**Title: The satisfaction with life and treatment scale (SLTS-7) in patients with Parkinson’s disease**

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# Abstract

**Background:** The patient perception of satisfaction with life and, in particular, treatment in Parkinson’s disease (PD) is currently understudied.

Objective: To explore a new 7-item rating tool to assess satisfaction with life and treatment (SLTS-7) in PD.

**Methods:** In this cross-sectional, multi-center study including patients screened for advanced therapies psychometric characteristics of the SLTS-7 were analysed. An exploratory factor analysis identified the underlying factorial structure of the SLTS-7.

**Results:** 117 patients were included and the data quality of the SLTS-7 was excellent (computable data 100%) and acceptability measures satisfied standard criteria. Besides the global assessment (item 1), the exploratory factor analysis produced item 2 (physical satisfaction) as an independent item and two factors among the remaining items: items 3-5 (psycho-social satisfaction), and items 6 and 7 (treatment satisfaction). Cronbach’s alpha was 0.89, indicative of a high internal consistency. The SLTS-7 total score correlated moderately with motor symptoms and weakly with non-motor symptoms total scores. SLTS-7 showed the highest correlations with the European Quality of Life with 5 items (EQ-5D) visual analogue scale (0.43-0.58, p<0.01), indicating a moderate convergent validity. The SLTS-7 significantly increased with higher non-motor symptoms burden levels (p=0.002).

**Conclusions:** Patient perceived life satisfaction in PD covers three aspects, namely physical, psycho-social, and treatment satisfaction. The new SLTS-7 is a valid, and easy-to-use tool to assess satisfaction with life and treatment in patients with PD screened for advanced therapies. Longitudinal studies analysing the effect of advanced treatment in PD on life and treatment satisfaction are warranted.

# Introduction

Quality of life (QoL) is one of the most important patient-reported outcome measures to evaluate treatment efficacy in patients with advanced Parkinson’s disease (PD).[1-3] Clinical studies mostly assess QoL using the disease-specific Parkinson’s disease questionnaire (PDQ) or the more generic European Quality of Life Questionnaire with 5 dimensions (EQ-5D).[4-6] However, these tools do not consider the concept of life satisfaction which has been described as a relevant component to holistically assess QoL.[7] Life satisfaction has been regarded as “the degree to which a person positively evaluates the overall quality of his/her life as a whole; in other words, how much the person likes the life he/she leads”.[8] Therefore, life satisfaction covers the cognitive aspects of well-being of a person triggered through subjective factors rather than external circumstances as it has been reported for QoL.[5, 9, 10] Nevertheless, to date, the literature on life satisfaction in PD is sparse.[11-13]

Ambrosio and colleagues developed and validated a 6-item Satisfaction with Life Scale (SLS-6) in PD.[11] This scale surveys life satisfaction overall and in five specific areas: physical health, psychological well-being, social-relations, leisure, and financial situation. However, the SLS-6 does not consider aspects of satisfaction with treatment, an essential component of the patient facing inclusive management strategy in patients with PD which might also have an important effect on life satisfaction. Understanding the factors that contribute to both satisfaction with life and treatment is critical for improving care and treatment in PD, in particular, for advanced treatment strategies in late stages of PD.[12]

Therefore, the main objective of our study was to evaluate the psychometric characteristics of a new tool modified from the SLS-6 including aspects on satisfaction with treatment, the so-called Satisfaction with Life and Treatment Scale-7 (SLTS-7). We hypothesized that the SLTS-7 is a valid and reliable tool to assess satisfaction with life and treatment in patients with PD.

# Materials and methods

## 2.1 Study design and ethical approval

The analysis was performed cross-sectionally as part of a prospective, observational, multicenter study including patients with PD who were screened for the eligibility of advanced therapies including deep brain stimulation, apomorphine and intrajejunal levodopa infusion.[14-16] Consecutive patients were included between 2013 and 2020 in Cologne and Marburg. All patients gave written informed consent before study inclusion. The study was directed in accordance with the Declaration of Helsinki and protocols approved by local ethics committees (Study numbers Cologne 12/145 and Marburg 155/17).

