**Supplementary Material**

**Pain Fluctuations in Parkinson’s Disease: Pain Type and Frequency Patterns, and Their Association with Motor and Non-Motor Fluctuations**

**SUPPLEMENTARY RESULTS**

*Circadian rhythm of pain and motor symptoms*

We observed a clear circadian rhythm of pain occurrence with highest frequencies in the early morning period with up to 62% of hours with pain (Supplementary Figure 3a). This pattern closely mirrored periods with motor Off but not Dyskinetic periods (Supplementary Figure 3b,c). This pattern translated into very high (100%) propotions of pain during motor Off state hours in the second night half (00.00 to 05.00), but rather stable distributions over the day 6.00 to 23.00 (Supplementary Figure 3d,e; for circadian rhythm of pain subtypes, see Supplementary Figure 3).

*Pain types during motor Off episodes*

Rather than compare pain and motor diary data from hour periods, the timing of pain occurrence were synchronized with Off episodes.1 Off episodes were defined as an Off state period of at least 1 hour duration following a motor On state period of at least 2 hours. There was no change of pain frequency in the first as well as the subsequent hours of the Off episode (p=0.626, χ2 test; Supplementary Figure 5a). Similar results were obtained when clinical observer motor diary data were used to define Off episodes (Supplementary Figure 5b).

*Cluster analyses of the temporal association of pain and other non-motor symptoms*

To dissect the patterns of co-occurrence of pain with other non-motor symptoms (NMS) on the hour level, we performed hierarchical clustering of simultaneously occurred pain and 10 other NMS as assessed by participant-rated diaries using size difference (an index of asymmetry) as dissimilarity measure and average linkage between groups as agglomeration rule. When analysing all motor states together, we detected two clusters of NMS with “Pain”, “Fatigue” and “Inner restlessness” in the first cluster and all other NMS in the second cluster (Supplementary Figure 6a). Similar cluster patterns were observed when analysing the data for the three motor states seperately (Supplementary Figures 6b-d).

*Association of pain times from pain dairy ratings with health-related quality of life (hr-QoL)*

Since hr-QoL had been reported to potentially not only correlate with pain but also with various demographic and clinical parameters such as age, sex, disease duration and severity as well as depression and cognition,2-5 we adjusted the correlations of pain diary data and PDQ-39 for potential demographic and clinical confounders by multivariate linear regression modelling. We indeed observed in the present cohort significant associations of PDQ-39 sum score with sex (median [IQR] score in females of 55 [37-65] and in males of 38 [22-54]; p=0.048, Mann-Whithney U test), disease severity (UPDRS part III motor score; Pearson correlation coefficient r=0.364; p=0.043) and BDI-2 (r=0.643; p<0.001), but not age (r=-0.006; p=0.970), disease duration (r=-0.037; p=0.803), and MoCA score (r=-0.015; p=0.918; all Pearson correlation tests). We calculated multivariate linear regressions to control for the candidate covariates age, sex, UPDRS part III, disease duration, BDI-2 score and MoCA score. Adjustment for these potential confounders largely confirmed the correlations of pain diary data with the PDQ-39 sum score (Supplementary Table 5): We detected significant associations of PDTPain as well as PDTPain/On and PDTPain/Dyskinetic but not PDTPain/Off with the PDQ-39 sum score. The same pattern of associations was observed when analysing PPTs (Supplementary Table 5). Similar results were obtained when applying only significantly correlated parameters as covariates to the multivariate models or when calculating the multivariate models for the association of the various pain times and the PDQ-39 sum score without subscore 8 (bodily pain/discomfort; data not shown).

