Table of Contents

Page(s)
1 - 2: Task Force Members
2: Student Volunteer and Objectives
2 - 3: Task Force Process
4 - 5: List of Measures (with page numbers noted for each and relevant ICF category)
6: Outcome Measure (OM) Rating Scale
6: Expanded Disability Status Scale
7 - 420: EDGE Documents

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Objectives:

1. Develop evidence-based recommendations for OMs for clinical practice, education, and/or research
2. Develop instructions sheets outlining administration and scoring procedures for each OM
3. Identify needs for future research on OM for individuals with MS

Taskforce Process:

1. Day-long initial meeting at CSM February 2011 in New Orleans
    a. Agreement on categories of OMs to consider, across the ICF spectrum
        i. Body structure and function
            1. Aerobic capacity and endurance
            2. Ataxia
            3. Cardiovascular / pulmonary status
            4. Coordination (non-equilibrium)
            5. Dizziness/vestibular
            6. Fatigue
            7. Flexibility
            8. Muscle performance
            9. Muscle tone
            10. Pain
            11. Posture
            12. Sensory integration
            13. Somatosensation
        ii. Activity
            1. Balance/falls
            2. Bed mobility
            3. Gait
            4. Reach and grasp
            5. Transfers
            6. Wheelchair skills

iii. Participation
1. Health and wellness
2. Home management
3. Leisure
4. Quality of life
5. Role function
6. Shopping
7. Social function
8. Work

b. Agreement on OMs to consider
c. Agreement of Examination Criteria for OM review → use of EDGE template developed by EDGE taskforce, Section on research APTA and used by StrokEDGE group
i. Decided to focus OM reviews, and all ratings/recommendations, on the clinical utility and strength of psychometric data specific to individuals with MS
d. Develpment of instructions sheets
e. Assignment of OMs and identification of 1^0 and 2^0 reviewers for each OM

2. Primary reviewer completed EDGE document and instruction sheets for all assigned measures
3. Primary and secondary reviewer reach consensus on recommendations reported in EDGE document
4. All task force members complete consensus survey based on recommendations
5. Survey reviewed by Kirsten Potter and Evan Cohen; results of survey and recommendations distributed to all task force members for discussion and final consensus
6. Final recommendations submitted to Neurology Section Board of Directors in December, 2011 and presented to membership at CSM, February, 2012 in Chicago

List of Outcome Measures

Outcome Measure	Page Numbers	Body function & structure	Activity	Participation
12 Minute Walk / Run	7 – 11		X	
12-Item MS Walking Scale	12 – 17		X	
2 Minute Walk Test	18 – 23		X	
5-Time Sit to Stand	24 – 29		X	
6 Minute Walk Test	30 – 37		X	
9-Hole Peg Test	38 – 44		X	
Activities-specific Balance Confidence Scale	45 – 51		X	X
Balance Evaluation Systems Test (BESTest)	52 – 58	X	X	
Berg Balance Scale	59 – 64		X	
Bioesthesiometer	65 – 69	X		
Box & Blocks Test	70 – 74	X		
Brief Fatigue Index/Inventory	75 – 79	X		
Canadian Occupational Performance Measure	80 – 88		X	X
Clinical Test of Sensory Interaction in Balance	89 – 95	X	X	
Disease Steps	96 – 100	X		
Dizziness Handicap Inventory	101 – 105	X	X	X
Dynamic Gait Index	106 – 111		X	
Expanded Disability Status Scale & Kurtzke Functional Systems Scale	112 – 121	X	X	
Fatigue Descriptive Scale	122 – 127	X	X	X
Fatigue Scale for Motor and Cognitive Functions	128 – 132	X		
Four Square Step Test	133 – 138		X	
Fullerton Advanced Balance Scale	139 – 143		X	
Function in Sitting Test	144 – 148		X	
Functional Assessment of MS	149 – 154	X	X	X
Functional Gait Assessment	155 – 161		X	
Functional Independence Measure	162 – 172	X	X	X
Functional Reach	173 – 180		X	
Goal Attainment Scale	181 – 187	X	X	X
Guy's Neurological Disability Scale	188 – 193	X		X
Hauser Ambulation Index	194 – 200		X	
High Level Mobility Assessment Tool (HiMat)	201 – 207	X	X	

Maximal Inspiratory Pressure (MIP) and Maximal Expiratory Pressure (MEP)	208 – 214	X		
Maximal Oxygen Uptake: VO_2 max and VO_2 peak	215 – 221	X		
Modified Ashworth Scale	222 – 229	X		
Modified Fatigue Impact Scale	230 – 234	X	X	
Motion Sensitivity Test	235 – 240	X		
Movement Ability Measure	241 – 247	X		
Multi-component Fatigue Scale	248 – 252	X	X	X
Multiple Sclerosis Functional Composite	253 – 262	X	X	
Multiple Sclerosis Impact Scale (MSIS – 29)	263 – 270			X
MS International Quality of Life Questionnaire	271 – 280			X
Multiple Sclerosis Quality of Life (MS- QOL 54)	281 – 286		X	X
Multiple Sclerosis Quality of Life Inventory	287 – 292	X	X	X
Multiple Sclerosis Spasticity Scale (MSSS – 88)	293 – 297	X	X	X
Neuropathic Pain Scale	298 – 303	X		
Nottingham Sensory Assessment	304 – 309	X		
Patient-specific Functional Scale	310 – 315		X	X
Physiologic Cost Index	316 – 320	X		
Rivermead Assessment of Sensorimotor Performance	321 – 327	X		
Rivermead Mobility Index	328 – 334		X	
Scale for the Assessment and Rating of Ataxia (SARA)	335 – 340	X	X	
Scripps Neurological Rating Scale	341 – 345	X		
Semmes-Weinstein Monofilaments	346 – 351	X		
Short Form Health Survey of the Medical Outcomes Study (SF – 36)	352 – 358			X
Static Standing Balance Test	359 – 363	X		
Tardieu Scale for Assessing Spasticity	364 – 370	X		
Timed 25-Foot Walk	371 – 377		X	
Timed Up & Go (TUG) with Cognitive & Manual	378 – 385		X	
Tinetti Falls Efficacy Scale	386 – 390		X	X
Tinetti Performance Oriented Mobility Assessment	391 – 400		X	
Trunk Control Test	401 – 406		X	
Trunk Impairment Scale	407 – 412	X	X	
Visual Analog Scale - Fatigue	413 - 419	X		

Outcome Measure Rating Scale

4	**Highly Recommend**	• excellent psychometrics in a MS population (e.g. valid and reliable and some data on responsiveness, MCD, MCID, etc.) and • excellent clinical utility in a MS population (e.g. administration is ≤ 20 minutes, requires equipment typically found in the clinic, no copyright payment required, easy to score)
3	**Recommend**	• good- psychometrics in a MS population (may lack information about reliability, validity, or responsiveness) in a MS population and • good clinical utility in a MS population (e.g. administration > 20 minutes, may require additional equipment to purchase or construct)
2	**Unable to Recommend at this time**	Insufficient information to support a recommendation for individuals with MS (e.g. limited psychometric data available or not available in a MS population)
1	**Do not Recommend**	Poor psychometrics &/or poor clinical utility in a MS population (time, equipment, cost, etc.)

Expanded Disability Status Scale

EDSS Level/Range	Lower End of Range	Upper End of Range
0.0 – 3.5	• Normal	• Moderate disability in 1 FS or mild disability in 3-4 FS • Fully ambulatory
4.0 – 5.5	• Fully ambulatory without aid or rest at least 500m. • Self sufficient, but relatively severe disability	• Ambulatory without aid 100 m. • Disability precludes full daily activities
6.0 – 7.5	• Intermittent or unilateral assist for walking 100 m.	• Unable to take more than few steps; restricted to wheelchair • May need assist for transfers
8.0 – 9.5	• Restricted to bed/chair/wheelchair • Retains self-care; effective upper extremity use	• Restricted to bed • Dependent • Unable to communicate and swallow

FS – Functional System

Kurtzke JF. Rating neurologic impairment in multiple sclerosis: an expanded disability status scale (EDSS). *Neurology.*1983;33(11):1444-1452.

Instrument name: 12 Minute Walk/Run	
Reviewer: Gail L. Widener, PT, PhD	**Date of review:** 7/14/11

ICF domain (check all that apply):

_____ Body function/structure __x__ Activity _____ Participation

Constructs measured: (check all that apply):

__x__ Aerobic capacity/endurance
_____ Ataxia
_____ Cardiovascular/pulmonary status
_____ Coordination (non-equilibrium)
_____ Dizziness/vestibular
_____ Fatigue
_____ Flexibility
_____ Muscle performance
_____ Muscle tone
_____ Pain
_____ Posture
_____ Sensory integration
_____ Somatosensation
_____ Balance/falls
_____ Bed mobility
__x__ Gait
_____ Reach and grasp
_____ Transfers
_____ Wheelchair skills
_____ Health and wellness
_____ Home management
_____ Leisure
_____ Quality of life
_____ Role function
_____ Shopping
_____ Social function
_____ Work

Other:

Type of measure:

__x__ Performance-based _____ Self-report

Instrument properties:

- The 12 minute run test developed by Cooper[1,2] is used to assess cardiovascular fitness in normal, healthy people. Normal ranges for adults are available to estimate $VO_{2\ max}$ and rate fitness, calculators on the internet make these assessments easy. It was initially tested in people with respiratory dysfunction.[3-5] McGavin et al[3] suggest performing the walking test twice in people with chronic bronchitis to increase test reliability.

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • ICC of 0.71 for people post stroke[6] Inter-rater: • ICC of 0.68 for people post stroke[6] Test-retest: • Not tested in people with MS however, people post stroke found excellent test-retest ICC=0.97-0.99) • Correlation among the 2MWT, 6MWT, 12MWT in people post stroke - 2:12 was r=0.993; 6:12 was r=0.994[6]

Validity (concurrent, criterion-related, predictive)	Concurrent validity: • Predictive validity: • Discriminative validity: • Sensitivity/Specificity/Predictive Values/Likelihood Ratios: • Sensitivity to change measured using standardized response means was 1.90 in people post stroke[6]
Ceiling/floor effects	Ceiling or Floor effects: • Continuous variable without floor or ceiling effects.
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • MCID: • Other responsiveness values: • Normative Data: • Normative data exists for normal healthy individuals[6]
Instrument use	• Level track
Equipment required	• Stopwatch/timer, 100 m track with 3 m intervals marked on track
Time to complete	• 12 minutes
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• Scored as the distance walked in 12 minutes. Cooper uses this information to estimate VO_2 max.
Level of client participation required (is proxy participation available?)	• Participation required
Limitations	• Participants need to have adequate walking skills to complete without human assistance
Recommendations **Practice Setting (check all that apply):** _____ Acute __X__ Inpatient Rehab _____ Home Health __X__ Skilled Nursing __X__ Outpatient Comments: •	
Level of Disability (check all that apply):	

__X__ EDSS 0.0 – 3.5
__X__ EDSS 4.0 – 5.5
__X__ EDSS 6.0 – 7.5 lower end of this group might be able to complete
_____ EDSS 8.0 – 9.5

Comments:

- People with greater clinical disability than using a walker or canes would not be able to complete.

Should this tool be required for entry-level curricula?

___x__ Yes ____ No

Comments:

-

Is this tool appropriate for research purposes?

____ Yes ___x__ No

Comments:

- Lack of psychometric data in MS, so do not recommend for use in research at this point in time.
- Recommend investigating psychometric properties in MS.
- Might be useful as a proxy measure for endurance for people with less mobility impairment

Attachments:

Score Sheets: _____ Uploaded on website __x__ Available but copyrighted _____
On-line calculator: http://www.exrx.net/Calculators/MinuteRun.html

- Instructions: _____ Uploaded on website __x__ Available but copyrighted _____ Unavailable

- Reference list: _____ Uploaded on website

Second Reviewer Comments:

- Agree with recommendations

Overall Taskforce Agreement with Recommendations:

-

Practice Setting	4	3	2	1	Comments
Acute				X	•
Inpatient Rehab			X		•
Home Health				X	•
Skilled Nursing			X		•
Outpatient			X		•

Overall Comments:

- Depending on the status of the patient, these settings would work. The 6MWT may be more appropriate depending on mobility status. The reliability or validity have yet to be established in pwMS

Level of Disability	4	3	2	1	Comments
EDSS 0.0 – 3.5			X		•
EDSS 4.0 – 5.5			X		•
EDSS 6.0 – 7.5				X	•
EDSS 8.0 – 9.5				X	•

Overall Comments:

- Same as above.

Entry-Level Criteria	Students should learn to administer tool	Students should be exposed to tool (e.g. to read literature)	Do not recommend	Comments
Should this tool be required for entry level curricula?		X		• Students need to understand that they have options for testing endurance for people with differing levels of ability.

Research Use	YES	NO	Comments
Is this tool appropriate for research purposes?		X	• Lack of psychometric data in MS, so do not recommend for use in research at this point in time. • Recommend investigating psychometric properties in MS. • It is a continuous variable to measure endurance and exercise tolerance in people with MS. For people post stroke in inpatient rehabilitation, it was found to be more sensitive to change than either the 2 or 6 MWTs.

References:

1 Cooper, KH. A means of assessing maximal oxygen intake. *JAMA*. 1968;203:201-204.

2 Cooper KH. The new aerobics. New York, Evans. 1976.
3 McGavin CR, Gupta PS, McHardy GJR. Twelve minute walking test for assessing disability in people with chronic bronchitis. *Br Med J.* 1976;1(6013):822-833.
4 Mungall IPF, Hainsworth R. Assessment of respiratory function in patients with chronic airways disease. *Thorax.* 1979;34(4):254-258.
5 Butland RJA, Pang J, Gross ER, Woodcock AA, Geddes DAM. Two-, six- and 12-minute walking tests in respiratory disease. *Br Med J (Clin Res Ed).* 1982; 284(6329): 1607-1608.
6 Kosak M, Smith T. Comparison of the 2-, 6-, and 12- minute walk tests in patients with stroke. *Reahbil Res Dev.* 2005; 42(1):103-107.

Instrument name: 12-Item Multiple Sclerosis Walking Scale (MSWS-12)	
Reviewer: Diane D. Allen, PT, PhD	**Date of review:** 07/24/11

ICF domain (check all that apply):

_____ Body function/structure __x___ Activity _____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance	_____ Balance/falls	_____ Health and wellness
_____ Ataxia	_____ Bed mobility	_____ Home management
_____ Cardiovascular/pulmonary status	___x__ Gait	_____ Leisure
_____ Coordination (non-equilibrium)	_____ Reach and grasp	_____ Quality of life
_____ Dizziness/vestibular	_____ Self care	_____ Role function
_____ Fatigue	_____ Transfers	_____ Shopping
_____ Flexibility	_____ Wheelchair skills	_____ Social function
_____ Muscle performance		_____ Work
_____ Muscle tone / spasticity		
_____ Pain		
_____ Posture		
_____ Sensory integration		
_____ Somatosensation		

Other:

Type of measure:

_____ Performance-based __x___ Self-report

Instrument description:

- The 12-item multiple sclerosis walking scale (MSWS-12) is a self-report measure of the impact of MS on the individual's walking ability.[1] The original scoring provides options 1-5 for each item, with 1 meaning no limitation and 5 meaning extreme limitation to the gait-related item. In a version 2, three items are scored 1-3, and nine items are scored 1-5. All references below refer to version 1.
- This instrument has been included in the gait outcome measures recommended by the consensus conference of the Consortium of Multiple Sclerosis Centers, November 2007.[2]

Reliability (test-retest, intra-rater, inter-rater)	<u>Internal consistency:</u> • The Cronbach's alpha was .94 to .97 in three samples (n=54 to 602) of patients with MS.[1] • Cronbach's alpha was .97 in a community population (n=149) and an outpatient population (n=53) with MS.[3] <u>Test-retest:</u>

	• In 400 people with MS in the community, ICC was .94 when the test was taken twice with an interval of 10 days.[1] • In 260 people with MS, ICC was .86 after a period of 6 months and .87 after 12 months.[4] The MSWS-12 was deemed to have longitudinal measurement invariance over 6 and 12 months, meaning that changes over extended time periods have a good probability of indicating real changes rather than changes in the measurement properties of the scale.[4]
Validity (concurrent, criterion-related, predictive)	<u>Concurrent validity:</u> • Pearson's r for correlation of MSWS-12 with other measures was: .65 for EDSS in 54 patients; -.79 with the physical functioning scale of the SF-36 in 78 patients; .79 with the physical portion of the MSIS-29 in 602 community people; .46 with the T25FW in 54 patients.[1] • Spearman's rho for correlation of MSWS-12 with other measures was: .73 to .84 with EDSS, .80-.87 with MSIS-29, and .65 with T25FW in community and outpatient groups with MS.[3] • In 81 people with MS, EDSS 3.5-6.0, the Kendall tau coefficient for correlation with: Berg Balance Scale was - .37; Four Square Step Test was .34; Timed Up and Go Cognitive was .32.[5] • In 40 people with MS, EDSS 0-6.5, the Spearman's rho for correlation with: EDSS was .69; MSFC was .67; six-minute walk was .81.[6] • In 133 people with MS, the Spearman's rho for correlation of the MSWS-12 with accelerometer counts over a 7-day period was -.68.[7] Correlation with the MSIS-29 physical was .78, and MSIS-29 psychological was .36.[7] • In 24 people with MS, the Pearson's r showed a correlation of the MSWS-12 with oxygen cost (ml/kg/meter) but not the oxygen consumption (ml/kg/minute) of the six-minute walk test at comfortable (.64) and fast (.62) walking speeds.[8] • In 13 people with MS, the Spearman rho correlation between MSWS-12 and gait velocity as measured by an instrumented gait mat was -.50.[9] • In 21 people with MS, EDSS scores 3.5-7.5, MSWS-12 scores correlated with Daily Step Count at rho = -.83, with T25FW at rho .78., with 6-minute walk at rho -.80, with BBS at -.78 and ABC at -.72.[10] <u>Predictive validity:</u> • In 76 people with MS, EDSS scores 3.5-6.0, people who recorded at least one fall in the 3 month data collection period had an average of 75 on the MSWS-12 compared to 58 in non-fallers (OR=1.03, CI 95% 1.01-1.05).[11]

	Discriminative validity: • Sensitivity/Specificity/Predictive Values/Likelihood Ratios: • A cut-off of > or =75 had a sensitivity of 52 and a specificity of 82 in predicting fallers vs. non-fallers in 76 people with MS, EDSS scores 3.5-6.0.[11]
Ceiling/floor effects	Ceiling effects (extreme limitation): • In 602 people with MS in the community, 4.7 % had the maximum possible score. In 54 people with MS undergoing steroidal treatment, 0% had the maximum possible score.[1] Floor effects (no limitation): • In 602 people with MS in the community, 13 % had the minimum possible score. In 54 people with MS undergoing steroidal treatment, 18.5% had the minimum possible score.[1]
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • MCID: • Other responsiveness values: • In 54 patients with MS undergoing steroid treatment, an effect size of .93 was noted, compared to an effect size of .45 for EDSS and .36 for T25FW.[1] • In 43 patients receiving rehabilitation for MS, the MSWS-12 showed an effect size of .89; in 46 patients receiving steroid treatment, the effect size on the MSWS-12 was .85.[12] • The MSWS-12 changed more (mean=19.3) in people who had a change of > or = 1 in EDSS scores than people who had no change in EDSS score in a 6-24 month period.[3] Normative Data: • In 20 healthy controls, the average MSWS-12 score was 2.2 (5.6) compared to an average of 28.2 (25) for 40 people with MS, EDSS 0-6.5.[6]
Instrument use	•
Equipment required	• Scale, pen/pencil.
Time to complete	• Less than or equal to 10 minutes.[2]
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• In version 1, all items are scored 1-5. In version 2, 3 items are scored 1-3, and the other 9 items are scored 1-5. Scores on the 12 items are summed. To transform to a 0-100 scale,[5] the minimum score of 12 is subtracted from the sum; the result is divided by 48 (for version 1) or 42 (for version 2) and then multiplied by 100.
Level of client participation required (is proxy	• No proxy forms have been reported.

participation available?)	
Limitations	• Has both ceiling (for people unable to walk) and floor (people with no walking difficulty) effects.

