4. Motor impairment and disability scales

An increasing number of scales used to assess Parkinson's disease (PD) motor manifestations (tremor, rigidity, bradykinesia) and disability have been developed in the past years. However, some of them lack appropriate validation. In this chapter, the most widely used and tested scales to assess motor manifestations and disability are discussed.

Scales for Outcomes in Parkinson's Disease-Motor (SCOPA-Motor) [1]	
Description of scale	
Overview	Composed of 21 items grouped into 3 sections: Motor impairment (10 items); activities of daily living (ADL) (7 items); and motor complications (4 items). Items are scored in a 4-point scale: from 0 (normal) to 3 (severe) Mean time to complete the scale: 8.1 (SD=1.9) minutes [1] Time frame:time of assessment, except for items nine and ten Rated by a specialized rater Specific for patients with PD
Copyright?	Owned by SCOPA-Propark Study
How can the scale be obtained?	The scale is available free of charge with the permission of the authors in the original publication [1] and in the website: www.scopa-propark.eu
Clinimetric properties of scale in patients with PD	
Feasibility	The scale has been applied to patients with PD across all stages [2]
Dimensionality	Multidimensional
Acceptability	No floor or ceiling effects, except floor effect in complications [2,3] Skewness was acceptable [3]
Reliability	Cronbach's alpha >0.90 for all sections [1–3]. Item-total corrected correlation and item homogeneity were satisfactory as a whole [1–3] Inter-rater reliability: moderate to substantial [1] Test-retest: kappa coefficients >0.80 in motor impairment section items [1]
Validity	Face/content validity: not tested Convergent validity: correlations between Unified Parkinson's Disease Rating Scale (UPDRS) and SCOPA-Motor related sections was very high [1]. Also, correlations with Hoehn & Yahr Staging Scale (HY) and Clinical Impression of Severity Index for Parkinson's Disease (CISI-PD) [3] Known-groups: significant differences in SCOPA-Motor sections scores by HY [2,3] and Clinical Global Impression (CGI) severity levels [2] Internal validity: not tested
Responsiveness & Interpretability	Standard error of measurement (SEM): from 0.40 (dyskinesias) to 2.62 (motor impairment) [2,3]

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Cross-cultural Adaptations & Others	English, Dutch, Spanish, and Brazilian translations (www.scopa-propark.eu). The scale has been used in USA and several Latin-American countries with satisfactory clinimetric results [3,4]
Overall impression	
Advantages	Shorter and quicker to administer than UPDRS and Movement Disorders Society sponsored revision of the Unified Parkinson's Disease Rating Scale (MDS-UPDRS), with suitable clinimetric properties
Disadvantages	Lack of data on test-retest reliability and responsiveness; some flaws in motor impairment section

Schwab & England Activities of Daily Living Scale (SE) [5]	
Description of scale	
Overview	Assesses patient's perceived disability through an 11-response options scale from 0% (bedridden with vegetative functions) to 100% (completely independent). A short description is provided for each step Time to complete the scale: a few minutes Time frame: time of assessment It may be rated by the clinician or the patient [6] Not specifically developed for but widely applied in PD [7]
Copyright?	Public domain
How can the scale be obtained?	It is available in several websites, such as: www.parkinsons.va.gov/resources/SE.asp
Clinimetric properties of scale in patients with PD	
Feasibility	Applicable across all PD stages Missing data: 7% in one study [8]
Dimensionality	Not applicable
Acceptability	Possible and observable score range coincide; floor and ceiling effects lower than 10%. Score distribution is mildly skewed towards negative values [8,9]
Reliability	No information available
Validity	Content validity: low for the global scale; satisfactory for all scale levels except the midpoint [10]. Convergent validity with HY, UPDRS, and Intermediate Scale for Assessment of Parkinson's Disease (ISAPD): moderate to high [10–12]
Responsiveness & Interpretability	The SE was sensitive to change in a two-year follow-up study [9] The minimally clinical important difference was estimated in six points [9] The SE is valid for all age groups and both sexes
Cross-cultural Adaptations & Others	Widely used and available in many languages. No studies about cross-cultural validity
Overall impression	
Advantages	Simple; widely used
Disadvantages	Lack of standardization of administration [6]; limited information about its reliability

