

Supplementary Material

Supplement 1: Description of the MDT-PD questionnaire

Table 1.1 MDT-PD score evaluation

The questionnaire result is interpreted following the below scale:

| MDT-PD web application (www.mdt-parkinson.com) | | | |
|---|-------------------------------------|--|---|
| Score | Classification | Clinical interpretation | Further intervention recommendations |
| < 3.65 | No noticeable dysphagia | Based on MDT-PD your patient is not showing any symptomatic dysphagia. | Another screening should be performed within the next 12 months. |
| ≥ 3.65 | Noticeable, oropharyngeal dysphagia | Based on MDT-PD your patient is showing an abnormality regarding a beginning oropharyngeal dysphagia. | For a differentiated analysis of dysphagia symptoms and decisions on necessary interventions (i.e., professional counseling, dietary adjustments, therapy), the following diagnostic examinations are medically indicated: <ol style="list-style-type: none"> 1. clinical dysphagia-therapeutic assessment (including observation of the intake of a test meal/fluids, at several time points) 2. additional, instrumental evaluation of swallowing via endoscopy (FEES) or video-fluoroscopy (VFSS) – preferably during levodopa ON and OFF states |
| ≥ 4.79 | Dysphagia with risk of aspiration | Based on MDT-PD your patient is facing a high risk of (manifested) dysphagia with laryngeal penetration or aspiration. | <ol style="list-style-type: none"> 1. The patient should be transferred to the hospital department specialized in dysphagia diagnostics including endoscopic (FEES) and/or video-fluoroscopic evaluation of swallowing (VFSS). Assessments during the medication ON and OFF phases are recommended. 2. Individually tailored, optimal treatment (medical interventions, dietary adaptation, or dysphagia-therapeutic functional as well as compensatory training) can be started immediately after the analysis of symptoms has been completed. |
| <p>Cut-offs for the original study have been computed with a sensitivity of 85% and a specificity of 72% for discrimination between “no noticeable dysphagia” vs. “noticeable, oropharyngeal dysphagia” or with a sensitivity of 90% and specificity of 86% vs. “dysphagia with risk of aspiration”, and with similarly high predictive and cross-validated values. Validation study was performed according to a diagnostic set based on 18 parameters using standardized protocols for the gold standard of flexible endoscopic evaluation of swallowing (FEES) and clinical swallowing assessment (CSA), and testing 3 different consistencies (fluid, solid, dry-crumbly) as well as two types of pills/tablets (n=82). For further information, see Simons et al. 2014 or www.mdt-parkinson.com</p> | | | |

Table 1.2 Short forms of the MDT-PD questionnaire items

| Category | Item | Allocated raw values |
|--|------------------------------|-----------------------------|
| I Difficulty swallowing food and liquids | 1. Chewing/swallowing | 0,1,2,3 |
| | 2. Discharge | 0,1,2,3 |
| | 3. Swallowing trigger | 0,1,2,3 |
| | 4. Multiple swallowing | 0,1,2,3 |
| | 5. Food remains | 0,1,2,3 |
| | 6. Food gets stuck | 0,1,2,3 |
| | 7. Coughing while eating | 0,1,2,3 |
| | 8. Coughing while drinking | 0,1,2,3 |
| | 9. Problems breathing | 0,1,2,3 |
| | 10. Changed voice | 0,1,2,3 |
| II Difficulty swallowing independent from food intake | 11. Saliva problems | 0,1,2,3 |
| | 12. Dry mouth | 0,1,2,3 |
| | 13. Choking on saliva | 0,1,2,3 |
| | 14. Pills | 0,1,2,3 |
| III Further swallowing-specific and accompanying burden | 15. Off times | 0,1,2,3 |
| | 16. Avoidance | 0,1,2,3 |
| | 17. Clearing throat | 0,1,2,3 |
| | 18. Duration (for meals) | 0,1,2,3 |
| | 19. Tiredness (within meals) | 0,1,2,3 |

| | | |
|--|------------------------|---------|
| | 20. Rinsing afterwards | 0,1,2,3 |
| | 21. Single swallowing | 0,1,2,3 |
| | 22. Loss of appetite | 0,1,2,3 |
| | 23. Heartburn/lump | 0,1,2,3 |
| IV Swallowing-specific health questions | 24. Lung infection | 0,3 |
| | 25. Loss of weight | 0,3 |
| | 26. Fluid intake | 0,3 |

Table 1.3 MDT-PD, French version – Questionnaire content

| Test de Dysphagie de Munich - Maladie de Parkinson | |
|--|--|
| I | PLAINTES RELATIVES A LA DEGLUTITION survenant en mangeant et en buvant |
| Catégories de réponse: 0 (presque) jamais; 1 ponctuellement/chaque mois (une/ plusieurs fois); 2 plus souvent/chaque semaine (une/ plusieurs fois); 3 très souvent/chaque jour (une/ plusieurs fois) | |
| | <ol style="list-style-type: none"> 1. J'ai des difficultés pour mâcher et avaler des aliments solides / fibreux / friables. (P.ex. pommes, viande, biscuits/biscottes) 2. Pendant les repas les aliments solides / liquides me ressortent de la bouche (ou du nez). 3. J'ai du mal à initier le processus de déglutition directement/ rapidement pour les aliments solides et liquides. 4. Pour avaler des aliments solides / liquides complètement, je dois déglutir plusieurs fois de suite. 5. Après avoir dégluti, j'ai des résidus d'aliments en bouche. 6. En avalant les aliments restent coincés dans ma gorge/ mon œsophage. (Éventuellement je régurgite par après) 7. En mangeant (ou après), je dois me râcler la gorge / tousser. 8. En buvant (ou après) (ou en mangeant une soupe), je dois me racler la gorge/ tousser. 9. Il m'arrive d'avoir des difficultés respiratoires / sensations d'étouffement en avalant des aliments solides ou liquides. 10. Ma voix à l'air modifiée immédiatement après avoir mangé/ bu. (P.ex. voilée/ affaiblie/ „mouillée“/ „gargouillant“) |
| II | PLAINTES RELATIVES A LA DEGLUTITION indépendamment de la prise alimentaire |
| Catégories de réponse: 0 ne correspond pas; 1 ne correspond plutôt pas; 2 correspond plutôt; 3 correspond complètement | |
| | <ol style="list-style-type: none"> 11. J'ai trop de salive dans ma bouche/ j'avale ma salive trop rarement ou j'ai en général des difficultés à avaler ma salive/ des écoulements de salive de la bouche 12. J'ai la bouche très sèche/pas suffisamment de salive. 13. Il m'arrive de tousser ou d'avoir des difficultés respiratoires après avoir avalé de travers ma salive/ suite au passage de salive dans la trachée. 14. J'ai des difficultés à avaler des comprimés. |
| III | Autres CONTRAINTES liées à la déglutition |
| Catégories de réponse: 0 ne correspond pas; 1 ne correspond plutôt pas; 2 correspond plutôt; 3 correspond complètement | |

15. Durant les phases "off" (atténuation de l'effet des médicaments L-Dopa), j'ai plus de difficultés pour avaler.
16. J'évite certains aliments ou consistances que j'avale souvent de travers. (P.ex. noix, gâteaux secs, pralines fourrées au liquide, crudités)
17. Libérer mes voies respiratoires en toussant/raclant après avoir avalé de travers me pose des problèmes.
18. Je nécessite plus de temps pour manger qu'autrefois. (P.ex. car je garde les aliments plus longtemps en bouche, je dois mâcher plus longtemps/"préparer" ou avaler avec plus de précaution)
19. Il m'arrive de me fatiguer beaucoup durant les repas (ou de m'endormir) et de ne pas finir de mâcher les aliments et les avaler.
20. En mangeant, j'ai besoin de liquide pour "faire passer" les aliments afin de mieux les avaler.
21. Je ne peux boire des liquides que par petites gorgées (isolées).
22. J'ai moins d'appétit et je prends moins de plaisir en mangeant qu'autrefois. (Éventuellement l'odorat/ le goût sont aussi altérés)
23. J'ai des problèmes tels que brûlures d'estomac/ reflux fréquents, sensation de boule dans la gorge/ œsophage ou sensation de pression derrière le sternum.

IV QUESTIONS DE SANTÉ relatives à la déglutition

Catégories de réponse: 0 non, ne correspond pas; 3 oui, correspond

24. Au cours de l'année dernière, j'ai eu une pneumonie ou des infections fébriles d'origine indéterminée.
25. J'ai une perte de poids involontaire.
26. Je bois moins de 1.5 l de liquide par jour. (Correspondant à la quantité minimale recommandée de 7 à 8 verres/ tasses d'eau, de jus, de thé, de café ou de soupe)

The MDT-PD is available in several language versions free of charge for clinical implementation: www.mdt-parkinson.com

Each version additionally contains preliminary remarks with patient information, instructions and help for completion.

Supplement 2: Description of the sample

46 participants among the PD patients from the LuxPARK cohort were enrolled in the study out of which 13 at visit 1, 14 at visit 2 and 19 at visit 3.

Table 2.1 Number and percentages of the patients for each visit enrolled in the validation process

| Event name | Frequency | Percent | Cumulative | Cumulative |
|------------|-----------|---------|------------|------------|
| Visit 1 | 13 | 28.26 | 13 | 28.26 |
| Visit 2 | 14 | 30.43 | 27 | 58.70 |
| Visit 3 | 19 | 41.30 | 46 | 100.00 |

Table 2.2 Characteristics of the sample expressed in means for the different assessments

| Variable | N | Missing data (n) | Mean | Std Dev | Minimum | Maximum |
|--|----|------------------|------------|------------|------------|------------|
| Age (years) | 46 | 0 | 67.9808857 | 9.9617232 | 45.4700000 | 88.2482167 |
| H&Y | 45 | 1 | 2.2000000 | 0.7567875 | 1.0000000 | 5.0000000 |
| MoCA | 45 | 1 | 26.0444444 | 2.4675674 | 18.0000000 | 30.0000000 |
| UPDRS III | 43 | 3 | 32.5116279 | 13.6737010 | 7.0000000 | 71.0000000 |
| Disease duration since diagnosis (years) | 45 | 1 | 7.0666667 | 4.3661924 | 1.0000000 | 20.0000000 |
| MDT 1 | 46 | 0 | 3.6299783 | 2.3453462 | -0.7890000 | 10.4700000 |
| MDT 2 | 39 | 2 | 3.7544359 | 2.2793351 | -0.7640000 | 8.6280000 |
| MDT 3 | 35 | 3 | 3.6764571 | 2.0526319 | 0.1550000 | 8.6280000 |

Abbreviations: H&Y: Hoehn and Yahr stage; MoCA: Montreal Cognitive Assessment; UPDRS III: Unified Parkinson's Disease Rating Scale part III, MDT 1-3 Munich Dysphagia Test – Parkinson's Disease (1 French version, first test; 2 French version, second test; 3 German version)

Table 2.3 Gender distribution of the sample

| Gender | Frequency | Percent | Cumulative (Frequency) | Cumulative (Percent) |
|--------|-----------|---------|------------------------|----------------------|
| M | 37 | 80.43 | 37 | 80.43 |
| F | 9 | 19.57 | 46 | 100.00 |

Table 2.4 Number of patients for different H&Y stages

| Hoehn & Yahr Stage | Frequency | Percent | Cumulative | Cumulative |
|--------------------|-----------|---------|------------|------------|
| | | | Frequency | Percent |
| 1 | 3 | 6.67 | 3 | 6.67 |
| 1,5 | 5 | 11.11 | 8 | 17.78 |
| 2 | 23 | 51.11 | 31 | 68.89 |
| 2,5 | 7 | 15.56 | 38 | 84.44 |
| 3 | 4 | 8.89 | 42 | 93.33 |
| 4 | 2 | 4.44 | 44 | 97.78 |
| 5 | 1* | 2.22 | 45 | 100.00 |