## 2.2 Participants and clinical assessments

PD was diagnosed according to UK Brain Bank criteria.[17] Screening and indication evaluations for advanced treatments were conducted by multi-disciplinary teams, including movement disorder neurologists, stereotactic neurosurgeons, neuropsychologists, neuropsychiatrists, and speech therapists according to Movement Disorder Society guidelines.[18]

The following scale was assessed as main outcome parameter:

## Satisfaction with Life and Treatment Scale-7

* The SLTS-7 is a modified version on the patient-completed SLS-6. Importantly, two questions on satisfaction with treatment were added and item 6 of the original SLS-6 addressing the financial situation was excluded as previous research in PD has shown that the financial situation has a weak association with life satisfaction.[11] Therefore, the SLTS-7 is a seven-item scale for self-evaluation of the satisfaction with life as a whole (item 1) that assesses five specific areas: physical health (item 2), psychological well-being (item 3), social relations (item 4), leisure (item 5), and additionally, Parkinson-treatment (item 6) and expectations met in relation to treatment (item 7). In items 1-6 the stem question is “All things considered, how satisfied are you with …?“. In more detail, in item 6 the question is “All things considered, how satisfied are you with your Parkinson-treatment?”. In Item 7 the question is: “All things considered: Does the treatment so far meet your expectations?“.[11] All items score from 1 (not at all; not satisfied) to 10 (totally; totally satisfied). Therefore, SLTS-7 total scores range from 7 (not satisfied) to 70 (totally satisfied).

Secondary outcomes included:

## Quality of life

* The 8-item Parkinson’s Disease Questionnaire (PDQ-8) is a PD-specific scale for self-evaluation of QoL and is recommended by the International Parkinson and Movement Disorder Society.[6] It is commonly used in advanced PD cohorts.[19, 20] The scale surveys mobility, activities of daily living, emotional well-being, social support, cognition, communication, bodily discomfort, and stigma. Every question can be answered with a five-level Likert-scale. The results are presented as summary index (SI) which ranges between 0 (no impairment) and 100 (maximum impairment).[4]
* The EQ-5D-3L was developed by the EuroQol Group with 5 dimensions and three levels by item. It is a generic measure that evaluates 5 aspects of QoL: mobility, self-care, daily activities, pain and discomfort, and anxiety and depression. Each item is assessed using a three-level Likert-scale resulting in a five digit Health State from „11111“ (completely healthy) to „33333“ (seriously ill) which can be converted into a SI from 0 (death) to 1 (best health state), although negative values are possible for states valued worse than death. A country-specific conversion was performed for Germany (time trade-off method, TTO) and is referred here as EQ-5D-3L TTO.[21]
* The EQ-VAS is a visual analogue scale for self-rating current health-related QoL and ranges from 0 (worst imaginable health state) to 100 (best imaginable health state).[21]

## Non-motor symptoms

* The clinician-rated Non-Motor Symptom Scale (NMSS) contains 30 items divided into nine domains: 1) cardiovascular, 2) sleep/fatigue, 3) mood/apathy, 4) perceptual problems/hallucinations, 5) attention/memory, 6) gastrointestinal tract, 7) urinary, 8) sexual function, and 9) miscellaneous (including pain, inability to smell/taste, weight changes, and sweating). Non-motor symptoms over the last four weeks are surveyed. The NMSS total score ranges from 0 (no non-motor symptoms) to 360 (maximum impairment of non-motor symptoms). The NMSS total score can be applied to grade the severity of the burden of NMS (0= none, 1-20 = mild, 21-40 = moderate, 41-70 = severe, 70 = very severe).[22]

## Motor aspects

* The Hoehn and Yahr (H&Y) scale classifies the severity of motor symptoms into 5 stages reflecting disease progression and deterioration and ranges from 0 (no signs of disease) to 5 (needing a wheelchair or bedridden unless assisted).[23]
* Motor symptoms were assessed with the SCales for Outcomes in PD-motor (SCOPA-motor), including motor evaluation, activities of daily living, and motor complications. The SCOPA-motor is a modified and abbreviated version of the Unified Parkinson's Disease Rating Scale (UPDRS) and corresponding domains highly correlate. The SCOPA-motor was used because its assessment time is approximately four times shorter than for the MDS-UPDRS.[24-26] The SCOPA-motor ranges from 0 (no impairment) to 75 points (maximum impairment).[26]