Rating Scale for Gait Evaluation (RSGE-PD) 23-item (Figure 4.1) [13] and 21-items [14] versions are available	
Description of scale	
Overview	Specifically developed to evaluate gait in patients with PD [13] The second version consists of 21 items, grouped into 4 sections: functional ability; long-term complications; socioeconomic; and examination. Items are rated 0 to 3, and a short description is provided for each step [14] Time to complete the scale: around 10 minutes Time frame: the week before, except for the examination section (current) Clinician-rated Specific for PD
Copyright?	Public domain
How can the scale be obtained?	It is published in the original paper [13] and Version 2.0 is included in a Spanish book on PD [15]
Clinimetric properties of scale in patients with PD	
Feasibility	Questions are appropriate for PD, and the scale is applicable to all PD stages
Dimensionality	Factor analysis of the first version showed four factors (mobility/gait, socio-economic aspects, rigidity, and complications) [13]
Acceptability	The RSGE-PD Version 2.0 does not show floor or ceiling effects, and skewness and kurtosis were within standards [16]
Reliability	Cronbach's alpha for the first version total scale was high, with a satisfactory inter-rater agreement for all items except axial rigidity [13]. Internal consistency of the second version was also appropriate (both for the domains and the total scale) [16]
Validity	The convergent validity of the first version was high with disability measures, as well as HY stage, UPDRS, and timed tests [13]. The second version showed a moderate-to-high convergent validity with disease and levodopa treatment duration [16] Version 2.0 displayed satisfactory known-groups validity by HY stage [16]
Responsiveness & Interpretability	No information available on responsiveness or interpretability Valid for both sexes. It was tested in sample populations with age range between 38 and 83 years of age. [13,16]
Cross-cultural Adaptations & Others	The RSGE-PD was developed and applied in Spanish [13,16]. There is an English version published [13]
Overall impression	
Advantages	It shows sound clinimetric properties and offers a global gait assessment
Disadvantages	Limited use; Has been criticized for being prone to observer bias, similarly to other clinical scales with subjective component [17]

Abnormal Involuntary Movement Scale (AIMS) [18]	
Description of scale	
Overview	Assessment of the severity of abnormal movements in different parts of the body: face, mouth, limbs, and trunk [18]. Includes three global assessments: overall severity, disability, and patient's awareness of dyskinesias Ten items rated on a 5-point scale, from 0 to 4 (absent, minimal, mild, moderate, severe). Maximum score is 40 Time to complete the scale: 15 minutes (estimated) [19] Clinician-rated. Specific instructions are provided Originally developed for rating tardive dyskinesia, it has been used for PD-related dyskinesia, but only partly validated in this population [19]
Copyright?	Public domain
How can the scale be obtained?	Available in many Internet sites (for example: http://depts.washington.edu/dbpeds/Screening Tools/AIMS.pdf)
Clinimetric properties of scale in patients with PD	
Feasibility	Not tested, although it has been widely used in patients with PD [19]. No evidence that AIMS is able to detect dyskinesia severity across PD stages [19]
Dimensionality	Its structure has not been formally tested
Acceptability	Not available [19]
Reliability	Internal consistency: not assessed Inter-rater and test-retest reliability: high in patients without PD [20,21]. In patients with PD, a modified version (excluding facial and global ratings items) reached a correlation between raters of 0.81 [22]. In another study, inter-rater reliability of the modified version was acceptable [23]
Validity	Face/content validity: not assessed Convergent validity: AIMS correlated weakly-to-moderately with Parkinson's Disease Questionnaire – 39 items (PDQ-39) domains [24]. ACorrelation between a modified version of AIMS and Parkinson Disease Dyskinesia Scale (PDYS-26) [22] and moderately-to-high with continuous ambulatory multi-channel accelerometry [23]. Modified AIMS scores increases in relation to ADL tasks [23] No other types of validity tested
Responsiveness & Interpretability	The AIMS has been used to ascertain changes in dyskinesias following treatment or surgery in several PD studies [25,26]. It seems to be responsive to changes [19]
Cross-cultural Adaptations & Others	Modified versions have been used in patients with PD [23,24] but have not been formally validated
Overall impression	
Advantages	Easy and quick to administer; widely used in clinical trials; sensitive to changes [19]
Disadvantages	Lack of validation studies in patients with PD; emphasizes ratings for facial-oral-lingual areas and less for movements in limbs and trunk