*Frequency Missing = 1

Table 2.5 Distribution of the diagnosis of parkinsonism forms in the sample at the time of the assessment

| Final Diagnosis of Parkinsonism | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
|---|------------------|----------------|-----------------------------|---------------------------|
| Parkinson's Disease | 38 | 82.60 | 38 | 82.60 |
| Parkinson's Disease and Dementia | 1 | 2.17 | 39 | 84.78 |
| Cerebrovascular Disease with Parkinsonism Features | 1 | 2.17 | 40 | 86.95 |
| Progressive Supranuclear Palsy | 3 | 6.52 | 43 | 93.47 |
| Cortical-basal Syndrome | 1 | 2.17 | 44 | 95.65 |
| Parkinsonism Unspecified | 2 | 4.34 | 46 | 100.00 |

Supplement 3: MDT-PD completion rates

Table 3.1 Completion rates at the different time points (item-wise)

| MDT-PD French Version (FR1) | | MDT-PD French Version (FR2) | | MDT-PD German Version (GE) | | |
|-----------------------------|----------------------|-----------------------------|----------------------|----------------------------|----------------------|--------------------|
| Item | Cumulative Frequency | Cumulative Percent | Cumulative Frequency | Cumulative Percent | Cumulative Frequency | Cumulative Percent |
| Q1 | 46 | 100.00 | 41 | 100.00 | 36 | 94.74 |
| Q2 | 46 | 100.00 | 41 | 100.00 | 37 | 97.37 |
| Q3 | 46 | 100.00 | 41 | 100.00 | 37 | 97.37 |
| Q4 | 46 | 100.00 | 41 | 100.00 | 37 | 97.37 |
| Q5 | 46 | 100.00 | 41 | 100.00 | 37 | 97.37 |
| Q6 | 46 | 100.00 | 41 | 100.00 | 37 | 97.37 |
| Q7 | 46 | 100.00 | 41 | 100.00 | 37 | 97.37 |
| Q8 | 46 | 100.00 | 41 | 100.00 | 37 | 97.37 |
| Q9 | 46 | 100.00 | 41 | 100.00 | 37 | 97.37 |
| Q10 | 46 | 100.00 | 41 | 100.00 | 36 | 94.74 |
| Q11 | 46 | 100.00 | 41 | 100.00 | 37 | 97.37 |
| Q12 | 46 | 100.00 | 41 | 100.00 | 37 | 97.37 |
| Q13 | 46 | 100.00 | 41 | 100.00 | 37 | 97.37 |
| Q14 | 46 | 100.00 | 41 | 100.00 | 38 | 100.00 |
| Q15 | 46 | 100.00 | 41 | 100.00 | 38 | 100.00 |
| Q16 | 46 | 100.00 | 41 | 100.00 | 38 | 100.00 |
| Q17 | 46 | 100.00 | 41 | 100.00 | 38 | 100.00 |

Supplementary Material

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|------------|----|--------|----|--------|----|--------|
| Q18 | 46 | 100.00 | 41 | 100.00 | 38 | 100.00 |
| Q19 | 46 | 100.00 | 41 | 100.00 | 37 | 97.37 |
| Q20 | 46 | 100.00 | 41 | 100.00 | 38 | 100.00 |
| Q21 | 46 | 100.00 | 40 | 97.56 | 38 | 100.00 |
| Q22 | 46 | 100.00 | 40 | 97.56 | 37 | 97.37 |
| Q23 | 46 | 100.00 | 41 | 100.00 | 38 | 100.00 |
| Q24 | 46 | 100.00 | 41 | 100.00 | 37 | 97.37 |
| Q25 | 46 | 100.00 | 41 | 100.00 | 38 | 100.00 |
| Q26 | 46 | 100.00 | 41 | 100.00 | 37 | 97.37 |

Supplement 4: Details for MDT-PD test-retest reliability

Table 4.1 Disagreement rate for the comparison MDT-PD FR1 vs. FR2 (number of patients, item-wise)

| Difference (points) | | | | |
|----------------------------|----------|----------|----------|----------|
| Item | 0 | 1 | 2 | 3 |
| Q1 | 35 | 3 | 0 | 0 |
| Q2 | 39 | 0 | 0 | 0 |
| Q3 | 37 | 2 | 0 | 0 |
| Q4 | 38 | 1 | 0 | 0 |
| Q5 | 35 | 4 | 0 | 0 |
| Q6 | 35 | 4 | 0 | 0 |
| Q7 | 34 | 5 | 0 | 0 |
| Q8 | 36 | 2 | 0 | 0 |
| Q9 | 39 | 0 | 0 | 0 |
| Q10 | 35 | 3 | 1 | 0 |
| Q11 | 32 | 4 | 2 | 0 |
| Q12 | 29 | 10 | 0 | 0 |
| Q13 | 32 | 5 | 1 | 0 |
| Q14 | 32 | 3 | 1 | 0 |
| Q15 | 36 | 1 | 1 | 0 |
| Q16 | 34 | 4 | 0 | 0 |
| Q17 | 36 | 3 | 0 | 0 |

| | | | | |
|------------|----|---|---|---|
| Q18 | 34 | 4 | 0 | 0 |
| Q19 | 35 | 4 | 0 | 0 |
| Q20 | 36 | 2 | 1 | 0 |
| Q21 | 37 | 2 | 0 | 0 |
| Q22 | 30 | 5 | 2 | 0 |
| Q23 | 34 | 4 | 0 | 0 |
| Q24 | 38 | 1 | 0 | 0 |
| Q25 | 37 | 2 | 0 | 0 |
| Q26 | 31 | 1 | 0 | 0 |

Table 4.2 Strength of response agreement in MDT-PD FR1 vs. FR2 (item-wise, evaluated with Kappa and Krippendorff's Alpha)

| Comparison | Disagree | Agree | Kappa | Kappa Lower Limit | Kappa Upper Limit | Krippendorff Alpha | K-Alpha Lower Limit | K-Alpha Upper Limit |
|-------------------|-----------------|--------------|--------------|--------------------------|--------------------------|---------------------------|----------------------------|----------------------------|
| Q1 | 34 | 4 | 0.00 | 0.00 | 0.00 | <i>0.63</i> | 0.19 | 0.85 |
| Q2 | 34 | 5 | 0.00 | 0.00 | 0.00 | <i>-0.05</i> | -0.89 | 0.79 |
| Q3 | 35 | 4 | 0.28 | -0.23 | 0.79 | <i>0.59</i> | -0.09 | 0.86 |
| Q4 | 34 | 5 | 0.54 | 0.20 | 0.89 | <i>0.36</i> | 0.13 | 0.84 |
| Q5 | 33 | 6 | 0.00 | 0.00 | 0.00 | <i>0.50</i> | -0.01 | 0.75 |
| Q6 | 30 | 9 | 0.00 | 0.00 | 0.00 | <i>0.51</i> | 0.14 | 0.75 |
| Q7 | 28 | 11 | 0.39 | 0.07 | 0.71 | <i>0.42</i> | 0.02 | 0.65 |

| | | | | | | | | |
|------------|----|----|------|------|------|-------------|-------|------|
| Q8 | 34 | 4 | 0.00 | 0.00 | 0.00 | <i>0.03</i> | -0.10 | 0.88 |
| Q9 | 37 | 2 | 0.77 | 0.47 | 1.00 | <i>0.55</i> | 0.44 | 1.00 |
| Q10 | 32 | 7 | 0.00 | 0.00 | 0.00 | <i>0.84</i> | 0.40 | 0.89 |
| Q11 | 22 | 16 | 0.67 | 0.48 | 0.87 | <i>0.59</i> | 0.52 | 0.89 |
| Q12 | 18 | 21 | 0.43 | 0.21 | 0.65 | <i>0.43</i> | 0.17 | 0.61 |
| Q13 | 25 | 13 | 0.51 | 0.27 | 0.75 | <i>0.36</i> | 0.23 | 0.73 |
| Q14 | 29 | 7 | 0.34 | 0.03 | 0.65 | <i>0.52</i> | -0.10 | 0.66 |
| Q15 | 32 | 6 | 0.50 | 0.12 | 0.88 | <i>0.80</i> | 0.11 | 0.90 |
| Q16 | 33 | 5 | 0.45 | 0.09 | 0.81 | <i>0.46</i> | 0.02 | 0.89 |
| Q17 | 30 | 9 | 0.66 | 0.42 | 0.91 | <i>0.84</i> | 0.36 | 0.84 |
| Q18 | 23 | 15 | 0.62 | 0.42 | 0.82 | <i>0.49</i> | 0.33 | 0.76 |
| Q19 | 32 | 7 | 0.39 | 0.13 | 0.65 | <i>0.40</i> | -0.03 | 0.74 |
| Q20 | 32 | 7 | 0.74 | 0.52 | 0.97 | <i>0.59</i> | 0.42 | 0.88 |
| Q21 | 32 | 7 | 0.82 | 0.60 | 1.00 | <i>0.91</i> | 0.56 | 1.00 |
| Q22 | 22 | 15 | 0.35 | 0.09 | 0.60 | <i>0.28</i> | 0.04 | 0.62 |
| Q23 | 29 | 9 | 0.63 | 0.40 | 0.86 | <i>0.38</i> | 0.38 | 0.84 |
| Q24 | 37 | 2 | 0.65 | 0.03 | 1.00 | <i>0.66</i> | -0.03 | 1.00 |
| Q25 | 33 | 6 | 0.77 | 0.47 | 1.00 | <i>0.89</i> | 0.44 | 1.00 |
| Q26 | 18 | 14 | 0.59 | 0.35 | 0.83 | <i>0.46</i> | 0.26 | 0.80 |

Table 4.3: Disagreement rate for the comparison MDT-PD FR1 vs.GE (number of patients, item-wise)

| Difference (points) | | | | |
|----------------------------|----------|----------|----------|----------|
| Item | 0 | 1 | 2 | 3 |
| Q1 | 30 | 2 | 0 | 0 |
| Q2 | 31 | 1 | 0 | 0 |
| Q3 | 31 | 1 | 0 | 0 |
| Q4 | 32 | 0 | 0 | 0 |
| Q5 | 30 | 2 | 0 | 0 |
| Q6 | 31 | 1 | 0 | 0 |
| Q7 | 32 | 0 | 0 | 0 |
| Q8 | 29 | 2 | 0 | 0 |
| Q9 | 31 | 1 | 0 | 0 |
| Q10 | 30 | 2 | 0 | 0 |
| Q11 | 29 | 1 | 1 | 0 |
| Q12 | 27 | 5 | 0 | 0 |
| Q13 | 29 | 2 | 1 | 0 |
| Q14 | 28 | 1 | 1 | 0 |
| Q15 | 31 | 1 | 0 | 0 |
| Q16 | 30 | 1 | 0 | 0 |

| | | | | |
|------------|----|---|---|---|
| Q17 | 31 | 1 | 0 | 0 |
| Q18 | 27 | 3 | 0 | 0 |
| Q19 | 30 | 2 | 0 | 0 |
| Q20 | 30 | 2 | 0 | 0 |
| Q21 | 28 | 3 | 0 | 0 |
| Q22 | 27 | 3 | 1 | 0 |
| Q23 | 29 | 2 | 0 | 0 |
| Q24 | 32 | 0 | 0 | 0 |
| Q25 | 32 | 0 | 0 | 0 |
| Q26 | 29 | 0 | 0 | 1 |

