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The unified Multiple System Atrophy Rating Scale: Intrarater reliability

Florian Krismer, MD[#1], **Klaus Seppi, MD**[#1], **François Tison, MD PHD**[2], **Cristina Sampaio, MD**[3], **Anja Zangerl, MD**[1], **Cecilia Peralta, MD**[1,4], **Farid Yekhlef, MD**[2], **Imad Ghorayeb, MD**[2], **Fabienne Ory-Magne, MD**[5], **Monique Galitzky, MD**[5], **Maria Bozi, MD**[6], **Tommaso Scaravilli, MD**[6,7], **Carlo Colosimo, MD**[8], **Felix Geser, MD PHD**[1,9], **Olivier Rascol, MD**[5], **Werner Poewe, MD**[1], **Niall P. Quinn, MD**[6], and **Gregor K. Wenning, MD PHD MSC**[1] **on behalf of the European Multiple System Atrophy Study Group**

[1]Department of Neurology, Innsbruck Medical University, Innsbruck, Austria

[2]Department of Neurology and French Reference Centre for MSA, University Hospital Bordeaux and Institute for Neurodegenerative Diseases, CNRS UMR 5293, University Bordeaux 2, Bordeaux, France

[3]Faculdade de Medicina de Lisboa, Hopital Santa Maria, Centro de Neurosciencias de Lisboa, Lisboa, Portugal

[4]Department of Neurology, CEMIC (Center for Medical Education and Clinical Research), Buenos Aires, Argentina

[5]Departments of Clinical Pharmacology and Neurosciences, CIC-9302/INSERM UMR825: French Reference Centre for MSA, University Hospital and University Paul Sabatier Toulouse III, Toulouse, France

[6]Sobell Department of Motor Neuroscience and Movement Disorders, Institute of Neurology, Queen Square, London, United Kingdom

[7]U.O.C. Neurologia, Ospedale dell'Angelo, Venice, Italy

[8]Department of Neurology and Psychiatry, Sapienza University, Rome, Italy

[9]Department of Neurology, Center for Biomedical Research, University of Ulm, Ulm, Germany

[#] These authors contributed equally to this work.

Abstract

Background—The unified multiple system atrophy rating scale was developed to provide a surrogate measure of disease progression in multiple system atrophy. In the present study, the intrarater agreement of the motor examination part of the unified multiple system atrophy rating scale was determined.

Corresponding author: Prof. Gregor K. Wenning MD PHD MSC, Division of Neurobiology, Department of Neurology and Neurosurgery, Innsbruck Medical University, Anichstraße 35, A-6020 Innsbruck, Phone: (+43) (0512) 504 81811.

Methods—All patients were first examined face-to-face, whilst being video-recorded, by two senior and two junior investigators. The patients' videotaped examinations were re-evaluated after 3 months. Intrarater reliability for each item was analyzed by kappa statistics.

Results—Overall weighted κ values were at least substantial or excellent for all unified multiple system atrophy rating scale motor examination items except for ocular motor dysfunction which showed only moderate intrarater agreement. Intrarater reliability was comparable between senior and junior raters with all κ differences being ≤ 0.22.

Conclusions—The motor examination part of the unified multiple system atrophy rating scale was found to have satisfactory intrarater reliability in the present cohort.

Keywords

Multiple system atrophy; MSA; UMSARS; rating scale; EMSA-SG

Introduction

Multiple system atrophy (MSA) is a relentlessly progressive and ultimately fatal neurodegenerative disease characterized clinically by autonomic failure accompanied by characteristic motor features.1, 2 According to applicable diagnostic criteria two motor variants may be distinguished; patients with predominant parkinsonism are designated MSA-P, whereas MSA-C applies to patients having a prominent cerebellar phenotype.3 In addition, three diagnostic categories of increasing certainty were specified: possible, probable, and definite MSA. While definite MSA requires pathological confirmation of widespread glial cytoplasmic inclusions accompanied by a distinct pattern of neurodegeneration,4 possible and probable MSA rely on clinical and neuroimaging findings. 3 Patient care is currently restricted to symptom-based therapy because of the current absence of disease-modifying agents.5 The European MSA Study Group (EMSA-SG) recognized the need for a disease-specific rating instrument which may serve as an outcome measure in clinical trials, and thus reliably determine the efficacy of given interventions. We therefore developed and validated the Unified MSA Rating Scale (UMSARS).6 During the validation process, the UMSARS was shown to be a reasonably short, multidimensional, reliable, and valid scale for semiquantitative assessment of Caucasian MSA patients with high internal consistency and substantial-to-excellent interrater agreement.6 Subsequently, two independent groups confirmed the instrument's sensitivity to change7, 8 which allowed the conduct of multicenter clinical trials exploiting UMSARS as surrogate measure of disease progression.9, 10 We here report the intrarater reliability of the motor examination part of UMSARS as determined in a multicenter validation study.