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**Supplementary Table 1.** Additional demographic and clinical characteristics of study cohort.

|  |  |  |
| --- | --- | --- |
|  | **Overall cohort (n=47)** | |
| **Clinical Phenotype** |  | |
| Tremor Dominant (TD), n (%) | 7 (15%) | |
| Axial Dominant (AxD), n (%) | 0 (0%) | |
| Appendicular Dominant, n (%) | 3 (6%) | |
| Rigor Dominant (RD), n (%) | 1 (2%) | |
| Postural Instability and Gait Difficulty (PIGD), n (%) | 36 (77%) | |
| **Reported motor complications during structured interview** | |
| Nighttime off, n (%) | 40 (85%) | |
| Wearing-off, n (%) | 44 (94%) | |
| Delayed on, n (%) | 36 (77%) | |
| On-off phenomenon, n (%) | 31 (66%) | |
| Peak-dose dyskinesia, n (%) | 36 (77%) | |
| Biphasic dyskinesia, n (%) | 9 (19%) | |
| Off-dose dystonia, n (%) | 26 (55%) | |
| Number of motor complications, *Median (IQR)* | 5 (4-6) | |
| **Medication** |  | |
| Levodopa, n (%) | 47 (100%) | |
| Dopamine agonists, n (%) | 29 (62%) | |
| MAO B inhibitors, n (%) | 33 (70%) | |
| COMT inhibitors, n (%) | 41 (87%) | |
| thereof: Safinamide, n (%) | 24 (51%) | |
| Amantadine, n (%) | 24 (51%) | |
| Levodopa LED (mg per day), *Median (IQR)* | 500 (425-700) | |
| Total LED (mg per day), *Median (IQR)* | 1,325 (1,025-1,667) | |
| **Clinical scales** |  | |
| MDS-UPDRS Total score On state*,* *Median (IQR)* | 64 (52-83) | |
| Part I | 13 (7-16) | |
| Part II | 16 (10-20) | |
| Part III | 28 (20-40) | |
| Part IV | 9 (7-11) | |
| Hoehn & Yahr stage, *Median (IQR)* | 2.5 (2-3) | |
| Stage 1.5, n (%) | 1 (2%) | |
| Stage 2, n(%) | 11 (23%) | |
| Stage 2.5, n (%) | 25 (53%) | |
| Stage 3.0, n (%) | 10 (21%) | |
| MoCA, *Median (IQR)* | 27 (25-28) | |
| BDI-2, *Median (IQR)\** | 10 (4-16) | |
| **Concomitant diseases / conditions$** |  | |
| Hypertension | 16 (34%) | |
| Joint or spinal osteoarticular degeneration | 14 (30%) | |
| Diabetes mellitus | 8 (17%) | |
| Coronary heart disease | 4 (9%) | |

Values are provided as number (percentages), median (interquartile range, IQR), or mean (standard deviation, SD). BDI, Beck Depression Inventory Second Edition; LED, Levodopa equivalent dose; MDS-UPDRS, Movement Disorder Society-revised version of the Unified Parkinson’s Disease Rating Scale; MoCA, Montreal Cognitive Assessment. Levodopa equivalent doses were calculated according to Jost and co-workers.6

$ All concomitant diseases / conditions which occurred in at least two patients (4%) are displayed.

**Supplementary Table 2.** Associations of times with pain and times with other non-motor symptoms in the various motor states.a

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Percentage daily times (PDTs) or percentage times with the respective non-motor symptom during the different motor states (in %)** | | | | | | | | | | | | | | | | | | | | |
|  | **Anxiety** | **Depressive mood** | **Fatigue** | **Inner restlessness** | **Concentration/ attention** | **Hallucinations** | **Excessive sweating** | | | **Bladder urgency** | | | **Drooling** | | | | **Dizziness** | | | | |
| **Percentage daily times (PDTs) with pain (% of waking day hours)** | | | | | | | | |  | | |  | | |  | | | | |  | |
| Pain (% daily time) | -0.173 | -0.029 | **0.427\*\*** | 0.152 | 0.111 | 0.041 | 0.144 | | | 0.106 | | | -0.028 | | | | **0.349\*** | | | | |
| **Percentage daily times with pain in respective motor state in % of waking day hours as rated by participants (PDT)** | | | | | | | |  | | |  | | |  | | | |  | | | |
| PDTOff (% of day) | 0.129 | 0.155 | **0.503\*\*** | 0.088 | 0.121 | -0.120 | 0.110 | | | -0.240 | | | 0.031 | | | | 0.264 | | | | |
| PDTOn (% of day) | 0.275 | 0.038 | **0.435\*\*** | 0.151 | 0.219 | 0.142 | -0.088 | | | 0.256 | | | -0.135- | | | | 0.088 | | | | |
| PDTDyskinetic (% of day) | -0.087 | 0.126 | **0.530\*\*** | 0.233 | 0.277 | 0.244 | 0.330 | | | 0.296 | | | -0.245 | | | | 0.300 | | | | |
| **Percentage pain time during the different motor states in % of motor state Off state hours as rated by participants (PPTMotor state)** | | | | | | | | | | | | | | | |  | | |  | |  |
| PPTOff (% of Off time) | -0.035 | 0.034 | **0.345\*** | 0.046 | -0.145 | -0.154 | -0.059 | | | -0.262 | | | -0.047 | | | | -0.031 | | | | |
| PPTOn (% of On time) | -0.078 | 0.122 | **0.516\*\*\*** | **0.328\*** | **0.323\*** | 0.098 | 0.070 | | | 0.198 | | | -0.081 | | | | 0.295 | | | | |
| PPTDyskinetic (% of Dyskinetic time) | -0.112 | 0.155 | **0.312\*** | 0.176 | -0.027 | 0.004 | 0.278 | | | 0.237 | | | -0.264 | | | | 0.226 | | | | |