## 2.3 Statistical analysis

The Shapiro-Wilk test and frequency distribution histograms were applied to test for normal distribution. Descriptive statistics were calculated to show baseline characteristics of the sample. For the validation process of the SLTS-7, firstly, data quality was analysed by percentage of computable scores and percentage of missing data (criterion: <5%).[27] Secondly, acceptability of the scale was analysed (observed versus possible score range, mean scores closeness to the mid-point (median), floor and ceiling effects as percentage of extreme possible values (criterion: <15%) [11], skewness statistic, and confidence interval of the mean.Thereafter, an exploratory factor analysis with orthogonal rotation (varimax) was conducted to examine whether a division into categories would be appropriate. An initial analysis informed by eigenvalues and scree plots was run to obtain the number of factors. The Kaiser-Meyer-Olkin test (with values ≥0.6 indicating adequate sampling) and Bartlet’s sphericity test (with p < 0.05 indicating adequate sampling) were used to analyse how suited the data are for factor analysis.[28] Following the exploratory factor analysis, we explored internal consistency by analysing Cronbach’s alpha (α value of ≥0.7 acceptable, ≥0.8 good, and ≥0.9 excellent), inter-item correlation (criterion value >0.20 and <0.75), and corrected item-total correlation (criterion: ≥0.30).[29-31] The convergent construct validity was expressed as Spearman correlations of the scale components (domains and total score) with other scales measuring similar or related constructs. A distinction was made between rater-based assessments such as H&Y, SCOPA-motor, and NMSS and patient-reported outcomes such as PDQ-8 and EQ-5D-3L. The strength of the correlations were defined as following: ‘weak’ rs = 0.20–0.39, ‘moderate’ rs = 0.40–0.59, ‘strong’ rs = 0.60–0.79, and ‘very strong’ rs = 0.80–1.00.[32, 33] The internal validity was measured as intercorrelations between domains (item 1, item 2, composite 3 to 5, composite 6 and 7) (criterion values: 0.30-0.70).[31, 34] Finally, the known-groups validity was explored as the ability of the scale to detect differences between NMSS burden levels. Differences between two groups were tested using the Mann-Whitney U test and between several groups were determined using the Kruskal-Wallis rank test. All analyses were conducted using Statistical Package for Social Science (SPSS version 26.0 for Mac) and p values < 0.05 were considered statistically significant.

# Results

## Baseline characteristics

In total, 117 patients (62.4% men) were included in this study with a mean age of 62.4 ±8.36 (range: 38-78) years and a mean disease duration of 9.87 ±4.57 (range: 2-22). The H&Y distribution was: 11.4% stage 1, 60.2% stage 2, 23.0% stage 3, 4.4% stage 4 and 0.9% stage 5. Table 1 shows additional baseline characteristics.

## Data quality and acceptability

Missing data was 0%, computable data 100%. Table 2 shows results in regard to acceptability. Overall, floor and ceiling effect, median, skewness of items and confidence interval for the mean met the standard criteria, except for the items social relations with a ceiling effect of 17.1%.

## Exploratory factor analysis

We conducted an exploratory factor analysis with the specific items 2-7 in order to identify domains within the items. The Kaiser-Meyer-Olkin test with a value of 0.77 and the Bartlett’s sphericity test (p <0.001) were adequate for a factor analysis. The exploratory factor analyses revealed a two-factor structure explaining a variance of 88.66% which grouped item 3,4 and 5 into one domain (psycho-social satisfaction) and item 6 and 7 into another domain (treatment satisfaction). The item 2 remained independent, not grouped with any other. Factor loading of all items scored above 0.7 (Table 3).

## Internal consistency

For all seven single items of the SLTS-7, Cronbach’s alpha index was 0.89. Inter-item correlations were between 0.35 and 0.84, whereby item 6 and 7 showed the highest correlation (0.84). The corrected item-total correlations were between 0.62 and 0.79.

## Convergent validity

Figure 1 illustrates Spearman correlations between the main outcomes. The SLTS-7 total score was moderately correlated with the SCOPA-motor and weakly with the NMSS total scores (both p < 0.01). In contrast, the PDQ-8 SI was weakly with the SCOPA-motor and moderately correlated with the NMSS total scores (both p < 0.01). The EQ-5D-3L TTO was weakly correlated with the H&Y as well as the NMSS and SCOPA-motor total scores, and (all p < 0.01).

Furthermore, Table 4 shows the correlations between the identified SLTS-7 domains and other scales. Notably, the SLTS-7 item-domain “Satisfaction with life as a whole” and “psycho-social domains” correlated moderately with PDQ-8 emotional well-being item, the latter SLTS-7 domain also with the PDQ-8 SI. Furthermore, correlations between all SLTS-7 domains and the EQ-VAS were moderate, whereas they were weak for EQ-5D-3L TTO.

## Internal validity

The intercorrelations between the domains were between 0.38 and 0.73 and are shown in Table 5.

## Known-groups validity

Table 6 summarizes the results of the known-groups validity exploring differences in SLTS-7 total score according to the NMSS burden levels. There were no significant differences in SLTS-7 total score according to sex (p>0.05).