Recommendations
Practice Setting (check all that apply):

__x___ Acute
__x___ Inpatient Rehab
__x___ Home Health
__x___ Skilled Nursing
__x___ Outpatient

Comments:
-

Level of Disability (check all that apply):

__x___ EDSS 0.0 – 3.5
__x___ EDSS 4.0 – 5.5
__x___ EDSS 6.0 – 7.5
_____ EDSS 8.0 – 9.5

Comments:
- Instructions state that if individual cannot walk at all, the requested box should be checked and no items should be completed.
- Recommended as a good indicator of actual walking behavior in people with EDSS 3.5-7.5 outside the clinical/laboratory spotlight because of high correlation with daily step count as recorded by a step activity monitor during all waking hours for up to 7 days.[10]

Should this tool be required for entry-level curricula?

__x___ Yes _____ No

Comments:
- Possibly, as an example of patient-perceived impact of disease on the activity of walking.

Is this tool appropriate for research purposes?

__x___ Yes _____ No

Comments:
- Focused on walking.

Attachments:

- Score Sheets: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable

- Instructions: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Reference list: _____ Uploaded on website

Second Reviewer Comments:

- Agree with ratings and recommendations.

Overall Taskforce Agreement with Recommendations:

-

Practice Setting	4	3	2	1	Comments
Acute	X				•
Inpatient Rehab	X				•
Home Health	X				•
Skilled Nursing	X				•
Outpatient	X				•

Overall Comments:

-

Level of Disability	4	3	2	1	Comments
EDSS 0.0 – 3.5	X				•
EDSS 4.0 – 5.5	X				•
EDSS 6.0 – 7.5	X				•
EDSS 8.0 – 9.5				X	•

Overall Comments:

-

Entry-Level Criteria	Students should learn to administer tool	Students should be exposed to tool (e.g. to read literature)	Do not recommend	Comments
Should this tool be required for entry level curricula?	X			• At least exposed; possibly utilize tool.

Research Use	YES	NO	Comments

Is this tool appropriate for research purposes?	X		• Use when the focus of the research is on walking.

References:

1. Hobart JC, Riazi A, Lamping DL, Fitzpatrick R, Thompson AJ. Measuring the impact of MS on walking ability: the 12-item MS Walking Scale (MSWS-12). *Neurol.* 2003;60:31-36.
2. Hutchinson B, Forwell SJ, Bennett S, Brown T, Karpatkin H, Miller D. Toward a consensus on rehabilitation outcomes in MS: gait and fatigue: report of a CMSC Consensus Conference, November 28--29, 2007. *Int J MS Care.* 2009;11(2):67-78.
3. McGuigan C, Hutchinson M. Confirming the validity and responsiveness of the Multiple Sclerosis Walking Scale-12 (MSWS-12). *Neurol.* 2004;62(11):2103-2105.
4. Motl RW, McAuley E, Mullen S. Longitudinal measurement invariance of the Multiple Sclerosis Walking Scale-12. *J Neurol Sci.* 2011;305(1-2):75-79.
5. Nilsagard Y, Gunnarsson L, Denison E. Self-perceived limitations of gait in persons with multiple sclerosis. *Advances in Physiotherapy.* 2007;9(3):136-143.
6. Goldman MD, Marrie RA, Cohen JA. Evaluation of the six-minute walk in multiple sclerosis subjects and healthy controls. *Mult Scler.* 2008;14:383-390.
7. Motl RW, Snook EM. Confirmation and extension of the validity of the Multiple Sclerosis Walking Scale-12 (MSWS-12). *J Neurol Sci.* 2008;268(1-2):69-73.
8. Motl RW, Dlugonski D, Suh Y, et al. Multiple Sclerosis Walking Scale-12 and oxygen cost of walking. *Gait Posture.* 2010;31(4):506-510.
9. Sosnoff JJ, Weikert M, Dlugonski D, Smith DC, Motl RW. Quantifying gait impairment in multiple sclerosis using GAITRite™ technology. *Gait Posture.* 2011;34(1):145-147.
10. Cavanaugh JT, Gappmaier VO, Dibble LE, Gappmaier E. Ambulatory activity in individuals with multiple sclerosis. *J Neurol Phys Ther.* 2011;35(1):26-33.
11. Nilsagard Y, Lundholm C, Denison E, Gunnarsson LG. Predicting accidental falls in people with multiple sclerosis--a longitudinal study. *Clin Rehabil.* 2009;23:259-269.
12. Riazi A, Thompson AJ, Hobart JC. Self-efficacy predicts self-reported health status in multiple sclerosis. *Mult Scler.* 2004;10(1):61-66.

Instrument name: 2 Minute Walk Test (MWT)

Reviewer: Amy M. Yorke, PT, NCS | **Date of review:** 6/18/11

ICF domain (check all that apply):

_____ Body function/structure ___x__ Activity _____ Participation

Constructs measured: (check all that apply):

__x___ Aerobic capacity/endurance
_____ Ataxia
_____ Cardiovascular/pulmonary status
_____ Coordination (non-equilibrium)
_____ Dizziness/vestibular
_____ Fatigue
_____ Flexibility
_____ Muscle performance
_____ Muscle tone
_____ Pain
_____ Posture
_____ Sensory integration
_____ Somatosensation
_____ Balance/falls
_____ Bed mobility
___x__ Gait
_____ Reach and grasp
_____ Transfers
_____ Wheelchair skills
_____ Health and wellness
_____ Home management
_____ Leisure
_____ Quality of life
_____ Role function
_____ Shopping
_____ Social function
_____ Work

Other:

Type of measure:

___x__ Performance-based _____ Self-report

Instrument properties:

- Submaximal measure of gait velocity and endurance. Distance walked in 2 minutes
- Other versions have different time duration of the test (3, 5, 6 ,10, and 12 minutes)

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • ICC=0.82; tested on 18 patients who sustained a CVA currently receiving inpatient rehab[1] Inter-rater: • ICC=0.85; tested on 18 patients who sustained a CVA currently receiving inpatient rehab[1] • ICC=0.92 for comfortable walking speed and ICC=0.98 maximum walking speed when tested on 37 inpatients and outpatients with neurological dysfunction (32 CVA, 3 Parkinson's disease, 1 MS, 1 spinal stenosis, 1 brain tumor, 1 cerebellar degeneration)[2] Test-retest:

	• ICC=0.97 tested on 46 subjects with various neurological conditions (1 with MS)[3] • ICC≥0.94 when tested on 16 older adults living in long term care[4]
Validity (concurrent, criterion-related, predictive)	Concurrent validity: • Comfortable and maximum walking speed were correlated with FIM transfer score r=0.581 and 0.377 respectively; FIM locomotion score r=0.524 and 0.566 respectively; rating of safety by rater r=0.521 and 0.341 respectively. Comfortable walking speed correlated with Chedoke-McMaster Disability Inventory Score at r=0.519[2] • High correlations between 2MWT versus 12MWT (r=0.955) and 2MWT and 6MWT (r=0.982) when tested on 10 patients with limited exercise tolerance secondary to chronic respiratory difficulty[B] • Pearson correlations for the 2 MWT by the same rater on the same day when tested in patients with stroke: 2MWT versus 6 MWT (r=0.997, p<0.0001) and 2MWT versus 12MWT (r=0.993, p<0.0001)[1] • Correlated with Rivermead Mobility Index (0.75) and 10-meter timed walk (-0.61) in individuals with various neurological conditions (1 with MS)[3] • In frail geriatric patients admitted to inpatient rehabilitation unit, correlations between 2 MWT and TUG on admission (r=-0.68, p<0.001) and discharge (r=-0.81, p<0.001); 2MWT and FIM on admission (r=0.59, p<0.001) and discharge (r=0.47, p=0.004); 2 MWT and modified Barthel Index on admission (r=0.42, p=0.005) and discharge (0.35, p=0.04); 2MWT and Functional Reach on admission (r=0.41, p<0.001) and discharge (0.51, p=0.002)[6] • Correlated with Berg Balance Scale, TUG, and 6MWT (r≥0.84) when tested in 16 older adults residing in long term care[4] Predictive validity: • When tested in patients with moderate MS (EDSS 4.5-6.5) 2 MWT explained over 50% of the variance (R^2=0.53, p<0.01) of habitual walking performance.[7] • Maximal speed walk test = (1.02)(comfortable speed walk test) + 7.08, R^2=0.86[2] • Comfortable speed walk test = (0.84)(maximal speed walk test) + 4.73, R^2=0.86[2] Discriminative validity: • In frail geriatric patients in inpatient rehabilitation 2MWT demonstrated the ability to discriminate between the use of aid or no aid during ambulation[6] • Able to discriminate between individuals with neurological conditions with sensory loss versus without lower extremity sensory impairment and those needing walking aids versus those

	not needing walking aids: 45/46 subjects unable to walk > 40 m in 2 minutes required assistive device; those able to walk >80 m did not need a device (1 with MS)[3] Sensitivity/Specificity/Predictive Values/Likelihood Ratios: • Found to be sensitive to determine walking endurance problems in individuals with PD[8]
Ceiling/floor effects	Ceiling effects: • Floor effects: •
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • Inter-occasion MDC values ranged from 12.2 to 14.7 m when tested in 16 older adults who resided in nursing home[4] • 19.8 meters for comfortable walking speed and 11.4 meters for maximum walking speed[2] MCID: • Other responsiveness values: • Responsiveness to change in 18 patients who were receiving inpatient rehab secondary to stroke as assessed with standardized response of means for 2MWT was 1.34[1] • In frail geriatric patients improvement in 2MWT after inpatient rehabilitation with standardized response of means was 0.7[6] Normative Data: • In a group of 50 patients with MS, those patients with EDSS scores 1.5-4.0 ambulated 173 m ± 31 (40-172). Patients with EDSS scores 4.5-6.5 ambulated 104 m ± 41 (40-172).[7]
Instrument use	• Minute walk tests have been used in various patient populations (neuromuscular, cardiovascular and pulmonary, cancer, amputation)
Equipment required	• Stopwatch • Two small cones to mark the turnaround point • A chair that can be easily moved along the walking course • Worksheets on a clipboard • Sphygmomanometer
Time to complete	• Two practice walks have been recommended prior to measurements secondary to initial training effects[5,8] • 2 minutes, plus additional time needed for instructions and practice trials (if utilized)
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• Distance walked, and the number and duration of rests during the 2 minutes should be measured
Level of client participation required (is proxy	• Client must be able to ambulate. Proxy not appropriate.

participation available?)	
Limitations	•

Recommendations
Practice Setting (check all that apply):

__x___ Acute
__x___ Inpatient Rehab
__x___ Home Health
__x___ Skilled Nursing
__x___ Outpatient

Comments:
- Feasibility in home environments may be limited by available space

Level of Disability (check all that apply):

__x___ EDSS 0.0 – 3.5
__x___ EDSS 4.0 – 5.5
__x___ EDSS 6.0 – 7.5
_____ EDSS 8.0 – 9.5

Comments:
- Appropriate for patients at EDSS levels 0.0—6.5

Should this tool be required for entry-level curricula?

__x___ Yes _____ No

Comments:
- The 2 MWT is a reliable and valid measure of submaximal gait endurance, easy to administer, and applicable to patients across various EDSS levels in a variety of settings

Is this tool appropriate for research purposes?

_____ Yes __x___ No

Comments:
- Lack of psychometric data in MS, so do not recommend for use in research at this point in time.
- Recommend investigating psychometric properties in MS.

Attachments:

- Score Sheets: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Instructions: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Reference list: _____ Uploaded on website

Second Reviewer Comments: • Great review, Amy. The psychometric data provided regarding non-MS populations is helpful, given the sparse data in subjects with MS.
Overall Taskforce Agreement with Recommendations: •

Practice Setting	**4**	**3**	**2**	**1**	**Comments**
Acute			X		•
Inpatient Rehab			X		•
Home Health			X		• Feasibility may be limited by space availability
Skilled Nursing			X		• Patients in this setting are often more disabled, which may limit the clinical utility of the 2 MWT
Outpatient			X		•
Overall Comments: • Rating reflects lack of psychometric data in MS population					

Level of Disability	**4**	**3**	**2**	**1**	**Comments**
EDSS 0.0 – 3.5			X		•
EDSS 4.0 – 5.5			X		•
EDSS 6.0 – 7.5			X		• Useful to EDSS 6.5
EDSS 8.0 – 9.5				X	•
Overall Comments: • Rating reflects lack of psychometric data in MS population					

Entry-Level Criteria	**Students should learn to administer tool**	**Students should be exposed to tool (e.g. to read literature)**	**Do not recommend**	**Comments**
Should this tool be required for entry level curricula?	X			• Broad applicability of the 2 MWT across patient groups and health individuals make it appropriate for entry level education

Research Use	YES	NO	Comments
Is this tool appropriate for research purposes?		X	• Lack of psychometric data in MS, so do not recommend for use in research at this point in time. • Recommend investigating psychometric properties in MS.

References:

1. Kosak M, Smith T. Comparison of the 2-, 6-, and 12-minute walk tests in patients with stroke. *Journal of Rehabilitation Research and Development.* 2005;42(1):103-108.
2. Miller PA, Moreland J, Stevenson TJ. Measurement properties of a standardized version of the two-minute walk test for individuals with neurological dysfunction. *Physiotherapy Canada.* 2002:54(4):241-257.
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Instrument name: 5 – Time Sit to Stand	
Reviewer: Susan E. Bennett, PT, DPT, EdD, NCS, MSCS	**Date of review:** 4/30/11

ICF domain (check all that apply):

_____ Body function/structure __x__ Activity _____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance
_____ Ataxia
_____ Cardiovascular/pulmonary status
_____ Coordination (non-equilibrium)
_____ Dizziness/vestibular
_____ Fatigue
_____ Flexibility
_____ Muscle performance
_____ Muscle tone / spasticity
_____ Pain
_____ Posture
_____ Sensory integration
_____ Somatosensation

_____ Balance/falls
_____ Bed mobility
_____ Gait
_____ Reach and grasp
_____ Self care
__x__ Transfers
_____ Wheelchair skills

_____ Health and wellness
_____ Home management
_____ Leisure
_____ Quality of life
_____ Role function
_____ Shopping
_____ Social function
_____ Work

Other:

Type of measure:

__x__ Performance-based _____ Self-report

Instrument description:

- Timed test of 5 repetitions of standing up and sitting down as quickly as possible when rising from a chair. It is a performance based multi-dimensional task that is a measure of both balance and lower extremity strength.

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • ICC range .970-.976 (Chronic stroke)[1] Inter-rater: • ICC=.999 (Chronic Stroke)[1] Test-retest: • ICC .89 in 30 older community-living adults[2] • ICC=0.933 in patients with stroke[3] • ICC range .989-.99 (Chronic stroke)[1] • ICC= .96 (osteoarthritis)[4]

Validity (concurrent, criterion-related, predictive)	Concurrent validity: • Spearman rho = -.68, between the FTSST and the DGI, and -.58 between FTSST and the ABC.[5] • Pearson Correlation Coefficients ranged from .635 to -.943 between the STS and the TUG or gait speed.[6] • Women with cognitive impairment took more time in performing FTSS (17.8+/- 0.9 seconds versus 16.1 +/- 0.3 seconds, p<0.001). [7] • FTSST demonstrated a statistically significant moderately high correlation with the TUG and gait speed.[8] • Negative correlation with the Berg Balance Scale scores (r=-0.837), moderate correlation with muscle strength index (r=-0.577) and distance covered in a 6-min walk test in community dwelling stroke survivors. [9] Predictive validity: • The FTSS limit value in predicting moderate cognitive impairment was set at 15 seconds by a sensitivity analysis (negative predictive value =86%). Negative association of FTSS with global cognitive performance. Achieving FTSS in less than 15 seconds made unlikely the existence of a moderate cognitive impairment.[7] • Elderly subjects needed more than 15 seconds to complete the test and had a 74% greater risk of recurrent falls then those who took less time.[10] Discriminative validity: • Vestibular patients: FTSST correctly identified 65% of fallers and was better in pts < 60 y/o (ABC=80%, DGI=78%)[5] Sensitivity/Specificity/Predictive Values/Likelihood Ratios: • An FTSST time of 13 seconds was judged to represent the best combination of sensitivity (66%) and specificity (67%). [5] • At the cutoff of 13 seconds, the positive predictive value of the FTSST for group membership was 61% (moderate) and the negative predictive value was 54%.[5] • A FTSST change of >/= 2.3 seconds was identified as a cut off score that provided the best discrimination of sensitivity (67.7%) and specificity (66.2%) for identification of patients that made clinical improvement.[8] • Cutoff score of 15 was predictive for fallers in the elderly.[10]
Ceiling/floor effects	Ceiling effects: • Floor effects:

5 – Time Sit to Stand

	•
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • MCID: • Other responsiveness values: • Adult patients with balance and/or vestibular disorders showed a responsiveness-treatment coefficient of 0.58 for the FTSST indicating moderate responsiveness.[8] Normative Data: • 23-60 y/o = 15.3 seconds[5] • 60-69 = 11.4 seconds [11] • 70-79= 12.6 seconds[11], • >80 y/o = 14.8 seconds[11] • 12.1 sec male & 12.2 sec female[2]
Instrument use	•
Equipment required	• 43 cm high chair (the height originally used, studies have used chairs with varying heights), stopwatch
Time to complete	• Short depends on the ability of the patient to perform, usually less than 1 minute.
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• Subjects start by crossing their arms on their chest, sitting with their back against the chair. • Tester states: I want you to stand up and sit down 5 times as quickly as you can when I say 'Go'. • Timing begins when the tester says 'Go" and stops when the subjects buttocks touch the chair on the fifth repetition. • Investigator instructs the subject to stand fully upright and to avoid touching the back of the chair during each repetition.
Level of client participation required (is proxy participation available?)	• Client must be present.
Limitations	• Appears to be more useful with younger subjects • Chair height related to subject height may affect whether an older adult is able to rise from the chair[5] • Few studies use the FTSST test for adults with balance and vestibular disorders[8] • Does not take into account coordination, proprioception or tone.
Recommendations **Practice Setting (check all that apply):** __x___ Acute	

__X__ Inpatient Rehab
__X__ Home Health
__X__ Skilled Nursing
__X__ Outpatient

Comments:

- Easy to perform and even in the home setting could be reproduced with the same chair available to the client

Level of Disability (check all that apply):

__X__ EDSS 0.0 – 3.5
__X__ EDSS 4.0 – 5.5
__X__ EDSS 6.0 – 7.5
_____ EDSS 8.0 – 9.5

Comments:

-

Should this tool be required for entry-level curricula?

_____ Yes ___x__ No

Comments:

- Applicable to many neurological populations, but data is lacking supporting its use in patients with MS

Is this tool appropriate for research purposes?

__ __ Yes __x___ No

Comments:

- Lack of psychometric data in MS, so do not recommend for use in research at this point in time.
- Recommend investigating psychometric properties in MS.

Attachments:

- Score Sheets: _NA__ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Instructions: ___X__ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Reference list: __X__ Uploaded on website

http://ptjournal.apta.org/content/85/10/1034.full#T1

Second Reviewer Comments: • Agree with recommendations
Overall Taskforce Agreement with Recommendations: •

Practice Setting	**4**	**3**	**2**	**1**	**Comments**
Acute			X		•
Inpatient Rehab			X		•
Home Health			X		•
Skilled Nursing			X		•
Outpatient			X		•
Overall Comments: • Ratings reflect lack of psychometric data specific to individuals with MS					

Level of Disability	**4**	**3**	**2**	**1**	**Comments**
EDSS 0.0 – 3.5			X		•
EDSS 4.0 – 5.5			X		•
EDSS 6.0 – 7.5			X		•
EDSS 8.0 – 9.5				X	•
Overall Comments: • Ratings for EDSS levels 0.0 – 7.5 reflect lack of psychometric data specific to individuals with MS					

Entry-Level Criteria	**Students should learn to administer tool**	**Students should be exposed to tool (e.g. to read literature)**	**Do not recommend**	**Comments**
Should this tool be required for entry level curricula?			X	• Recommendation is based on lack of psychometric data in individuals with MS

Research Use	**YES**	**NO**	**Comments**
Is this tool appropriate for research purposes?		X	• Lack of psychometric data in MS, so do not recommend for use in research at this point in time.