PDT, percentage daily time. PPTMotor state, proportion of hours with pain as percentage of total hours in the respective motor state as assessed by PD Home diaries.

aResults are from Pearson correlation tests (r, correlation coefficient) comparing PDTs with pain or percentage pain time during the different motor states in % of motor state Off state (PPTs) with the respective times with the various other non-motor symptoms. \*p<0.05, \*\*p<0.01, and \*\*\*p<0.001 from Pearson correlation tests. Significant correlations are marked by bold letters.

**Supplementary Table 3.** Associations of times with pain in the various motor states and demographic and clinical characteristics.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Age, r#** | **Sex, p§** | **Disease duration, r#** | | **Fluctuation duration, r#** | | **UPDRS**  **part III, r#** | | **UPDRS part IV, r#** | | | **UPDRS total, r#** | | | | **BDI-2, r#** | | | | **MoCA score, r#** | | | |
| **Percentage daily times with pain in % of waking day hours (PDT))** | | | |  | |  | |  | |  | | |  |  | | | | |  | | | |
| Pain (% daily time) | 0.114 | p=0.360 | -0.022 | | -0.165 | | -0.062 | | 0.214 | | | 0.095 | | | | -0.115 | | | | -0.240 | | | |
| **Percentage daily times with pain in respective motor state in % of waking day hours as rated by participants (PDT)** | | | | | | | | | | | | | | |  | | | |  | | | |
| Off state with pain (% of day) | 0.183 | p=0.533 | -0.079 | | -0.015 | | 0.013 | | 0.153 | | | 0.067 | | | | -0.077 | | | | -0.093 | | | |
| On state with pain (% of day) | -0.052 | p=0.187 | -0.024 | | -0.083 | | -0.082 | | 0.228 | | | 0.010 | | | | -0.144 | | | | -0.085 | | | |
| Dyskinetic state with pain (% of day) | 0.146 | p=0.533 | 0.050 | | -0.243 | | -0.037 | | 0.094 | | | 0.154 | | | | -0.017 | | | | **-0.359\*** | | | |
| **Percentage pain time during the different motor states in % of motor state Off state hours as rated by participants (PPTMotor state)** | | | | | | | | | | |  | | | |  | |  |  | | |  | | | |
| Off state with pain (% of Off state) | 0.021 | p=0.229 | -0.093 | | -0.188 | | -0.196 | | 0.098 | | | -0.065 | | | | -0.104 | | | | -0.127 | |
| On state with pain (% of On state) | 0.143 | p=0.242 | -0.020 | | -0.176 | | -0.057 | | 0.270 | | | 0.134 | | | | -0.042 | | | | -0.242 | |
| Dyskinetic state with pain (% of Dyskinetic state) | 0.117 | p=0.356 | 0.067 | | -0.067 | | 0.066 | | **0.363\*** | | | 0.245 | | | | -0.033 | | | | -0.195 | |

BDI, Beck’s depression inventory; MoCA, Montreal cognitive assessment; PDT, percentage daily time; PPTMotor state, proportion of hours with pain as percentage of total hours in the respective motor state as assessed by PD Home diaries; UPDRS, Unified PD rating scale.