# Discussion

In the present study we addressed the psychometric characteristics of the new SLTS-7 assessing satisfaction with life and treatment. Our results provide evidence that the SLTS-7 is a valid tool that can be easily applied in a PD population screened for advanced treatments to assess both satisfaction with life and treatment.

## Clinimetric properties

The data quality of the SLTS-7 was excellent with 100% computable data. We observed adequate values for the floor and ceiling effect, median, skewness of items and confidence interval for the mean, providing evidence that the SLTS-7 is an acceptable tool to be applied in our advanced PD population. The distribution of data is comparable to the findings of the validation study of the SLS-6.[11]

In addition to item 1 representing the overall satisfaction with life, we conducted an exploratory factor analysis among the specific components (items 2-7). We identified that item 2 (physical satisfaction) remained as an independent domain not linked to other factors while items 3 to 7 correspond to two additional domains as following: items 3,4 and 5 in a psycho-social satisfaction domain and items 6 and 7 in a treatment satisfaction domain. The distinction between the domains physical (motor) and psycho-social (non-motor) satisfaction is not surprising as QoL in PD is influenced independently by motor and non-motor aspects.[35-37]

Regarding the internal consistency, Cronbach’s alpha was 0.89, indicative of a high internal consistency. Also, the inter-item correlations and the corrected item-total correlations showed satisfactory values.[11] All intercorrelations between SLTS-7 domains were between 0.38 and 0.73 showing acceptable internal validity and supporting the fact that life as a whole is positively significantly associated with all three identified domains. The highest association was found between life as a whole and the domain psycho-social satisfaction (rs = 0.73).

With regards to known-groups validity, the SLTS-7 scores were significantly worse with more severe NMS burden. Male and female patients experienced no significant difference in satisfaction with life and treatment. Further studies are needed to explore how sensitive SLST-7 is to change over time or after an intervention.

## Satisfaction with life as a whole and all items

Overall, the mean “satisfaction with life as a whole” was 6.8 (with a possible range score between 1-10) and the highest satisfaction scores were found for the item “social relations” (mean 7.2) which is in line with the findings of Ambrosio and colleagues in a general PD population.[11] The lowest satisfaction score was found for the item “physical health” (mean 5.0) which is slightly lower than the findings by Ambrosio and colleagues (mean 5.7).[11] This discrepancy might be explained by the fact that all patients in our population were referred for advanced treatment and, therefore, more affected by motor symptoms.

Following previous studies in the general population, we observed that satisfaction with life as a whole is closely linked to the self-perceived health status measured with the EQ-VAS.[9]

The SLTS-7, PDQ-8 and EQ-5D-3L address different constructs: Satisfaction with life and treatment, specific health-related quality of life in PD and generic health-related quality of life. Our results underpin these differences in constructs as (1) only the SLTS-7 contains treatment-related items and (2) we observed distinct non-motor and motor correlation profiles for all three tools (see Figure 1): The SLTS-7 was moderately correlated with motor and weakly with non-motor symptoms total burden. In contrast, the PDQ-8 SI was weakly correlated with motor and moderately with non-motor symptoms total burden, which is in line with previous studies.[38] The EQ-5D-3L TTO was the only scale to be significantly correlated with motor disease progression (H&Y).[39]

## Physical satisfaction

We found a weaker association between the physical satisfaction and PDQ-8 SI which is in line with previous observations that motor symptoms are associated with QoL rather weakly.[40]

## Psycho-social satisfaction

The highest correlation was found between the domain “psycho-social satisfaction” and PDQ-8 SI which confirms previous findings that psychological well-being is closely connected with QoL.[38] To our knowledge this is the first study to provide evidence that “psycho-social satisfaction” separately contributes to life satisfaction. Furthermore, we found that the domain “psycho-social satisfaction” was moderately correlated with the non-motor total burden and PDQ-8 emotional well-being item, underlining that this domain captures non-motor aspects of life satisfaction.

## Treatment satisfaction

Life and treatment satisfaction have been studied in patients treated with deep brain stimulation for movement disorders in general. For instance, Kuehler and collegues have developed a quality of life questionnaire including life and treatment satisfaction (Questions on Life Satisfaction (QLSM).[41] However, this questionnaire was examined in mixed cohorts with several movement disorders, not specifically PD. A study by Ferrera and colleagues provided evidence for an improvement of life and health satisfaction particularly satisfaction with motor function and independence 17 months after subthalamic stimulation in a PD population.[42] However, the sample size was small (21 patients) and the applied QLSM tool was not validated specifically for patients with PD.[42] Reddy and colleagues developed a tool (PRO-APD) in order to measure the perceived problem severity prior to the initiation of an advanced PD treatment and the associated expectations. However, they did not specifically address and measure satisfaction.[43]

To our knowledge, the SLTS-7 is the first scale for combined assessments of life and treatment satisfaction validated specifically in a PD population. The treatment domain covers two aspects, PD treatment (item 6) and expectations met in relation to the treatment (item 7), both items showed a strong significant inter-correlation. Correlation analyses indicate the close relationship between “treatment satisfaction” and self-reported health status (EQ-VAS).