Methods

A total of 40 patients with a clinical diagnosis of MSA according to the initial Gilman criteria11 were recruited in four EMSA-SG centers (Bordeaux, Innsbruck, London, Toulouse) and assessed on their regular medication. Global disease severity was determined by Hoehn & Yahr staging (H&Y) and a 3-point disease severity scale (SS-3).6 Intrarater validation was performed in a two-step approach. First, all patients were examined face-to-

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face (live rating) by one senior investigator travelling to the centers (GKW) as well as an additional senior and two junior investigators from each local center (Local rater teams were Bordeaux: FT [senior], IG [junior], FY [junior]; Innsbruck: WP [senior], KS [junior], ADZ [junior]; London: NPQ [senior], MB [junior], TS [junior]; Toulouse: OR [senior], MG [junior], FO [junior]). Board-certified neurologists with long-lasting experience in movement disorders were considered senior investigators whereas the term junior investigators applied to residents in neurology. Each face-to-face examination was recorded on videotape. In a second step, three months after the initial examination, the same investigators re-rated the motor part of the UMSARS examination from the original video recordings. In order to obtain independent assessments, the examiners were not allowed to exchange opinions during evaluations. Finally, as rigidity cannot be judged by inspection, item 6 of the UMSARS motor examination subscale ("Increased tone") was excluded from the present analysis.

Statistical Analysis

Data were analysed using SPSS 20.0 (SPPS Inc., Chicago, IL, USA) and Excel (Microsoft, Redmond, WA, USA). Intrarater reliability among individual junior and senior raters as well as overall agreement for each UMSARS motor examination item were determined by kappa (κ) statistics.12, 13 Weighted κ values were calculated by means of quadratic disagreement weights14 and interpreted as follows according to recommendations published previously:15 0 to 0.20 slight agreement; 0.21 to 0.40 fair agreement; 0.41 to 0.60 moderate agreement; 0.61 to 0.80 substantial agreement; 0.81 to 1.00 excellent agreement. Intrarater agreement of UMSARS motor examination subscore of live examination and video rating was determined using intraclass correlation coefficients (ICC) derived from a one-way random effects analysis of variance model.16

Results

In the present cohort, MSA-P was more frequent than MSA-C (MSA-P:MSA-C 1.8:1) with diagnostic certainty being considered probable in 32 and possible in 8 out of 40 cases. Mean (standard deviation) age at symptom-onset and disease duration were 57.0 (8.5) and 6.0 (4.2) years, respectively. Further demographic and clinical data are given in Table 1.

Intrarater agreement

The results of the intrarater reliability analysis are summarized in Table 2. Overall weighted κ values were at least substantial (κ (w) = 0.6–0.8) or excellent (κ (w) ≥ 0.8) for all UMSARS motor examination items except for ocular motor dysfunction which showed moderate intrarater agreement. Intrarater reliability was comparable between senior and junior raters with all κ discrepancies being ≤ 0.22. Finally, intraclass correlation coefficients proved the UMSARS motor examination subscore to be reliable.

Discussion

It was previously demonstrated that the UMSARS is a MSA-specific semi-quantitative assessment instrument showing high internal consistency as well as substantial to excellent

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interrater reliability6. Moreover, two independent groups have shown that UMSARS scores are sensitive to change.7, 8 To complete the validation process of the scale, we here report the results of an intrarater validation study.

