Table S1. Demographic characteristics of enrolled patients with early-stage Parkinson’s disease according to the presence/absence of sleep disorders.

| Without sleep disorders (N=297) | With sleep disorders (N=92) | t/\(x^2\) | P  | Patients with cognitive dysfunction (N=155) | t/\(x^2\) | P  | Patients without cognitive dysfunction (N=234) | t/\(x^2\) | P  |
|-------------------------------|----------------------------|----------|---|------------------------------------------|----------|---|------------------------------------------|----------|---|
| Sex (male, %)                |                            |          |   |                                          |          |   |                                          |          |   |
| 193(65.0%)                   | 54(58.7%)                  | 1.198    | 0.173* | 68(67.3%)                               | 0.599    | 0.357* | 125(63.8%)                               | 0.982    | 0.283* |
| Age, y, mean ± SD            |                            |          |   |                                          |          |   |                                          |          |   |
| 63.92 ± 8.84                 | 63.75 ± 9.09               | -0.120   | 0.905* | 64.79±8.79                              | -0.670   | 0.504* | 63.20±8.86                              | 0.465    | 0.643* |
| Duration, y, mean ± SD       |                            |          |   |                                          |          |   |                                          |          |   |
| 3.12 ± 3.64                  | 3.51 ± 3.26                | 1.943    | 0.056* | 3.05 ± 3.45                             | 1.546    | 0.133* | 2.99 ± 3.80                             | 1.304    | 0.194* |
| UPDRS-III, mean ± SD         |                            |          |   |                                          |          |   |                                          |          |   |
| 17.73 ± 9.07                 | 19.86 ± 9.36               | 1.570    | 0.117* | 18.42 ± 8.92                           | -0.073   | 0.942* | 17.18 ± 9.19                           | 2.204    | 0.029** |
| mH&Y stage, mean ± SD        |                            |          |   |                                          |          |   |                                          |          |   |
| 1.68 ± 0.54                  | 1.78 ± 0.55                | 1.192    | 0.234* | 1.71 ± 0.55                      | -0.601   | 0.549* | 1.67 ± 0.54                         | 2.220    | 0.028** |
| LED, mg, mean ± SD           |                            |          |   |                                          |          |   |                                          |          |   |
| 334.71 ± 309.17              | 386.89 ± 382.03            | 1.053    | 0.561* | 346.28 ± 314.21                   | 0.207    | 0.837* | 310.44 ± 291.45                   | 3.064    | 0.003** |

SD: standard deviation. PD: Parkinson’s disease. UPDRS-III: Unified Parkinson’s Disease Rating Scale part III. mH&Y stage: modified Hoehn and Yahr stage

*a Student’s t-test

*b Chi-square test

* Significant difference
Table S2. Sleep parameters of enrolled patients with early-stage Parkinson’s disease according to the presence/absence cognitive dysfunction.

|                  | Patients with cognitive dysfunction (N=155) | Patients without cognitive dysfunction (N=234) | t/t²  | P       |
|------------------|--------------------------------------------|-----------------------------------------------|-------|---------|
| PDSS, mean ± SD  | 101.23 ± 13.29                              | 129.35 ± 14.19                               | 4.615 | 0.000 **|
| Sleep latency, min, mean ± SD | 52.34 ± 18.26                              | 19.47 ± 9.12                                | -3.597| 0.000 *  |
| Wake after sleep onset, min, mean ± SD | 76.23 ± 28.17                              | 39.27 ± 22.49                               | -5.432| 0.000 **|
| Sleep efficiency, % | 78.65 ± 32.87                              | 90.36 ± 42.62                               | 6.376 | 0.000 **|
| N1 time (min), mean ± SD | 41.93 ± 35.86                              | 22.44 ± 18.73                               | -4.543| 0.000 **|
| N3 time (min), mean ± SD | 43.25 ± 28.32                              | 71.06 ± 48.47                               | 7.735 | 0.000 **|
| Total sleep time (min), mean ± SD | 342.41 ± 106.28                             | 429.14 ± 111.47                             | 6.563 | 0.000 **|
| AHI, mean ± SD   | 6.11 ± 5.62                                 | 5.21 ± 6.59                                  | -0.341| 0.403  |
| PLMI, mean ± SD  | 10.23 ± 9.62                                 | 9.78 ± 7.28                                  | -0.564| 0.874  |
| With sleep disorders | 54(34.8%)                                   | 38(16.2%)                                    | 17.863| 0.000 b*|
| Without sleep disorders | 101(65.2%)                                  | 196(83.8%)                                   |       |         |

SD: standard deviation. PDSS: Parkinson’s Disease Sleep Scale. N1 time: NREM sleep stage 1 sleep time. N3 time: NREM sleep stage 3 sleep time.

AHI: apnea-hypopnea index. PLMI: periodic limb movement index

* Student's t-test

b Chi-square test

* Significant difference