As suggested by Ambrosio and colleagues our results support the notion that besides globally, life satisfaction should be addressed in different domains in order to reflect a comprehensive real-life representation of the different components of life satisfaction for each individual patient.[11]

## Satisfaction with life and quality of life

QoL and life satisfaction are two distinct entities which complement each other.[44] While QoL appears to be a wider concept focusing on external factors, life satisfaction is influenced more by internal and subjective aspects and in this context it has been termed “subjective QoL”.[10, 13] As outlined previously, a patients with PD might report a low QoL, whereas their life satisfaction can be reasonably good if they are satisfied ,e.g. with their personal and family life.[45] Our observation that the correlation between satisfaction with life as a whole and specific satisfaction domains was most prominent for “psycho-social satisfaction” highlights the importance of internal factors for this construct.

## Limitations

The present study has several limitations. Our sample size was smaller than in the validation study of the SLS-6. However, we conducted the validation in a highly selected patient population undergoing advanced therapies and our sample size was comparable to other validation studies in cohorts undergoing advanced therapies in PD.[46-48] As this analysis was conducted in a highly selected group of patients with advanced PD, our results might not be applicable to a general PD population at an earlier phase of their disease as well as populations with other medical conditions. Cross-validations of the SLTS-7 in independent cohorts are required to confirm our results. An easy and valid assessment of life satisfaction including a treatment aspect is relevant not only to PD but also to other chronic diseases. Therefore, cross-validations may be conducted in other conditions. Furthermore, the multicenter design of our study increases external validity by reducing bias potentially caused by single center studies. In this study we only conducted an exploratory factor analysis in a cross-sectional design without performing a confirmatory factor analysis. Further studies should confirm our findings in longitudinal designs to further validate the use of the SLTS-7 for the measurement of the effect of treatment on PD.

## Conclusions

In the present study, we have shown that the SLTS-7 is a valid, reliable and easy to use tool to assess satisfaction with life and with treatment in patients with PD screened for advanced therapies. Our study provides first evidence that life satisfaction in patients with PD includes three aspects, namely physical, psycho-social, and treatment satisfaction and, to our knowledge, the SLTS-7 is the first scale for a combined assessment of these aspects validated specifically in a PD population. Further longitudinal studies analysing the effect of advanced treatment in PD on satisfaction with life and treatment are warranted.

# Financial disclosure/Conflicts of Interest

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# Data Availability

The data used to support the findings of this study are available from the corresponding author upon reasonable request.

# Author roles

Anna Sauerbier – data acquisition, data analysis, drafting of the manuscript

Pia Bachon – data acquisition, data analysis, critical revision of the manuscript

Leire Ambrosio – SLTS-7 scale concept and design, critical revision of the manuscript

Philipp A. Loehrer – data acquisition, critical revision of the manuscript

Alexandra Rizos – data acquisition, critical revision of the manuscript

Stefanie T. Jost – data acquisition, critical revision of the manuscript

Alexandra Gronostay – critical revision of the manuscript

Agni Konitsioti – critical revision of the manuscript

Michael T. Barbe – critical revision of the manuscript

Gereon R. Fink – critical revision of the manuscript

Keyoumars Ashkan – data acquisition, critical revision of the manuscript

Christopher Nimsky – critical revision of the manuscript

Veerle Visser-Vandewalle – data acquisition, critical revision of the manuscript

K. Ray-Chaudhuri – data acquisition, critical revision of the manuscript

Lars Timmermann – data acquisition, critical revision of the manuscript

Pablo Martinez-Martin – SLTS-7 scale conception, study concept and design, data analysis, drafting of the manuscript, critical review of the manuscript

Haidar S. Dafsari – study concept and design, data acquisition, data analysis, drafting of the manuscript, critical review of the manuscript