Table 4.4 Strength of response agreement in MDT-PD FR1 vs. GE (item-wise, evaluated with Kappa and Krippendorf's Alpha)

| Comparison | Disagree | Agree | Kappa | Kappa Lower Limit | Kappa Upper Limit | Krippendorf Alpha | K-Alpha Lower Limit | K-Alpha Upper Limit |
|-------------------|-----------------|--------------|--------------|--------------------------|--------------------------|--------------------------|----------------------------|----------------------------|
| Q1 | 30 | 2 | 0.00 | 0.00 | 0.00 | <i>0.49</i> | 0.28 | 1.00 |
| Q2 | 28 | 4 | -0.05 | -0.12 | 0.03 | <i>-0.04</i> | -1.00 | 0.74 |
| Q3 | 31 | 1 | 0.65 | 0.02 | 1.00 | <i>-0.04</i> | -0.30 | 1.00 |
| Q4 | 31 | 1 | 0.90 | 0.72 | 1.00 | <i>0.83</i> | 0.57 | 1.00 |
| Q5 | 30 | 2 | 0.00 | 0.00 | 0.00 | <i>0.66</i> | 0.21 | 1.00 |

| | | | | | | | | |
|------------|----|----|------|-------|------|-------------|-------|------|
| Q6 | 28 | 4 | 0.00 | 0.00 | 0.00 | <i>0.42</i> | 0.13 | 0.90 |
| Q7 | 27 | 5 | 0.61 | 0.28 | 0.95 | <i>0.41</i> | 0.07 | 0.83 |
| Q8 | 28 | 3 | 0.00 | 0.00 | 0.00 | <i>0.02</i> | -0.11 | 0.88 |
| Q9 | 31 | 1 | 0.84 | 0.54 | 1.00 | <i>0.84</i> | 0.53 | 1.00 |
| Q10 | 29 | 3 | 0.84 | 0.66 | 1.00 | <i>0.81</i> | 0.68 | 1.00 |
| Q11 | 19 | 12 | 0.74 | 0.53 | 0.94 | <i>0.53</i> | 0.44 | 0.86 |
| Q12 | 20 | 12 | 0.61 | 0.38 | 0.84 | <i>0.44</i> | 0.36 | 0.76 |
| Q13 | 23 | 9 | 0.68 | 0.43 | 0.93 | <i>0.57</i> | 0.30 | 0.84 |
| Q14 | 25 | 5 | 0.32 | -0.09 | 0.74 | <i>0.13</i> | -0.14 | 0.74 |
| Q15 | 28 | 4 | 0.73 | 0.36 | 1.00 | <i>0.52</i> | 0.17 | 1.00 |
| Q16 | 29 | 2 | 0.64 | 0.19 | 1.00 | <i>0.85</i> | -0.06 | 1.00 |
| Q17 | 29 | 3 | 0.00 | 0.00 | 0.00 | <i>0.61</i> | 0.35 | 0.93 |
| Q18 | 20 | 10 | 0.65 | 0.43 | 0.87 | <i>0.67</i> | 0.37 | 0.79 |
| Q19 | 27 | 5 | 0.45 | 0.14 | 0.76 | <i>0.48</i> | -0.04 | 0.74 |
| Q20 | 27 | 5 | 0.79 | 0.54 | 1.00 | <i>0.78</i> | 0.56 | 1.00 |
| Q21 | 25 | 6 | 0.00 | 0.00 | 0.00 | <i>0.59</i> | 0.19 | 0.90 |
| Q22 | 22 | 9 | 0.55 | 0.27 | 0.83 | <i>0.66</i> | 0.22 | 0.71 |
| Q23 | 25 | 6 | 0.73 | 0.49 | 0.97 | <i>0.65</i> | 0.42 | 0.94 |
| Q24 | 32 | 0 | 0.00 | 0.00 | 0.00 | <i>0.00</i> | -1.00 | 0.00 |
| Q25 | 29 | 3 | 1.00 | 1.00 | 1.00 | <i>1.00</i> | 0.63 | 1.00 |
| Q26 | 16 | 14 | 0.81 | 0.61 | 1.00 | <i>0.63</i> | 0.53 | 0.90 |

Table 4.5 Disagreement rate for the comparison MDT-PD FR2 vs. GE (number of patients, item-wise)

| Difference (points) | | | | |
|----------------------------|----------|----------|----------|----------|
| Item | 0 | 1 | 2 | 3 |
| Q1 | 31 | 1 | 0 | 0 |
| Q2 | 31 | 1 | 0 | 0 |
| Q3 | 31 | 1 | 0 | 0 |
| Q4 | 30 | 2 | 0 | 0 |
| Q5 | 32 | 0 | 0 | 0 |
| Q6 | 32 | 0 | 0 | 0 |
| Q7 | 32 | 0 | 0 | 0 |
| Q8 | 30 | 2 | 0 | 0 |
| Q9 | 31 | 1 | 0 | 0 |
| Q10 | 30 | 2 | 0 | 0 |
| Q11 | 30 | 1 | 0 | 0 |
| Q12 | 28 | 4 | 0 | 0 |
| Q13 | 31 | 1 | 0 | 0 |
| Q14 | 31 | 1 | 0 | 0 |
| Q15 | 32 | 0 | 0 | 0 |
| Q16 | 31 | 1 | 0 | 0 |
| Q17 | 30 | 2 | 0 | 0 |
| Q18 | 29 | 2 | 0 | 0 |

| | | | | |
|------------|----|---|---|---|
| Q19 | 32 | 0 | 0 | 0 |
| Q20 | 29 | 2 | 0 | 0 |
| Q21 | 28 | 3 | 0 | 0 |
| Q22 | 29 | 2 | 0 | 0 |
| Q23 | 31 | 1 | 0 | 0 |
| Q24 | 32 | 0 | 0 | 0 |
| Q25 | 32 | 0 | 0 | 0 |
| Q26 | 30 | 0 | 0 | 2 |

Table 4.6 Strength of response agreement in MDT-PD FR2 vs. GE (item-wise, evaluated with Kappa and Krippendorf's Alpha)

| Comparison | Disagree | Agree | Kappa | Kappa Lower Limit | Kappa Upper Limit | Krippendorf Alpha | K-Alpha Lower Limit | K-Alpha Upper Limit |
|------------|----------|-------|-------|-------------------|-------------------|-------------------|---------------------|---------------------|
| Q1 | 31 | 1 | 0.84 | 0.54 | 1.00 | <i>0.77</i> | 0.43 | 1.00 |
| Q2 | 31 | 1 | 0.00 | 0.00 | 0.00 | <i>-1.00</i> | -1.00 | 0.00 |
| Q3 | 30 | 2 | 0.47 | -0.16 | 1.00 | <i>0.46</i> | 0.10 | 1.00 |
| Q4 | 30 | 2 | 0.76 | 0.46 | 1.00 | <i>0.90</i> | 0.51 | 1.00 |
| Q5 | 31 | 1 | 1.00 | 1.00 | 1.00 | <i>0.91</i> | 0.73 | 1.00 |
| Q6 | 32 | 0 | 1.00 | 1.00 | 1.00 | <i>0.54</i> | 0.43 | 1.00 |
| Q7 | 29 | 3 | 0.77 | 0.47 | 1.00 | <i>0.42</i> | 0.23 | 0.90 |
| Q8 | 29 | 3 | 0.35 | -0.22 | 0.92 | <i>1.00</i> | -0.09 | 1.00 |

| | | | | | | | | |
|------------|----|----|------|------|------|-------------|-------|------|
| Q9 | 31 | 1 | 0.84 | 0.54 | 1.00 | <i>1.00</i> | 0.53 | 1.00 |
| Q10 | 28 | 4 | 0.00 | 0.00 | 0.00 | <i>0.81</i> | 0.55 | 1.00 |
| Q11 | 20 | 11 | 0.84 | 0.67 | 1.00 | <i>0.81</i> | 0.57 | 0.95 |
| Q12 | 22 | 10 | 0.75 | 0.55 | 0.95 | <i>0.79</i> | 0.54 | 0.92 |
| Q13 | 25 | 7 | 0.87 | 0.70 | 1.00 | <i>0.89</i> | 0.61 | 1.00 |
| Q14 | 27 | 5 | 0.63 | 0.24 | 1.00 | <i>0.70</i> | 0.29 | 1.00 |
| Q15 | 30 | 2 | 1.00 | 1.00 | 1.00 | <i>0.76</i> | 0.64 | 1.00 |
| Q16 | 28 | 4 | 0.53 | 0.06 | 1.00 | <i>0.27</i> | -0.22 | 0.88 |
| Q17 | 27 | 5 | 0.00 | 0.00 | 0.00 | <i>0.66</i> | 0.39 | 0.93 |
| Q18 | 23 | 8 | 0.84 | 0.68 | 1.00 | <i>0.82</i> | 0.63 | 0.95 |
| Q19 | 30 | 2 | 1.00 | 1.00 | 1.00 | <i>1.00</i> | 0.70 | 1.00 |
| Q20 | 25 | 6 | 0.64 | 0.33 | 0.94 | <i>0.65</i> | 0.29 | 0.93 |
| Q21 | 25 | 6 | 0.00 | 0.00 | 0.00 | <i>0.53</i> | 0.15 | 0.81 |
| Q22 | 23 | 8 | 0.80 | 0.58 | 1.00 | <i>0.64</i> | 0.53 | 0.95 |
| Q23 | 27 | 5 | 0.86 | 0.67 | 1.00 | <i>0.81</i> | 0.49 | 0.94 |
| Q24 | 32 | 0 | 0.00 | 0.00 | 0.00 | <i>1.00</i> | 1.00 | 1.00 |
| Q25 | 29 | 3 | 1.00 | 1.00 | 1.00 | <i>0.79</i> | 0.68 | 1.00 |
| Q26 | 18 | 14 | 0.87 | 0.70 | 1.00 | <i>0.89</i> | 0.67 | 1.00 |

Supplement 5: MDT-PD - Internal consistency**Table 5.1 MDT-PD language comparisons (mean differences item-wise)**

| Item | FR2-FR1 | | | | | GE-FR2 | | | | | GE-FR1 | | | | |
|------------|---------|------|---------|------|------|--------|------|---------|------|------|--------|------|---------|------|------|
| | N | Mean | Std Dev | Min. | Max. | N | Mean | Std Dev | Min. | Max. | N | Mean | Std Dev | Min. | Max. |
| Q1 | 41 | 0.09 | 0.25 | 0 | 1 | 36 | 0.04 | 0.18 | 0 | 1 | 37 | 0.03 | 0.11 | 0 | 0.5 |
| Q2 | 41 | 0.06 | 0.17 | 0 | 0.5 | 36 | 0.03 | 0.17 | 0 | 1 | 37 | 0.07 | 0.21 | 0 | 1 |
| Q3 | 41 | 0.07 | 0.24 | 0 | 1 | 36 | 0.04 | 0.18 | 0 | 1 | 37 | 0.05 | 0.23 | 0 | 1 |
| Q4 | 41 | 0.09 | 0.22 | 0 | 1 | 36 | 0.06 | 0.23 | 0 | 1 | 37 | 0.04 | 0.18 | 0 | 1 |
| Q5 | 41 | 0.12 | 0.29 | 0 | 1 | 36 | 0.01 | 0.08 | 0 | 0.5 | 37 | 0.07 | 0.24 | 0 | 1 |
| Q6 | 41 | 0.13 | 0.27 | 0 | 1 | 36 | 0.03 | 0.12 | 0 | 0.5 | 37 | 0.06 | 0.16 | 0 | 0.5 |
| Q7 | 41 | 0.20 | 0.35 | 0 | 1 | 36 | 0.06 | 0.16 | 0 | 0.5 | 37 | 0.08 | 0.19 | 0 | 0.5 |
| Q8 | 41 | 0.09 | 0.26 | 0 | 1 | 36 | 0.07 | 0.24 | 0 | 1 | 37 | 0.10 | 0.27 | 0 | 1 |
| Q9 | 41 | 0.02 | 0.11 | 0 | 0.5 | 36 | 0.03 | 0.17 | 0 | 1 | 37 | 0.03 | 0.16 | 0 | 1 |
| Q10 | 41 | 0.11 | 0.28 | 0 | 1 | 36 | 0.05 | 0.19 | 0 | 1 | 36 | 0.02 | 0.10 | 0 | 0.5 |
| Q11 | 41 | 0.18 | 0.47 | 0 | 2 | 35 | 0.07 | 0.18 | 0 | 0.67 | 36 | 0.14 | 0.38 | 0 | 2 |
| Q12 | 41 | 0.28 | 0.44 | 0 | 2 | 36 | 0.10 | 0.26 | 0 | 1 | 37 | 0.20 | 0.41 | 0 | 2 |
| Q13 | 41 | 0.18 | 0.40 | 0 | 2 | 36 | 0.06 | 0.20 | 0 | 1 | 37 | 0.16 | 0.39 | 0 | 2 |
| Q14 | 41 | 0.19 | 0.41 | 0 | 2 | 36 | 0.06 | 0.20 | 0 | 1 | 37 | 0.17 | 0.40 | 0 | 2 |
| Q15 | 41 | 0.11 | 0.37 | 0 | 2 | 37 | 0.02 | 0.11 | 0 | 0.67 | 38 | 0.06 | 0.21 | 0 | 1 |
| Q16 | 41 | 0.10 | 0.29 | 0 | 1 | 37 | 0.09 | 0.26 | 0 | 1 | 38 | 0.07 | 0.25 | 0 | 1 |
| Q17 | 41 | 0.12 | 0.29 | 0 | 1 | 37 | 0.05 | 0.14 | 0 | 0.5 | 38 | 0.06 | 0.15 | 0 | 0.5 |