#Results are from Pearson correlation tests (r, correlation coefficient) comparing PDTs with pain or percentage pain time during the different motor states   
(PPTsMotor state) with the respective with age, disease duration, motor fluctuation duration, MDS-UPDRS part III motor score as a measure of disease severity, MDS-UPDRS part IV as a quantitative measure of motor fluctuations, total UPDRS score, BDI-2 and MoCA. \*p<0.05, \*\*p<0.01, and \*\*\*p<0.001 from Pearson correlation tests. Significant correlations are marked by bold letters.

§Results from Mann-Whitney-U test comparing male and female participants.

**Supplementary Table 4.** Association of daily pain times in the three motor states as rated by PD Home motor diary and PDQ-39 score and subscores.a

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Subscore 1 “Mobility”** | **Subscore 2 “Activities of daily living”** | **Subscore 3 ”Emotional well-being”** | **Subscore 4 “Stigma”** | **Subscore 5 “Social support”** | **Subscore 6 “Cognitions”** | | **Subscore 7 “Communi-cation”** | | **Subscore 8 “Bodily discomfort”** | | **Sum of subscores 1 to 7** | | **Sum score** | |
| **Percentage daily times (PDTs) with pain (% of waking day hours)** | | | | | | |  | |  |  | |  | |  | |
| Pain (% daily time) | **0.326\*** | 0.217 | 0.247 | 0.022 | 0.070 | 0.083 | | -0.160 | | 0.181 | | 0.259 | | 0.268 | |
| **Percentage daily times with pain in respective motor state in % of waking day hours as rated by participants (PDT)** | | | | | | | | | |  | |  | |  | |
| Off state with pain (% of day) | 0.109 | -0.015 | 0.187 | -0.036 | -0.028 | 0.089 | | -0.163 | | 0.163 | | 0.076 | | 0.091 | |
| On state with pain (% of day) | 0.201 | 0.096 | 0.187 | 0.174 | 0.029 | -0.044 | | -0.137 | | 0.254 | | **0.261\*** | | **0.281\*** | |
| Dyskinetic state with pain (% of day) | 0.389\* | **0.386\*** | 0.156 | -0.089 | 0.143 | 0.127 | | -0.019 | | -0.052 | | **0.320\*** | | **0.302\*** | |
| **Percentage pain time during the different motor states in % of motor state Off state hours as rated by participants (PPTMotor state)** | | | | | | | | | |  |  |  |  | |  | |
| Off state with pain (% of Off state) | 0.174 | 0.070 | 0.297 | 0.151 | -0.027 | 0.197 | | -0.027 | | 0.295 | | 0.207 | | 0.230 | |
| On state with pain (% of On state) | **0.341\*** | 0.237 | **0.307\*** | 0.063 | 0.055 | 0.049 | | -0.113 | | 0.194 | | **0.289\*** | | **0.298\*** | |
| Dyskinetic state with pain (% of Dyskinetic state) | **0.340\*** | **0.323\*** | 0.144 | 0.021 | 0.191 | 0.050 | | -0.080 | | 0.096 | | **0.305\*** | | **0.381\*** | |

PDQ-39, Parkinson’s Disease Questionnaire 39; PDT, percentage daily time; PPTMotor state, proportion of hours with pain as percentage of total hours in the respective motor state as assessed by PD Home diaries.

#Results are from Pearson correlation tests (r, correlation coefficient) comparing PDTs with pain or percentage pain time during the different motor states   
(PPTsMotor state) with PDQ-39 subscores, PDQ-39 sum score of subscores 1 to 7 and PDQ-39 sum score. \*p<0.05, \*\*p<0.01, and \*\*\*p<0.001 from Pearson correlation tests. Significant correlations are marked by bold letters.