Rush Dyskinesia Rating Scale (RDRS) [27]	
Description of scale	
Overview	Objective assessment of dyskinesia during activities of daily living RDRS assesses the interference of dyskinesia during three standardized motor tasks: walking, drinking from a cup, and dressing. Each task is rated on a 5-point scale for severity of dyskinesia, from 0 (absent) to 4 (violent dyskinesia, incompatible with any normal motor task). Additionally, the type of dyskinesia and which one is most disabling is recorded Time to complete the scale: 5 minutes (estimated) [19] Time frame: time of assessment Rated by a health professional Specific for PD
Copyright?	Public domain
How can the scale be obtained?	Available from the original publication [27] and in the MDS website: www.movementdisorders.org/publications/rating_scales/
Clinimetric properties of scale in patients with PD	
Feasibility	Designed and validated for PD, RDRS has been widely used in this setting [19] Applicability across PD stages not formally tested
Dimensionality	Not tested, but it is intended to assess a unique construct (eg, disability caused by dyskinesia)
Acceptability	Not reported
Reliability	Internal consistency: not reported Inter-rater reliability: high for severity of dyskinesia, moderate-low for type and most disabling dyskinesia ratings. Intra-rater agreement was high [27]
Validity	Not tested
Responsiveness & Interpretability	Although used in clinical trials, its sensitivity and responsiveness have not been formally tested [19]. The scale seems to detect changes in dyskinesia due to treatment [28]
Cross-cultural Adaptations & Others	Not reported Derived from the Obeso Dyskinesia Scale [29]
Overall impression	
Advantages	Short and easy to administer; assesses functional disability in a standardized way
Disadvantages	Lack of full formal validation; does not include pain/discomfort due to dyskinesia or patient's perceptions

The Wearing-Off Questionnaires (WOQ) Several versions: Patient Questionnaire (WOQ-32) [30]; Patient Card Questionnaire (WOQ-19), known as the 'QUICK Questionnaire' (Spanish version) [31]; 9-item symptom questionnaire (WOQ-9) [32]; and a 10-item questionnaire (Q10) [33]	
Description of scale	
Overview	The WOQ questionnaires were developed as screening tools to identify patients with wearing-off. The number of items is specified in the name of the scales, with 9, 10, 19, or 32 items. There is also an 18-item version (WOQ-18), similar to the WOQ-19 but without the item 'Aching' [34]. The WOQ-19 and Q10 have six items in common, the former with a higher detection power for non-motor symptoms [33]. For each item, patients are asked to mark if they experience the symptom, and if it improves after the next medication dose. A positive response is considered when a symptom is reported to improve Time to complete the scale: around 5 (shorter version) to 15 minutes (longer versions), 6 to 7 minutes for the WOQ-10 [33] Time frame: time of assessment The questionnaires are completed by the patient Specifically developed and validated for PD
Copyright?	Public domain
How can the scale be obtained?	The WOQ-32 is published as an appendix to the original study [30]. The Spanish, Flemish, and Italian versions of the WOQ-19 have also been published [34–36]
Clinimetric properties of scale in patients with PD	
Feasibility	The WOQ-18 and WOQ-19 were judged by clinicians as useful for detecting wearing-off symptoms [34,37]. The WOQ scales are applicable to all PD stages
Dimensionality	Not assessed
Acceptability	No information
Reliability	The internal consistency of the WOQ-19 was adequate and test-retest reliability was also appropriate [36]
Validity	Content validity is estimated to be adequate The WOQ-32 significantly differentiated between groups by duration of levodopa treatment [30], and the WOQ-19 by HY stage and education level [35]. The WOQ-19 total number of symptoms correlates moderately with quality of life [38]. Criterion validity was established for the WOQ-19, when compared to clinical diagnosis of wearing-off established by a neurologist [36]. The WOQ-32 and WOQ-19 identified more patients with wearing off than other methods [30,35]. The prevalence of symptoms assessed by the WOQ-10 increases significantly with increasing wearing-off severity rated by neurologists [33]
Responsiveness & Interpretability	The WOQ scales were used in some clinical trials as screening measures to identify wearing-off patients [38,39]. Both motor and non-motor symptoms, as identified by the WOQ-9, were sensitive to dopaminergic treatment [40] WOQ scales are valid for both sexes and all ages