| | | | | | | | | | | | | | | | |
|------------|----|------|------|---|------|----|------|------|---|------|----|------|------|---|------|
| Q18 | 41 | 0.13 | 0.22 | 0 | 0.67 | 37 | 0.05 | 0.15 | 0 | 0.67 | 38 | 0.13 | 0.23 | 0 | 0.67 |
| Q19 | 41 | 0.11 | 0.26 | 0 | 1 | 37 | 0.03 | 0.16 | 0 | 1 | 38 | 0.11 | 0.27 | 0 | 1 |
| Q20 | 41 | 0.11 | 0.36 | 0 | 2 | 36 | 0.08 | 0.23 | 0 | 1 | 37 | 0.05 | 0.20 | 0 | 1 |
| Q21 | 41 | 0.04 | 0.17 | 0 | 1 | 37 | 0.09 | 0.26 | 0 | 1 | 38 | 0.08 | 0.25 | 0 | 1 |
| Q22 | 40 | 0.31 | 0.56 | 0 | 2 | 36 | 0.12 | 0.30 | 0 | 1 | 38 | 0.26 | 0.52 | 0 | 2 |
| Q23 | 40 | 0.11 | 0.26 | 0 | 1 | 36 | 0.07 | 0.21 | 0 | 1 | 37 | 0.08 | 0.22 | 0 | 1 |
| Q24 | 41 | 0.07 | 0.47 | 0 | 3 | 37 | 0.00 | 0.00 | 0 | 0 | 38 | 0.08 | 0.49 | 0 | 3 |
| Q25 | 41 | 0.15 | 0.65 | 0 | 3 | 37 | 0.02 | 0.12 | 0 | 0.75 | 37 | 0.08 | 0.49 | 0 | 3 |
| Q26 | 41 | 0.27 | 0.69 | 0 | 3 | 37 | 0.24 | 0.83 | 0 | 3 | 38 | 0.22 | 0.70 | 0 | 3 |

Table 5.2 Cronbach's alpha values for MDT-PD language versions

| FR1 | | FR2 | | GE | |
|------------|---------------------|------------|---------------------|------------|---------------------|
| Raw | Standardized | Raw | Standardized | Raw | Standardized |
| 0.80 | 0.84 | 0.84 | | 0.83 | 0.87 |

Explanation: If the variances of the items vary widely standardized values are obtained by scaling the variables to a unit variance of 1.

Table 5.3 Cronbach's alpha values for MDT-PD language versions (1 item deleted)

The deletion of one item had no major influence on the coefficient Alpha thereby keeping a high level of consistency.

| | FR1 | | | | FR2 | | | | GE | | | |
|-----------|------------------|-------|------------------|-------|------------------|-------|------------------|-------|------------------|-------|------------------|-------|
| | Raw | | Standardized | | Raw | | Standardized | | Raw | | Standardized | |
| Del. Var. | Corr. with Total | Alpha |
| Q1 | 0.30 | 0.79 | 0.37 | 0.84 | 0.59 | 0.82 | 0.66 | 0.87 | 0.38 | 0.82 | 0.52 | 0.86 |
| Q2 | 0.09 | 0.80 | 0.13 | 0.85 | - | - | - | - | 0.00 | 0.83 | -0.04 | 0.87 |
| Q3 | 0.51 | 0.79 | 0.57 | 0.83 | 0.43. | 0.83 | 0.51 | 0.88 | 0.50 | 0.82 | 0.58 | 0.86 |
| Q4 | 0.41 | 0.79 | 0.46 | 0.84 | 0.31. | 0.83 | 0.40 | 0.88 | 0.45 | 0.82 | 0.53 | 0.86 |
| Q5 | 0.30 | 0.79 | 0.35 | 0.84 | 0.33 | 0.83 | 0.36 | 0.88 | 0.33 | 0.82 | 0.34 | 0.86 |
| Q6 | 0.36 | 0.79 | 0.45 | 0.84 | 0.59 | 0.82 | 0.67 | 0.87 | 0.41 | 0.82 | 0.51 | 0.86 |
| Q7 | 0.47 | 0.78 | 0.55 | 0.83 | 0.58. | 0.82 | 0.60 | 0.87 | 0.51 | 0.82 | 0.57 | 0.86 |
| Q8 | 0.29 | 0.79 | 0.26 | 0.84 | 0.51 | 0.8 | 0.55 | 0.87 | 0.30 | 0.82 | 0.42 | 0.86 |
| Q9 | 0.55 | 0.79 | 0.59 | 0.83 | 0.48 | 0.83 | 0.47 | 0.88 | 0.54 | 0.82 | 0.55 | 0.86 |
| Q10 | 0.42 | 0.79 | 0.43 | 0.84 | 0.47 | 0.82 | 0.48 | 0.88 | 0.43 | 0.82 | 0.47 | 0.86 |
| Q11 | 0.47 | 0.78 | 0.45 | 0.84 | 0.48. | 0.82 | 0.47 | 0.88 | 0.47 | 0.82 | 0.44 | 0.86 |
| Q12 | 0.10 | 0.80 | 0.09 | 0.85 | 0.2. | 0.83 | 0.31 | 0.88 | 0.19 | 0.83 | 0.21 | 0.87 |
| Q13 | 0.54 | 0.78 | 0.57 | 0.83 | 0.62 | 0.82 | 0.61 | 0.87 | 0.59 | 0.81 | 0.56 | 0.86 |
| Q14 | 0.37 | 0.79 | 0.39 | 0.84 | 0.28 | 0.83 | 0.27 | 0.88 | 0.30 | 0.82 | 0.27 | 0.87 |
| Q15 | 0.65 | 0.77 | 0.63 | 0.83 | 0.62 | 0.82 | 0.64 | 0.87 | 0.70 | 0.81 | 0.72 | 0.85 |
| Q16 | 0.57 | 0.78 | 0.58 | 0.83 | 0.63 | 0.82 | 0.64 | 0.87 | 0.58 | 0.82 | 0.58 | 0.86 |

| | | | | | | | | | | | | |
|-----|------|------|------|------|------|------|-------|------|------|------|------|------|
| Q17 | 0.65 | 0.77 | 0.65 | 0.83 | 0.69 | 0.81 | 0.70 | 0.87 | 0.72 | 0.81 | 0.75 | 0.85 |
| Q18 | 0.50 | 0.78 | 0.50 | 0.83 | 0.28 | 0.83 | 0.28 | 0.88 | 0.53 | 0.81 | 0.51 | 0.86 |
| Q19 | 0.11 | 0.80 | 0.10 | 0.85 | 0.29 | 0.83 | 0.28 | 0.88 | 0.21 | 0.82 | 0.20 | 0.87 |
| Q20 | 0.63 | 0.78 | 0.67 | 0.83 | 0.65 | 0.82 | 0.65 | 0.87 | 0.63 | 0.81 | 0.69 | 0.85 |
| Q21 | 0.40 | 0.79 | 0.41 | 0.84 | 0.47 | 0.82 | 0.48 | 0.88 | 0.64 | 0.81 | 0.67 | 0.85 |
| Q22 | 0.46 | 0.78 | 0.42 | 0.84 | 0.57 | 0.82 | 0.58 | 0.87 | 0.54 | 0.81 | 0.51 | 0.86 |
| Q23 | 0.05 | 0.80 | 0.03 | 0.85 | 0.21 | 0.83 | 0.15 | 0.89 | 0.10 | 0.83 | 0.01 | 0.87 |
| Q24 | 0.15 | 0.80 | 0.19 | 0.84 | 0.31 | 0.83 | 0.28 | 0.88 | 0.11 | 0.83 | 0.05 | 0.87 |
| Q25 | 0.11 | 0.80 | 0.04 | 0.85 | 0.26 | 0.84 | 0.29 | 0.88 | 0.17 | 0.83 | 0.11 | 0.87 |
| Q26 | 0.10 | 0.82 | 0.09 | 0.85 | 0.01 | 0.86 | -0.03 | 0.89 | 0.17 | 0.85 | 0.16 | 0.87 |

Table 5.4 Variance Inflation Factor (VIF) values for each question of the MDT-PD questionnaire

| Variable | Label (questionnaire item) | Variance Inflation | | |
|----------|--|--------------------|-------|-------|
| | | FR1 | FR2 | GE |
| mdt_1 | I have difficulties with the chewing and swallowing of solid/ fibrous/ crumbly food. (e.g. apples, meat, cracker/ chips) | 6.12 | 33.50 | 56.20 |
| mdt_2 | During meals, food/liquid escapes from the mouth (or the nose). | 2.67 | | 2.83 |
| mdt_3 | I find it difficult to directly/ quickly start the swallowing process when taking in liquids or food. | 6.41 | 10.58 | 18.81 |
| mdt_4 | For the complete swallowing of food/ liquids I need to swallow multiple times in a row. | 3.39 | 16.76 | 31.87 |
| mdt_5 | Food residues remain in my mouth after swallowing. | 2.69 | 3.10 | 4.87 |
| mdt_6 | During the swallowing process, food gets stuck in my throat/ esophagus. (maybe I even have to choke) | 7.68 | 40.20 | 28.40 |
| mdt_7 | During (or after) eating food I have to hawk/cough. | 4.01 | 4.17 | 5.20 |
| mdt_8 | During (or after) drinking liquids (or eating soup) I have to hawk/ cough. | 2.50 | 15.31 | 4.62 |
| mdt_9 | It happens that I have difficulties breathing/a sense of suffocation when swallowing food or liquids. | 4.18 | 5.26 | 4.13 |
| mdt_10 | Right after eating food/ drinking liquids my voice has changed. (e.g. coated/weakened/wet/gargling) | 3.94 | 4.08 | 7.03 |

Supplementary Material

| | | | | |
|---------------|---|------|-------|-------|
| mdt_11 | I have increased amount of saliva in my mouth /I swallow my saliva too rarely or I have general problems swallowing my saliva/ drooling. | 3.03 | 2.65 | 3.49 |
| mdt_12 | I have a very dry mouth/ not enough saliva. | 2.95 | 2.53 | 3.93 |
| mdt_13 | It happens that I cough or have trouble breathing because I have choked on my saliva/saliva went into my trachea. | 5.30 | 6.22 | 5.00 |
| mdt_14 | I have problems swallowing pills. | 2.22 | 7.01 | 8.09 |
| mdt_15 | During the off-phases (off-drug-state/declining levodopa levels) I have more difficulties to swallow. | 3.73 | 7.10 | 14.31 |
| mdt_16 | I avoid specific foods or textures that often make me choke. (e.g. nuts, crumb cake, liquid-filled pralines, raw vegetable salads) | 4.32 | 6.36 | 4.49 |
| mdt_17 | It is difficult for me to hawk/ cough after I choke in order to clear my throat. | 3.83 | 12.68 | 16.90 |
| mdt_18 | Nowadays, it takes me more time to eat than it used to. (e.g. because I have to chew longer/foods are longer in my mouth due to longer preparation time or more careful swallowing) | 3.64 | 3.65 | 4.62 |
| mdt_19 | It happens that I get tired during meals (or even fall asleep) and don't finish chewing and swallowing my food. | 2.88 | 6.20 | 12.93 |
| mdt_20 | During meals I have to have liquids to flush down the food in order to be able to better swallow. | 5.48 | 11.40 | 18.04 |
| mdt_21 | I can only swallow liquids in small sips. | 2.78 | 5.33 | 11.84 |
| mdt_22 | I have a reduced appetite or pleasure to eat than before. (sense of taste and smell are potentially affected) | 3.26 | 9.86 | 8.17 |
| mdt_23 | I have problems, such as heartburn/ frequent burping, sense of lump in the throat/ esophagus, sense of pressure behind the breastbone. | 2.75 | 3.64 | 5.86 |
| mdt_24 | Within the last year I had a lung infection or unclear fever-infections | 3.71 | 12.34 | 5.21 |
| mdt_25 | I involuntarily loose body weight. | 4.19 | 8.14 | 12.04 |
| mdt_26 | I drink less than 50 oz. of liquid during a given day (equal to suggested minimum of 7-8 glasses/cups water, juice, tea, coffee, soup) | 2.07 | 2.36 | 3.01 |