			• Recommend investigating psychometric properties in MS.

References:

1) Mong Y, Tilda T, et al. 5-Repetition Sit-to-Stand Test in Subjects With Chronic Stroke: Reliability and Validity. *Arch Phys Med Rehabil*. 2010 March;91(3):407-413.
2) Lord SR, Murr SM, Chapman K, et al. Sit-to-stand performance depends on sensation, speed, balance, and psychological status in addition to strength in older people. *J Gerontol A Biol Sci Med Sci*. 2002;57: 539-43.
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4) Lin Y, et al. Tests for physical function of the elderly with knee and hip osteoarthritis. *Scand J Med Sci Sports*. 2001;11:280-286.
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6) Schaubert KL, Bohannon RW. Reliability and validity of three strength measures obtained from community-dwelling elderly persons. *J Strength Cond Res*. 2005 Aug;(3):717-20.
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8) Meretta B, Whitney S, Marchetti G, et al. The five times sit to stand test: Responsiveness to change and concurrent validity in adults undergoing vestibular rehabilitation. *Journal of Vestibular Research*. 2006;16:233-243. 27, 28, 34, 10, 8, 21, 14
9) Ng S. Balance ability, not muscle strength and exercise endurance, determines the performance of hemiparetic subjects on the timed-sit-to-stand test. *Am J Phys Med Rehabil*. 2010;89(6):497-504.
10) Buatois S, Miljkovic D, et al. Five times sit to stand test is a predictor of recurrent falls in healthy community living subjects aged 65 and older. *Journal of the American Geriatrics Society*. 2008;56(8):1575-1577.
11) Bohannon RW. Reference values for the five-repetition sit-to-stand test: a descriptive meta-analysis of data for elders. Percept Mot Skills. 2006 Aug; 103(1):215-22.

Instrument name: 6 Minute Walk Test (MWT)

Reviewer: Kirsten Potter, PT, DPT, MS, NCS | **Date of review:** 3/5/11

ICF domain (check all that apply):

_____ Body function/structure __x___ Activity _____ Participation

Constructs measured: (check all that apply):

__x___ Aerobic capacity/endurance
_____ Ataxia
_____ Cardiovascular/pulmonary status
_____ Coordination (non-equilibrium)
_____ Dizziness/vestibular
_____ Fatigue
_____ Flexibility
_____ Muscle performance
_____ Muscle tone / spasticity
_____ Pain
_____ Posture
_____ Sensory integration
_____ Somatosensation

_____ Balance/falls
_____ Bed mobility
__x___ Gait
_____ Reach and grasp
_____ Self care
_____ Transfers
_____ Wheelchair skills

_____ Health and wellness
_____ Home management
_____ Leisure
_____ Quality of life
_____ Role function
_____ Shopping
_____ Social function
_____ Work

Other:

Type of measure:

__x___ Performance-based _____ Self-report

Instrument description:

- Submaximal measure of gait velocity and durance – distance walked in 6 minutes
- Other versions: different time duration of test (2, 3, 5, 10, and 12 minutes)

Reliability (test-retest, intra-rater, inter-rater)

Intra-rater:

- ICC = 0.91; tested on 40 patients with MS (EDSS range 0 – 6.5)[1]
- ICC values ranged from 0.76 – 0.90 when tested on elders with late stage Alzheimer's disease.[2]

Inter-rater:

- ICC = 0.94; tested on 40 patients with MS (EDSS range 0 – 6.5)[1]
- ICC = 0.93 (95% CI 0.74 – 0.98) in 19 patients with MS (EDSS ≤ 6.5)[3]
- ICC values ranged from 0.97 – 0.99 when tested on elders with late stage Alzheimer's disease.[2]

Test-retest:

- In 12 ambulatory, community dwelling individuals with various forms of MS (EDSS mean = 3.6; range 2.0 – 6.5) ICC = 0.96 (95%

	CI 0.87 – 0.99)[4] • In 19 subjects with MS (EDSS ≤ 6.5), ICC = 0.96 (95% CI 0.91 – 0.98)[3] • ICC = 0.96 in subjects with Parkinson's disease[5] • ICC = 0.987 in subjects with Alzheimer's disease[6] • 2 minute walk test = 0.97; tested on 46 subjects with various neurological conditions (1 with MS)[7] • ICC = 0.95 of 6 MWT in community dwelling older individuals[8]
Validity (concurrent, criterion-related, predictive)	<u>Concurrent validity:</u> • In ambulatory community dwelling individuals with various forms of MS (EDSS mean = 3.6; range 2.0 – 6.5): 6 MWT correlated with functional stair test (rho = 0-85.; p = .00) and sit to stand test (rho = 0-.82; p = .00); 6 MWT did not correlate significantly with static standing balance test (rho = 0.31; p = .34) or rating of perceived exertion (rho = -0.31; p = .33)[4] • With EDSS (r = - 0.76, p < 0.0001), Modified Ashworth Scale (r = - 0.69, p < 0.0001), FEV_1/FVC ratio (r = - 0.47, p < 0.008), baseline heart rate (r = - 0.41, p < 0.024) in ambulatory patients with MS (median EDSS score = 4.0; range 1.5 – 6)[9] • With FVC (r = 0.36, p < 0.049), change in heart rate (r = 0.55, p < 0.002), and Barthel Index score (r = 0.81, p < 0.049) in ambulatory patients with MS (median EDSS score = 4.0; range 1.5 – 6)[9] • 6 MWT (expressed as percent of predicted value) correlated with EDSS score (rho = -0.82, p< 0.01), but not Modified Fatigue Impact Score in individuals with mild MS (median EDSS = 2.5; range 1 – 3.5)[10] • Mental health inventory (r = 0.33; P = 0.013)[1] • EDSS functional system scale scores: pyramidal (r = -0.63; p < 0.0001), cerebellar (r = -0.69; p < 0.0001), and sensory (r = -0.63; p < 0.0001)[1] • Modified Fatigue Impact Scale (r = 0.59; p < 0.001), Modified Fatigue Impact Scale – Physical subsection (r = 0.66; p < 0.001), SF – 36 physical component score (r = 0.69; p < 0.001), and MS Walking Scale – 12 (r = 0.72; p < 0.0001)[1] • EDSS score (r = -0.73; p < 0.0001), MS Functional Composite (r = 0.59; p < 0.001), Timed 25 Foot walk (r = -0.83; p < 0.0001) • 2 minute walk test significantly correlates with Rivermead Mobility Index (0.75) and 10-meter timed walk (-0.61) in individuals with various neurological conditions (1 with MS)[7] <u>Predictive validity:</u> •

	Discriminative validity: • 6 MWT appears able to discriminate between healthy individuals and those with MS; 6 MWT distance[9] covered by 96.7% of subjects with MS was lower than the 95% CI of the healthy subjects (588.1 vs. 639.9 m) • Able to distinguish between individuals with MS and healthy controls (controls walked 616 m ± 61.9) ($p<0.0001$) and between individuals with mild (595 m ± 50.3) vs. moderate (496 ± 106.3) vs. severe (378 ± 83.1) MS based on EDSS score ($p<0.05$)[1] • More precise, compared to Timed 25 Foot Walk Test and MS Functional Composite, in determining disability groups in people with MS[1] • Able to distinguish between healthy individuals (6 MWT mean = 577 m ± 56) vs. those with MS (6 MWT mean = 384 ± 42) ($p < 0.05$)[10] • 2 minute walk test is able to discriminate between individuals with neurological conditions with lower extremity sensory impairment vs. without lower extremity sensory impairment and those needing walking aids vs. those not needing walking aids: 45/46 subjects unable to walk > 40 m in 2 minutes required assistive device; those able to walk > 80 m did not need a device[7] Sensitivity/Specificity/Predictive Values/Likelihood Ratios: •
Ceiling/floor effects	Ceiling effects: • Floor effects: •
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • ± 92.16m tested in 120 ambulatory individuals with MS: median EDSS = 2.0 with range 0 – 6.5[11] • 82 m in patients with Parkinson's disease[5] • 33.47 m (109.8 ft) in subjects with Alzheimer's disease[6] MCID: • Using an anchor of EDSS score: MIC deterioration of 6 MWT = -55.06m (95% CI: -79.51 to -30.62; p<.000); area under receiver operating curve = 0.76 (95% CI: 0.65 to 0.86; p< .000); 6 MWT able to detect individuals who are deteriorating vs. those who are stable[11] • Using patient's perception of change in health as the anchor: MIC deterioration of 6 MWT = -53.35m (95% CI: -77.97 to -28.72; p<.000); area under receiver operating curve = 0.76 (95% CI: 0.67

	to 0.85; p< .000); 6 MWT is able to detect individuals who are deteriorating vs. those who are stable[11] <u>Other responsiveness values:</u> • SEM in subjects with Alzheimer's disease = 20.28 m (66.53 ft)[6] <u>Normative Data:</u> • Reference data in 53 healthy subjects aged 50 – 85 = 631±93 m; males walked 84 m greater than females; variability in walking distance related to subject height, age, and weight[12] • Reference data in 65 people of Asian descent, mean age = 65: 624 m for males and 541 m for females[13] • 6MWT values for 10 healthy individuals aged 36 – 69 (= 683 m; range 630 – 720 m).[14] • Reference values for 6 MWT according to age and gender:[15] Men: Aged 20 – 40 (n = 19): 800 ± 83 m Aged 41 – 60 (n = 12): 671 ± 56 m Aged 61 – 80 (n = 10): 687 ± 89 m Women: Aged 20 – 40 (n = 15): 699 ± 37 m Aged 41 – 60 (n = 13): 670 ± 85 m Aged 61 – 80 (n = 10): 583 ± 53 m • 6 MWT distances (mean in meters, SD, 95% CI) for community dwelling independent elders according to age and gender:[8] **Age 60 – 69:** Male (n=15): 572 m; SD = 92; CI = 521 – 623 Female (n=22): 538 m; SD = 92; CI = 497 – 579 **Age 70 – 79:** Male (n=14): 527 m; SD = 85; CI = 478 – 575 Female (n=22): 471 m; SD = 75; CI = 440 - 507 **Age 80 – 89:** Male (n=8): 417 m; SD = 73; CI = 356 – 478 Female (n=15): 392 m; SD = 85; CI = 345 – 440 • Median distance walked during 6MWT = 576 m for males (median age 59.5 years) and 494 m for females (median age 62.0 years); reference equations to predict total distance walked during 6MWT in healthy adults:[16] Men: 6MWD = (7.57 x height$_{cm}$) – (5.02 x age) – (1.76 x weight$_{cm}$) – 309 m Alternate equation using BMI: 6MWD = 1,140 m - (5.61 x BMI) – (6.94 x age) To determine lower limit (using either equation), subtract 153

	Women: 6MWD = (2.11 x height$_{cm}$) – (2.29 x weight$_{cm}$) – (5.78 x age) + 667 m Alternate equation using BMI: 6MWD = 1,017 m - (6.24x BMI) – (5.83 x age) To determine lower limit (using either equation), subtract 139
Instrument use	• Minute walk tests have been used in various patient populations (e.g., neuromuscular, cardiovascular and pulmonary, cancer, amputation) • Detailed instructions are provided in the American Thoracic Society: Guidelines for the Six-Minute Walk Test[17]
Equipment required	• Stopwatch • Two small cones to mark the turnaround point • A chair that can be easily moved along the walking course • Worksheets on a clipboard • Sphygmomanometer
Time to complete	• 6 minutes, plus additional time needed for instructions.
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• Distance walked, and the number and duration of rests during the 6 minutes should be measured
Level of client participation required (is proxy participation available?)	• Client must be able to ambulate. Proxy not appropriate. • One trial is sufficient; no practice effect has been found when tested on individuals with MS[1] • Well tolerated by individuals with MS, even those with severe walking disability[1]
Limitations	• While reference values exist, these tend to pertain primarily to older individuals and subject populations in these studies were small
Recommendations **Practice Setting (check all that apply):** __x___ Acute __x___ Inpatient Rehab _____ Home Health __x___ Skilled Nursing __x___ Outpatient Comments: • Feasibility in home environments may be limited by available space	

Level of Disability (check all that apply):

__x___ EDSS 0.0 – 3.5
__x___ EDSS 4.0 – 5.5
__x___ EDSS 6.0 – 7.5
_____ EDSS 8.0 – 9.5

Comments:

- Appropriate for patients at EDSS levels 0.0 – 6.5.

Should this tool be required for entry-level curricula?

__x___ Yes _____ No

Comments:

- The 6 MWT is a reliable and valid measure of submaximal gait endurance, easy to administer, and applicable to patients across various EDSS levels in a variety of settings

Is this tool appropriate for research purposes?

__x___ Yes _____ No

Comments:

-

Attachments:

- Score Sheets: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Instructions: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Reference list: _____ Uploaded on website

Second Reviewer Comments:

- Agree with ratings and recommendations.

Overall Taskforce Agreement with Recommendations:

-

Practice Setting	4	3	2	1	Comments
Acute		X			• Rating reflects potential for clinical utility issues in an acute care setting
Inpatient Rehab	X				•
Home Health				X	• Feasibility may be limited by space availability
Skilled Nursing		X			• Patients in this setting may be more disabled, which may limit the clinical

					utility of the 6 MWT
Outpatient	X				•
Overall Comments: •					

Level of Disability	**4**	**3**	**2**	**1**	**Comments**
EDSS 0.0 – 3.5	X				•
EDSS 4.0 – 5.5	X				•
EDSS 6.0 – 7.5		X			• Studies support use of 6 MWT up to EDSS = 6.5; limited utility at levels ≥7.0
EDSS 8.0 – 9.5				X	•
Overall Comments: •					

Entry-Level Criteria	**Students should learn to administer tool**	**Students should be exposed to tool (e.g. to read literature)**	**Do not recommend**	**Comments**
Should this tool be required for entry level curricula?	X			• Broad applicability of the 6 MWT across patient groups and healthy individuals make it appropriate for entry level education

Research Use	**YES**	**NO**	**Comments**
Is this tool appropriate for research purposes?	X		•

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12. Troosters T, Gosselink R, Decramer M. Six minute walking distance in healthy elderly subjects. *Eur Respir J.*1999;14(2):270-274.
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Instrument name: 9 Hole Peg Test (9HPT)

Reviewer: Kathleen Brandfass, MS, PT | **Date of review:** 8/18/11

ICF domain (check all that apply):

_____ Body function/structure __X___ Activity _____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance	_____ Balance/falls	_____ Health and wellness
_____ Ataxia	_____ Bed mobility	_____ Home management
_____ Cardiovascular/pulmonary status	_____ Gait	_____ Leisure
__X__ Coordination (non-equilibrium)	__X__ Reach and grasp	_____ Quality of life
_____ Dizziness/vestibular	_____ Self care	_____ Role function
_____ Fatigue	_____ Transfers	_____ Shopping
_____ Flexibility	_____ Wheelchair skills	_____ Social function
__X__ Muscle performance		_____ Work
_____ Muscle tone / spasticity		
_____ Pain		
_____ Posture		
_____ Sensory integration		
_____ Somatosensation		

Other:

Type of measure:

__X__ Performance-based _____ Self-report

Instrument description:

- A 9HPT apparatus with nine ¼-inch pegs is required for this test. The 9HPT is a timed test in which the individual retrieves each peg from the well and places it in the pegboard. Once all 9 pegs are in the pegboard, the individual returns the pegs to the well, 1 at a time. The test is conducted on both the dominant and non-dominant hands, and is measured in seconds.

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • In a group of 32 PWMS (mean EDSS score of 4.5 +/-1.3, range 2-7), 2 raters had ICC of .96 and .98, respectively across 6 tests administered on same day.[1] • In 2 studies of healthy adults, r-values for intrarater reliability for the right hand were .46 [2] and .69,[3] and for the left hand were .44 [2] and .69.[3]

	Inter-rater: • In a group of 32 PWMS (mean EDSS score of 4.5 +/-1.3, range 2-7): ICC=.93 for 6 tests administered on the same day.[1] Test-retest: • In a group of 21 PWMS (mean EDSS score of 4.33 +/-1.93) taking 3 successive 9HPTs on the same day, within individuals SD=7.74 seconds, and between individuals SD=10.62 seconds. In a group of 68 PWMS (mean EDSS score of 4.73 +/-2.33) comparing baseline measures with 6-month retesting, within individuals SD=12.66 seconds, and between individuals SD=17.84 seconds.[4] • Cohen et al identified a learning effect on the 9HPT, with marked improvements in the score between trials 1 and 2. A small improvement was found between trials 2 and 3, and little change was found between trials 3 and 4.[5] This suggests that the individuals should have 1, and preferably 2, practice trials prior to a measured trial.
Validity (concurrent, criterion-related, predictive)	Concurrent validity: • In study with 68 PWMS (mean EDSS score of 4.73 +/-2.33) moderate correlation (-0.7) with the Box and Blocks test.[4] • In study of 31 PWMS (mean EDSS score of 2.56 +/- 1.91), there was moderate correlation between the dominant hand and non-dominant hand 9HPT time with Fatigue Severity Scale (FSS) (r= .248 and r= .128, respectively); Paced Auditory Serial Addition Test (PASAT) (r= -.301 and r= -.258, respectively); The Multiple Sclerosis Quality of Life Instrument-54 (MSQOL-54) - Physical Health Composite Score (r= -.372 and r= -.375, respectively); and the MSQOL-54 – Mental Health Composite Score (r= -.148 and r= -.173, respectively).[6] • In study of 436 PWMS (EDSS mean score 5.2 +/- 1.1, range 3.5-6.5) 9HPT time was correlated with the 3-second PASAT (r=.35), the Timed 25-foot Walk Test (r=.51) and with the Multiple Sclerosis Functional Composite Score (r=.84), and inversely correlated with EDSS score (r= -.47).[5] • In study of 137 PWMS (EDSS median score=2.5, interquartile range = 1.5-5.5), 9HPT time inversely correlated with whole brain parenchyma/intracranial volume (r= -.37) and correlated with ventricular whole brain parenchyma (r= .42) as measured by MRI.[7] Predictive validity: • A 20% worsening from baseline increases odds of a one-point

	worsening in EDSS score by 5.0.[8] Discriminative validity: • Sensitivity/Specificity/Predictive Values/Likelihood Ratios: • In study with 112 PWMS (mean EDSS score=4.5, range = 3.5-6.0) prior to and 6 weeks after receiving IV methylprednisolone, the 9HPT time had a 12% sensitivity and a 93% specificity in identifying change on an individually-rated measure of change over time. This change was measured using an anchor-based approach in which participants rated change as either no recovery at all, little recovery, moderate recovery or complete recovery compared to the baseline status. The 9HPT had a positive predictive validity of 60% and a negative predictive validity of 55%.[9]
Ceiling/floor effects	Ceiling effects: • No reported ceiling effects Floor effects: • No reported floor effects
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • MCID: • A 20% difference is considered a reliable change.[4,10-14] Other responsiveness values: • Normative Data: • Normative values based on age (greater than 20 years) and gender are available.[3]
Instrument use	• Upper extremity function
Equipment required	• 9HPT apparatus, stop watch
Time to complete	• 1 to 5 minutes depending on the upper extremity function of the individual.
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• Recorded in seconds for both dominant and non-dominant hand
Level of client participation required (is proxy participation available?)	• Active participation of the individual is required
Limitations	• Test results could be skewed by upper extremity motor limitations or tremor, and cognitive dysfunction. The identified

	practice effect must be considered when administering the 9HPT.

Recommendations
Practice Setting (check all that apply):

__X__ Acute
__X__ Inpatient Rehab
__X__ Home Health
__X__ Skilled Nursing
__X__ Outpatient

Comments:

- Acute setting could potentially have less application secondary to level of acuity. All other settings are dependent on upper extremity function.

Level of Disability (check all that apply):

__X__ EDSS 0.0 – 3.5
__X__ EDSS 4.0 – 5.5
__X__ EDSS 6.0 – 7.5
__X___ EDSS 8.0 – 9.5

Comments:

- There is little evidence for the use of the 9HPT in PWMS with EDSS scores of 8.0-8.5, however, it seems that if the person to be tested has adequate upper extremity function to complete the test that it might still be useful in this more disabled population.

Should this tool be required for entry-level curricula?