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# Tables and figures

## Table 1 Baseline characteristics

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Possible  score range | Mean | SD | Observed score range |
| Age at baseline | - | 62.4 | 8.4 | 38 - 78 |
| Disease duration | - | 9.9 | 4.6 | 2 - 22 |
| SLTS-7 total score  Satisfaction with | 7 - 70 | 46.1 | 11.6 | 13 - 67 |
| 1. Life as a whole | 1 - 10 | 6.8 | 2.0 | 2 - 10 |
| 2. Physical health | 1 - 10 | 5.0 | 2.2 | 1 - 9 |
| 3. Psychological well-being | 1 - 10 | 6.8 | 2.1 | 2 - 10 |
| 4. Social relations | 1 - 10 | 7.2 | 2.2 | 2 - 10 |
| 5. Leisure | 1 - 10 | 6.9 | 2.1 | 2 - 10 |
| 6. Treatment | 1 - 10 | 7.0 | 2.2 | 1 - 10 |
| 7. Expectations met  Item 3-5 Composite (Psycho-social)  Item 6-7 Composite (Treatment) | 1 - 10  3 - 30  2 - 20 | 6.6  20.8  13.5 | 2.3  5.7  4.3 | 1 - 10  6 - 30  2 - 20 |
| PDQ-8 Summary Index | 0 - 100 | 32.0 | 15.7 | 0 - 72 |
| EQ-VAS | 0 - 100 | 56.2 | 19.3 | 1 - 99 |
| EQ-5D-3L TTO\* | -0.594 – 1.00 | 0.75 | 0.21 | 0.1 - 1.00 |
| Non-Motor Symptom Scale | 0 - 360 | 56.8 | 31.4 | 5 - 182 |
| SCOPA-M | 0 - 75 | 22.5 | 7.6 | 7 - 50 |
| Motor examination | 0 - 42 | 10.6 | 5.2 | 1 - 25 |
| Disability | 0 - 21 | 7.3 | 3.3 | 1 - 18 |
| Motor complications | 0 - 12 | 4.6 | 2.6 | 0 - 10 |
| H&Y (Median) | 1 - 5 | 2.4 | 0.66 | 1 - 5 |
| LEDD | - | 1119.7 | 526.5 | 210 - 2737 |

\*Adapted to Germany according to TTO conversion published by the EuroQol Group.

Abbreviations: CISI-PD = Clinical Impression of Severity Index-Parkinson’s Disease; EQ-5D-3L = European Quality of Life Questionnaire with 5 Dimensions and 3 Levels; H&Y = Hoehn and Yahr; LEDD = Levodopa Equivalent Daily Dose; PDQ-8 = Parkinson’s Disease Questionnaire-8; SCOPA-motor = SCales for Outcomes in PD-motor scale; SD = Standard Deviation; SLTS-7 = Satisfaction of Life and Treatment Scale-7; TTO = Time-Trade-Off; VAS = Visual Analogue Scale

## Table 2 Acceptability of the Satisfaction with Life and Treatment Scale-7 (SLTS-7)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Satisfaction with | Floor effect (%) | Ceiling effect (%) | Median | Skew-ness | 95% Confidence Interval |
| 1. Life as a whole | 0.9 | 6.0 | 7 | -0.47 | 6.4 - 7.2 |
| 2. Physical health | 7.7 | 0.9 | 5 | -0.21 | 4.6 - 5.4 |
| 3. Psychological well-being | 2.6 | 6.0 | 7 | -0.50 | 6.4 - 7.2 |
| 4. Social relations | 3.4 | 17.1 | 8 | -0.59 | 6.8 - 7.6 |
| 5. Leisure | 3.4 | 9.4 | 7 | -0.51 | 6.5 - 7.2 |
| 6. Treatment | 2.6 | 9.4 | 8 | -0.81 | 6.6 - 7.4 |
| 7. Expectations met  Items 3-5 Composite (Psycho-social)  Items 6-7 Composite (Treatment) | 1.7  0.9  0.9 | 7.7  0.9  6.0 | 7  22  14 | -0.46  -0.57  -0.66 | 6.2 - 7,0  19.8 - 21.9  12.8 - 14.3 |

## Table 3 Factor loadings after rotation in exploratory factor analysis

|  |  |  |  |
| --- | --- | --- | --- |
|  | Factor | | |
| Satisfaction with | 1 | 2 | 3 |
| 2. Physical health | 0.271 | 0.187 | **0.910** |
| 3. Psychological health | **0.597** | 0.303 | 0.592 |
| 4. Social relations | **0.910** | 0.162 | 0.155 |
| 5. Leisure | **0.818** | 0.199 | 0.369 |
| 6. Treatment | 0.172 | **0.934** | 0.181 |
| 7. Expectations met | 0.202 | **0.927** | 0.165 |