Cross-cultural Adaptations & Others	Besides English [30] and Spanish [33,41], the WOQ has been translated and used in many languages such as French [42], Russian [39], Flemish [34], Chinese [43], Japanese [44], Italian [36], German [38], and Czech [45], among others [46]
Overall impression	
Advantages	Specific screening instruments for wearing-off, with adequate screening properties [47]; simplicity, ease, and short time of completion; very useful for clinical practice and research. WOQ-19 and WOQ-9 are "recommended" by the MDS-Task force for screening of wearing-off in PD [47]
Disadvantages	WOQ-32 was not intended for use in clinical practice and may cause patient fatigue in completing it [46]; WOQ 10 requires additional studies Some studies differ to each other in requiring one or two positive responses to diagnose wearing-off [33,46]

Figure 4.1 Rating Scale for Gait Evaluation in Parkinson's Disease (RSGE)

I Functional ability (Historical; determine for "On/Off")

1 Space where walking takes place
- **0** Normal; the patient walks freely inside and outside the house
- **1** The patient walks freely but with caution or accompanied outside the house, with few or no limitations
- **2** Some help or support is needed inside the house. Activity outside is scarce or nil
- **3** Incapacity or significant difficulty in walking inside, even when aided

2 Independence related to gait
- **0** Normal
- **1** Only the most demanding activites (walking quickly or with long steps, jumping some obstacles) are limited
- **2** Some help is needed or there are limitations in performing activities that require movement (going for a walk, getting on a bus, passing from one room to another)
- **3** Disabled; needs assistance to move

3 Arising from chair/getting out of bed
- **0** Normal
- **1** Mild slowing and /or difficulty but completely independent
- **2** Moderate slowing and/or difficulty, can need support or some assistance to get up
- **3** Unable to arise without help

4 Climbing stairs
- **0** Normal
- **1** Mild impairment but could be normal for an older person
- **2** Moderately impaired (slowing, difficulty, fatiguing); occasionally may need assistance
- **3** Needs significant assistance or cannot climb stairs at all

5 Walking
- **0** Normal
- **1** Mild slowing and/or difficulty
- **2** Moderate slowing and/or difficulty, but requires little or no assistance
- **3** Severe slowing and/or difficulty, requiring significant assistance or cannot walk even assisted

6 Falling
- **0** None
- **1** Rare falling
- **2** Occasionally falls, but less than once per day
- **3** Falls once per day or more

II Long-tern complications (Historical; in the past week)

7 Freezing episodes when walking
- **0** None
- **1** Occasional freezing, but there are no falls due to freezing
- **2** Frequent freezing; occasional falls due to freezing
- **3** Constantly present, giving rise to frequent falls or prevention of walking

8 "Off" episondes impairing gait
- **0** None
- **1** "Offs" impairing gait ≤1 h per day
- **2** "Offs" impairing gait 1–3 h in a day
- **3** "Offs" impairing gait >3 h in a day

9 Dyskinesias impairing gait
- **0** None
- **1** Mildly disabling
- **2** Moderately disabling (causing insecurity, lack of balance, accidents)
- **3** Severely disabling; can prevent walking