__X___ Yes _____ No

Comments:

- Brief tool for evaluating upper extremity function with adequate reliability, validity and clinical utility in the MS population.

Is this tool appropriate for research purposes?

__X___ Yes _____ No

Comments:

- Both as a stand-alone measure of upper extremity function and as a component of the Multiple Sclerosis Functional Composite.

Attachments:

- Score Sheets: National MS Society web site_____ Uploaded on website _____ Available but copyrighted _____ Unavailable

- Instructions: National MS Society web site _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
  Instructions were published by Mathiowetz et al.[3]

- Reference list: _____ Uploaded on website

Second Reviewer Comments:

- I concur with the review.

Overall Taskforce Agreement with Recommendations:

-

Practice Setting	**4**	**3**	**2**	**1**	**Comments**
Acute	X				•
Inpatient Rehab	X				•
Home Health	X				•
Skilled Nursing	X				•
Outpatient	X				•

Overall Comments:

-

Level of Disability	**4**	**3**	**2**	**1**	**Comments**
EDSS 0.0 – 3.5	X				•
EDSS 4.0 – 5.5	X				•
EDSS 6.0 – 7.5	X				•
EDSS 8.0 – 9.5		X			•

Overall Comments:

- Dependent on upper extremity function therefore depending on the capability of the individual could be tested at EDSS level thru 6.0-7.5. May be appropriate for use through EDSS of 8.5 if sufficient upper extremity function remains.

Entry-Level Criteria	**Students should learn to administer tool**	**Students should be exposed to tool (e.g. to read literature)**	**Do not recommend**	**Comments**
Should this tool be required for entry level	X			• The reason for inclusion of the 9HPT in entry core

curricula?				curricula: the test is as relevant tool for evaluating upper extremity function in the MS population. The measure is sensitive to change. It has reliability and validity data as a separate test and as part of the MSFC.

Research Use	YES	NO	Comments
Is this tool appropriate for research purposes?	X		• Has been utilized in multiple research trials. The 9HPT is appropriate for future clinical trials. • Recommend investigating psychometric properties in patients with MS with more significant disease severity (higher EDSS levels).

References:

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14. Schwid SR, Goodman AD, McDermott MP, Bever CF, Cook SD. Quantitative functional measures in MS: what is a reliable change? *Neurology.* Apr 23 2002;58(8):1294-1296.

Instrument name: Activities-specific Balance Confidence Scale (ABC)

Reviewer: Amy M. Yorke, PT, NCS | **Date of review:** 5/5/11

ICF domain (check all that apply):

_____ Body function/structure __x___ Activity __x___ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance
_____ Ataxia
_____ Cardiovascular/pulmonary status
_____ Coordination (non-equilibrium)
_____ Dizziness/vestibular
_____ Fatigue
_____ Flexibility
_____ Muscle performance
_____ Muscle tone
_____ Pain
_____ Posture
_____ Sensory integration
_____ Somatosensation

__x___ Balance/falls
_____ Bed mobility
___x__ Gait
_____ Reach and grasp
___x__ Transfers
_____ Wheelchair skills

_____ Health and wellness
___x__ Home management
_____ Leisure
_____ Quality of life
_____ Role function
___x__ Shopping
_____ Social function
_____ Work

Other:

Type of measure:

_____ Performance-based ___x__ Self-report

Instrument properties:

- 16 item questionnaire rating confidence on a continuous scale from 0-100% performing a variety of in home and community based functional activities.[1]
- A short version of the test, the ABC-6 has been developed and found to be valid and a reliable measure of balance confidence in community dwelling older adults.[2-3] The ABC-6 has not been tested on patients with MS.
- A simplified version of the ABC Scale was developed for older adults. The simplified version has not been tested on patients with MS.[4]

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • Inter-rater: • Test-retest: • ICC = .92 (95% CI 0.80-0.97); tested on 25 patients with MS[5] • High test-retest reliability when tested with a sample of 60 community dwelling seniors (r=0.92)[1]

	• ICC = .85 (95% CI 0.68-0.93) tested among 77 individuals with stroke who live in the community[6]
Validity (concurrent, criterion-related, predictive)	<u>Concurrent validity:</u> • ABC related to Berg Balance Scale (r=0.48), Dynamic Gait Index (r = 0.54), Timed Up and Go (r= -0.38), Hauser Deambulation Index (r = -0.45) tested in a group of 51 patients with MS[7] • ABC and Falls Efficacy Scale (FES) highly correlated (r=0.84)[1] in community dwelling older adults • Moderate positive linear correlation between ABC with the BBS (r=0.36) and gait speed (r=0.48) in patients with chronic stroke[6] • ABC related to SF-36 physical functioning subscale (r=0.60), Berg Balance Scale (r=0.42), maximum walking speed (r=0.43), comfortable walking speed (r=0.42), 6 minute walk test (r=0.40), Barthel Index (r=0.37), and the Timed Up and Go (r=0.37) in 91 community dwelling stroke survivors[8] • In 25 patients post stroke, the ABC correlated moderately with the DGI (r=0.68)[9] • Moderate correlation (r=0.58) between the ABC and the DGI in patients with vestibular dysfunction[10] • Moderate negative correlation (r=-0.64) between the ABC and DHI in 71 patients with vestibular dysfunction[11] • High correlation between the ABC and FES (r=0.86) in 188 community dwelling older adults[12] <u>Predictive validity:</u> • In 91 community dwelling stroke survivors, ABC scores were associated with walking independence, use of an assistive device, and depression. An improvement on the ABC was predictive of physical function and health, and perceived health status.[7] • ABC explained only 22% of the variance in predicting which older adults would restrict their activity[12] <u>Discriminative validity:</u> • <u>Sensitivity/Specificity/Predictive Values/Likelihood Ratios:</u> • In a group of 51 patients with MS, a cut off score >40% demonstrated sensitivity of 65% and specificity of 77% between fallers and non-fallers[7] • In a group of125 older adults categorized into 2 groups (fallers and non-fallers) a cut off score >67% demonstrated 84% sensitivity and 88% specificity[13] • ABC scores in older adults: < 50 indicate a low level of physical functioning (e.g. home care), scores 50-80 indicate a moderate level of functioning (older adults living in retirement homes and

	then with chronic health conditions), and scores > 80 indicated highly functioning older adults[14] • ABC with a cut off score of 81%, positive likelihood ratio of 3.60 and negative likelihood ratio of 0.00, demonstrated increased risk of falling in community dwelling stroke survivors[15]
Ceiling/floor effects	<u>Ceiling effects:</u> • No ceiling effect was observed for the ABC test in patients with MS[6] • Demonstrated in 272 community dwelling female Medicare beneficiaries aged 70 and older at risk for falling[16] <u>Floor effects:</u> •
Sensitivity to change (responsiveness, MCID, MDC) / normative data	<u>MDC:</u> • <u>MCID:</u> • <u>Other responsiveness values:</u> • Found to be responsive in community dwelling seniors[1,12-13] • Standardized response means were 0.05 for the ABC in elderly women undergoing 12 week home based education program[16] <u>Normative Data:</u> • 213 community dwelling older women (>70 years) mean score: 78.2 (16.7)[16]
Instrument use	
Equipment required	• Score sheet
Time to complete	• 10-15 minutes • ABC-6 approximately 5 minutes[2-3] • In a simplified version of the ABC the stem of survey was changed to: "up to what point are you confidence that you will maintain your balance when you do the following activities". Scoring changed to ordinal scale: 0=not confident at all, 1=slightly confident, 2=moderately confident, 3=very confident[4]
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• Each item is rated on a continuous scale (0-100%) of confidence. • Higher scores indicate greater balance confidence. • Scores for each item are to be added and divide the total by 16 to give a final average score • The final score ranges from 0-100%
Level of client participation required (is proxy participation available?)	• Self-report survey or can be administered by a tester
Limitations	• Older adults may rate level of confidence different (getting in versus out of the car) for the activity listed[1] • Older adults may not purposely avoid or not be exposed to the activity listed (e.g. walking on icy sidewalk)[1]

	• Older adults have shown problems in interpretation of the question and the response format[4] • Requires intact cognition

Recommendations
Practice Setting (check all that apply):

___x__ Acute
___x__ Inpatient Rehab
___x__ Home Health
___x__ Skilled Nursing
___x__ Outpatient

Comments:
- American and British English, Chinese, French Canadian, Dutch versions available.

Level of Disability (check all that apply):

___x__ EDSS 0.0 – 3.5
___x__ EDSS 4.0 – 5.5
___x__ EDSS 6.0 – 7.5
_____ EDSS 8.0 – 9.55

Comments:
- Considerations need to be made requiring patients current level of function
- Not appropriate to utilize if patient is wheelchair bound

Should this tool be required for entry-level curricula?

__x___ Yes _____ No

Comments:
- Quick and easy to administer
- Can be administered by support staff
- Can be used in multiple populations that have a fear of falling

Is this tool appropriate for research purposes?

__x___ Yes _____ No

Comments:
- ABC scale has been used in intervention trials for MS and provides unique information on the subject's perception of balance, which can be compared/contrasted with performance based clinical measures.

Attachments:

- Score Sheets: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable

- Instructions: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Reference list: _____ Uploaded on website (attached)

Second Reviewer Comments:

- Agree with primary review, the ABC has been validated in the MS population and correlates to multiple balance measures.

Overall Taskforce Agreement with Recommendations:

-

Practice Setting	4	3	2	1	Comments
Acute		X			•
Inpatient Rehab		X			•
Home Health		X			•
Skilled Nursing		X			•
Outpatient		X			•

Overall Comments:

- Rating reflects lack of responsiveness data in MS

Level of Disability	4	3	2	1	Comments
EDSS 0.0 – 3.5		X			•
EDSS 4.0 – 5.5		X			•
EDSS 6.0 – 7.5		X			•
EDSS 8.0 – 9.5				X	•

Overall Comments:

- Rating of 3 for EDSS levels 0.0 – 7.5 reflects lack of responsiveness data in MS

Entry-Level Criteria	Students should learn to administer tool	Students should be exposed to tool (e.g. to read literature)	Do not recommend	Comments
Should this tool be required for entry level curricula?	X			• This tool is widely used clinically and in research and students should know how to administer the test.

Research Use	YES	NO	Comments
Is this tool appropriate for research purposes?	X		•

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1. Powell LE, Myers AM. The Activities-specific Balance Confidence (ABC) Scale. *Journal of Gerontology.* 1995;50A(1):M28-M34.
2. Peretz C, Herman T, Jausdorff JM, Giladi N. Assessing fear of falling: Can a short version of the Activities-specific Balance Confidence Scale be useful? *Movement Disorders*. 2006;21(12):2101-2105.
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Instrument name: Balance Evaluation Systems Test (BESTest)	
Reviewer: Kirsten Potter, PT, DPT, MS, NCS	**Date of review:** 3/17/11

ICF domain (check all that apply):

__x___ Body function/structure __x___ Activity _____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance	__x___ Balance/falls	_____ Health and wellness
_____ Ataxia	_____ Bed mobility	_____ Home management
_____ Cardiovascular/pulmonary status	__x___ Gait	_____ Leisure
_____ Coordination (non-equilibrium)	_____ Reach and grasp	_____ Quality of life
_____ Dizziness/vestibular	_____ Self care	_____ Role function
_____ Fatigue	__x__Transfers	_____ Shopping
__x__ Flexibility	_____ Wheelchair skills	_____ Social function
__x__ Muscle performance		_____ Work
_____ Muscle tone / spasticity		
_____ Pain		
__x__ Posture		
__x__ Sensory integration		
_____ Somatosensation		

Other: Flexibility, muscle performance/strength, and posture are tested in the context of postural control in the BESTest, but are not included items on the Mini-BESTest

Type of measure:

__x___ Performance-based _____ Self-report

Instrument description:

- Developed to assist with identifying the underlying postural control systems responsible for poor functional balance[1]
- 6 underlying systems comprise the BESTest subsections: I: biomechanical constraints (5 items), II: stability limits / verticality (3 items), III: anticipatory postural adjustments (5 items), IV: postural responses (5 items), V: sensory orientation (2 items), and VI: stability in gait (7 items)
- More information can be found at http://www.bestest.us/about.html
- A mini-BESTest has been developed; 14 items from 4 of the original 6 sections of the BESTest (Anticipatory – Transitions; Postural Responses, Sensory Organization; Dynamic Gait) [2]

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • Inter-rater: • ICC = 0.91 for total score; section sub-scores ICCs ranged 0.79 – 0.96; tested in subjects with and without balance disorders, ages 50 - 88 (3 with Parkinson's disease, 5 with vestibular dysfunction, 1 with peripheral neuropathy and total hip replacement, and 3 healthy controls)[1]

	• I: biomechanical constraints (ICC = 0.80), II: stability limits / verticality (ICC = 0.79), III: anticipatory postural adjustments (ICC = 0.92), IV: postural responses (ICC = 0.92), V: sensory orientation (ICC = 0.88), and VI: stability in gait (ICC = 0.91)[1] • ICC = 0.96 (95% CI = 0.89 – 0.99) tested in patients with Parkinson's disease[3] <u>Test-retest:</u> • ICC = 0.91 (95% CI = 0.80 – 0.96) and ICC = 0.88 (95% CI = 0.72 – 0.95) when administered by student physical therapists and physical therapists, respectively; subjects with Parkinson's disease[3]
Validity (concurrent, criterion-related, predictive)	<u>Concurrent validity:</u> • Total BESTest correlates with Activities-specific Balance Confidence Scale (ABC): r = 0.636, p<.01 in subjects with and without balance disorders, [1] • ABC scale scores moderately correlate with BESTest sub-section scores (r = 0.41 – 0.78) in subjects with and without balance disorders, [1] • In subjects with Parkinson's disease, BESTest correlates with ABC (rho = 0.757), Berg Balance Scale (rho = 0.873), and Functional Gait Assessment (rho = 0.882)[3] <u>Predictive validity:</u> • <u>Discriminative validity:</u> • Subjects with balance deficits score significantly lower than healthy controls (p = 0.36)[1] <u>Construct validity:</u> • Poorer performance on Section V: Sensory Orientation in subjects with vestibular disorders; Section IV: Postural Responses in those with Parkinson's disease; and Section III: Anticipatory Postural Adjustments in subjects with neuropathy[1] • Mini-BESTest: hierarchical order of test items is consistent with clinical expectations[2] <u>Sensitivity/Specificity/Predictive Values/Likelihood Ratios:</u> • In subjects with Parkinson's disease, at cut off score ≤ 69%, sensitivity = 0.84 and specificity = 0.76; post-test probability with test ≤ cut off value = 61.3%; post-test probability with test > cut off value = 8.7%; LR+ = 3.49 (95% CI = 2.11 – 5.77); LR - = 0.21 (95% CI = 0.09 – 0.52); sensitivity higher for BESTest as compared

	to Functional Gait Assessment and Berg Balance Scale[3]
Ceiling/floor effects	Ceiling effects: • In patients with Parkinson's disease: lack of ceiling effect (6.4% of subjects scored in top 10%)[3] • Mini-BESTest: no apparent ceiling effect in individuals with balance deficits (mixed neurological conditions, including MS)[2] Floor effects: • Mini-BESTest: no apparent floor effect in individuals with balance deficits (mixed neurological conditions, including MS)[2]
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • MCID: • Other responsiveness values: • Normative Data: •
Instrument use	• BESTest has been studied in healthy individuals and those with Parkinson's disease, vestibular dysfunction, and peripheral neuropathy with total hip replacement[1] • Mini- BESTest has been studied in subjects with balance disorders due to a variety of neurological conditions, including MS[2]
Equipment required	• Stop watch • Measuring tape mounted on wall for Functional Reach test • Approximately 60 cm x 60 cm (2 X 2 ft) block of 4-inch, medium-density, Tempur foam • 10 degree incline ramp (at least 2 x 2 ft) to stand on • Stair step, 15 cm (6 inches) in height for alternate stair tap • 2 stacked shoe boxes for obstacle during gait • 2.5 Kg (5-lb) free weight for rapid arm raise • Firm chair with arms with 3 meters in front marked with tape for

	Get Up and Go test • Masking tape to mark 3 m and 6 m lengths on the floor for Get Up and Go • Two of the tools available for the test (incline ramp and foam block) are available for purchase at http://www.bestest.us/purchasing.html
Time to complete	• 20 - 30 minutes in trained therapists[1] • Mini-BESTest: 10 – 15 minutes[2]
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• 27 tasks; some items consisting of 2 to 4 sub-items; total of 36 item grouped into 6 systems • Each item scored on a 4-level, ordinal scale from 0 (worst performance) to 3 (best performance) • Total score and subtest scores are obtained and provided as a percentage of the total score • Mini-BESTest scored on a 3-point ordinal scale from 0 (severe) to 2 (normal)
Level of client participation required (is proxy participation available?)	• Must be completed by the patient (proxy not appropriate)
Limitations	• Limited psychometric studies • Lack of evidence of its utility in directing treatment • No testing in MS population to date • Time to complete BESTest may not be feasible in all clinical settings
Recommendations **Practice Setting (check all that apply):** __x___ Acute __x___ Inpatient Rehab __x___ Home Health __x___ Skilled Nursing __x___ Outpatient Comments: •	
Level of Disability (check all that apply):	

__x___ EDSS 0.0 – 3.5
__x___ EDSS 4.0 – 5.5
__x___ EDSS 6.0 – 7.5
_____ EDSS 8.0 – 9.5

Comments:

- Few items pertain to sitting balance; hence the BESTest is most appropriate for patients with EDSS score ≤ 7.5

Should this tool be required for entry-level curricula?
_____ Yes __x___ No
Comments:

- Although psychometrics to date are limited, the BESTest may facilitate a student's understanding of the examination of constructs underlying postural control. However, data is lacking to support its use in individuals with MS.

Is this tool appropriate for research purposes?
_____ Yes __x___ No
Comments:

- Available psychometrics indicate excellent reliability and validity in limited populations (Parkinson's disease and vestibular disorders)
- Lack of psychometric data in MS, so do not recommend for use in research at this point in time.
- Recommend investigating psychometric properties in MS.

Attachments:

- Score Sheets: __x___ Uploaded on website __x___ Available but copyrighted _____ Unavailable
- Instructions: __x___ Uploaded on website ___x__ Available but copyrighted _____ Unavailable
- Reference list: _____ Uploaded on website

Second Reviewer Comments:

- Agree with primary review; comprehensive balance assessment not researched in MS population

Overall Taskforce Agreement with Recommendations:

-

Practice Setting	4	3	2	1	Comments
Acute			X		•
Inpatient Rehab			X		•
Home Health			X		•

Skilled Nursing			X		•
Outpatient			X		•
Overall Comments: • Rating reflects limited psychometric data to support the use of the BESTest for individuals with MS at this point of time					

Level of Disability	**4**	**3**	**2**	**1**	**Comments**
EDSS 0.0 – 3.5			X		•
EDSS 4.0 – 5.5			X		•
EDSS 6.0 – 7.5			X		•
EDSS 8.0 – 9.5				X	•
Overall Comments: • Above ratings pertain only to BESTest (not Mini-BESTest) • BESTest most appropriate for patients at EDSS levels ≤ 7.5; rating reflects lack of psychometric data for individuals with MS					

Entry-Level Criteria	**Students should learn to administer tool**	**Students should be exposed to tool (e.g. to read literature)**	**Do not recommend**	**Comments**
Should this tool be required for entry level curricula?			X	• Recommendation is based on lack of psychometric data in individuals with MS • However, the BESTest may facilitate a student's understanding of the examination of constructs underlying postural control

Research Use	**YES**	**NO**	**Comments**
Is this tool appropriate for research purposes?		X	• Reliability and validity of BESTest for individuals with MS is unknown; if established, BESTest could be a useful measure for research in MS • Recommend investigating psychometric properties in MS

References:

1. Horak FB, Wrisley DM, Frank J. The Balance Evaluation Systems Test (BESTest) to differentiate balance deficits. *Phys Ther.* May 2009;89(5):484-498.
2. Franchignoni F, Horak F, Godi M, et al. Using psychometric techniques to improve the Balance Evaluation Systems Test: the mini-BESTest. *J Rehabil Med.* Apr;42(4):323-331.
3. Leddy AL, Crowner BE, Earhart GM, Leddy AL, Crowner BE, Earhart GM. Functional gait assessment and balance evaluation system test: reliability, validity, sensitivity, and specificity for identifying individuals with Parkinson disease who fall. *Phys Ther.* Jan;91(1):102-113.

