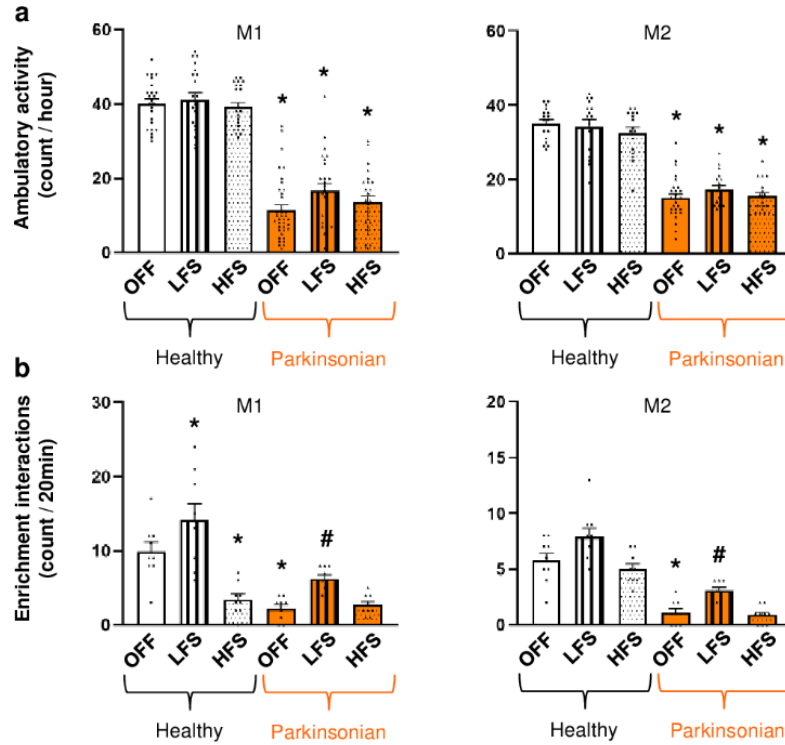1   **Supplementary information**
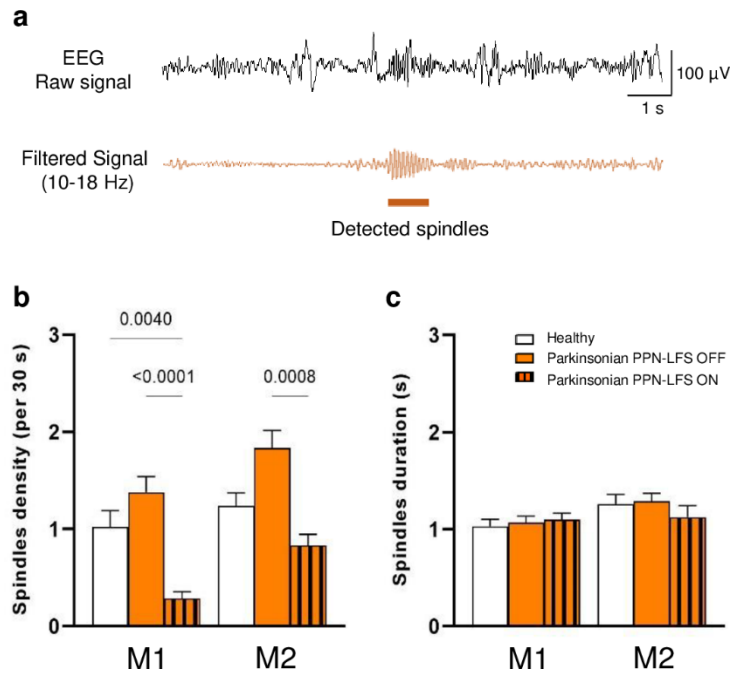
2

4   **Supplementary Figure 1: Effect of PPN-LFS and -HFS on motor behavior in parkinsonian animals. a** Ambulatory
5   locomotor activity, expressed in count per hour (mean ± SEM), calculated at fixed time (10:00 h) in healthy (white) and
6   parkinsonian (orange) states, with PPN-LFS (vertical lines) or PPN-HFS (dots), repeated minimum 18 times for M1 (left) and
7   M2 (right). **b** Number of interactions with the enrichment (mean ± SEM) present in the behavioral cage during 9 random light-
8   OFF sessions for M1 (left) and M2 (right). *different from healthy state OFF-stimulation, # different from parkinsonian state
9   OFF-stimulation: Kruskal-Wallis test followed by Dunn's multiple comparisons test was used to determine whether motor
10   changes were dependent on the different PPN-DBS conditions.

11

a

EEG
Raw signal

Filtered Signal
(10-18 Hz)

Detected spindles

100 µV

1 s

b

Spindles density (per 30 s)

0.0040

<0.0001   0.0008

M1   M2

c

Spindles duration (s)

☐ Healthy
■ Parkinsonian PPN-LFS OFF
▦ Parkinsonian PPN-LFS ON

M1   M2

Supplementary Figure 2: Basic features of sleep spindles during non-REM sleep stage 2. a Example of a recorded
spindle events. **b** Spindles density per 30 s (mean ± SEM) during non-REM sleep N2 for M1 and M2 in healthy (white),
parkinsonian (orange) and parkinsonian with PPN-LFS (orange with vertical lines) conditions. **c S**pindles duration, expressed
in second (mean ± SEM). A Kruskal-Wallis test followed by Dunn's multiple comparisons test was used to compare in the
healthy, parkinsonian and parkinsonian with PPN-LFS conditions.