Items assigned to specific factor are highlighted in bold font

## Table 4 Convergent construct validity of the Satisfaction with Life and Treatment Scale-7 (SLTS-7)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Satisfaction with Life and Treatment Scale | | | | |
|  | Life as a whole | Physical health | Psycho-social | Treatment | Total Score |
| **PDQ-8 Summary Index** | -0.36 | -0.31 | -0.51 | -0.33 | -0.48 |
| Mobility | -0.29 | -0.26 | -0.33 | -0.23 | -0.33 |
| Activities of daily living | -0.24 | -0.26 | -0.35 | -0.22 | -0.33 |
| Emotional well-being | -0.46 | -0.27 | -0.47 | -0.28 | -0.46 |
| Stigma | -0.27 | -0.25 | -0.35 | -0.29 | -0.35 |
| Social support | -0.25 | -0.18 | -0.37 | -0.26 | -0.34 |
| Cognition | -0.14a | -0.17a | -0.19 | -0.11a | -0.19 |
| Communication | -0.27 | -0.16a | -0.37 | -0.20 | -0.33 |
| Bodily discomfort | -0.05a | -0.03a | -0.23 | -0.24 | -0.20 |
|  |  |  |  |  |  |
| **EQ-5D-3L TTO\*** | 0.24 | 0.33 | 0.33 | 0.20 | 0.33 |
| Mobility | -0.12a | -0.22 | -0.23 | -0.19 | -0.25 |
| Self-Care | -0.24 | -0.30 | -0.40 | -0.21 | -0.36 |
| Usual activities | -0.31 | -0.41 | -0.38 | -0.30 | -0.44 |
| Pain | -0.15 | -0.15 | -0.12a | -0.04a | -0.12a |
| Anxiety/Depression | -0.34 | -0.23 | -0.41 | -0.23 | -0.38 |
| **EQ-VAS** | 0.53 | 0.57 | 0.47 | 0.43 | 0.58 |
|  |  |  |  |  |  |
| **H&Y** | -0.22 | -0.11a | -0.09a | -0.05a | -0.12a |
| **SCOPA-M total score** | -0.41 | 0.28 | -0.40 | -0.28 | -0.41 |
| **NMSS total score** | -0.25 | -0.29 | -0.39 | -0.26 | -0.37 |

Spearman rank correlation coefficients.

All p <0.01, except (a) not significant.

\*Adapted to Country according to EuroQol.

Abbreviations: H&Y = Hoehn und Yahr; EQ-5D-3L = European Quality of Life Questionnaire with 5 Dimensions and 3 Levels; NMSS = Non-Motor Symptom Scale; PDQ-8 = Parkinson’s Disease Questionnaire-8; SCOPA-motor = SCales for Outcomes in PD-motor scale; TTO = Time-Trade-Off; VAS = Visual Analogue Scale

## Table 5 Internal validity of the Satisfaction with Life and Treatment Scale-7 (SLTS-7)

|  |  |  |  |
| --- | --- | --- | --- |
|  | 1. Life as a whole | 2. Physical health | 3-5 Psycho-social |
| 2. Physical health | 0.61 | - | - |
| 3-5 Psycho-social | 0.73 | 0.62 | - |
| 6-7 Treatment | 0.52 | 0.38 | 0.52 |

Spearman rank correlation coefficients. All p <0.001.

## Table 6 Known-groups validity

|  |  |
| --- | --- |
|  | **Satisfaction with Life and Treatment scale-7 (SLTS-7)** |
|  | **Total score** |
| **NMSS burden levels** | **Mean ±SD** |
| Mild | 56.14 ±5.55 |
| Moderate | 49.09 ±9.77 |
| Severe | 46.56 ±11.53 |
| Very severe | 40.45 ±12.33 |
|  |  |

Kruskal-Wallis rank test was used to test differences between the groups, p = 0.002; there were no patients who reported no non-motor symptoms.