Supplement 6: Detailed analyses of MDT-PD construct validity

Table 6.1 Analysis of MDT-PD mean differences on the diagnosis of parkinsonism in FR1

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F | R-Square |
|------------------------|----|----------------|-------------|---------|--------|----------|
| Model | 5 | 29.8571915 | 5.9714383 | 1.07 | 0.3906 | 0.120856 |
| Error | 39 | 217.1895257 | 5.5689622 | | | |
| Corrected Total | 44 | 247.0467172 | | | | |
| Diagnosis | 5 | 29.85719153 | 5.97143831 | 1.07 | 0.3906 | |

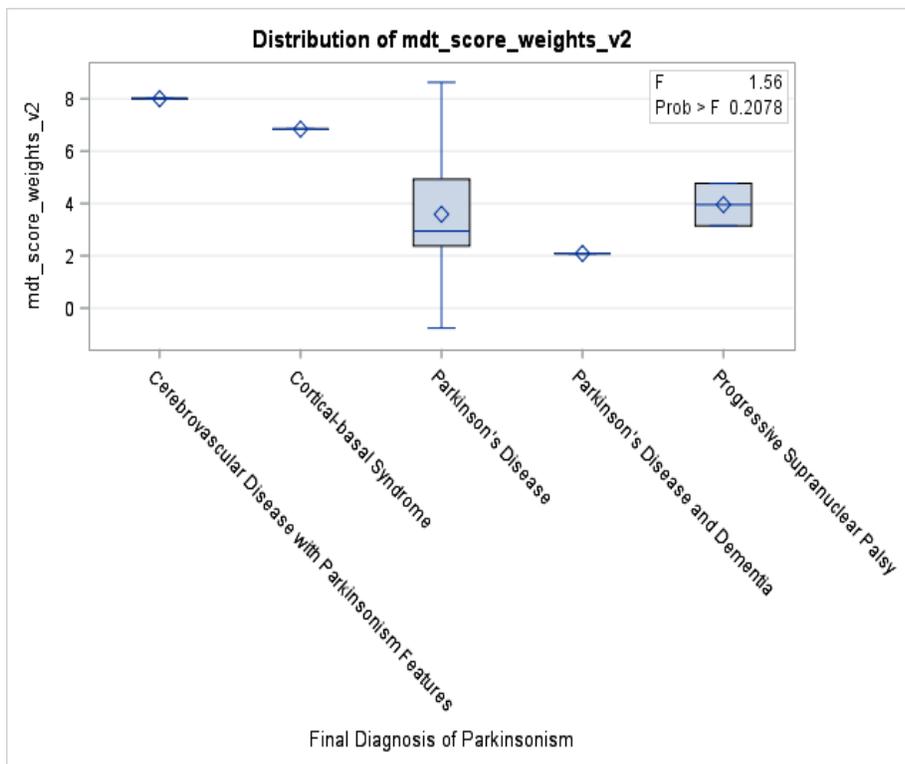
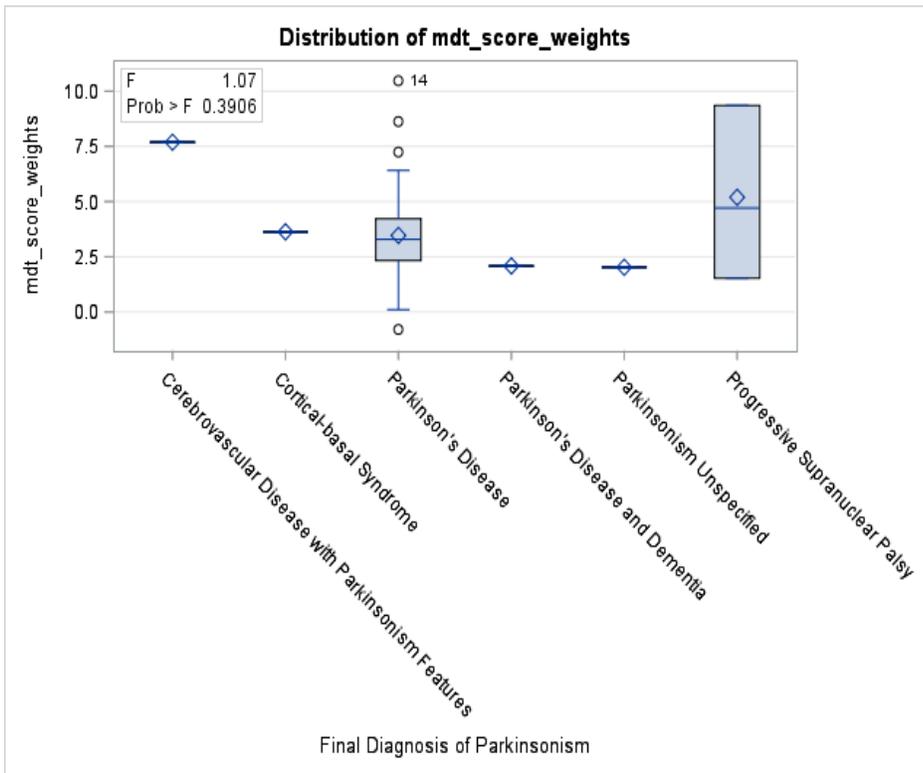
Table 6.2 Analysis of MDT-PD mean differences on the diagnosis of parkinsonism in FR2

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F | R-Square |
|------------------------|----|----------------|-------------|---------|--------|----------|
| Model | 4 | 31.3634172 | 7.8408543 | 1.56 | 0.2078 | 0.159092 |
| Error | 33 | 165.7772342 | 5.0235526 | | | |
| Corrected Total | 37 | 197.1406514 | | | | |
| Diagnosis | 4 | 31.36341719 | 7.84085430 | 1.56 | 0.2078 | |

Table 6.3 Analysis of MDT-PD mean differences on the diagnosis of parkinsonism in GE

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F | R-Square |
|------------------------|----|----------------|-------------|---------|--------|----------|
| Model | 3 | 6.2593111 | 2.0864370 | 0.46 | 0.7133 | 0.043837 |
| Error | 30 | 136.5258107 | 4.5508604 | | | |
| Corrected Total | 33 | 142.7851218 | | | | |
| Diagnosis | 3 | 6.25931110 | 2.08643703 | 0.46 | 0.7133 | |

Figure 6.1 Distribution of MDT-PD scores on the diagnosis of parkinsonism in FR1, FR2 and GE



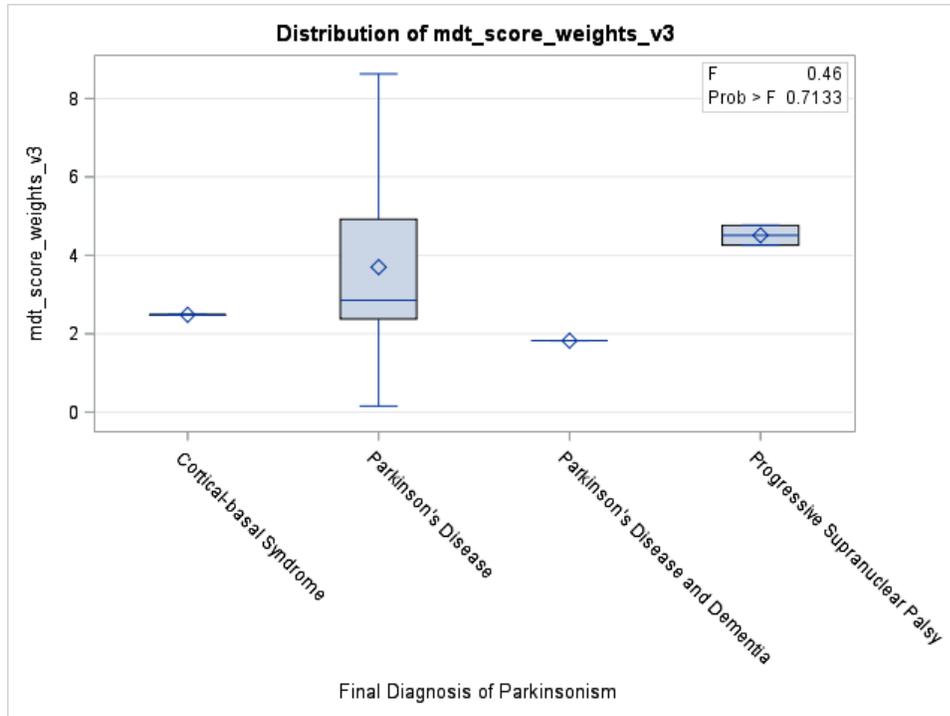


Table 6.4 Analysis of MDT-PD mean differences on Hoehn & Yahr stages in FR1

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F | R-Square |
|------------------------|----|----------------|-------------|---------|--------|----------|
| Model | 6 | 20.7734144 | 3.4622357 | 0.59 | 0.7385 | 0.084825 |
| Error | 38 | 224.1225919 | 5.8979629 | | | |
| Corrected Total | 44 | 244.8960063 | | | | |
| H&Y | 6 | 20.77341438 | 3.46223573 | 0.59 | 0.7385 | |

Table 6.5 Analysis of MDT-PD mean differences on Hoehn & Yahr stages in FR2

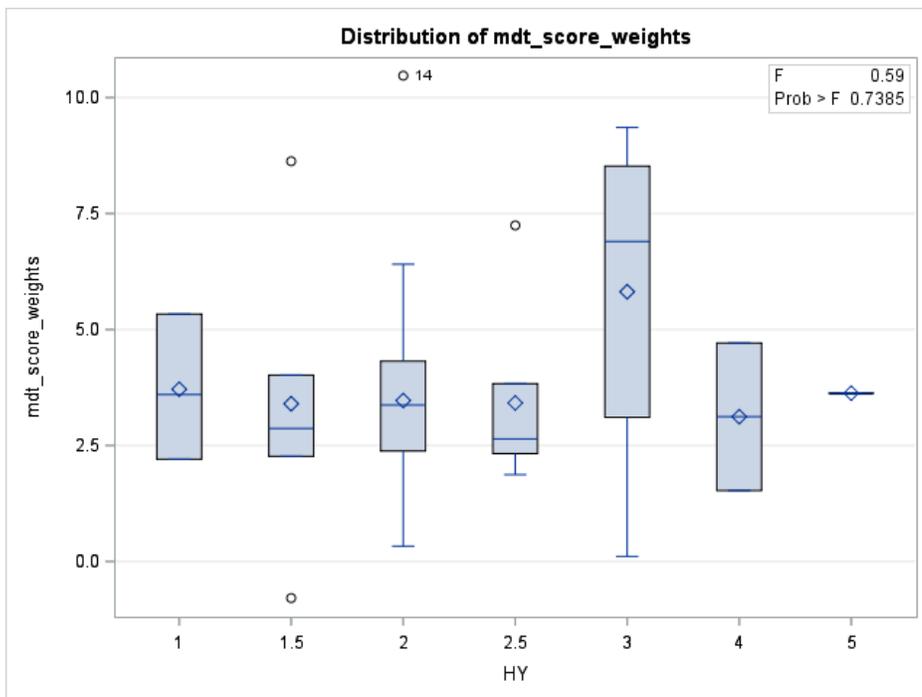
| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F | R-Square |
|--------------|----|----------------|-------------|---------|--------|----------|
| Model | 6 | 16.5468600 | 2.7578100 | 0.49 | 0.8124 | 0.083814 |
| Error | 32 | 180.8771396 | 5.6524106 | | | |

| | | | | | | |
|------------------------|----|-------------|------------|------|--------|--|
| Corrected Total | 38 | 197.4239996 | | | | |
| H&Y | 6 | 16.54685996 | 2.75780999 | 0.49 | 0.8124 | |