III Socioeconomic (Historical)

10 Activities of work or self-care
- **0** Normal
- **1** Mild slowing or difficulty in performance
- **2** Moderately impaired; some of these activities are no longer possible
- **3** Incapable of performing these activities

11 Economy (economic consequences of the disability due to the gait impairment)
- **0** Normal
- **1** Mildly affected as a consequence of limitations in job, public transport, shopping
- **2** Moderately affected by working troubles and/or costs of treatment, special transport, caregiver, structural adaptions at home
- **3** Significant economic consequences; social resources and institutional assistance may be needed

12 Leisure and social activites
- **0** Normal
- **1** Feasible only with mild difficulty
- **2** Only some activities are possible
- **3** Incapable of performing these activites

13 Family organization (effects of the disorder on the family organization and activities)
- **0** Normal
- **1** Mildly affected; minimal consequences or limitations
- **2** Moderately affected; the functional limitation of the patient have an influence on the family organization and activities
- **3** Severely affected; caring for the patient is the pivotal activity

IV Examination (at the time of visit)

14 Initiation (patient is instructed to initiate the gait, from standing, immediately after the order)
- **0** Normal
- **1** Mild slowing
- **2** Moderate slowing; may have start hesitation
- **3** Unable or severly impaired in initiating the gait

15 Festination
- **0** None
- **1** Occosional festination
- **2** Frequent festination; occasional falls from festination
- **3** Unable to walk or frequent falls from festination

16 Arm swing
- **0** Normal
- **1** Decreased arm swing (uni- or bilateral)
- **2** Absence of arm swing (uni- or bilateral), but the upper extremities keep a normal posture
- **3** Absence of arm swhing with flexion of upper extremites

17 Turns (180°)
- **0** Normal
- **1** Mild slowing or cautiousness; performed in one or two phases
- **2** Moderate slowing or difficulty; performed in three or more phases
- **3** Turns are very slowed and difficult or assistance is required

18 Balance while walking
- **0** Normal
- **1** Occasional impairment with self-adjustment or minimal support
- **2** Moderately impaired; requires support (eg, stick) or mild assistance to walk; occasional falls due to imbalance.
- **3** Severely impaired or unable to walk even when assisted; frequent falls due to imbalance

19 Arising from chair (patient attempts to arise from a straight-backed, 45 cm high, wood or metal chair with the wrists, semipronated, resting on the proximal thighs in a natural posture)
- **0** Normal
- **1** Mild slowing but sits upright at first attempt
- **2** Needs more than one attempt and/or support (eg, from arms of seat) but needs assistance
- **3** Unable to arise without help

20 Postural stability (response to sudden posterior displacement produced by pull on shoulders from behind while the patient is erect with eyes open and feet slightly apart [up to 30 cm]; patient is prepared)
- **0** Normal
- **1** Retropulsion, but recovers unaided
- **2** Retropulsion without recovering; would fall if not caught by examiner
- **3** Very unstable, tends to fall spontaneously or unable to stand without assistance

21 Rigidity in lower limbs (patient seated, relaxed, with feet side by side and with hips and knees flexed around 90°. The resistance to the passive abduction-adduction produced by means of the hands of examiner placed on the knees of patient is evaluated. It is recommended that this maneuver be performed with the examiner located at the side of, not facing, the patient)
- **0** Absent
- **1** Slight or barely detectable
- **2** Moderate, but full range of motion is easily achieved
- **3** Severe; range of motion is achieved with difficulty

22 Axial rigidity (resistance to the passive mobility of the neck is assessed)
- **0** Absent
- **1** Slight or barely detectable
- **2** Moderate, but full range of motion is easily achieved
- **3** Severe; range of motion is achieved with difficulty

23 Posture
- **0** Normal
- **1** Not quite erect, slightly stooped posture; it could be normal for an older person
- **2** Moderately stooped posture, definitely abnormal; can be slightly leaning to one side
- **3** Severely stooped posture; can be moderately leaning to one side

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