Abbreviations: NMSS = Non-motor Symptoms Scale; SD = Standard Deviation

## Figure 1 Distinct non-motor and motor correlation profiles for SLTS-7, EQ-5D-3L TTO and PDQ-8 SI

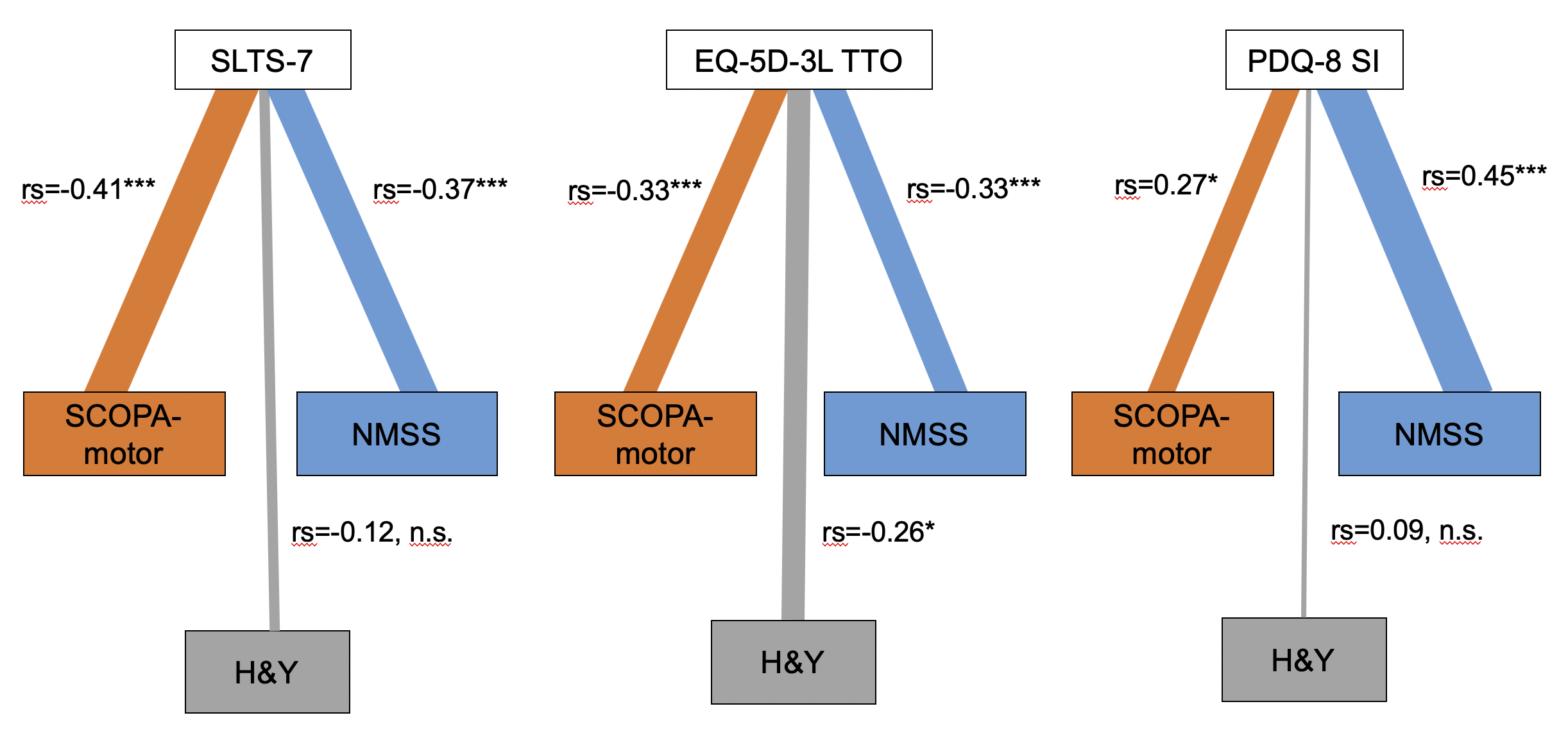


Figure 1 shows the correlations between SLTS-7, EQ-5D-3L TTO and PDQ-8 SI and SCOPA-motor (orange), H&Y (grey), and NMSS (blue). The line thickness corresponds to the strength of correlations, i.e. Spearman rank correlation coefficients (‘very weak’ rs = 0.00–0.19, ‘weak’ rs = 0.20–0.39, ‘moderate’ rs = 0.40–0.59, ‘strong’ rs = 0.60–0.79, and ‘very strong’ rs = 0.80–1.00); \* p<0.05; \*\* p<0.01; \*\*\* p<0.001; n.s. = not significant

The SLTS-7 total score was moderately significantly correlated with the SCOPA-motor and weakly with the NMSS. In contrast, the PDQ-8 SI was weakly with the SCOPA-motor and moderately correlated with the NMSS.

The EQ-5D-3L TTO was weakly correlated with the H&Y, SCOPA-motor, and NMSS.

Abbreviations: H&Y = Hoehn und Yahr; EQ-5D-3L TTO = European Quality of Life Questionnaire with 5 Dimensions and 3 Levels Time-Trade-Off; NMSS = Non-Motor Symptom Scale; PDQ-8 SI= Parkinson’s Disease Questionnaire-8 Summary Index; SCOPA-motor = SCales for Outcomes in PD-motor scale; SLTS-7 = Satisfaction with Life and Treatment Scale-7