Instrument name: Berg Balance Scale

Reviewer: Diane D. Allen, PT, PhD | **Date of review:** 7/18/11

ICF domain (check all that apply):

_____ Body function/structure _x____ Activity _____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance	__x___ Balance/falls	_____ Health and wellness
_____ Ataxia	_____ Bed mobility	_____ Home management
_____ Cardiovascular/pulmonary status	_____ Gait	_____ Leisure
_____ Coordination (non-equilibrium)	_____ Reach and grasp	_____ Quality of life
_____ Dizziness/vestibular	_____ Self care	_____ Role function
_____ Fatigue	_____ Transfers	_____ Shopping
_____ Flexibility	_____ Wheelchair skills	_____ Social function
_____ Muscle performance		_____ Work
_____ Muscle tone / spasticity		
_____ Pain		
_____ Posture		
_____ Sensory integration		
_____ Somatosensation		

Other:

Type of measure:

__x___ Performance-based _____ Self-report

Instrument description:

- 14-item test of (mostly) standing balance, originally generated[1] and validated[2] for determining risk for falling in elderly people, with a cut-off score of <45 out of 56 associated with increased risk of falling[3]; now used to assess balance in many populations; translated into many languages

Reliability (test-retest, intra-rater, inter-rater)

Internal Consistency:

- Cronbach's alpha was .9 for 50 patients with MS using the Iranian version of the BBS.[4]

Inter-rater:

- ICC (95% CI) was .99 (.97-1.00) in 9 people with MS, measured in two sessions by two people, an experienced and less-experienced physiotherapist[5] (for tandem stance and single-leg stance, both legs were tested and the lowest score was used)
- ICC (95% CI) was .96 (.90-.97) in 25 people with MS as tested concurrently by two experienced raters[6]
- ICC (95% CI) was .9 (.9-.9) in 50 people with MS as tested concurrently by two experienced raters[4]

	Test-retest: • ICC (95% CI) was .85 (.72-.94) in 19 people with MS across 3 sessions separated by one week intervals[5] (for tandem stance and single-leg stance, both legs were tested and the lowest score was used) • ICC (95% CI) was .96 (.91-.98) in 25 people with MS across two sessions separated by 3 days, as tested by a single rater[6]
Validity (concurrent, criterion-related, predictive)	Concurrent validity: • Scores on the BBS were moderately (r = .5) to highly correlated (r = .81) with 70% of the quantitative measures taken via the NeuroCom SMART Balance Master in 14 people with MS and 10 control subjects.[7] • Spearman correlation coefficients with other balance measures in 51 patients with MS who were able (at least) to stand for 3 seconds and walk 6 m even with an assistive device: .78 with the Dynamic Gait Index; -.62 with the Timed Up and Go; .48 with the Activities-specific Balance Confidence scale; and -.32 with the Dizziness Handicap Inventory.[8] Predictive validity: • Discriminative validity: • Scores on the BBS were significantly different between 10 controls (mean 56, SD 0) and 14 people with MS (mean 54.35, SD .69) who had EDSS scores ranging from 1 to 3.[7] Sensitivity/Specificity/Predictive Values/Likelihood Ratios: • In 76 people with MS, EDSS scores 3.5-6.0, a cut-off point of 55 had a sensitivity of 94% and a specificity of 32% in differentiating fallers (at least one fall recorded prospectively during a 12-week period) and non-fallers. The authors say that the high score cut-off may be an artifact of the ceiling effect in 13 of their sample.[9] • In 51 people with MS who were able to stand for 3 seconds and walk 6 m even with an assistive device, a cut-off point of 45 (>44) had a sensitivity of 40% and a specificity of 90% in differentiating fallers (by retrospective report of falls in previous month) and non-fallers.[8]
Ceiling/floor effects	Ceiling effects: • In 76 people with MS, EDSS scores 3.5-6.0, 13 (17%) scored the maximum of 56 points.[9] • In 51 patients with MS who were able (at least) to stand for 3 seconds and walk 6 m even with an assistive device, 3 (6%) scored the maximum of 56 points.[8]

	• In 13 patients with MS, EDSS scores 1.5-6.5, 3 (23%) scored the maximum of 56 points.[10] Floor effects: •
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • For 48 patients post-stroke, Stevenson[11] determined that 5.8 points was the MDC with 90% confidence, and that 6.9 was the MDC with 95% confidence of a true change between two raters scoring the BBS on consecutive days. MCID: • Lord et al.[12] set 6 points on the BBS as the minimal clinically important difference for people with MS, then demonstrated that 10 people in each of two intervention groups (facilitation and task oriented) averaged 8.5 and 7.2 points improvement after 15-19 one-hour treatments over 5-7 weeks. The effect sizes for the two groups were .64 and .68. Other responsiveness values: • After 6 weeks of a home program, 13 people with MS (EDSS 1.5-6.5) improved BBS score 5.8 points on average, a statistically significant difference. Normative Data: •
Instrument use	•
Equipment required	• Chair with arm rests (plus one other chair or mat table for transfers), 6 inch stepstool, yard stick, tape measure, paper, pencil, object to pick up (slipper), stopwatch
Time to complete	• 20-30 minutes
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• 14 items are scored along a 5-point ordinal scale, with scores ranging from 0-4 • Descriptive criteria are provided with 4 being able to perform independently and 0 unable to perform • Max score 56, score of 45 or below associated with high fall risk • Shortened versions of the Berg Balance Scale have been suggested based on the progressive difficulties of the 14 tasks and the lack of necessity to have patients attempt tasks that are clearly easy or too hard for them.[13]

Level of client participation required (is proxy participation available?)	• Performance-based measure: No proxy available
Limitations	• Ceiling and floor effects noted in other populations; thus not appropriate for fully ambulatory patients who have no unsteadiness and for non-ambulatory patients who do not stand.

Recommendations
Practice Setting (check all that apply):
___x__ Acute
___x__ Inpatient Rehab
___x__ Home Health
___x__ Skilled Nursing
___x__ Outpatient

Comments:
-

Level of Disability (check all that apply):
__x___ EDSS 0.0 – 3.5
__x___ EDSS 4.0 – 5.5
__x___ EDSS 6.0 – 7.5 *
_____ EDSS 8.0 – 9.5

Comments:
- Used in studies including people at EDSS 6.5 and lower.

Should this tool be required for entry-level curricula?
__x___ Yes _____ No
Comments:
- Should be required in curricula related to fall risk but not necessarily associated with curricula related to MS.

Is this tool appropriate for research purposes?
__x___ Yes _____ No
Comments:
- Even for those for whom the BBS is appropriate, additional measures should be used to test dynamic balance and self-reported fall risk.

Attachments:
- Score Sheets: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Instructions: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Reference list: _____ Uploaded on website

Second Reviewer Comments: • I agree with your ratings/recommendations.
Overall Taskforce Agreement with Recommendations: •

Practice Setting	**4**	**3**	**2**	**1**	**Comments**
Acute	X				• Useful if patient is able to stand independently.
Inpatient Rehab	X				•
Home Health	X				•
Skilled Nursing	X				•
Outpatient	X				•
Overall Comments: •					

Level of Disability	**4**	**3**	**2**	**1**	**Comments**
EDSS 0.0 – 3.5	X				• Useful if patient has some unsteadiness when standing or walking.
EDSS 4.0 – 5.5	X				•
EDSS 6.0 – 7.5	X				• Has been used for people with EDSS scores of 6.5 or lower.
EDSS 8.0 – 9.5				X	• Rating reflects lack of clinical utility for patients with significant disability
Overall Comments: •					

Entry-Level Criteria	**Students should learn to administer tool**	**Students should be exposed to tool (e.g. to read literature)**	**Do not recommend**	**Comments**
Should this tool be required for entry level	X			• Learn with curricula on fall risk; not necessarily associated with MS.

Berg Balance Scale

curricula?				
Research Use	**YES**	**NO**	**Comments**	
Is this tool appropriate for research purposes?	X		• Should be used with other tools to assess dynamic balance and self-report of fall risk.	

References:

1. Berg K, Wood-Dauphinee S, Williams JI. Measuring balance in the elderly: Preliminary development of an instrument. *Physiother Can.* 1989;41:304.
2. Berg K, Wood-Dauphinee SL, Williams JI, Maki BE. Measuring balance in the elderly: Validation of an instrument. *Can J of Pub Health.* 1992;83:S7-11.
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7. Fjeldstad C, Pardo G, Frederiksen C, Bemben D, Bemben M. Assessment of postural balance in multiple sclerosis. *International Journal of MS Care.* 2009;11(1):1-5.
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Instrument name: Bioesthesiometer	
Reviewer: Gail L. Widener	**Date of review:** 5/5/11

ICF domain (check all that apply):

__x___ Body function/structure _____ Activity _____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance
_____ Ataxia
_____ Cardiovascular/pulmonary status
_____ Coordination (non-equilibrium)
_____ Dizziness/vestibular
_____ Fatigue
_____ Flexibility
_____ Muscle performance
_____ Muscle tone / spasticity
_____ Pain
_____ Posture
_____ Sensory integration
__x___ Somatosensation
_____ Balance/falls
_____ Bed mobility
_____ Gait
_____ Reach and grasp
_____ Self care
_____ Transfers
_____ Wheelchair skills
_____ Health and wellness
_____ Home management
_____ Leisure
_____ Quality of life
_____ Role function
_____ Shopping
_____ Social function
_____ Work

Other:

Type of measure:

__x___ Performance-based _____ Self-report

Instrument description:

- The bioesthesiometer is an instrument designed to measure vibration perception threshold (VPT). Was initially designed to measure vibration to aid in diagnosis of peripheral neuropathy in persons with diabetes mellitus.

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • Inter-rater: • Tested in 15 people with diabetic peripheral neuropathy: r=0.93[1] Test-retest: • Tested in 80 people with test-retest scores of r=0.87 for sites on the hands and feet.[2]
Validity (concurrent, criterion-related, predictive)	Concurrent validity: • Correlated with sensory evoked potentials in people with MS and found weak correlations (Rho=0.372) with upper limb and moderate correlation (Rho= 0.499) with lower limbs.[3] Predictive validity: • Discriminative validity: • Sensitivity/Specificity/Predictive Values/Likelihood Ratios: • 92% sensitivity and 39% specificity for detecting foot ulceration in patients with DM.[4]
Ceiling/floor effects	Ceiling effects: • Floor effects: •
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • MCID: • Other responsiveness values: • Normative Data: • Available for people ages 10-90, studied in 519 non-diabetic individuals.[5]
Instrument use	• Used to assess vibration perception threshold
Equipment required	• The tool is only available commercially from many sources
Time to complete	5-10 minutes depending on the number of sites tested
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• The probe is applied to the body while gradually increasing the amplitude until the vibration is detected. Conversely, the amplitude can be slowly lowered to record the amplitude at which vibration sense is lost. Threshold is the value at which VPT is first perceived.
Level of client participation required (is proxy participation available?)	• As with sensory tests, communication dysfunction may make this test less reliable
Limitations	Instrument psychometric properties have not been tested in people with

Bioesthesiometer

	MS.

Recommendations
Practice Setting (check all that apply):

__x___ Acute
__x___ Inpatient Rehab
__x___ Home Health
__x___ Skilled Nursing
__x___ Outpatient

Comments:

- The need for special equipment limits the clinical utility of this test.

Level of Disability (check all that apply):

__x___ EDSS 0.0 – 3.5
__x___ EDSS 4.0 – 5.5
__x___ EDSS 6.0 – 7.5
__x___ EDSS 8.0 – 9.5

Comments:

-

Should this tool be required for entry-level curricula?

_____ Yes __x___ No

Comments:

-

Is this tool appropriate for research purposes?

_____ Yes ___x__ No

Comments:

- This test is easy to administer and provides an objective measure of vibration perception threshold for people with MS or other pathologies that result in sensory disturbance.
- However, there is a lack of psychometric data in MS, so do not recommend for use in research at this point in time.
- Recommend investigating psychometric properties in MS.

Attachments:

- Score Sheets: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Instructions: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Reference list: _____ Uploaded on website

Bioesthesiometer

Second Reviewer Comments: • Agree. This instrument provides a more precise quantitative measure of vibration perception as an alternative to recording the seconds from application of a struck tuning fork (usually 128-Hz) to the medial malleolus and counting seconds until the patient says "it is finished".[5,6] A variation to the bioesthesiometer is the Vibratron, which is another vibrating instrument, but the patient is given a forced choice to determine which of two rods is vibrating.[8-10]
Overall Taskforce Agreement with Recommendations: •

Practice Setting	**4**	**3**	**2**	**1**	**Comments**
Acute			X		•
Inpatient Rehab			X		•
Home Health			X		•
Skilled Nursing			X		•
Outpatient			X		•

Overall Comments:
- Clinical utility is diminished because of specialized equipment and lack of psychometric data for the MS population.

Level of Disability	**4**	**3**	**2**	**1**	**Comments**
EDSS 0.0 – 3.5			X		•
EDSS 4.0 – 5.5			X		•
EDSS 6.0 – 7.5			X		•
EDSS 8.0 – 9.5			X		•

Overall Comments:
- Clinical utility is diminished by the need for specialized equipment.

Entry-Level Criteria	**Students should learn to administer tool**	**Students should be exposed to tool (e.g. to read literature)**	**Do not recommend**	**Comments**
Should this tool be required for entry level curricula?			X	• Recommendation reflects lack of psychometric data in individuals with MS

Bioesthesiometer

Research Use	YES	NO	Comments
Is this tool appropriate for research purposes?		X	• Lack of psychometric data in MS, so do not recommend for use in research at this point in time. • Recommend investigating psychometric properties in MS.

References:

1. Van Deursen RWM, Sanchez MM, Derr JA, et al. Vibration perception threshold testing in patients with diabetic neuropathy: ceiling effects and reliability. *Diabet Med.* 2001;18:469-475.

2. Frennette B, Mergler D, Ferraris J. Measurement precision of a portable instrument to assess vibrotactile perception threshold. *Eur J Appli Physiol.* 1990; 61:386-391.

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6. Citaker S, Gunduz AG, Guclu MB, Nazliel B, C Irkec. Relationship between foot sensation and standing balance in patients with mutliple sclerosis. *Gait Posture.*2011; 34:275-278.

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8. Bove FJ, Letz R, Baker EL. Sensory thresholds among contructiont trade painters: a cross-sectional study using new methods for measuring temperature and vibration sensitivity. *J Occup Med.* 1989;31(4):320-325.

9. Zackowski KM, Smith SA, Reich DS, et al. Sensorimotor dysfunction in multiple sclerosis and column-specific magnetization transfer-imaging abnormalities in the spinal cord. *Brain.* 2009; 132:1200-1209.

10. Newsome SD, Wang JI, Kang JY, Calabresi PA, Zackowski KM. *J Neurol Sci.* 2011;305:103-111.

Instrument name: Box and Block Test (of Manual Dexterity)

Reviewer: Evan Cohen, PT, MA, PhD, NCS | **Date of review:** 7/11

ICF domain (check all that apply):

__X__ Body function/structure _____ Activity _____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance
_____ Ataxia
_____ Cardiovascular/pulmonary status
__X__ Coordination (non-equilibrium)
_____ Dizziness/vestibular
_____ Fatigue
_____ Flexibility
__X__ Muscle performance
_____ Muscle tone
_____ Pain
_____ Posture
_____ Sensory integration
_____ Somatosensation

_____ Balance/falls
_____ Bed mobility
_____ Gait
__X__ Reach and grasp
_____ Transfers
_____ Wheelchair skills

_____ Health and wellness
_____ Home management
_____ Leisure
_____ Quality of life
_____ Role function
_____ Shopping
_____ Social function
_____ Work

Other:

Type of measure:

__X__ Performance-based _____ Self-report

Instrument description:

- The Box and Blocks Test (BBT) is a test of manual dexterity. Wooden blocks (1"-square) are placed in a wooden box that has two equally-sized compartments that are separated by a 15.2 cm high divider. The patient has one minute to move as many blocks as possible, one at a time, from one compartment to the other.

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • Inter-rater: • Pearson's *r*: Right hand = 1.000, Left hand = .999 (N=27 healthy females age 20-39)[1]. • In PWMS (N=9, EDSS range of 0-6.5): ICC for right hand = .93 (95% CI = .73-.98, std error = 2.43, coefficient of variation = 4.4), for left = .94 (95% CI = .76-.99) std error = 2.45, coefficient of variation = 4.2)[2]. • In a combined sample of people with MS, CVA and TBI (with limited description of the MS sample): ICC = .993 with

	Spearman's rho = .993 (N=44) (PWMS had EDSS = 6.25 (4.5-8.5)[3]. Test-retest: • In able-bodied subjects: ICC = 0.89-0.90; subjects with impairment: ICC=0.96-0.97[4]. • In PWMS: ICC for right hand = .87 (95% CI = .72-.95, std error = 3.54, coefficient of variation = 4.4), for left = .91 (95% CI = .81-.96, std error = 3.27, coefficient of variation = 4.4). N=19, with EDSS range of 0-6.5[2]. • In a sample of people with MS, CVA and TBI (with limited description of the MS sample): ICC = .963, Spearman's rho = .973 (PWMS had EDSS = 6.25 (4.5-8.5)[3].
Validity (concurrent, criterion-related, predictive)	Concurrent validity: • In study with 68 MS patients moderate correlation (-0.7) with box and block test[5]. Predictive validity: • Discriminative validity: • With the Minnesota Rate of Manipulation Test-Placing: *r*=0.91[6]. With the General Aptitude Test Battery: *r* = 0.863[6]. Sensitivity/Specificity/Predictive Values/Likelihood Ratios: • A 20% worsening from baseline increases odds of a one-point worsening in EDSS score by 5.0[7].
Ceiling/floor effects	Ceiling effects: • Floor effects: •
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • A 20% change in score would be due to a true change 95% of the time. This sample included control (N=21, EDSS=4.33+/-1.93) and prospective groups (N=68, EDSS=4.73 +/-2.33) of PWMS[7]. • A raw score change of 8.11 or a 30.3% change in score is the MDC (n=109, median EDSS 2.0, range 0-6.5)[8]. MCID: • A reduction in score of 5.23 blocks (95% CI = -8.58 to -2.07) for the dominant hand when compared to EDSS score, and a reduction of 3.48 (95% CI = -6.83 to -0.13) when compared to a modified version of the Functional Status Questionnaire (n=109, median EDSS 2.0, range 0-6.5)[8]. Other responsiveness values: • Normative Data:

	• Normative values based on age (greater than 20 years) and gender are available[1].
Instrument use	•
Equipment required	• Wooden box constructed for this assessment and wooden cubes available commercially and a timer or stopwatch. A construction schematic was published by Mathiowetz et al[1].
Time to complete	• Approximately one minute per hand
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• Total number of blocks transferred in one minute. A score is recorded separately for each hand.
Level of client participation required (is proxy participation available?)	• Person must be present
Limitations	• Tests upper extremity reach and grasp

Recommendations
Practice Setting (check all that apply):

__X__ Acute
__X__ Inpatient Rehab
__X__ Home Health
__X__ Skilled Nursing
__X__ Outpatient

Comments:
-

Level of Disability (check all that apply):

__X__ EDSS 0.0 – 3.5
__X__ EDSS 4.0 – 5.5
__X__ EDSS 6.0 – 7.5
__X__ EDSS 8.0 – 9.5

Comments:
- No available evidence for use in PWMS with EDSS of 8.0-9.5, but it is apparent that this test might be relevant at those levels of disease severity.

Should this tool be required for entry-level curricula?

__X__ Yes _____ No

Comments:
- Exposure to the tool

Is this tool appropriate for research purposes?

__X__ Yes _____ No

Comments: A quick and simple measure of UE function

-

Attachments:

- Score Sheets: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Instructions: _____ Uploaded on website __x__ Available but copyrighted _____ Unavailable
  Described by Mathiowetz and colleagues[1].
- Reference list: _____ Uploaded on website

Second Reviewer Comments:

-

Overall Taskforce Agreement with Recommendations:

-

Practice Setting	4	3	2	1	Comments
Acute		X			•
Inpatient Rehab		X			•
Home Health		X			•
Skilled Nursing		X			•
Outpatient		X			•

Overall Comments:

- Good psychometric properties; rating reflects need to purchase equipment.