**Supplementary Table 5.** Multivariate regression analyses of pain times in the three motor states from PD Home diary ratings with the PDQ-39 sum score.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **PDQ-39 sum score, r#** |  | **Multivariate regression model analysis with PDQ-39 sum score as dependent variable§** | | | | | |
|  |  |  | **Regression parameters** |  | | **Significant determinants (p<0.05)** | | |
| **Percentage daily times (PDTs) with pain (% of waking day hours)** | | | | |  | |  |
| Pain (% daily time) | 0.268 |  | **R2=0.629, *F*=9.44, p*<*0.001** |  | | **Pain: β=0.376, p=0.001; UPDRS III: β=0.245, p=0.020; BDI-2: β=0.659, p<0.001** | | |
| **Percentage daily times with pain in respective motor state in % of waking day hours as rated by participants (PDT)** | | | | | | | |
| Off state with pain (% of day) | 0.091 |  | **R2=0.520, *F*=6.03, p<0.001** |  | | **UPDRS III: β=0.268, p=0.044; BDI-2: β=0.612, p<0.001** | | |
| On state with pain (% of day) | **0.281\*** |  | **R2=0.577, *F*=7.61, p<0.001** |  | | **Pain: β=0.288, p=0.012; UPDRS III: β=0.232, p=0.037; BDI-2: β=0.662, p<0.001** | | |
| Dyskinetic state with pain (% of day) | **0.302\*** |  | **R2=0.626, *F*=9.33, p*<*0.001** |  | | **Pain: β=0.379, p=0.001; UPDRS III: β=0.245, p=0.020; BDI-2: β=0.603, p<0.001** | | |
| **Percentage pain time during the different motor states in % of motor state Off state hours as rated by participants (PPTMotor state)** | | | | | | | |
| Off state with pain (% of Off state) | 0.230 |  | **R2=0.633, *F*=8.36, p*<*0.001** |  | | **UPDRS III: β=0.347, p*=*0.003; BDI-2: β=0.641, p<0.001** | | |
| On state with pain (% of On state) | **0.298\*** |  | **R2=0.614, *F*=8.85, p*<*0.001** |  | | **Pain: β=0.351, p=0.002; UPDRS III: β=0.247, p=0.021; BDI-2: β=0.627, p<0.001** | | |
| Dyskinetic state with pain (% of Dyskinetic state) | **0.381\*** |  | **R2=0.592, *F*=7.26, p*<*0.001** |  | | **Pain: β=0.285, p=0.015; UPDRS III: β=0.291, p=0.044; BDI-2: β=0.605, p<0.001** | | |

PDQ-39, Parkinson’s Disease Questionnaire 39; PDT, percentage daily time; PPTMotor state, proportion of hours with pain as percentage of total hours in the respective motor state as assessed by PD Home diaries.

#Results are from Pearson correlation tests (r, correlation coefficient) comparing pain times with PDQ-39 sum score as a measure of health-related quality of life. \*p<0.05 from Pearson correlation tests. Significant correlations are marked by bold letters.

§Test results are from multivariate regression analyses with entering the candidate independent covariates age, sex, disease duration, MDS-UPDRS part III motor score as a measure of disease severity, BDI-2 and MoCA as well as the corresponding variable of interest (pain times from pain diary ratings). Multicollinearity of candidate variables were excluded by Pearson correlation test (|r|<0.5). Non-significant p-values of model coefficients (p≥0.05) have been omitted for clarity. Significant results are marked by bold letters.

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**Supplementary Figure 1. Temporal association of pain and its various types with simultaneous clinical observer motor diary ratings in Parkinson’s disease patients.**

(a) Proportions of hourly diary ratings of pain by participants with respect to simultaneous clinical observer motor diary ratings (motor Off state, motor n state, Dyskinetic state). Note that in 33.2% of all ratings the participants reported the presence of pain (dotted line as reference). Values are percentages. p-values above the diagram are from *post-hoc* χ2 tests with Bonferroni adjustment (p-value from χ2 test comparing all three motor states: 0.0017). (b) Proportion of hourly participant diary ratings of the various pain types with respect to simultaneous clinical observer motor diary ratings (motor Off state, motor n state, Dyskinetic state). Values are percentages. \*p<0.05 and \*\*\*p<0.001 are from χ2 tests comparing all three motor states, while $/#/§ represents p<0.05, $$/##/§§ p<0.01 and $$$/###/§§§ p<0.001 for pair-wise comparisons as displayed in upper left corner applying χ2 tests test with Bonferroni adjustment. Data are based on 1.006 simultaneous hourly ratings (98.1% of all time periods and 99.2% of waking hours on 2 consecutive days) in (a) and 503 simultaneous hourly ratings (98.4% of all time periods and 98.8% of waking hours on 1 day) in (b) by 47 participants.

