disease sleep scale--validation of the revised version PDSS-2. *Mov Disord* 2011;26(4):644-52.
[PUBMED](#) | [CROSSREF](#)
14. Kwon DY, Kim JW, Ma HI, Ahn TB, Cho J, Lee PH, et al. Translation and validation of the Korean version of the 39-item Parkinson's disease questionnaire. *J Clin Neurol* 2013;9(1):26-31.
[PUBMED](#) | [CROSSREF](#)
15. Koh SB, Kim JW, Ma HI, Ahn TB, Cho JW, Lee PH, et al. Validation of the Korean-version of the nonmotor symptoms scale for Parkinson's disease. *J Clin Neurol* 2012;8(4):276-83.
[PUBMED](#) | [CROSSREF](#)
16. Stiasny-Kolster K, Mayer G, Schäfer S, Möller JC, Heinzel-Gutenbrunner M, Oertel WH. The REM sleep behavior disorder screening questionnaire--a new diagnostic instrument. *Mov Disord* 2007;22(16):2386-93.
[PUBMED](#) | [CROSSREF](#)
17. Kaufmann H, Malamut R, Norcliffe-Kaufmann L, Rosa K, Freeman R. The Orthostatic Hypotension Questionnaire (OHQ): validation of a novel symptom assessment scale. *Clin Auton Res* 2012;22(2):79-90.
[PUBMED](#) | [CROSSREF](#)
18. Setthawatcharawanich S, Limapichat K, Sathirapanya P, Phabphal K. Validation of the Thai SCOPA-sleep scale for assessment of sleep and sleepiness in patients with Parkinson's disease. *J Med Assoc Thai* 2011;94(2):179-84.
[PUBMED](#)
19. Hagell P, Westergren A, Janelidze S, Hansson O. The Swedish SCOPA-SLEEP for assessment of sleep disorders in Parkinson's disease and healthy controls. *Qual Life Res* 2016;25(10):2571-7.
[PUBMED](#) | [CROSSREF](#)
20. Martinez-Martin P, Visser M, Rodriguez-Blazquez C, Marinus J, Chaudhuri KR, van Hilten JJ, et al. SCOPA-sleep and PDSS: two scales for assessment of sleep disorder in Parkinson's disease. *Mov Disord* 2008;23(12):1681-8.
[PUBMED](#) | [CROSSREF](#)
21. Scaravilli T, Gasparoli E, Rinaldi F, Polesello G, Bracco F. Health-related quality of life and sleep disorders in Parkinson's disease. *Neurol Sci* 2003;24(3):209-10.
[PUBMED](#) | [CROSSREF](#)
22. Borek LL, Kohn R, Friedman JH. Mood and sleep in Parkinson's disease. *J Clin Psychiatry* 2006;67(6):958-63.
[PUBMED](#) | [CROSSREF](#)
23. Verbaan D, van Rooden SM, Visser M, Marinus J, van Hilten JJ. Nighttime sleep problems and daytime sleepiness in Parkinson's disease. *Mov Disord* 2008;23(1):35-41.
[PUBMED](#) | [CROSSREF](#)
24. Damiano AM, Snyder C, Strausser B, Willian MK. A review of health-related quality-of-life concepts and measures for Parkinson's disease. *Qual Life Res* 1999;8(3):235-43.
[PUBMED](#) | [CROSSREF](#)
25. Karlsen KH, Larsen JP, Tandberg E, Maeland JG. Influence of clinical and demographic variables on quality of life in patients with Parkinson's disease. *J Neurol Neurosurg Psychiatry* 1999;66(4):431-5.
[PUBMED](#) | [CROSSREF](#)
26. You S, Cho YW. Sleep disorders in patients with Parkinson's disease. *J Korean Sleep Res Soc* 2014;11(2):45-9.
[CROSSREF](#)
27. Suzuki K, Miyamoto M, Miyamoto T, Okuma Y, Hattori N, Kamei S, et al. Correlation between depressive symptoms and nocturnal disturbances in Japanese patients with Parkinson's disease. *Parkinsonism Relat Disord* 2009;15(1):15-9.
[PUBMED](#) | [CROSSREF](#)
28. Arnao V, Cinturino A, Valentino F, Perini V, Mastrilli S, Bellavia G, et al. In patient's with Parkinson disease, autonomic symptoms are frequent and associated with other non-motor symptoms. *Clin Auton Res* 2015;25(5):301-7.
[PUBMED](#) | [CROSSREF](#)
29. Zhou J, Zhang J, Lam SP, Chan JW, Mok V, Chan A, et al. Excessive daytime sleepiness predicts neurodegeneration in idiopathic REM sleep behavior disorder. *Sleep* 2017;40(5):zsx041.
[PUBMED](#) | [CROSSREF](#)