The motor examination part of the UMSARS underwent intrarater reliability testing by comparison of live rating to subsequent video analysis of the initial examination 3 months later. Our results revealed that all but one item (ocular motor dysfunction) had substantial to excellent intrarater agreement. Ocular motor dysfunction showed moderate agreement which might be explained by the challenge of scoring eye movement using video analysis. As expected, κ values were higher in the intrarater reliability study compared to the interrater reliability study published previously.6 Moreover, intrarater agreement was comparable among senior and junior examiners with differences in κ values being below or equal to 0.20 except for item 3 (ocular motor dysfunction) which had a $\Delta\kappa$ of 0.22. The latter observation confirms the previous finding that junior investigators can use the UMSARS reliably once they are trained in applying the UMSARS and provided they receive detailed instructions.6

The present study further underscores that the UMSARS has satisfactory intrarater reliability as a disease-specific and multidimensional rating instrument for semi-quantitative assessment of MSA patients. However, some limitations have to be acknowledged. Video analysis may not perfectly replicate a face-to-face examination. An intrarater study with two live examinations separated by a certain time interval is difficult to perform in MSA. Choosing an appropriate time interval between two live examinations is limited by the rapidly progressive disease course of MSA. Thus, as demonstrated by two studies with the serial application of the UMSARS at patients with MSA,7, 8 the progressive nature of the disease would have led to a deterioration of the UMSARS score and several of the UMSARS items at follow-up. On the other hand, a short follow-up between two potential live examinations might have introduced a bias towards overestimation of the intrarater reliability values. Therefore, we chose this study design of a videotaped face-to-face examination of the patients followed by a re-evaluation using the same video 3 months later. Furthermore, since the scale was validated in European Caucasians, its validity and applicability in a different racial or ethnic context remains to be established. Finally, UMSARS does not cover every aspect of the complex phenomenology of MSA, so that other validated scales may need to be developed to document a more comprehensive picture of the disease.

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Florian Krismer	Nothing to disclose
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Maria Bozi	Nothing to disclose
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Felix Geser	Nothing to disclose
Olivier Rascol	Nothing to disclose
Niall P. Quinn	Nothing to disclose
Werner Poewe	Nothing to disclose
Gregor K. Wenning	Nothing to disclose

Authors' Roles

1. Research project:
   - **A.** Conception
   - **B.** Organization
   - **C.** Execution
2. Statistical Analysis:
   - **A.** Design
   - **B.** Execution
   - **C.** Review and Critique
3. Manuscript:
   - **A.** Writing of the first draft
   - **B.** Review and Critique

Author	Financial disclosure/conflict of interest related to the manuscript
Florian Krismer	2a, 2b, 3a

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Author	Financial disclosure/conflict of interest related to the manuscript
Klaus Seppi	1a, 1b, 1c, 2a, 2c, 3b
François Tison	1a, 1b, 1c, 2c, 3b
Cristina Sampaio	1a, 2c, 3b
Anja Diem-Zangerl	1a, 1b, 1c, 2a, 2c, 3b
Cecilia Peralta	2a, 2b, 3b
Farid Yekhlef	1a, 1b, 1c, 2c, 3b
Imad Ghorayeb	1a, 1b, 1c, 2c, 3b
Fabienne Ory-Magne	1a, 1b, 1c, 2c, 3b
Monique Galitzky	1a, 1b, 1c, 2c, 3b
Tommaso Scaravilli	1a, 1b, 1c, 2c, 3b
Maria Bozi	1a, 1b, 1c, 2c, 3b
Carlo Colosimo	1a, 2c, 3b
Felix Geser	1b, 3b
Olivier Rascol	1a, 1b, 1c, 2c, 3b
Niall P. Quinn	1a, 1b, 1c, 2c, 3b
Werner Poewe	1a, 1b, 1c, 2a, 2c, 3b
Gregor K. Wenning	1a, 1b, 1c, 2a, 2c, 3b

Financial Disclosures

Florian Krismer

Stock Ownership in medically-related fields	None
Intellectual Property Rights	None
Consultancies	None
Expert Testimony	None
Advisory Boards	None
Employment	Division of Neurobiology, Department of Neurology, Innsbruck Medical University
Partnerships	None
Contracts	None
Honoraria	None
Royalties	None
Grants	None
Other	None

Klaus Seppi

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Stock Ownership in medically-related fields	None
Intellectual Property Rights	None
Consultancies	Novartis, Boehringer Ingelheim, Lundbeck, Schwarz Pharma, UCB, GlaxoSmithKline
Expert Testimony	None
Advisory Boards	None
Employment	Department of Neurology, Innsbruck Medical University
Partnerships	None
Contracts	None
Honoraria	Novartis, Boehringer Ingelheim, Lundbeck, Schwarz Pharma, UCB, GlaxoSmithKline
Royalties	None
Grants	None
Other	None