Table 6.6 Analysis of MDT-PD mean differences on Hoehn & Yahr stages in GE

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F | R-Square |
|------------------------|----|----------------|-------------|---------|--------|----------|
| Model | 6 | 3.8264889 | 0.6377482 | 0.13 | 0.9918 | 0.026712 |
| Error | 28 | 139.4256358 | 4.9794870 | | | |
| Corrected Total | 34 | 143.2521247 | | | | |
| H&Y | 6 | 3.82648890 | 0.63774815 | 0.13 | 0.9918 | |

Figure 6.2 Distribution of MDT-scores on Hoehn & Yahr stages in FR1, FR2 and GE



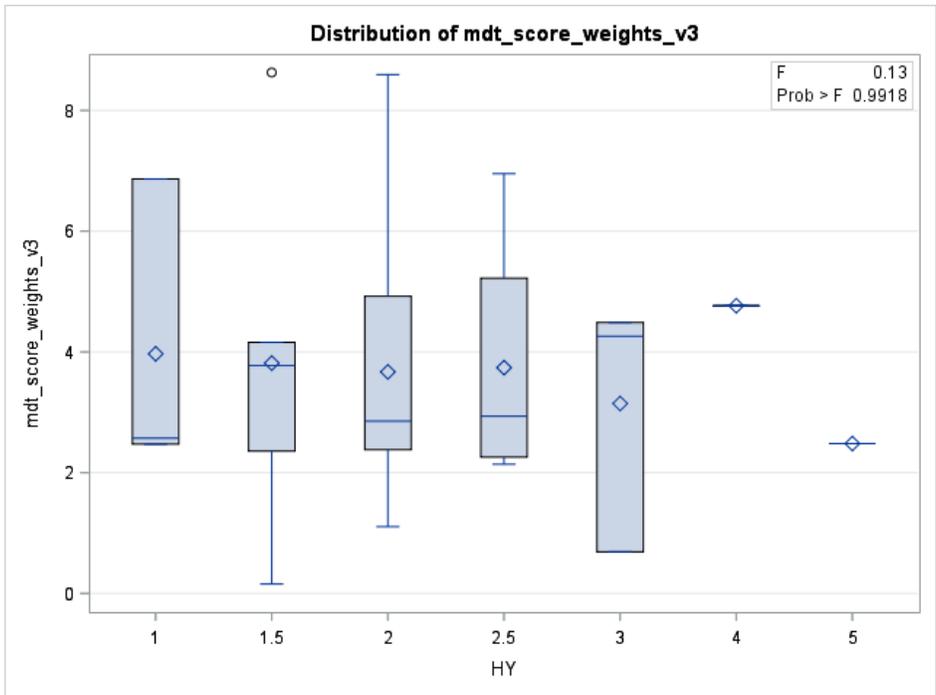
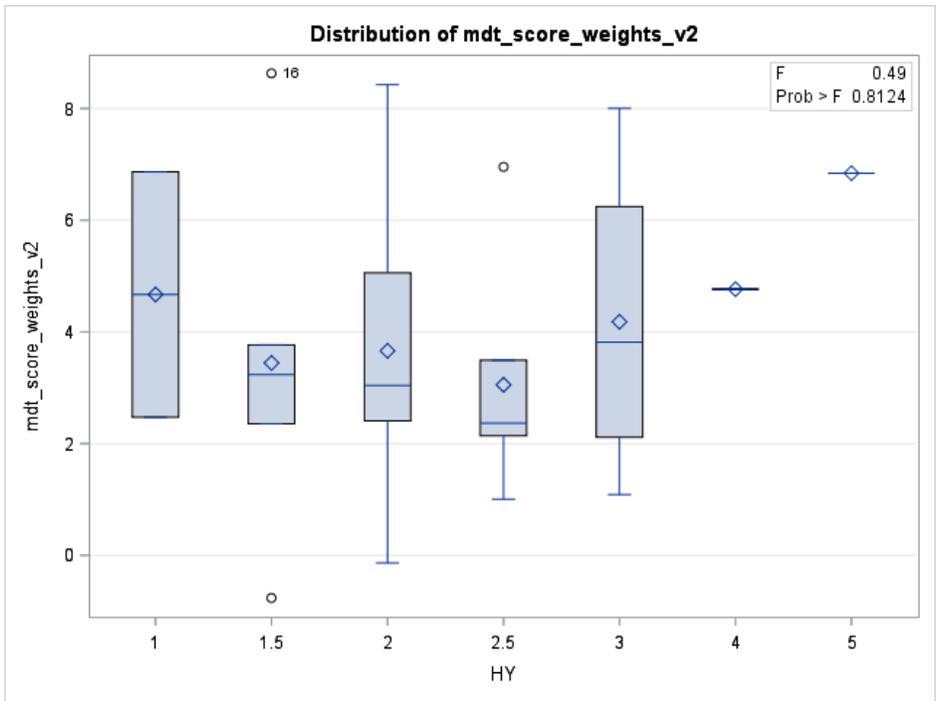


Table 6.7 Correlation between MDT-PD and Moca scores in FR1

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|------------------------|----|----------------|-------------|---------|--------|
| Model | 1 | 4.2891936 | 4.2891936 | 0.77 | 0.3862 |
| Error | 43 | 240.6068127 | 5.5955073 | | |
| Corrected Total | 44 | 244.8960063 | | | |

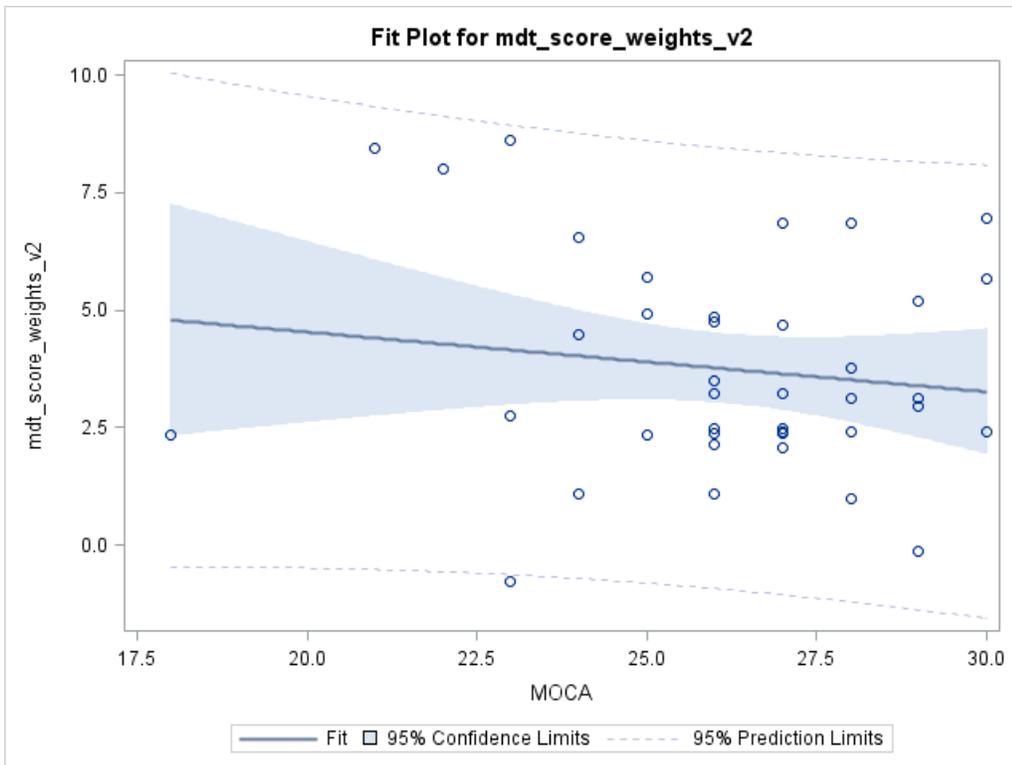
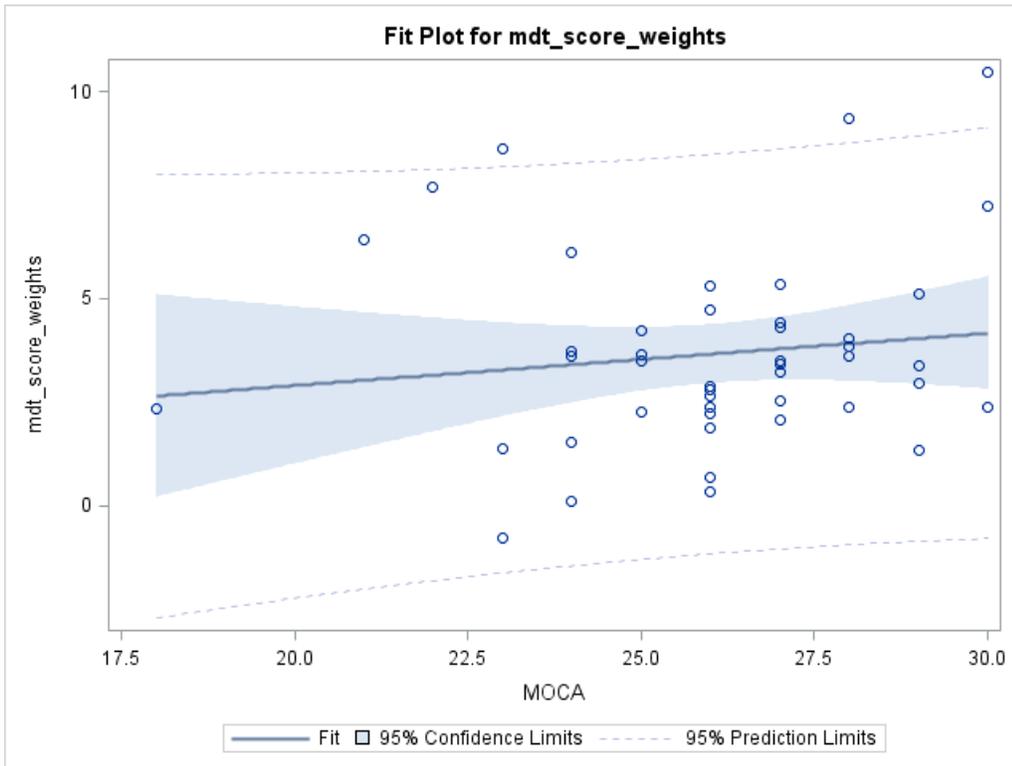
Table 6.8 Correlation between MDT-PD and Moca scores in FR2

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|------------------------|----|----------------|-------------|---------|--------|
| Model | 1 | 4.1356935 | 4.1356935 | 0.79 | 0.3793 |
| Error | 37 | 193.2883061 | 5.2240083 | | |
| Corrected Total | 38 | 197.4239996 | | | |

Table 6.9 Correlation between MDT-PD and Moca scores in GE

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|------------------------|----|----------------|-------------|---------|--------|
| Model | 1 | 4.5272313 | 4.5272313 | 1.08 | 0.3069 |
| Error | 33 | 138.7248934 | 4.2037846 | | |
| Corrected Total | 34 | 143.2521247 | | | |