30. Rolinski M, Szewczyk-Krolkowski K, Tomlinson PR, Nithi K, Talbot K, Ben-Shlomo Y, et al. REM sleep behaviour disorder is associated with worse quality of life and other non-motor features in early Parkinson's disease. *J Neurol Neurosurg Psychiatry* 2014;85(5):560-6.
[PUBMED](#) | [CROSSREF](#)
31. Postuma RB, Bertrand JA, Montplaisir J, Desjardins C, Vendette M, Rios Romenets S, et al. Rapid eye movement sleep behavior disorder and risk of dementia in Parkinson's disease: a prospective study. *Mov Disord* 2012;27(6):720-6.
[PUBMED](#) | [CROSSREF](#)
32. Pushpanathan ME, Loftus AM, Thomas MG, Gasson N, Bucks RS. The relationship between sleep and cognition in Parkinson's disease: a meta-analysis. *Sleep Med Rev* 2016;26:21-32.
[PUBMED](#) | [CROSSREF](#)
33. Kang SH, Lee HM, Seo WK, Kim JH, Koh SB. The combined effect of REM sleep behavior disorder and hyposmia on cognition and motor phenotype in Parkinson's disease. *J Neurol Sci* 2016;368:374-8.
[PUBMED](#) | [CROSSREF](#)
34. Chaudhuri KR, Pal S, DiMarco A, Whately-Smith C, Bridgman K, Mathew R, et al. The Parkinson's disease sleep scale: a new instrument for assessing sleep and nocturnal disability in Parkinson's disease. *J Neurol Neurosurg Psychiatry* 2002;73(6):629-35.
[PUBMED](#) | [CROSSREF](#)
35. Martínez-Martín P, Salvador C, Menéndez-Guisasola L, González S, Tobías A, Almazán J, et al. Parkinson's Disease Sleep Scale: validation study of a Spanish version. *Mov Disord* 2004;19(10):1226-32.
[PUBMED](#) | [CROSSREF](#)
36. Martínez-Martín P, Cubo-Delgado E, Aguilar-Barberà M, Bergareche A, Escalante S, Rojo A, et al. A pilot study on a specific measure for sleep disorders in Parkinson's disease: SCOPA-Sleep. *Rev Neurol* 2006;43(10):577-83.
[PUBMED](#)
37. Young A, Home M, Churchward T, Freezer N, Holmes P, Ho M. Comparison of sleep disturbance in mild versus severe Parkinson's disease. *Sleep* 2002;25(5):573-7.
[PUBMED](#) | [CROSSREF](#)
38. Happe S, Lüdemann P, Berger KFAQT study investigators. The association between disease severity and sleep-related problems in patients with Parkinson's disease. *Neuropsychobiology* 2002;46(2):90-6.
[PUBMED](#) | [CROSSREF](#)
39. Gjerstad MD, Wentzel-Larsen T, Aarsland D, Larsen JP. Insomnia in Parkinson's disease: frequency and progression over time. *J Neurol Neurosurg Psychiatry* 2007;78(5):476-9.
[PUBMED](#) | [CROSSREF](#)

Appendix 1. Scale for Outcomes in Parkinson's Disease-Sleep (original version)

Aim of the Questionnaire

By means of this questionnaire, we would like to find out to what extent *in the past month* you have had problems with sleeping. Some of the questions are about problems with sleeping *at night*, such as, for example, not being able to fall asleep or not managing to sleep on. Another set of questions is about problems with sleeping *during the day*, such as dozing off (too) easily and having trouble staying awake.

First read these instructions before you answer the questions!

Place a cross in the box above the answer which best reflects your situation.

If you wish to change an answer, fill in the 'wrong' box and place a cross in the correct one. If you have been using sleeping tablets, then the answer should reflect how you have slept while taking these tablets.

NS: Nighttime Sleep Problems

response options: not at all – a little – quite a bit – a lot

In the past month, ...