Level of Disability	4	3	2	1	Comments
EDSS 0.0 – 3.5		X			•
EDSS 4.0 – 5.5		X			•
EDSS 6.0 – 7.5		X			•
EDSS 8.0 – 9.5		X			•

Overall Comments:

- Rating reflects need to purchase equipment.
- Most widely examined in those with EDSS of 0-6.5, but may be relevant for those with EDSS of >6.5

Entry-Level Criteria	Students should learn to administer	Students should be exposed to tool (e.g. to	Do not recommend	Comments

	tool	**read literature)**		
Should this tool be required for entry level curricula?		X		• Excellent clinical utility with evidence for usefulness across many neurologic diagnoses.

Research Use	**YES**	**NO**	**Comments**
Is this tool appropriate for research purposes?	X		•

References:

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5. Goodkin DE, Hertsgaard D, Seminary J. Upper extremity function in multiple sclerosis: improving assessment sensitivity with box-and-block and nine-hole peg tests. *Archives of Physical Medicine & Rehabilitation.* Oct 1988;69(10):850-854.

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8. Paltamaa J, Sarasoja T, Leskinen E, Wikstrom J, Malkia E. Measuring deterioration in international classification of functioning domains of people with multiple sclerosis who are ambulatory. *Physical therapy.* Feb 2008;88(2):176-190.

Instrument name: Brief Fatigue Inventory (Index) BFI	
Reviewer: Gail L. Widener, PT, PhD	**Date of review:** 8/11/11

ICF domain (check all that apply):

__X__ Body function/structure _____ Activity _____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance
_____ Ataxia
_____ Cardiovascular/pulmonary status
_____ Coordination (non-equilibrium)
_____ Dizziness/vestibular
__X__ Fatigue
_____ Flexibility
_____ Muscle performance
_____ Muscle tone
_____ Pain
_____ Posture
_____ Sensory integration
_____ Somatosensation
_____ Balance/falls
_____ Bed mobility
_____ Gait
_____ Reach and grasp
_____ Transfers
_____ Wheelchair skills
_____ Health and wellness
_____ Home management
_____ Leisure
_____ Quality of life
_____ Role function
_____ Shopping
_____ Social function
_____ Work

Other:

Type of measure:

_____ Performance-based __X__ Self-report

Instrument properties:

- The Brief Fatigue Inventory (BFI) was developed to quickly measure severity of fatigue in people with cancer.[1] Consists of nine items that look at fatigue in the past that are rated on a 0-10 numeric rating scale where 0 is no fatigue or does not interfere and 10 is bad fatigue or completely interferes with activity/work. The BFI has been translated and validated in several languages (Japanese, German, Korean, Chinese, Taiwanese, French)[2-7] and disease groups (brain tumors, OA, RA, chronic illness).[8-11]BFI was evaluated in people post stroke, but because people did not complete the tool it was deemed unfeasible to use.[12]

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • N/A Inter-rater: • N/A Test-retest: • N/A

Validity (concurrent, criterion-related, predictive)	Concurrent validity: • Correlated with the fatigue component of the Functional Assessment of Cancer Therapy (r=-0.88) and with the fatigue subscale of the Profile Of Mood States (r=0.84)[1] Predictive validity: • N/A Discriminative validity: • Scores ≥7 indicates severe fatigue[1] Sensitivity/Specificity/Predictive Values/Likelihood Ratios: •
Ceiling/floor effects	Ceiling effects: • Floor effects: •
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • MCID: • Other responsiveness values: • Normative Data: •
Instrument use	• Questionnaire
Equipment required	• None
Time to complete	• 5 minutes
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• Average score of the items completed. Test can be scored with as few as 5 out of 9 questions answered.[1]
Level of client participation required (is proxy participation available?)	• Can be completed via self-report, interview or interactive voice recording system.
Limitations	• Do not have any test-retest reliability data; has not been validated or tested in pwMS.

Recommendations
Practice Setting (check all that apply):

____ Acute
____ Inpatient Rehab
____ Home Health
____ Skilled Nursing
____ Outpatient

Comments:
•

Level of Disability (check all that apply):

____ EDSS 0.0 – 3.5
____ EDSS 4.0 – 5.5
____ EDSS 6.0 – 7.5
____ EDSS 8.0 – 9.5

Comments:
- Can apply to any person who has fatigue; but not validated in pwMS

Should this tool be required for entry-level curricula?

_____ Yes __X__ No

Comments:
- Not specific for pwMS.

Is this tool appropriate for research purposes?

_____ Yes __X__ No

Comments:
- No validity testing in pwMS, limited reliability testing has occurred in people with cancer.

Attachments:

Score Sheets: _____ Uploaded on website _____ Available but copyrighted _X___ http://www.mdanderson.org/education-and-research/departments-programs-and-labs/departments-and-divisions/symptom-research/symptom-assessment-tools/brief-fatigue-inventory-bfi.html (fee applies for use in clinical research trials)
- Instructions: _____ Uploaded on website _____ Available but copyrighted _____ above website
- Reference list: _____ Uploaded on website

Second Reviewer Comments:
- Agree with primary review, the BFI is not validated for individuals with MS; multiple alternate fatigue scales are available to assess MS related fatigue. Do not recommend this scale.

Overall Taskforce Agreement with Recommendations:
-

Practice Setting	4	3	2	1	Comments
Acute				X	•
Inpatient Rehab				X	•
Home Health				X	•

Skilled Nursing				X	•
Outpatient				X	•
Overall Comments: • While this is a valid measure in people with cancer there is no validation or reliability in pwMS					

Level of Disability	**4**	**3**	**2**	**1**	**Comments**
EDSS 0.0 – 3.5				X	•
EDSS 4.0 – 5.5				X	•
EDSS 6.0 – 7.5				X	•
EDSS 8.0 – 9.5				X	•
Overall Comments: • No validation or reliability in pwMS.					

Entry-Level Criteria	**Students should learn to administer tool**	**Students should be exposed to tool (e.g. to read literature)**	**Do not recommend**	**Comments**
Should this tool be required for entry level curricula?			X	• Do not recommend for pwMS, but would use it to measure fatigue in people with cancer

Research Use	**YES**	**NO**	**Comments**
Is this tool appropriate for research purposes?		X	• Not validated in pwMS

References:

1. Mendoz TR, Wang XS, Cleeland CS, Morrissey M, Johnson BA, Wendt JK, Huber SL. The rapid assessment of fatigue severity in cancer patients: use of the brief fatigue inventory. *Cancer.* 1999;85:1186-1196.
2. Okuyama T, Wang ZS, Akechi T, Mendoza TR, Hosaka T, Cleeland CS, Uchitomi Y. Validation study of the Japanese version of the brief fatigue inventory. *J Pain Symptom Manage.* 2003; 25(2):106-117.
3. Radbruch L, Sabatowski B, Elsner F, Everts J, Mendoza T, Cleeland C. Validation of the German version of the brief fatigue inventory. *J Pain Symptom Manage*. 2003;25(5):449-458.

Brief Fatigue Inventory (Index)

4. Wang XS, Hao XS, Wang Y, Guo H, Jiang YQ, Mendoza TR, Cleeland CS. Validation study of the Chinese version of the brief fatigue inventory (BFI-C). *J Pain Symptom Manage.* 2004;27(4):322-332.
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10. Murphy SL, Lynden AK, Smith DM, Dong Q, Koliba JF. Effects of a tailored activity pacing intervention on pain and fatigue for adults with osteoarthritis. *AJOT.* 2010;64:869-876.
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12. Mead G, Lunch J, Grieg C, Young A, Lewis Sharpe M. Evaluation of fatigue scales in stroke patients. *Stroke.* 2007; 38: 2090-2095.

Instrument name: Canadian Occupational Performance Measure (COPM)

Reviewer: Diane D. Allen, PT, PhD | **Date of review:** 3/4/11

ICF domain (check all that apply):

_____ Body function/structure __x___ Activity __x___ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance	_____ Balance/falls	_____ Health and wellness
_____ Ataxia	_____ Bed mobility	__x__ Home management
_____ Cardiovascular/pulmonary status	__x__ Gait	__x__ Leisure
_____ Coordination (non-equilibrium)	_____ Reach and grasp	_____ Quality of life
_____ Dizziness/vestibular	__x__ Self-care	__x__ Role function
_____ Fatigue	_____ Transfers	__x__ Shopping
_____ Flexibility	_____ Wheelchair skills	_____ Social function
_____ Muscle performance		__x__ Work
_____ Muscle tone		
_____ Pain		
_____ Posture		
_____ Sensory integration		
_____ Somatosensation		

Other: client self-perception of self-care, productivity, and leisure occupation

Type of measure:

_____ Performance-based __x___ Self-report

Instrument Description

Client-centered tool designed to detect client self-perceptions of performance and satisfaction in self-care, productivity, and leisure over time.[23] This measure is designed to measure individualized patient goal achievement. It has been translated into 24 languages and is used in over 35 countries. Also available in Pediatric, French, Hebrew, Icelandic, Japanese, German, Danish, Swedish, Greek, Spanish, Mandarin Chinese, Korean, Russian, Slavic, Italian, Portuguese and Norwegian versions.

Administration of the COPM consists of a semi-structured interview of the patient by the therapist to elicit the activities that a patient wants or needs or is expected to perform, and then negotiation of goals for intervention to address the activities identified. The process is semi-structured because the therapist provides examples of activities in each of three domains (self-care, productivity, leisure) and the patient identifies which are relevant, which he or she can perform, and how satisfied he or she is with the performance. The therapist and patient then weight each activity for its importance, and the score is based on importance, ability, and satisfaction. Re-assessment repeats the scoring and can determine if additional problems have emerged.

Note: reviews of the use of the COPM have been published in 2006[29] and 2004.[31]

Reliability (test-retest,	Test-Retest (**Study Population**)

intra-rater, inter-rater)	• Performance .63[2] (**Unspecified Population – [UP]**) • Satisfaction .84[2] • Performance .89[3] (**Stroke**) • Satisfaction .88[3] • Whole Test .90-.92[4] (**COPD**) <u>Intra-class correlations</u> • Performance .63[5,] (**Schizophrenia**) • Satisfaction .69[5] • Performance.67[6] (**UP**) • Satisfaction .69[6] <u>Internal Consistency</u> • Performance .41-.56[7] (**UP**) • Satisfaction .71[7] Correlation between performance and satisfaction scores (.68).[7] • Italian Version: Whole Test α=.774[8] (**Ankylosing Spondylitis**) <u>Internal Consistency (Pediatric Version)</u> • Performance .73[9] (**Pediatric Cerebral Palsy**) • Satisfaction .82[9]
Validity (concurrent, criterion-related, predictive)	<u>Validity*</u>: • RNL .72-.93[10] (**CVA, TBI, SCI**) • Dash – DLV[11] (**Unilat UE disorders**) • HAQ .37-.67[12] (**Rheumatoid Arthritis**) • WQL .46, WPP .53[5] (**Schizophrenia**) • SPSQ .17-.39, RNL .22-.38, LSS .21-.46[13] (**UP**) • FIM[14] (**SNF population incl. Stroke**) • D-AIMS2[15] (**Hemophilia**) • Klein-Bell Not Significant, SPSQ .22-.39, FIM .14-.32[16] (**Stroke and Orthopedic**) • SPSQ and RNL most alike conceptually to COPM, measuring the largest components of the same domain as the COPM.[17] (**UP**) • Italian Version: BASFI -.566, BASDAI -.491[8] (**Ankylosing Spondylitis**) <u>Discriminant Validity</u>: None of the standardized functional measures (Barthel Index, Frenchay Activities Index, SA-SIP30, EQ-5D) significantly correlated with the COPM, but they all significantly correlated with each other.[3] (**Stroke**) • <u>Convergent Validity</u>: 63% of problems corresponded with DIP, 74% corresponded with SIP68.[18] (**UP**) • <u>Combined use with Goal Attainment Scaling</u> resulted in satisfactorily client-centered goals in patients with TBI even with moderate to severe impairment of self-awareness.[26] • <u>Convergent Validity</u> of r = 0.51 with the Occupational Self-

	Assessment (OSA) and r = 0.58 with the Melville-Nelson Self-Identified Goals Assessment (SIGA).[28] • Sensitive to cultural differences: able to address occupations of ethnic minorities but could be improved with examples of cultural occupations.[30]
Ceiling/floor effects	N/A
Sensitivity to change (responsiveness, MCID, MDC) / normative data	Responsiveness: • Swedish version responsive to change with 73% of problems identified having a change in score of 2 points or more.[19] (**Neurologic and Orthopedic**) • Standardized Response Mean 1.43, Effect Size 1.8[20] (**Musculoskeletal**) • Initial and final scores for both performance and satisfaction for COPM show significant change over time (p<.0001 to .001).[2] (**UP**) MCID: Change of 2 points or more represents ¾ of a standard deviation which is considered to be clinically important difference as judged by clients and family members.[21,22] (**Stroke, TBI**) Pediatric version: 2 points[9] (**Pediatric Cerebral Palsy**) • Predictive: 65% accuracy of for discharge status using COPM and FIM vs 29% accuracy with FIM alone.[14] (**SNF population**)
Instrument use	
Equipment required	• Questionnaire
Time to complete	20-40 min.[23] 20-30min.[5] 15 min if no supplementary conversation.[17] • But may depend on pt cognition and cooperation.[10] • Older individuals require more time and more explanation, and were not familiar with the process of self-rating as compared to younger patients.[10]
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• The five most important self-identified problems with self-care, productivity, or leisure activities form the scale items. The pt is asked to rate each on a scale of 1 – 10 in terms of a) ability to perform the activity (1 = not able to 10 = able to perform with excellence) and b) satisfaction with their present performance (1 = not satisfied to 10 = extremely satisfied). Item ratings are multiplied by their corresponding importance rating to determine baseline scores for each activity (ranging from 0 – 100). Satisfaction & performances scores for all activities summed separately and then divided by the number of rated activities (usually 5). Summary performance and satisfaction scores are used as the basis for comparisons over time. Interviewer may need to supplement information gathered during interview through other means such as observation, administration of special tests, and assessment of patient environments.[1]
Level of client participation	5-step semi-structured interview conducted by an occupational therapist

required (is proxy participation available?)	or other trained provider.[1] Caregiver/proxy may respond on the patient's behalf, but they may not identify the same deficits or problems as the patient would and there may be differences with regard to the importance of activities.[17]
Limitations	• The semi-structured character of the COPM may result in a somewhat different interview on different occasions. On every single day a patient may experience different problems. In addition, perceptions of problems change such that, while the same problem may be identified on 2 occasions, priorities shift and rating of importance change. It is therefore not surprising that the item pool is not completely stable.[3] • Interview process is not standardized and both the quality and adequacy of information obtained from interview may vary considerably between interviewers.[1] • Interviewer must be comfortable with client-centered approach to both assessment and practice.[17] • There is a fixed list of activities for the client to discuss, which may not be relevant to the individual and therefore does not always reflect the individual's role expectation.[24]

Recommendations
Practice Setting (check all that apply):

_____ Acute (not checked because of length of measure)
__x___ Inpatient Rehab
__x___ Home Health
__x___ Skilled Nursing
__x___ Outpatient

Comments:
-

Level of Disability (check all that apply):

__x___ EDSS 0.0 – 3.5
__x___ EDSS 4.0 – 5.5
__x___ EDSS 6.0 – 7.5
__x___ EDSS 8.0 – 9.5

Comments:
- Lexell et al (2006)[25] used the COPM in people with scores of 1-8.5. Esnouf et al (2010) showed improvement on the COPM in people with scores of 4-6.5.[27]

Should this tool be required for entry-level curricula?

_____ Yes __x___ No

Comments:

- Would be good to educate students in the use of this tool or Patient Specific Functional Scale or Goal Attainment Scale each of which can address a wide range of constructs of particular interest to the patient (each tool is individualized to the patient's goals and abilities). The COPM may be useful for detecting change in individuals that are at the floor or ceiling of other scales because the patient identifies the critical tasks. Time to administer is lengthy.

Is this tool appropriate for research purposes?

_____ Yes __x___ No

Comments:

- For research purposes, generalizing across populations is difficult because of the individualization of items. The test–retest reliability of the performance and satisfaction scores is good.[3] (**Stroke**) This tool is widely used in research in Canada.
- Lack of psychometric data in MS, so do not recommend for use in research at this point in time.
- Recommend investigating psychometric properties in MS.

Attachments:

- Score Sheets: _x____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Instructions: __x___ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Reference list: __x___ Uploaded on website

Second Reviewer Comments:

- Tool used in entry-level curricula: No. This tool has been developed for specific use by occupational therapists to assess patients self perception of occupational performance.
- Research purposes: agree as a means of patient self report
- Practice Setting: Acute 1; all other settings 2
- Level of Disability: agree with levels if one chose to use the COPM
- Entry-level curricula: do not recommend reading the literature, but familiarity that it is a self report measure of person's perception of one's self-care, productivity and leisure

Overall Taskforce Agreement with Recommendations:

-

Practice Setting	4	3	2	1	Comments
Acute			X		• Lengthy to administer and no psychometrics in acute patients

Inpatient Rehab			X		•
Home Health			X		•
Skilled Nursing			X		•
Outpatient			X		•

Overall Comments:

- Psychometric data is limited in the MS population. It is lengthy to administer (17.5-40 minutes) but is client specific. May be useful to demonstrate change in lower functioning individuals.

Level of Disability	4	3	2	1	Comments
EDSS 0.0 – 3.5			X		•
EDSS 4.0 – 5.5			X		•
EDSS 6.0 – 7.5			X		•
EDSS 8.0 – 9.5			X		•

Overall Comments:

- Rating reflects lack of psychometric data in individuals with MS.

Entry-Level Criteria	Students should learn to administer tool	Students should be exposed to tool (e.g. to read literature)	Do not recommend	Comments
Should this tool be required for entry level curricula?			X	• Rating reflects lack of psychometrics in individuals with MS and some concerns regarding clinical utility

Research Use	YES	NO	Comments
Is this tool appropriate for research purposes?		X	• Lack of psychometric data in MS, so do not recommend for use in research at this point in time. • Recommend investigating psychometric properties in MS. • However, as an adjunct to other measures; can capture nuances and changes specific to individual patients; may be more sensitive to detect changes

			that are not obtained in more routinely administered measures.

* RNL - Reintegration to Normal Living Index, DASH-DLV – Dutch version of Disabilities of Arm, Shoulder, and Hand Questionnaire. FIM – Functional Independence Measure, HAQ – Health Assessment Questionnaire, Klein-Bell – Klein Bell ADL Activity Subscale, LSS – Life Satisfaction Scale, D-AIMS2 - Dutch version of the Arthritis Impact Measurement Scale 2, SPSQ – Satisfaction with Performance Scaled Questionnaire, WQL – Wisconsin Quality of Life-Client Questionnaire, WPP – Work Personality Profile, BASFI – Bath Ankylosing Spondylitis Functional Index, BASDAI – Bath Ankylosing Spondylitis Disease Activity, DIP – Disability and Impact Profile, SIP68 – Sickness Impact Profile.

Note: COPM has been used in many populations in addition to those already reported: children with spina bifida or CP, Incomplete SCI, TBI, Alzheimer's Disease, multiple disabilities, psychiatric diagnoses, whiplash, amputation, autism, paralytic scoliosis, adolescents with special needs, older adults, wheelchair users, dystonia, cancer, inflammatory arthritis, depression, Asperger's syndrome, craniofacial pain, homeless, post-traumatic stress, vision deficits, hip arthroplasty, and chronic low back pain.