Figure 6.3 Correlation between MDT-PD and MoCA scores in FR1, FR2 and GE



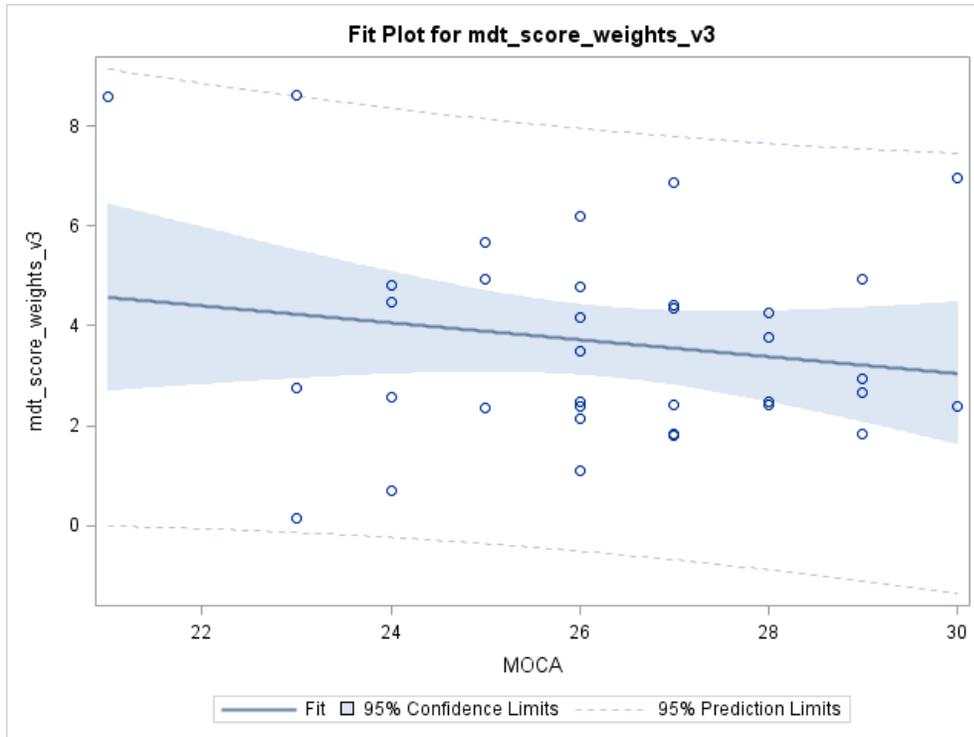


Table 6.10 Correlation between MDT-PD and MDS-UPDRSIII scores in FR1

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|-----------------|----|----------------|-------------|---------|--------|
| Model | 1 | 1.7100217 | 1.7100217 | 0.29 | 0.5926 |
| Error | 41 | 241.1020823 | 5.8805386 | | |
| Corrected Total | 42 | 242.8121040 | | | |

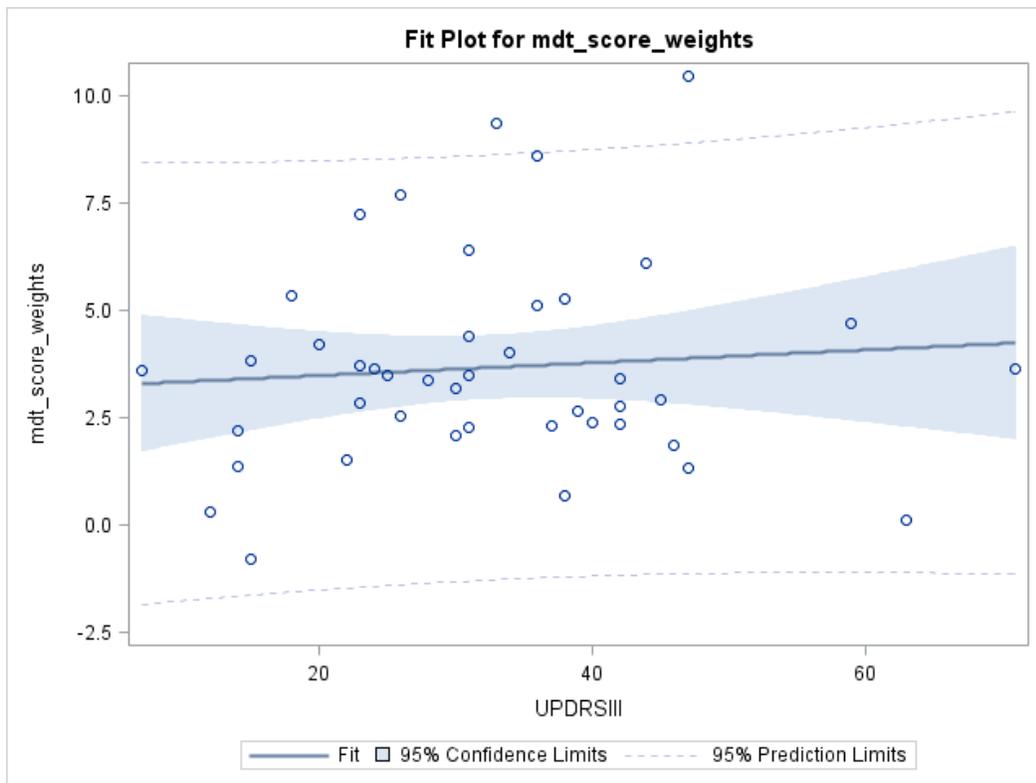
Table 6.11 Correlation between MDT-PD and MDS-UPDRSIII scores in FR2

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|-----------------|----|----------------|-------------|---------|--------|
| Model | 1 | 0.1376729 | 0.1376729 | 0.02 | 0.8760 |
| Error | 35 | 195.0970618 | 5.5742018 | | |
| Corrected Total | 36 | 195.2347348 | | | |

Table 6.12 Correlation between MDT-PD and MDS-UPDRSIII scores in GE

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|-----------------|----|----------------|-------------|---------|--------|
| Model | 1 | 1.9974334 | 1.9974334 | 0.45 | 0.5096 |
| Error | 31 | 139.1111016 | 4.4874549 | | |
| Corrected Total | 32 | 141.1085350 | | | |

Figure 6.4 Correlation between MDT-PD and MDS-UPDRSIII in FR1, FR2 and GE



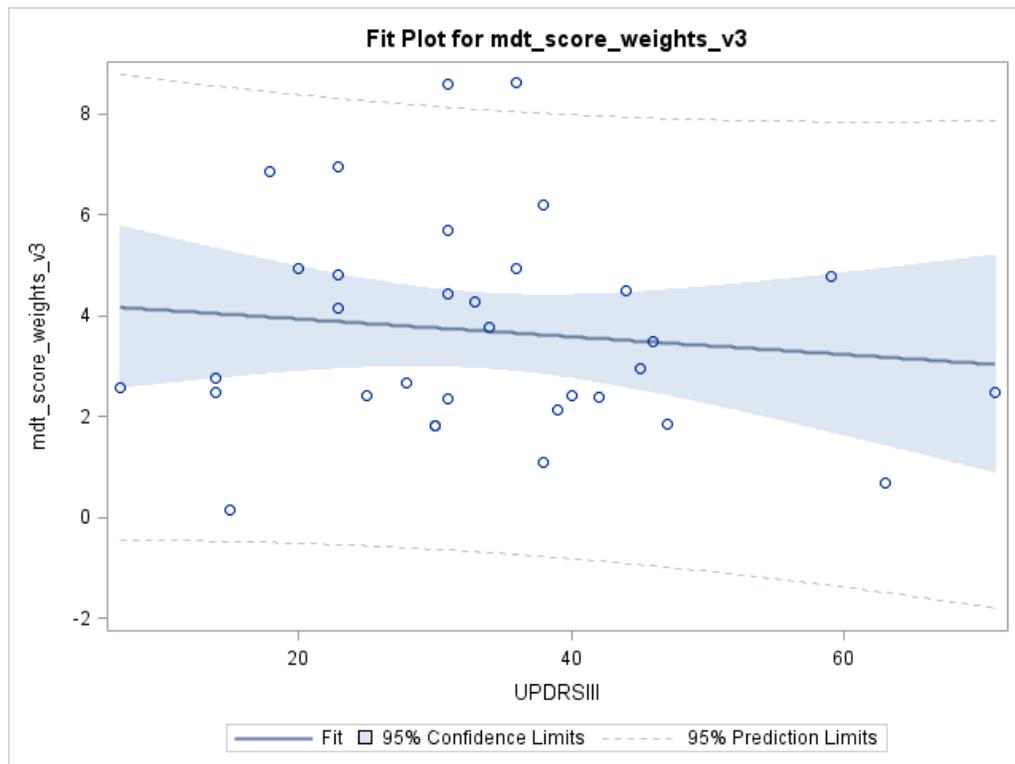
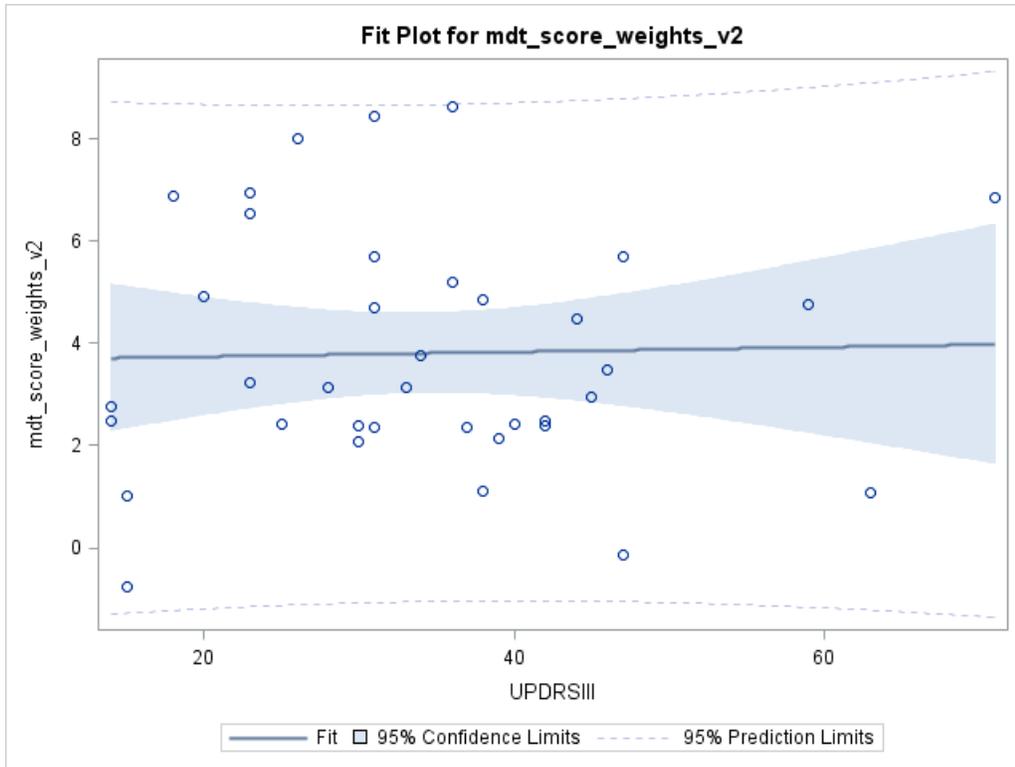


Table 6.13 Correlation between MDT-PD and disease duration in FR1

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F | R-Square |
|------------------------|----|----------------|-------------|---------|--------|----------|
| Model | 1 | 5.6354609 | 5.6354609 | 1.02 | 0.3179 | 0.022168 |
| Error | 45 | 248.5797761 | 5.5239950 | | | |
| Corrected Total | 46 | 254.2152370 | | | | |