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**Supplementary Figure 2. Perception of disease severity by clinical observer on the hour level with respect to pain diary data and clinical observer motor diary ratings.**

Perception of disease severity as rated by participants on the Clinical Global Impression of Severity (CGI-S) on the hour level. Illustration of the distribution of CGI-S ratings with respect to correspondingly rated pain using the levels “Normal” (deep green color), “Mild” (bright green color), “Moderate” (yellow color) and “Severe” (orange color). The analyses were performed for all motor states (left diagram) and for motor Off state, motor On state and Dyskinetic state (from left to right diagram) as assessed by simultaneous clinical diary ratings. All CGI-S values were originally each assessed with 7 severity grades, but then condensed to four levels to enhance clarity of the figure (please refer to Methods for more details). Values are percentages. p-values above the diagrams are from χ2 tests comparing all PGI-S scores in pain versus no-pain hours, and \* represents p<0.05, \*\*p<0.01, and \*\*\*p<0.001 for pair-wise comparisons of PGI-S score applying χ2 tests with Bonferroni adjustment. Data are based on 1,006 simultaneous hourly ratings (98.1% of all time periods and 99.2% of waking hours on 2 consecutive days) by 47 participants.

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**Supplementary Figure 3. Circadian rhythm of pain as assessed by the pain diary and its association with the circadian rhythm of motor states as rated by the PD Home motor diary.**

**(a-c)** Distribution of pain hours **(a)** as well as motor Off state **(b)** and Dyskinetic state hours (**c,** % of waking hours) over the course of 24 hours. All diary sets were included for analysis, but individual time periods were excluded from analysis if there was no response or more than one response on either diary. Hours marked as asleep were included into the calculations, but not displayed in the diagrams. Dashed lines represent the mean occurrence of pain (a), motor Off state (b) and Dyskinetic state (c) as assessed by the PD home motor diary over the whole 24-hour time period. (d,e) Percentage pain times (PPTs) during motor Off state (PPTOff) (d) and Dyskinetic state (PPTDyskinetic) (e) over the course of 24 hours. Data are based on 1.506 simultaneous waking hour ratings (67.9% of all time periods on 2 consecutive days) by 47 participants.

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**Supplementary Figure 4. Circadian rhythm of pain types as rated by the participants using the pain diary.**

(a-j) Distribution of pain type hours (% of waking hours) over the course of 24 hours. All diary sets were included for analysis, but individual time periods were excluded from analysis if there was no response or more than one response on either diary. Hours marked as asleep were included into the calculations, but not displayed in the diagrams. Data are based on 764 simultaneous waking hour ratings (67.7% of all time periods on study day 2) by 47 participants.

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**Supplementary Figure 5. Temporal connection of pain and motor Off state as assessed by PD home motor diary during the time course of Off episodes.**

(a) Proportions of responses on simultaneous Pain diary (yellow color) and PD home diary motor Off ratings (blue color) synchronized to the onset of participant-rated Off episodes. (b) Proportions of responses on simultaneous Pain diary (yellow color) and clinical observer motor Off ratings (blue color) synchronized to the onset of observer-rated Off episodes. Values are provided as numbers from 83 Off episodes (a) and 53 Off episodes (b) in 47 participants.

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**Supplementary Figure 6. Co-occurrence patterns of pain and other non-motor symptoms from pain and NMS diary states as rated by participants.**

Hierarchical clustering of pain and 10 other NMS. Simultaneously occurred NMS were clustered using size difference (an index of asymmetry) as dissimilarity measure and average linkage between groups as agglomeration rule. Upper left diagram (a) represents data for all motor states, while the other diagrams display data for motor Off state (b), motor On state (c) and Dyskinetic state (d) as assessed by the diaries. Data are based on 1,089 simultaneous hourly ratings (68.1% of all time periods and 96.5% of waking hours on 1 day) by 47 participants.