1. ... have you had trouble falling asleep when you went to bed at night?
2. ... to what extent do you feel that you have woken *too often*?
3. ... to what extent do you feel that you have been lying awake for *too long* at night?
4. ... to what extent do you feel that you have woken up *too early* in the morning?
5. ... to what extent do you feel you have had *too little* sleep at night?

Overall, how well have you slept at night during the past month?

response options: very well – well – rather well – not well but not badly – rather badly – badly – very badly

DS: Daytime Sleepiness

response options: never – sometimes – regularly – often

1. How often in the past month have you fallen asleep unexpectedly either during the day or in the evening?
2. How often in the past month have you fallen asleep while sitting peacefully?
3. How often in the past month have you fallen asleep while watching TV or reading?
4. How often in the past month have you fallen asleep while talking to someone?
5. In the past month, have you had trouble staying awake during the day or in the evening?
6. In the past month, have you experienced falling asleep during the day as a problem?

Appendix 2. Scale for Outcomes in Parkinson's Disease-Sleep (Korean version)

SCOPA-수면

이 설문지는 지난 한달 동안 수면에 어떤 문제가 있는 지를 파악하기 위한 것입니다. 질문 중 일부는 잠들지 못하거나, 중간에 잠이 깨는 것과 같은 야간 수면 문제입니다. 다른 질문들은 낮에 너무 쉽게 잠들거나 깨어 있기 어려운 낮 시간의 수면 문제에 대한 것입니다.

A. 수면제 사용

A1. 지난 몇 개월 동안 수면제를 몇 번 복용하하셨습니까?

(의사 처방을 받거나 그렇지 않았거나)

전혀 없음

일주일당 1회 미만

일주일당 1, 2회

일주일당 3회 이상

A2. 지난 한달 동안 수면제를 몇 번 복용하하셨습니까?

이름: _____ 한달 복용량: _____ 1회 복용량: _____

이름: _____ 한달 복용량: _____ 1회 복용량: _____

이름: _____ 한달 복용량: _____ 1회 복용량: _____

B. 야간 수면

다음은 야간 수면에 대한 질문입니다. 수면제를 복용하고 있다면, 약을 복용하는 상태를 기준으로 답을 하시면 됩니다.

B1. 지난 한달 동안 밤에 잠이 들기가 어려운 일이 어느 정도 있었습니까?

전혀 없음

약간

상당히 많음

많음

B2. 지난 한달 동안 너무 자주 깬다고 느낀 일이 어느 정도 있었습니까?

전혀 없음

약간

상당히 많음

많음

B3. 지난 한달 동안 밤에 너무 오래 잠이 들지 않았다고 느꼈던 일이 어느 정도 있었습니까?

전혀 없음

약간

상당히 많음

많음

B4. 지난 한달 동안 아침에 너무 일찍 깬다고 느낀 일이 어느 정도 있었습니까?

전혀 없음

약간

상당히 많음

많음

B5. 지난 한달 동안 밤에 잠을 너무 적게 잔다고 느낀 일이 얼마나 있었습니까?

전혀 없음

약간

상당히 많음

많음

(continued to the next page)

Appendix 2. (Continued) Scale for Outcomes in Parkinson's Disease-Sleep (Korean version)

C1. 전반적으로 평가할 때 지난 한달 동안 잠을 얼마나 잘 잤습니까?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
매우 잘 잤다	잘 잤다	다소 잘 잤다	그럭저럭 잤다	다소 못 잤다	잘 못 잤다	아주 못 잤다

D. 낮과 저녁 시간 수면

D1. 지난 한달 동안 낮 또는 저녁에 갑자기 잠에 든 일이 몇 번입니까?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
전혀 없음	가끔	주기적으로	자주

D2. 지난 한달 동안 편안하게 앉아 있다가 잠 든 일은 얼마나 자주 있었습니까?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
전혀 없음	가끔	주기적으로	자주

D3. 지난 한달 동안 TV를 보거나, 책을 읽다가 잠이 든 일은 얼마나 자주 있었습니까?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
전혀 없음	가끔	주기적으로	자주

D4. 지난 한달 동안 다른 사람과 이야기하다가 잠든 일이 얼마나 자주 있었습니까?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
전혀 없음	가끔	주기적으로	자주

D5. 지난 한달 동안 낮 또는 저녁에 깨어 있기 힘들었던 일이 있습니까?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
전혀 없음	가끔	주기적으로	자주

D6. 지난 한달 동안 낮에 잠이 들어서 문제가 된 적이 있나요?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
전혀 없음	가끔	주기적으로	자주