François Tison

Stock Ownership in medically-related fields	None
Intellectual Property Rights	None
Consultancies	ADDEX Pharma
Expert Testimony	None
Advisory Boards	Novartis, GlaxoSmithKline and Boehringer Ingelheim
Employment	Le Centre hospitalier universitaire de Bordeaux
Partnerships	None
Contracts	None
Honoraria	None
Royalties	None
Grants	Travel grants from Novartis, Lundbeck and UCB and a research grant from the Michael J. Fox Foundation
Other	Lecture fees from Novartis, GlaxoSmithKline and UCB

Cristina Sampaio

Stock Ownership in medically-related fields	None
Intellectual Property Rights	None
Consultancies	None
Expert Testimony	None
Advisory Boards	None
Employment	None

Partnerships	None
Contracts	None
Honoraria	None
Royalties	None
Grants	None
Other	None

Anja Zangerl

Stock Ownership in medically-related fields	None
Intellectual Property Rights	None
Consultancies	None
Expert Testimony	None
Advisory Boards	None
Employment	Department of Neurology, Innsbruck Medical University
Partnerships	None
Contracts	None
Honoraria	None
Royalties	None
Grants	None
Other	None

Cecilia Peralta

Stock Ownership in medically-related fields	None
Intellectual Property Rights	None
Consultancies	Teva, Boehringer-Ingelheim
Expert Testimony	None
Advisory Boards	None
Employment	Department of Neurology, CEMIC Medical University
Partnerships	None
Contracts	None
Honoraria	Boehringer-Ingelheim, Teva, Buxton, Novartis
Royalties	None
Grants	None
Other	None

Farid Yekhlef

Stock Ownership in medically-related fields	None
Intellectual Property Rights	None
Consultancies	None
Expert Testimony	None
Advisory Boards	None
Employment	Centre hospitalier René Dubos, 95 300 Pontoise, France
Partnerships	None
Contracts	None
Honoraria	None
Royalties	None
Grants	None
Other	Biogen Idec

Imad Ghorayeb

Stock Ownership in medically-related fields	None
Intellectual Property Rights	None
Consultancies	None
Expert Testimony	None
Advisory Boards	None
Employment	Institut des Maladies Neurodégénératives, Université Victor Segalen Bordeaux 2, CNRS UMR 5293
Partnerships	None
Contracts	None
Honoraria	None
Royalties	None
Grants	None
Other	None

Fabienne Ory-Magne

Stock Ownership in medically-related fields	None
Intellectual Property Rights	None
Consultancies	None
Expert Testimony	None
Advisory Boards	Served on Scientific Advisory Board for Novartis
Employment	Department of Neurology, CHU Toulouse, France
Partnerships	None

Contracts	None
Honoraria	None
Royalties	None
Grants	None
Other	None

Monique Galitzky

Stock Ownership in medically-related fields	None
Intellectual Property Rights	None
Consultancies	None
Expert Testimony	None
Advisory Boards	None
Employment	Clinical Investigation Center- CHU Toulouse - France
Partnerships	None
Contracts	None
Honoraria	None
Royalties	None
Grants	None
Other	None

Tommaso Scaravilli

Stock Ownership in medically-related fields	None
Intellectual Property Rights	None
Consultancies	None
Expert Testimony	None
Advisory Boards	None
Employment	U.O.C. Neurologia, Ospedale dell'Angelo, Venice
Partnerships	None
Contracts	None
Honoraria	None
Royalties	None
Grants	None
Other	None

Maria Bozi

Stock Ownership in medically-related fields	None
Intellectual Property Rights	None
Consultancies	None
Expert Testimony	None
Advisory Boards	None
Employment	“Hygeia” Diagnostic and Therapeutic Medical Center, Athens, Greece. EOPYY Branch of Nea Ionia, Athens, Greece
Partnerships	None
Contracts	None
Honoraria	None
Royalties	None
Grants	None
Other	None