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Instrument name: Clinical Test for Sensory Interaction on Balance (CTSIB)

Reviewer: Amy M. Yorke, PT, NCS | **Date of review:** 7/11/11

ICF domain (check all that apply):

__x___ Body function/structure __x___ Activity _____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance
_____ Ataxia
_____ Cardiovascular/pulmonary status
_____ Coordination (non-equilibrium)
_____ Dizziness/vestibular
_____ Fatigue
_____ Flexibility
_____ Muscle performance
_____ Muscle tone
_____ Pain
_____ Posture
__x___ Sensory integration
_____ Somatosensation
__x___ Balance/falls
_____ Bed mobility
_____ Gait
_____ Reach and grasp
_____ Transfers
_____ Wheelchair skills
_____ Health and wellness
_____ Home management
_____ Leisure
_____ Quality of life
_____ Role function
_____ Shopping
_____ Social function
_____ Work

Other:

Type of measure:

___x__ Performance-based _____ Self-report

Instrument properties:

- Developed to systematically test the influence of visual, vestibular, and somatosensory input in standing balance that does not require computerized equipment[1]
- Standing balance is assessed under 6 different somatosensory and visual conditions[1-2]
  - Condition 1: Firm surface, eyes open
  - Condition 2: Firm surface, eyes closed
  - Condition 3: Firm surface, eyes open with visual conflict dome
  - Condition 4: Foam surface, eyes open
  - Condition 5: Foam surface, eyes closed
  - Condition 6: Form surface, eyes open with visual conflict dome
- Modified CTSIB eliminates conditions 3 and 6 (visual conflict) since no difference was found in scores between conditions 2 and 5 and conditions 5 and 6[3]

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • Not tested in patients with MS Inter-rater: • Not tested in patients with MS • High in healthy young subjects (r=0.99)[3]

	• Testing on 5 patients with unilateral hemiparesis secondary to CVA Kappa = 0.77 ($p<0.05$)[4] • 81 patients (no specific information provided regarding history provided) seen in a balance clinic (mean age 54 years, SD 15.5) assessed by two observers with the modified CTSIB demonstrated Kappa values of 0.31 ($p=0.006$) for Condition 1, 0.62 ($p<0.001$) for Condition 2, 0.81 ($p<0.001$) for Condition 4, and 0.80 ($p<0.001$) for Condition 5. When each observer was compared to computerized posturography, Kappa values ranged from 0.53 to 0.76 ($p<0.001$) on Conditions 2, 4, and 5; however, Condition 1 demonstrated 0.33 (0.001) for Observer 1 and 0.135 (0.165) for Observer 2.[5] <u>Test-retest:</u> • Not tested in patients with MS • Good ($r=0.75$) in community dwelling older adults[6] • Good in healthy young subjects ($r=0.99$)[3]
Validity (concurrent, criterion-related, predictive)	<u>Concurrent validity:</u> • Not tested in patients with MS • Significant positive correlation between CTSIB and Fugl-Meyer Sensorimotor sensory subscores (rho = 0.55, $p<0.05$), balance subscores (rho = 0.77, $p<0.01$), and total lower extremity recovery scores (rho=0.69, $p< 0.05$) when tested in 5 patients with unilateral hemiparesis secondary to CVA[4] • In 35 patients with vestibular dysfunction correlation with CTSIB and dynamic posturography ranged between 0.45 and 0.89 ($p<0.001$-0.034)[7] • Kappa = 0.80 when CTSIB compared to dynamic posturography, in patients with vestibular dysfunction, utilizing dichotomous outcome of abnormal or normal [7] • High correlation with SOT when completed with feet together during conditions 2 ($r=0.48$) and 5 ($r=0.51$) in 30 persons with a diagnosis of vestibular or balance dysfunction[8] <u>Predictive validity:</u> • <u>Discriminative validity:</u> • Not tested in patients with MS • In 96 community dwelling elderly divided into three groups, no history of fall, one fall, or recurrent falls, those with recurrent falls demonstrated more abnormal results for Condition 4 and 5 when compared to those with no falls[9] <u>Sensitivity/Specificity/Predictive Values/Likelihood Ratios:</u> • Not tested in patients with MS • CTSIB 90% sensitivity and 95% specificity using SOT as criterion standard[10]

	• CTSIB sensitivity 87% and specificity 60% with scores SOT in persons participating in vestibular physical therapy[7] • Modified CTSIB sensitivity of 88% with feet together or apart, with specificity of 50% with feet together and 44% with feet apart in 30 patients with vestibular dysfunction[8] • Condition 5 on the SOT with the corresponding condition on the modified CTSIB demonstrated a sensitivity of 91% and specificity of 57% with feet together and a sensitivity of 83% and specificity of 36% with feet apart in 30 patients with vestibular dysfunction[8]
Ceiling/floor effects	<u>Ceiling effects:</u> • <u>Floor effects:</u> •
Sensitivity to change (responsiveness, MCID, MDC) / normative data	<u>MDC:</u> • <u>MCID:</u> • <u>Other responsiveness values:</u> • <u>Normative Data:</u> • Not tested • Score of 20 seconds for conditions 4-6 has been suggested to be within normal limits for older adults[3]

Instrument use	• Patient position in standing
	  o Foot position
	  ▪ Together or in tandem[2]
	  ▪ No difference noted with feet together versus feet apart[8]
	  ▪ No difference noted with shoes on or shoes off[11]
	  o Arm position
	  ▪ Across chest[2,4,6,8]
	  ▪ Across waist[3]
	• Complete six conditions
	  o Condition 1: Firm surface, eyes open
	  o Condition 2: Firm surface, eyes closed
	  o Condition 3: Firm surface, eyes open in dome (visual conflict)
	  o Condition 4: Foam surface, eyes open
	  o Condition 5: Foam surface, eyes closed
	  o Condition 6: Foam surface, eyes open in dome (visual conflict)
	• Foam surface
	  o 4 or 6 inch medium density t-foam[10]
	  o 4 inch upholstery foam[7]

	o 3 inch high density viscoelastic foam[8] • One[3] , three [2,6], and five[4] trials, up to 30 seconds/trial of each condition are performed • Testing discontinued when 30 seconds is reached[2,6] • Timing stops if patient moves arms, legs, or feet[6] • Record time and visual observation of movement as objective measures[1-2]; can also record normal (completed 30 second trial) or abnormal (did not successfully complete 30 second trial)[7]
Equipment required	• Foam surface • Stopwatch • Paper lantern (for conditions 3 and 6)
Time to complete	• If all trials completed approximately 15-20 minutes[3-4] • Three trials of all conditions of mod CTSIB completed within 10 minutes without patient taking break [11]
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• Timing of trials can be added up together to attain one score depending upon number of conditions completed and number of trials completed with each condition • Results can also be as normal (≥30 seconds) or abnormal (<30 seconds)
Level of client participation required (is proxy participation available?)	• Active participation required
Limitations	• Amount of sway recorded is subjective as compared to information attained in SOT • Person needs to be able to stand independently without using an assistive device • Variations in testing methods (e.g., patient position, type of foam, number of trials used) may cause confusion for therapists administering the CTSIB and may impact reliability of the test

Recommendations
Practice Setting (check all that apply):

__x___ Acute
__x__ Inpatient Rehab
__x___ Home Health
__x___ Skilled Nursing
__x___ Outpatient

Comments:
- Can be used in any practice setting; however, the patient needs to be able to maintain independent standing

Level of Disability (check all that apply):

___x__ EDSS 0.0 – 3.5

___x__ EDSS 4.0 – 5.5 ___x__ EDSS 6.0 – 7.5 _____ EDSS 8.0 – 9.5 Comments: • Person needs to be able to stand independently without an assistive device
Should this tool be required for entry-level curricula? _____ Yes __x___ No Comments: • Due to the lack of psychometric data on patients with MS
Is this tool appropriate for research purposes? _____ Yes ___x__ No Comments: • Lack of psychometric data in MS, so do not recommend for use in research at this point in time. • Recommend investigating psychometric properties in MS.
Attachments: • Score Sheets: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable • Instructions: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable • Reference list: _____ Uploaded on website
Second Reviewer Comments: • Agree with ratings and recommendations. The CTSIB seems appropriate for use in individuals with MS and would likely provide useful information, but the lack of psychometric data is problematic for use at this point in time.
Overall Taskforce Agreement with Recommendations: •

Practice Setting	**4**	**3**	**2**	**1**	**Comments**
Acute			X		•
Inpatient Rehab			X		•
Home Health			X		•
Skilled Nursing			X		•
Outpatient			X		•
Overall Comments:					

• Patient needs to be able to stand independently without an assistive device; most likely to encounter a patient with this ability in outpatient setting					
Level of Disability	**4**	**3**	**2**	**1**	**Comments**
EDSS 0.0 – 3.5			X		•
EDSS 4.0 – 5.5			X		•
EDSS 6.0 – 7.5			X		• Person must be able to maintain independent standing
EDSS 8.0 – 9.5				X	•
Overall Comments: • Patient needs to be able to stand independently without an assistive device					

Entry-Level Criteria	**Students should learn to administer tool**	**Students should be exposed to tool (e.g. to read literature)**	**Do not recommend**	**Comments**
Should this tool be required for entry level curricula?			X	• For persons with MS, test is lacking psychometric data; however, there is more information about this test on patients with vestibular disorders as well as psychometric properties on the SOT

Research Use	**YES**	**NO**	**Comments**
Is this tool appropriate for research purposes?		X	• Lack of psychometric data in MS, so do not recommend for use in research at this point in time. • Recommend investigating psychometric properties in MS. • Most research utilizes SOT; however, completing clinically based research using the CTSIB or modified CTSIB would provide clinicians with psychometric properties

References:

Clinical Test for Sensory Interaction on Balance

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Instrument name: Disease Steps	
Reviewer: Susan E. Bennett, PT, DPT, EdD, NCS, MSCS	**Date of review:** 9/10/11

ICF domain (check all that apply):

__x__ Body function/structure _____ Activity _____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance
_____ Ataxia
_____ Cardiovascular/pulmonary status
_____ Coordination (non-equilibrium)
_____ Dizziness/vestibular
_____ Fatigue
_____ Flexibility
_____ Muscle performance
_____ Muscle tone / spasticity
_____ Pain
_____ Posture
_____ Sensory integration
_____ Somatosensation

_____ Balance/falls
_____ Bed mobility
__X__ Gait
_____ Reach and grasp
_____ Self care
__X__ Transfers
_____ Wheelchair skills

_____ Health and wellness
_____ Home management
_____ Leisure
_____ Quality of life
_____ Role function
_____ Shopping
_____ Social function
_____ Work

Other:
Classification is determined by history and neurologic examination in addition to disease course of MS

Type of measure:

__x__ Performance-based _____ Self-report

Instrument description:

- Assessment of functional disability in MS to serve as a guide for neurologists in the decision of when to intervene therapeutically and also to observe the patient's response over time. Classification is based on ambulation status as well as a history and neurologic examination.

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • Inter-rater: • Kappa= 0.8[1] Test-retest: •
Validity (concurrent, criterion-related, predictive)	Concurrent validity: • The Spearman correlation coefficient between Disease Steps and the EDSS is 0.958 [1]

	• Strong correlation between Disease Steps scores and EDSS r= 0.944[2] • Consistent correlations between change in Disease Steps score and change in EDSS: at 1 year r=0.545, at 2 years r=0.635, and at 3 years r=0.622.[2] Predictive validity: • Discriminative validity: • Sensitivity/Specificity/Predictive Values/Likelihood Ratios: •
Ceiling/floor effects	Ceiling effects: • Floor effects: •
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • MCID: • Other responsiveness values: • Normative Data: • Median staying time at a specific level was 12 months[2]
Instrument use	•
Equipment required	• 25 foot clear walk way
Time to complete	• Raters could simply and quickly categorize patients, based on examination of gait [1 to 5 minutes], completion of neurological exam for grades 0 – 2 could require 15 – 30 minutes
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• Scale consists of: • 0= Functionally normal with no limitations on activity or lifestyle • 1= Mild disability, mild symptoms or signs • 2= Moderate disability, visible abnormality of gait • 3= Early cane, use a cane or other form of unilateral support for greater distances, but can walk at least 25 feet without it • 4= Late cane, cane dependent, unable to walk 25 feet without a cane or other form of unilateral support • 5= Bilateral support, require bilateral support to walk 25 feet • 6= Confined to wheelchair • U= Unclassifiable, used for patients who do not fit above classification • See a more in-depth scale attached
Level of client participation	• To obtain scores 0 – 5 patients are required to walk 25 feet.

Disease Steps

required (is proxy participation available?)	Neurological exam performed requires client participation that establishes scores 1-2.
Limitations	• Unclassifiable patients included individuals with severe visual impairment, overwhelming fatigue, significant bowel or bladder involvement, or severe cognitive impairment in patients with otherwise minor physical disability.[1] • May be more sensitive for patients who use unilateral support.[1] • Heavily weighted towards ambulation.[1] • May not capture acute attacks and does not incorporate measures of disease activity such as attack frequency.[1]

Recommendations
Practice Setting (check all that apply):

__X___ Acute
__X__ Inpatient Rehab
__X__ Home Health
__X__ Skilled Nursing
__X__ Outpatient

Comments:
- May not be as appropriate for Skilled Nursing facility as majority of patients there would be at 6 on the scale

Level of Disability (check all that apply):

__X___ EDSS 0.0 – 3.5
__X___ EDSS 4.0 – 5.5
__X___ EDSS 6.0 – 7.5
__X___ EDSS 8.0 – 9.5

Comments:
- Disease steps has been strongly correlated with all level of the EDSS

Should this tool be required for entry-level curricula?

__X__ Yes _____ No

Comments:
- Students should be aware of this test

Is this tool appropriate for research purposes?

_____ Yes __X__ No

Comments:
- Limited objectivity of the scale

Disease Steps

Attachments:

- Score Sheets: __X_ Uploaded on website ____ Available but copyrighted _____ Unavailable

Disease Steps - National **Multiple Sclerosis** Society
www.nationalmssociety.org/download.aspx?id=256

- Instructions: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Reference list: __X___ Uploaded on website

Second Reviewer Comments:

- Concur with the ratings for Disease Steps

Overall Taskforce Agreement with Recommendations:

-

Practice Setting	**4**	**3**	**2**	**1**	**Comments**
Acute		X			•
Inpatient Rehab		X			• More objective data could be used in this practice setting, such as the Timed 25' walk, 2 or 6 minute walk, or 5 Times sit to stand
Home Health		X			•
Skilled Nursing		X			•
Outpatient		X			•

Overall Comments:

- Scale is specific to MS and strongly correlated with gold standard EDSS

Level of Disability	**4**	**3**	**2**	**1**	**Comments**
EDSS 0.0 – 3.5		X			•
EDSS 4.0 – 5.5		X			•
EDSS 6.0 – 7.5		X			•
EDSS 8.0 – 9.5		X			•

Overall Comments:

- Strongly correlated with EDSS

Entry-Level Criteria	**Students should learn to**	**Students should be exposed to**	**Do not recommend**	**Comments**

Disease Steps

	administer tool	**tool (e.g. to read literature)**		
Should this tool be required for entry level curricula?		X		• Familiar with its use with EDSS

Research Use	**YES**	**NO**	**Comments**
Is this tool appropriate for research purposes?		X	• Limited objective criteria

References:

1) Hohol M.J., Orav E.J., Weiner H.L. Disease Steps in multiple sclerosis: A simple approach to evaluate disease progress. *Neurology*. 1995 Feb;45(2):251-5.
2) Hohl M.J., Orav E.J., Weiner H.L. Disease steps in multiple sclerosis: a longitudinal study comparing Disease Steps and EDSS to evaluate disease progression. *Multiple Sclerosis*. 1999(5):349-354.
3) **Disease Steps** - National **Multiple Sclerosis** Society www.nationalmssociety.org/download.aspx?id=256

Instrument name: Dizziness Handicap Inventory

Reviewer: Amy M. Yorke, PT, NCS | **Date of review:** 6/3/11

ICF domain (check all that apply):

___x__ Body function/structure _x____ Activity ___x__ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance
_____ Ataxia
_____ Cardiovascular/pulmonary status
_____ Coordination (non-equilibrium)
__x___ Dizziness/vestibular
_____ Fatigue
_____ Flexibility
_____ Muscle performance
_____ Muscle tone
_____ Pain
_____ Posture
_____ Sensory integration
_____ Somatosensation
___x__ Balance/falls
___x__ Bed mobility
__x___ Gait
_____ Reach and grasp
__x___ Transfers
_____ Wheelchair skills
_____ Health and wellness
___x__ Home management
__x___ Leisure
__x___ Quality of life
___x__ Role function
__x___ Shopping
__x___ Social function
__x___ Work

Other:

Type of measure:

_____ Performance-based ___x__ Self-report

Instrument properties:

- 25 item multidimensional questionnaire that quantified a person's perception of disability and handicap in three subscales: physical, emotional, and functional.
- Scores range from 0-100 where 100 indicates the highest level of perceived disability and handicap

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • Inter-rater: • Test-retest: • Excellent test-retest reliability (r=0.97) during test development[1] • ICC 0.90 (95% CI 0.77-0.96), tested on 25 patients with MS[2]
Validity (concurrent,	Concurrent validity:

criterion-related, predictive)	• In a group of 51 patients with MS: DHI related to Berg Balance (r = -0.32), Dynamic Gait Index (r = -0.39), Timed Up and Go (r = 0.35), Hauser Ambulation Index (r = 0.32), Activities Specific Based Confidence Scale (r = -0.70)[3] • DHI significantly correlated with Dynamic Visual Acuity testing when tested 1 week after mild TBI.[4] • Moderately strong correlation between scores of DHI and ABC when tested on patients with vestibular dysfunction (r=-0.64)[5] Predictive validity: • 5 item BPPV subscale developed from current DHI significant predictor of the likelihood of having BPPV[6] Discriminative validity: • Good relationship between the number of dizzy spells/year (<12, ≥ 12, and permanent) and score on the DHI[1] Sensitivity/Specificity/Predictive Values/Likelihood Ratios: • In a group of 51 patients with MS, a cut off score of < 59 demonstrated a sensitivity of 50% and specificity of 77% in discriminating between fallers and non-fallers[3]
Ceiling/floor effects	Ceiling effects: • Reported 1.9% of the time in a study of 51 patients with MS[3] Floor effects: •
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • MCID: • 18 point difference between pre-treatment and post-treatment scores could be considered a significant change in person's self-perceived handicap[1] Other responsiveness values: • Normative Data: •
Instrument use	•
Equipment required	• Score sheet
Time to complete	• Approximately 10 minutes
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• Each item is answered with a "Never" (0 points), "Sometimes" (2 points), or "Always" (4 points). Scores range from 0-100 can be further subdivided into three subscales: physical (7 items, maximum 28 points), functional (9 items, maximum 36 points), and emotional (9 items, maximum 36 points). The higher the score, the greater the perceived handicap.
Level of client participation required (is proxy participation available?)	• Self-report survey

Limitations	•

Recommendations
Practice Setting (check all that apply):

_____ Acute
__x___ Inpatient Rehab
__x___ Home Health
__x___ Skilled Nursing
__x___ Outpatient

Comments:
-

Level of Disability (check all that apply):

__x___ EDSS 0.0 – 3.5
__x___ EDSS 4.0 – 5.5
__x___ EDSS 6.0 – 7.5
_____ EDSS 8.0 – 9.5

Comments:
-

Should this tool be required for entry-level curricula?

_x____ Yes _____ No

Comments:
- Quick and easy to administer
- Can be administered by support staff
- Can be used in multiple patients that have the complaint of dizziness

Is this tool appropriate for research purposes?

___x__ Yes _____ No

Comments:
- Has been utilized in research studies

Attachments:

- Score Sheets: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Instructions: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Reference list: _____ Uploaded on website

Second Reviewer Comments: Agree with primary reviewer.