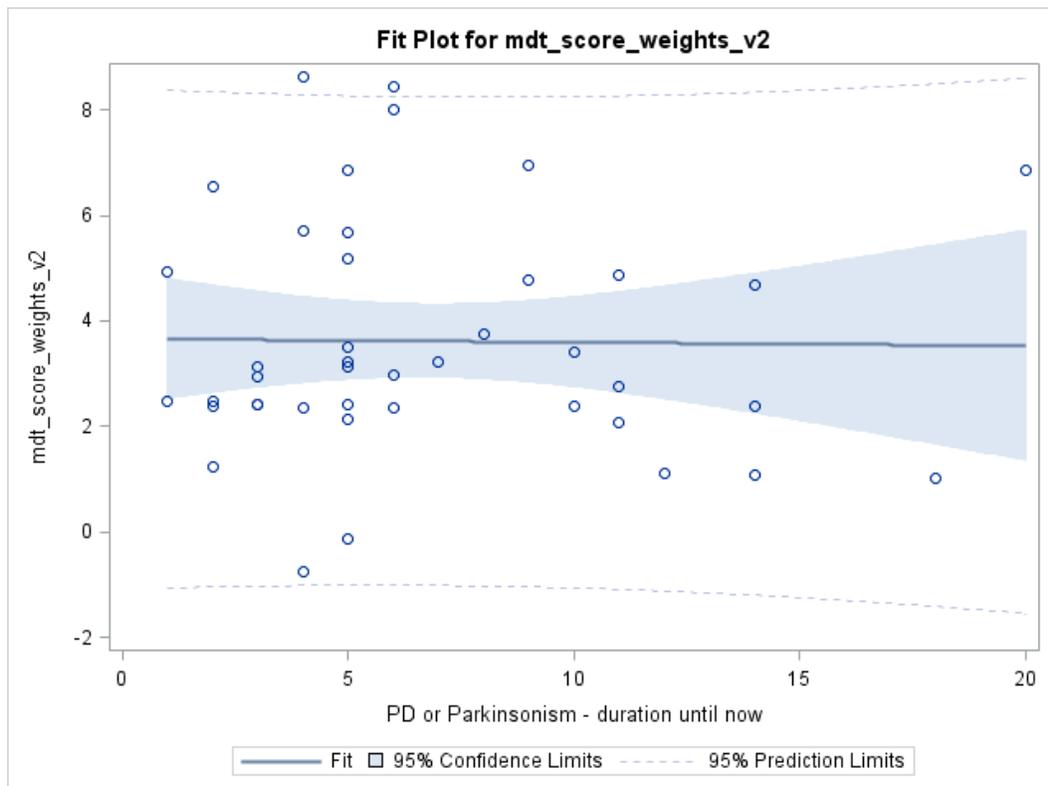
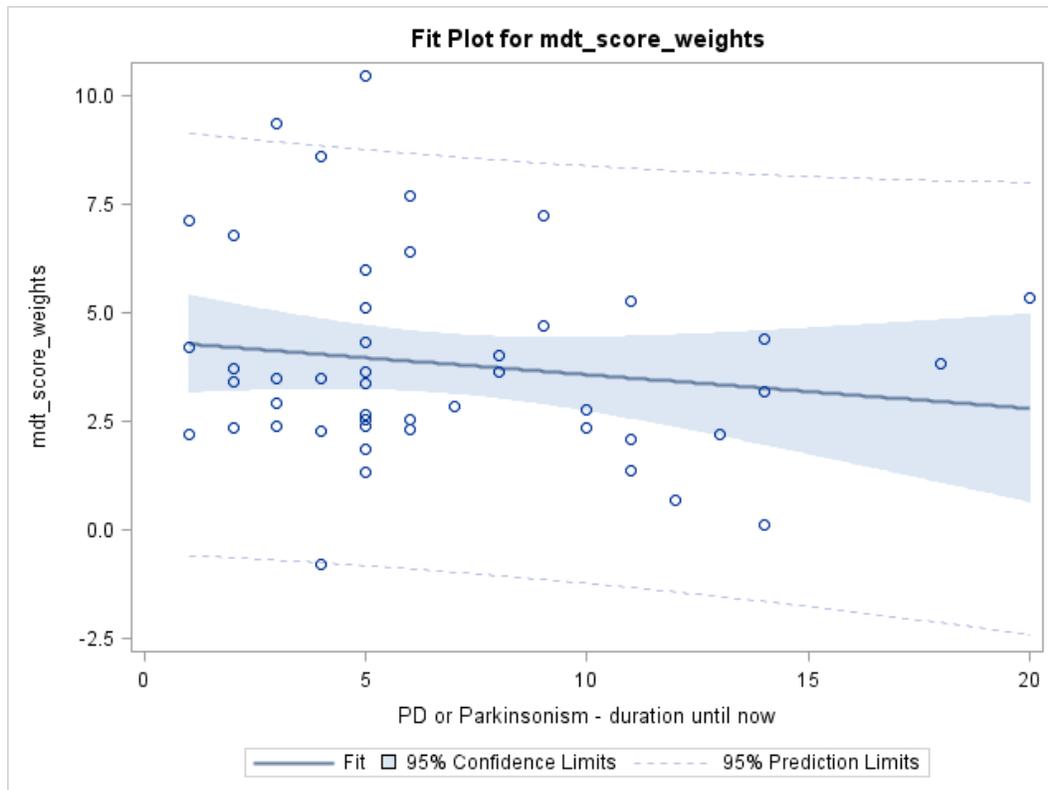
Table 6.14 Correlation between MDT-PD and disease duration in FR2

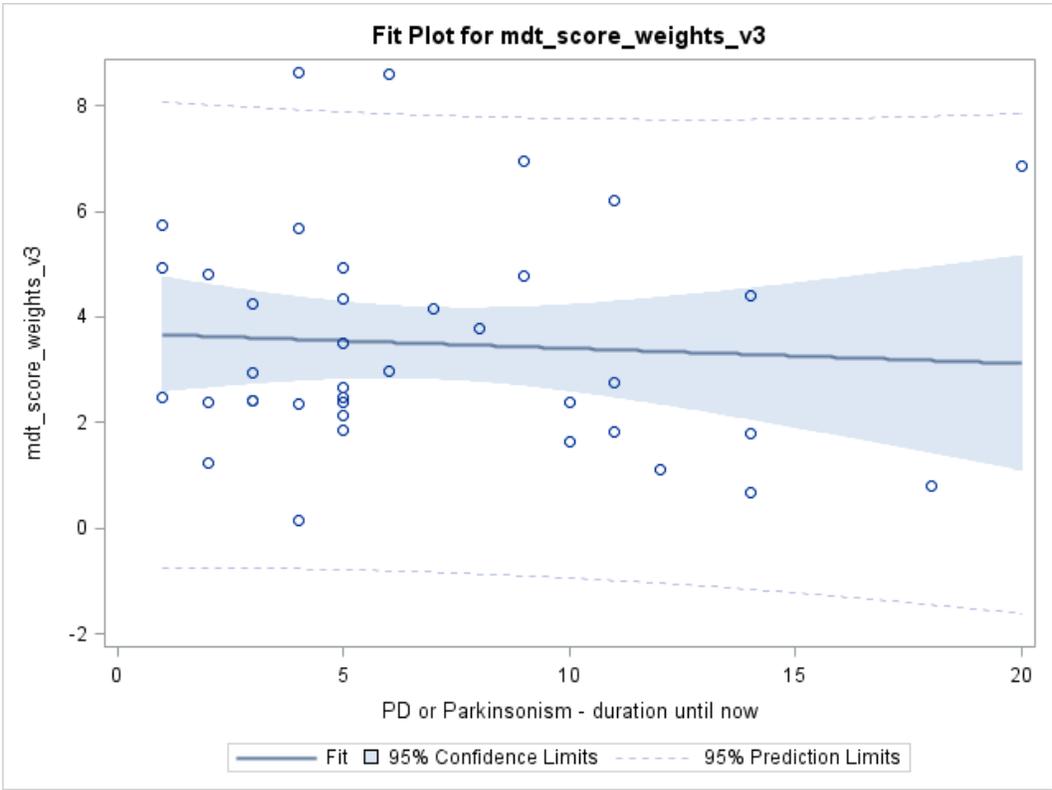
| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F | R-Square |
|------------------------|----|----------------|-------------|---------|--------|----------|
| Model | 1 | 0.0387460 | 0.0387460 | 0.01 | 0.9311 | 0.000189 |
| Error | 40 | 204.9740164 | 5.1243504 | | | |
| Corrected Total | 41 | 205.0127624 | | | | |

Table 6.15 Correlation between MDT-PD and disease duration in GE

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F | R-Square |
|------------------------|----|----------------|-------------|---------|--------|----------|
| Model | 1 | 0.6993853 | 0.6993853 | 0.16 | 0.6937 | 0.004239 |
| Error | 37 | 164.3002127 | 4.4405463 | | | |
| Corrected Total | 38 | 164.9995980 | | | | |

Figure 6.5 Correlation between MDT-PD and disease duration in FR1, FR2 and GE and third evaluations.





Supplement 7 Supplementary evaluation of MDT-PD score characteristics

Table 7.2 Distribution of the MDT-PD questionnaire score categories

| | FR1 | FR2 | GE |
|--|------------|------------|------------|
| No noticeable dysphagia | 29 (63.04) | 23 (58.97) | 19 (54.29) |
| Noticeable, oropharyngeal dysphagia | 7 (15.22) | 4 (10.26) | 7 (20.00) |
| Dysphagia with risk of aspiration | 10 (21.74) | 12 (30.77) | 9 (25.71) |
| Total | 46 | 39 | 39 |

Table 7.3 Descriptive statistics of the MDT-PD questionnaire score

| | | Weighted MDT-PD sum score | | |
|---------------------------------------|---------|----------------------------------|------------|-----------|
| | | FR1 | FR2 | GE |
| N | valid | 46 | 39 | 35 |
| | missing | 0 | 7 | 11 |
| Standard error of the mean | | 0.35 | 0.36 | 0.35 |
| Mean | | 3.63 | 3.75 | 3.68 |
| Median | | 3.39 | 3.14 | 2.94 |
| Standard deviation | | 2.35 | 2.28 | 2.05 |
| Skewness | | 0.98 | 0.44 | 0.77 |
| Standard error of the skewness | | 0.35 | 0.38 | 0.40 |
| Kurtosis | | 1.23 | -0.28 | 0.29 |
| Standard error of the kurtosis | | 0.69 | 0.74 | 0.78 |
| Range | | 11.26 | 9.39 | 8.47 |
| Minimum | | -0.79 | -0.76 | 0.16 |
| Maximum | | 10.47 | 8.63 | 8.63 |
| Percentile | 25 | 2.27 | 2.38 | 2.38 |
| | 75 | 4.42 | 8.63 | 4.81 |

Table 8 Comparison between differently defined severity codes for dysphagia classification in order to test the diagnostic accuracy of the MDT-PD questionnaire

| Diagnostic parameter | Dysphagia severity classification | | |
|----------------------------|--|--------------------------------------|--|
| | PAS-H ₂ O | 0 | 1 |
| Simons et al. 2014 | No dysphagia (PAS = 1) Material does not enter the airway | Oropharyngeal dysphagia (PAS = 2) | Dysphagia with risk of aspiration (PAS >= 3) Including penetration and aspiration (starting with <u>level 3</u> : “Material enters the airway, remains above the vocal folds, and is not ejected from the airway” until <u>level 8</u> : “Material enters the airway, passes below the vocal folds, and no effort is made to eject) |
| Buhmann et al. 2018 | Without severe pathological findings (PAS 1-2) Including penetration of laryngeal structures above the vocal folds (level 2: “Material enters the airway, remains above the vocal folds, and is ejected from the airway”) | Penetration (PAS 3-5) | Aspiration (PAS 6-8) |

PAS-H₂O: Penetration-aspiration scale (PAS) for the consistency water (H₂O) was used together with flexible endoscopic evaluation of swallowing (FEES).

Background information about diagnostic study approaches:
For validation purpose of the MDT-PD a set of 18 diagnostic parameter were used for subjects’ final dysphagia severity classification in the original study, Simons et al. 2014 (4 parameter via clinical swallowing assessment CSA, 14 parameter via FEES);
Buhmann et al. 2018 used PAS-H₂O as the only diagnostic parameter against MDT-PD (with divergent severity codes).

PAS definition after Rosenbek, JC, Robbins, J, Roecker EV, Coyle, JL, & Woods, JL. A Penetration-Aspiration Scale. *Dysphagia* 11:93-98, 1996