Carlo Colosimo

Stock Ownership in medically-related fields	None
Intellectual Property Rights	None
Consultancies	None
Expert Testimony	None
Advisory Boards	Allergan, Ipsen, Lundbeck, UCB/Schwarz
Employment	Sapienza University
Partnerships	None
Contracts	None
Honoraria	None
Royalties	CIC Edizioni Internazionali Publishers, Cambridge University Press
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Other	None

Felix Geser

Stock Ownership in medically-related fields	None
Intellectual Property Rights	None
Consultancies	None
Expert Testimony	None
Advisory Boards	None
Employment	Universitätsklinikum Ulm, Medizinische Fakultät der Universität Ulm

Partnerships	None
Contracts	None
Honoraria	None
Royalties	None
Grants	None
Other	None

Olivier Rascol

Stock Ownership in medically-related fields	None
Intellectual Property Rights	None
Consultancies	Abbott, Addex, BIAL, Boehringer Ingelheim, Impax Pharmaceuticals, Lundbeck, Merck Serono, Movement Disorders Society, Novartis, Oxford Biomedica, Teva, Schering-Plough, UCB and XenoPort
Expert Testimony	None
Advisory Boards	Abbott, Addex, Impax Pharmaceuticals, Lundbeck, Merck Serono, Merz, Novartis, Oxford Biomedica, Schering-Plough, Teva, UCB and XenoPort
Employment	None
Partnerships	None
Contracts	None
Honoraria	Boehringer Ingelheim, GSK, Lundbeck, MDS, Novartis, Teva, UCB
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Other	None

Werner Poewe

Stock Ownership in medically-related fields	None
Intellectual Property Rights	None
Consultancies	Astra Zeneca, Teva, Novartis, GSK, Boehringer-Ingelheim, UCB, Orion Pharma and Merck Serono
Expert Testimony	None
Advisory Boards	None
Employment	Department of Neurology, Innsbruck Medical University
Partnerships	None
Contracts	None
Honoraria	Astra Zeneca, Teva, Novartis, GSK, Boehringer-Ingelheim, UCB, Orion Pharma, and Merck Serono (Lecture fees)
Royalties	None

Grants	Movement Disorders Society and the Michael J. Fox Foundation for Parkinson's Research
Other	None

Niall P. Quinn

Stock Ownership in medically-related fields	None
Intellectual Property Rights	None
Consultancies	None
Expert Testimony	Expert testimony on 2 cases of Parkinson’s disease
Advisory Boards	None
Employment	None
Partnerships	None
Contracts	None
Honoraria	Lecture honoraria from Orion Pharma
Royalties	None
Grants	None
Other	None

Gregor K. Wenning

Stock Ownership in medically-related fields	None
Intellectual Property Rights	None
Consultancies	None
Expert Testimony	None
Advisory Boards	None
Employment	Division of Neurobiology, Department of Neurology, Innsbruck Medical University
Partnerships	None
Contracts	None
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Other	None

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References

1. Wenning GK, Colosimo C, Geser F, Poewe W. Multiple system atrophy. Lancet Neurology. 2004; 3(2):93–103. [PubMed: 14747001]

2. Kollensperger M, Geser F, Ndayisaba JP, et al. Presentation, diagnosis, and management of multiple system atrophy in Europe: final analysis of the European multiple system atrophy registry. Mov Disord. 2010; 25(15):2604–2612. [PubMed: 20922810]

3. Gilman S, Wenning GK, Low PA, et al. Second consensus statement on the diagnosis of multiple system atrophy. Neurology. 2008; 71(9):670–676. [PubMed: 18725592]

4. Trojanowski JQ, Revesz T. Proposed neuropathological criteria for the post mortem diagnosis of multiple system atrophy. Neuropathology and applied neurobiology. 2007; 33(6):615–620. [PubMed: 17990994]

5. Stefanova N, Bucke P, Duerr S, Wenning GK. Multiple system atrophy: an update. Lancet Neurol. 2009; 8(12):1172–1178. [PubMed: 19909915]

6. Wenning GK, Tison F, Seppi K, et al. Development and validation of the Unified Multiple System Atrophy Rating Scale (UMSARS). Mov Disord. 2004; 19(12):1391–1402. [PubMed: 15452868]

7. Geser F, Wenning GK, Seppi K, et al. Progression of multiple system atrophy (MSA): a prospective natural history study by the European MSA Study Group (EMSA SG). Mov Disord. 2006; 21(2): 179–186. [PubMed: 16161136]

8. May S, Gilman S, Sowell BB, et al. Potential outcome measures and trial design issues for multiple system atrophy. Mov Disord. 2007; 22(16):2371–2377. [PubMed: 17914727]

9. Holmberg B, Johansson JO, Poewe W, et al. Safety and tolerability of growth hormone therapy in multiple system atrophy: a double-blind, placebo-controlled study. Mov Disord. 2007; 22(8):1138–1144. [PubMed: 17469198]

10. Dodel R, Spottke A, Gerhard A, et al. Minocycline 1-year therapy in multiple-system-atrophy: effect on clinical symptoms and [(11)C] (R)-PK11195 PET (MEMSA-trial). Mov Disord. 2010; 25(1):97–107. [PubMed: 20014118]

11. Gilman S, Low P, Quinn N, et al. Consensus statement on the diagnosis of multiple system atrophy. American Autonomic Society and American Academy of Neurology. Clinical autonomic research : official journal of the Clinical Autonomic Research Society. 1998; 8(6):359–362. [PubMed: 9869555]

12. Cohen J. A Coefficient of Agreement for Nominal Scales. Educational and Psychological Measurement. 1960; 20(1):37–46.

13. Fleiss JL. Statistical methods for rates and proportions. Wiley; 1981.

14. Agresti A. Categorical data analysis. Wiley; 1990.

15. Landis JR, Koch GG. The measurement of observer agreement for categorical data. Biometrics. 1977; 33(1):159–174. [PubMed: 843571]

16. Shrout PE, Fleiss JL. Intraclass correlations: uses in assessing rater reliability. Psychological bulletin. 1979; 86(2):420–428. [PubMed: 18839484]

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Table 1

Demographics and clinical characteristics

Patients (n)	**40**
Gender (male/female, n)	**16/24**
MSA-P/C (n)	**26/14**
MSA-possible/probable (n)	**8/32**
Age at onset, years (mean ± SD)	**57.0 ± 8.5**
Disease duration, years (mean ± SD)	**6.0 ± 4.2**
H & Y stage, median (range)	**4 (2 – 5)**
3-point severity scale (n)	**5 / 13 / 22**
UMSARS (mean ± SD, median, IQR)	**52.3 ± 18.3, 53.5, 31.0**
UMSARS ADL (mean ± SD, median, IQR)	**25.8 ± 9.6, 25.0, 16.0**
UMSARS ME (mean ± SD, median, IQR)	**26.5 ± 9.6, 25.5, 13.5**

MSA-P/C … multiple system atrophy-parkinsonian subtype/cerebellar subtype; H & Y stage … Hoehn & Yahr staging (0 – 5); 3-point severity scale … mild / moderate / severe; UMSARS … Unified MSA rating scale (0 – 104); UMSARS ADL … UMSARS subscale “Activities of daily living” (0 – 48); UMSARS ME … UMSARS subscale “Motor examination” (0 – 56)

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Table 2

UMSARS motor examination: Intrarater reliability. κ (w) over all centres; 0– 0.20, slight agreement; 0.21–0.40, fair agreement; 0.41– 0.60, moderate agreement; 0.61– 0.80, substantial agreement; 0.81–1.00, excellent agreement.

Item	κ (w)		
	SR	*JR*	*Overall*
1 Facial expression	0.75	0.71	0.74
2 Speech	0.84	0.75	0.79
3 Ocular motor dysfunction	0.57	0.44	0.50
4 Tremor at rest	0.73	0.73	0.73
5 Action tremor	0.82	0.69	0.76
6 Increased tone	**Not applicable**		
7 Rapid alternating movement of hands	0.68	0.60	0.64
8 Finger tapping	0.78	0.74	0.76
9 Leg agility	0.80	0.60	0.71
10 Heel-Shin test	0.84	0.82	0.83
11 Arising from chair	0.96	0.97	0.96
12 Posture	0.86	0.84	0.85
13 Body sway	0.90	0.91	0.91
14 Gait	0.89	0.90	0.89
ICC of UMSARS II score - 1st examination	0.98	0.97	0.98

Abbreviations: ICC … intraclass coefficient; κ (w) … weighted kappa; SR … senior rater; JR … junior rater; UMSARS … unified MSA rating scale.