• Agree with primary reviewer.
Overall Taskforce Agreement with Recommendations: •

Practice Setting	**4**	**3**	**2**	**1**	**Comments**
Acute				X	•
Inpatient Rehab		X			•
Home Health			X		•
Skilled Nursing			X		•
Outpatient	X				•
Overall Comments: •					

Level of Disability	**4**	**3**	**2**	**1**	**Comments**
EDSS 0.0 – 3.5	X				•
EDSS 4.0 – 5.5	X				•
EDSS 6.0 – 7.5	X				•
EDSS 8.0 – 9.5			X		•
Overall Comments: •					

Entry-Level Criteria	**Students should learn to administer tool**	**Students should be exposed to tool (e.g. to read literature)**	**Do not recommend**	**Comments**
Should this tool be required for entry level curricula?	X			•

Research Use	**YES**	**NO**	**Comments**
Is this tool appropriate for research purposes?	X		•

References:

Dizziness Handicap Inventory

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Instrument name: Dynamic Gait Index (DGI)

Reviewer: Kirsten Potter, PT, DPT, MS, NCS | **Date of review:** 4/22/11

ICF domain (check all that apply):

_____ Body function/structure ___x__ Activity _____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance
_____ Ataxia
_____ Cardiovascular/pulmonary status
_____ Coordination (non-equilibrium)
_____ Dizziness/vestibular
_____ Fatigue
_____ Flexibility
_____ Muscle performance
_____ Muscle tone / spasticity
_____ Pain
_____ Posture
_____ Sensory integration
_____ Somatosensation
__x___ Balance/falls
_____ Bed mobility
__x___ Gait
_____ Reach and grasp
_____ Self care
_____ Transfers
_____ Wheelchair skills
_____ Health and wellness
_____ Home management
_____ Leisure
_____ Quality of life
_____ Role function
_____ Shopping
_____ Social function
_____ Work

Other:

Type of measure:

__x___ Performance-based _____ Self-report

Instrument description:

- The DGI was developed as a measure to assess and document a patient's ability to respond to changing task demands during walking[1]
- It is appropriate for use in ambulatory / high functioning individuals and patients with vestibular and other neurological disorders

Reliability (test-retest, intra-rater, inter-rater)

Intra-rater:

- In subjects with MS, total DGI values ranged from r = 0.760 – 0.986 (p<.05) (unable to compute for task 7, step around obstacles, due to inadequate variability among patients)[2]

Inter-rater:

- Total DGI ICC = 0.983 (p<0.05) in MS; individual item ICC values ranged 0.910 – 0.976 (p<.05); reliability tested via videotape of subjects performing the test[2]
- ICC = 0.85 in ambulatory individuals with MS[3]

Test-retest:

	• ICC = 0.85 in ambulatory individuals with MS[3]
Validity (concurrent, criterion-related, predictive)	Concurrent validity: • In ambulatory individuals with MS, DGI correlates significantly ($p < 0.0001$) with Deambulation Index (rho = -80), Berg Balance Scale (rho = 0.78), Timed Up and Go (rho = -0.72), Activities Specific Balance Confidence Scale (rho = 0.54), and Dizziness Handicap Inventory (rho = -0.39)[4] • DGI correlates to 6.1 m walk test in subjects with MS (EDSS 2.0 – 6.0): r = -0.801, $p < 0.01$[2] Predictive validity: • In individuals with MS, at a cut of > 12: sensitivity = 45% and specificity = 85% for predicting fall risk; as compared to the DGI, sensitivity was better in the Dizziness Handicap Inventory (cut off <59: 50%) and Activities Specific Balance Confidence Scale (cut off >40: 65%) and specificity values were better in the Berg Balance Scale (cut off >44: 90%)[4] Discriminative validity: • The DGI is able to discriminate between fallers (mean DGI = 13.3; SD = 5.2) and non-fallers (mean DGI = 16.9; SD = 5.) with MS ($p = 0.025$[4] • The DGI discriminated better than the Berg Balance Scale, but less when compared to the Activities Specific Balance Confidence Scale and the Dizziness Handicap Inventory[4] Sensitivity/Specificity/Predictive Values/Likelihood Ratios: • See above
Ceiling/floor effects	Ceiling effects: • No significant ceiling effect found in a study of 63 individuals with MS (able to stand independently for > 3 seconds and walk 6 m with/without an assistive device), none of the items of the scale reached the maximum score[4] Floor effects: •
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • Not reported for MS; in patients with stroke, MDC = 4 and MDC% = 16.6%[5] MCID: • Not reported in individuals with MS; in patients with migraine with vestibular disorders (peripheral or central) MCID = 4[6] Other responsiveness values: • Not reported for MS; in patients with stroke, ES = 0.56 and 0. 62 from first week to 2 and 5 months post stroke, respectively; both significant at p <

<table>
<tr><td></td><td>0.01 [5]

<u>Normative Data:</u>
• In 318 subjects, mean age = 49.2 (range 20.7 – 83.2):[7]
<table><tr><th>Decade</th><th>Mean</th><th>SD</th><th>Range</th></tr><tr><td>3</td><td>24.0</td><td>0.2</td><td>23-24</td></tr><tr><td>4</td><td>24.0</td><td>0.2</td><td>23-24</td></tr><tr><td>5</td><td>23.9</td><td>0.4</td><td>22-24</td></tr><tr><td>6</td><td>23.9</td><td>0.4</td><td>22-24</td></tr><tr><td>7</td><td>23.2</td><td>0.9</td><td>21-24</td></tr><tr><td>8</td><td>22.0</td><td>2.0</td><td>13-24</td></tr></table></td></tr>
<tr><td>Instrument use</td><td>• The DGI has been used in various patient populations (e.g., MS, stroke, Parkinson’s, vestibular disorders, and older adults)</td></tr>
<tr><td>Equipment required</td><td>• Scoring form
• Level walking area at least 20 feet in length
• Stopwatch
• Shoe box
• 2 cones (to serve as obstacles in walking pathway)
• Stairs with railing</td></tr>
<tr><td>Time to complete</td><td>• 15 minutes</td></tr>
<tr><td>How is the instrument scored? (e.g., total score, are there subscales, etc…)</td><td>• 8 items that vary the walking task by changing walking speeds, walking with head turning, turning and stopping, walking over and around obstacles, and ascending / descending stairs
• Scoring focuses on changes in balance or changes in gait patterns during the various walking tasks
• Scores are based on a 4-point scale:
o 3 = No gait dysfunction
o 2 = Minimal impairment
o 1 = Moderate impairment
o 0 = Severe impairment
• A shortened DGI was developed based on Rasch analysis of level of item difficulty for 123 persons with diagnosed balance or vestibular problems (not including MS). It contains 4 items: horizontal head turns, vertical head turns, gait on level surfaces, and changes in gait speed; the shortened version has equivalent or superior psychometric properties compared to the 8 item version[8]</td></tr>
</table>

Level of client participation required (is proxy participation available?)	• Requires the patient to perform challenging gait tasks.
Limitations	• Familiarity with the scoring system prior to administering test is important, as scoring system varies among items. • Scoring interpretation has reported to be confusing[2] and standardized instructions seem cumbersome

Recommendations
Practice Setting (check all that apply):
__x___ Acute
__x___ Inpatient Rehab
__x___ Home Health
__x___ Skilled Nursing
__x___ Outpatient

Comments:
-

Level of Disability (check all that apply):
__x___ EDSS 0.0 – 3.5
__x___ EDSS 4.0 – 5.5
_____ EDSS 6.0 – 7.5
_____ EDSS 8.0 – 9.5

Comments:
- Not appropriate for patients who are unable to ambulate while performing challenging gait tasks

Should this tool be required for entry-level curricula?
__x___ Yes _____ No
Comments:
-

Is this tool appropriate for research purposes?
___x__ Yes _____ No
Comments:
-

Attachments:
- Score Sheets: __x___ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Instructions: __x___ Uploaded on website _____ Available but copyrighted _____ Unavailable

• Reference list: _____ Uploaded on website
Second Reviewer Comments: • I agree with your recommendations.
Overall Taskforce Agreement with Recommendations: •

Practice Setting	**4**	**3**	**2**	**1**	**Comments**
Acute		X			•
Inpatient Rehab		X			•
Home Health		X			•
Skilled Nursing		X			•
Outpatient		X			•
Overall Comments: • Rating of 3 reflects lack of responsiveness values for the DGI specific to patients with MS					
Level of Disability	**4**	**3**	**2**	**1**	**Comments**
EDSS 0.0 – 3.5		X			•
EDSS 4.0 – 5.5		X			•
EDSS 6.0 – 7.5				X	•
EDSS 8.0 – 9.5				X	•
Overall Comments: • Patient must be able to perform high level balance and gait tasks to complete the DGI; ratings of 3 for lower EDSS levels (i.e., ≤ 5.5) primarily reflect lack of responsiveness data in individuals with MS					

Entry-Level Criteria	**Students should learn to administer tool**	**Students should be exposed to tool (e.g. to read literature)**	**Do not recommend**	**Comments**
Should this tool be required for entry level curricula?	X			•

Research Use	**YES**	**NO**	**Comments**

Is this tool appropriate for research purposes?	X		•

References:

1. Shumway-Cook A, Woollacott MJ. *Motor Control: Theory and Practical Applications*. Baltimore: Lippincott, Williams, and Wilkins; 1995.
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3. Cattaneo D, Jonsdottir J, Repetti S, Cattaneo D, Jonsdottir J, Repetti S. Reliability of four scales on balance disorders in persons with multiple sclerosis. *Disabil Rehabil.*2007;29(24):1920-1925.
4. Cattaneo D, Regola A, Meotti M, Cattaneo D, Regola A, Meotti M. Validity of six balance disorders scales in persons with multiple sclerosis. *Disabil Rehabil.*2006;28(12):789-795.
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Instrument name: Expanded Disability Status Scale (EDSS) & Kurtzke Functional Systems Score (FSS)

Reviewer: Kirsten Potter, PT, DPT, MS, NCS & Kathleen Brandfass, MS, PT

Date of review: 9/8/11

ICF domain (check all that apply):

___x__ Body function/structure __x___ Activity _____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance
__x___ Ataxia
_____ Cardiovascular/pulmonary status
__x___ Coordination (non-equilibrium)
_____ Dizziness/vestibular
_____ Fatigue
_____ Flexibility
_____ Muscle performance
_____ Muscle tone / spasticity
_____ Pain
_____ Posture
_____ Sensory integration
__x___ Somatosensation
_____ Balance/falls
_____ Bed mobility
_x___ Gait
_____ Reach and grasp
_x___ Self care
_x___ Transfers
_x___ Wheelchair skills
_____ Health and wellness
_____ Home management
_____ Leisure
_____ Quality of life
_____ Role function
_____ Shopping
_____ Social function
_____ Work

Other: brain stem functions (e.g., nystagmus, dysarthria), bowel/bladder, visual acuity, mentation

Type of measure:

____x_ Performance-based __x___ Self-report

Comment: The only self-report item is bowel/bladder. However, a telephone version of the EDSS has been developed and tested[1] as has a calculator for handheld personal digital assistants and computers;[2] this review focuses on the original EDSS and FSS described by Kurtzke[3] and the calculator version.[2]

Instrument description:

- The EDSS was first reported by Kurtzke in 1983[3] and is based on the FSS, originally developed as the Disability Status Scale (DSS) in 1955. The DSS was subsequently modified to the FSS.
- The FSS is based on 8 functional central nervous system (FS) components: pyramidal, cerebellar, brain stem, sensory, bowel/bladder, visual, cerebral and other. Each of these systems is independent from the others, but collectively they represent all neurological impairment seen in MS.[3]
- The EDSS/FSS is completed by a physician (usually a neurologist) and is considered to be the gold standard measure for individuals with MS.
- An expert system, using a computer system to compute EDSS scores semi-automatically, has been developed, but doesn't appear to be commonly discussed in the literature with exception of an article by Gaspari et al;[4] more information can be found at http://www.cs.unibo.it/~gaspari/www/aedss/whatis.html
- A calculator version, able to be used by personal digital assistants and computers, is also available and may be downloaded/purchased through iTunes, AndroLib, AppBrain, PC World,

Android, among others	
Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • 10 patients with clinically stable MS and EDSS scores ranging 1 – 3.5: EDSS ICC ranged from 0.876 – 0.961 (4 raters); FS ICC values ranged from 0.783 – 0.935 (pyramidal), 0.675 – 0.908 (cerebellar), 0.321 – 0.933 (brainstem), 0.413 – 0.791 (visual), 0.864 – 0.933 (bowel/bladder with altered definition), and 0.773 – 0.893 (sensory)[5] • In in-patients with MS, scores for 2 raters differed widely: EDSS ICC = 0.61 and ICC = 0.94; FS scores ranged from ICC = 0.67 (mental) to 0.83 (pyramidal) and ICC = 0.28 (mental) to 0.79 (brainstem)[6] • 64 MS patients EDSS - Κ =0.65/ICC = 0.99; FS: pyramidal- Κ =0.63/ICC = 0.95;cerebellar- Κ =0.61/ICC = 0.91; brain stem- Κ =0.59/ICC = 0.88; bowel/bladder= Κ 0.63/ICC = 0.95; sensory- Κ =0.41/ICC= 0.81; mental- Κ =0.42/ICC = 0.87; visual- Κ =0.67/ICC = 0.95.[7] Inter-rater: • 10 patients with clinically stable MS and EDSS scores ranging 1 – 3.5: EDSS ICC ranged from 0.654 – 0.708; FS ICC values ranged from 0.423 – 0.645 (pyramidal), 0.307 – 0.471 (cerebellar), 0.011 – 0.023 (brainstem), 0.027 – 0.285 (visual), 0.740 – 0.783 (bowel/bladder with altered definition), and 0.573 – 0.610 (sensory)[5] • In in-patients with MS: EDSS ICC = 0.78; FS scores ranged from ICC = 0.38 (sensory) to 0.72 (bowel/bladder)[6] • 168 MS patients (values in parentheses represent percent perfect agreement): EDSS Κ = 0.62 (69%); for FS: pyramidal Κ =0.47 (69%), cerebellar Κ =0.32 (48%), brain stem Κ 0.44 (59%), sensory Κ = 0.31 (48%), bowel/bladder Κ = 0.43 (59%), visual Κ 0.58 (69%), cerebral Κ =0.46 (71%); indicating high degree of variability in inter-rater reliability.[8] • 64 MS patients EDSS - Κ =0.70/ICC = 0.99; FS: pyramidal- Κ =0.64/ICC = 0.92;cerebellar- Κ =0.66/ICC = 0.67;brain stem- Κ =0.63/ICC = 0.67; bowel/bladder- Κ =0.60/ICC = 0.92; sensory- Κ =0.43/ICC = 0.86;mental- Κ =0.58/ICC = 0.78; visual- Κ =0.42/ICC = 0.88.[7] • 24 patients with MS: Κ for FS ranged from 0.28 (pyramidal) – 0.56 (cerebellar) & EDSS = 0.49, indicating low reliability, when raters had to assign exactly the same scores to be in agreement; when ratings could differ by 1 point, Κ ranged from 0.87 (for cerebellar and mental) to 1.0 (bowel/bladder) for FS and 0.94 for EDSS; all Κ values for FS and EDSS were between 0.87 = 1.0 when

	ratings with differences of 2 points were deemed to be in agreement[9] • Reliability is lower at EDSS levels < 5.0 than higher levels[9] • In 20 patients with stable MS, K values for EDSS ranged from 0.32 -0.76; fair to moderate agreement found for FS items (widely ranging reliability among the 3 pairs administering the test); error accounted for 12 – 50% of the variation between FSS scores and 17% for EDSS (both greater than Ambulation Index); greater variability in scores found for patients with EDSS < 6.0[10] • Reliability between calculator version of EDSS and pen/pencil version K = 0.84 ($p < 0.0001$); ICC for the distribution of differences between EDSS scores obtained with the 2 versions – 0.86[2] <u>Test-retest:</u> • Reliability coefficient = 0.93[11] • For the calculator version of the EDSS, K = 0.93 ($p < 0.0001$); ICC for the distribution of differences between EDSS scores obtained between the 2 assessments – 0.92[2]
Validity (concurrent, criterion-related, predictive)	<u>Concurrent validity:</u> • In 194 patients, EDSS correlates significantly and negatively with all SF-36 dimensions except bodily pain; highest correlations found for physical functioning (r = -0.86), social functioning (r = -0.48), and general health (r = 0.46); all $p < 0.0001$; FS scores highly correlate with each other (r ranging from 0.52 – 0.90); multiple regression showed largely weak correlations between FS scores and SF-36 dimensions (strongest correlation was FS pyramidal with SF-26 physical functioning =0.58, $p < 0.01$)[12] • In 43 patients with MS: EDSS correlated significantly with the Activities of Daily Living Scale (rho = 0.82; $p < 0.0001$); correlations between ADL Scale subscales and EDSS were generally moderate (range rho = 0.57 for communication to rho = 0.82 for mobility); stepwise multiple regression indicated that only the mobility subscale accounted for the variance in the relationship between EDSS and ADL[13] • In in-patients with MS, EDSS correlates highly with the Barthel Index and Functional Independence Measure (r = 0.-89 and r = -0.84, respectively); poor correlations were found between the EDSS and the London Handicap Scale, SF-36, General Health Questionnaire, psychological well-being, and age; correlations among FSS items range from r = -0.23 to r = 0.52 and correlations between the EDSS and FSS items range r = -0.10 to r = 0.59[6] • Cross sectional correlations between sum scores for EDSS and self report measure of disability, Guy's Neurologic Disability

	Scale (GNDS), were rho = 0.69 and 0.77 ($p < 0.01$) at baseline and follow-up, respectively; when assessed in regards to change over time, rho = 0.19 ($p < 0.01$); correlations between change in FSS and GNDS were largely marginal to weak; moderate correlation found between bladder/bowel related items on each measure (rho = 0.58, $p < 0.01$); correlations between GNDS subcategories and change in EDSS score were weak and insignificant (only significant correlation pertained to change in EDSS with lower limb function on GNDS, rho = 0.28, $p < 0.01$)[14] • 10 – 22% of patients who show significant worsening on EDSS showed significant improvement in perceived disability as measured by the GNDS and in 29.7% of patients who showed significant improvement on EDSS, there was significant worsening on GNDS[14] • EDSS correlates significantly with Barthel Index (r = -0.74), London Handicap Scale (r = - 0.69), EuroQoL VAS (r = -0.69), SF-36 physical functioning (r = - 0.82), SF-36 physical role limitation (r = - 0.50), SF-36 social functioning r = -0.47; SF-36 vitality: r = -0.41, SF-36 general health perception r = -.047, Scripps Neurological Rating Scale (r = - 0.92), Functional Independence Measure (r = - 0.87), Cambridge MS Basic Score disability and handicap (r = 0.82 and 0.62, respectively), Ambulation Index (r = 0.68)[7] • Correlation between EDSS calculator and Ambulation Index, rho = 0.73 ($p < 0.001$)[2] <u>Predictive validity:</u> • Baseline EDSS scores are able to predict EDSS at 1 and 2 years later (rho = 0.852 and 0.772, respectively; both significant at $p < 0.001$); 1-year EDSS score is able to predict 2-year EDSS score (rho = 0.884, $p < 0.001$); ability of EDSS changes in 1st year are correlated weakly to changes in 2nd year (rho = 0.171, $p < 0.03$); similar correlations were made in regards to EDSS predicting MS Functional Composite scores (all of these showed a weak relationship with rho values < 0.422)[15] • OR (95% CI) for worsening of EDSS at 1-year predicting worsening at year 2 = 15.3; however, the presence of worsening at year 1 (as compared to baseline) reduced the likelihood of worsening from year 1 to 2 (OR = 0.8)[15] <u>Discriminative validity:</u> • The EDSS has been shown to be less able to discriminate between patients at varying disability levels than the Barthel Index and Functional Independence Measure[6] • Patients with low EDSS scores (≤ 2.5) show lower mean scores on

	SF-36 dimensions (with exception of mental health) as compared to general population; these patients scored significantly better than the patients with higher EDSS scores in all dimensions ($p < 0.005$); patients with EDSS scores 3.0 – 6.0 show significantly higher quality of life scores as compared to those with higher EDSS scores (≥ 6.5)[12] Sensitivity/Specificity/Predictive Values/Likelihood Ratios: • Sensitivity and specificity of EDSS in ability to predict worsening at 1-year = 0.55 and 0.94, respectively; LR+ = 8.84 and LR- = 0.49[15] • Sensitivity and specificity of a short-term worsening (baseline – 1-year) in EDSS i to predict worsening at year 2 = 0.68 and 0.78, respectively; LR+ = 3.14 and LR- = 0.41[15] • Sensitivity and specificity of short-term worsening in EDSS to predict worsening at 2-years = 0.33 and 0.83, respectively; LR+ = 1.96 and LR- = 0.81[15] • LR + of significant worsening from baseline to year-1 to predict significant worsening from baseline to year 2 = 9.61 and to predict subsequent worsening (year 1 to year 2) LR + = 1.11[15]
Ceiling/floor effects	Ceiling effects: • Not present when administered to in-patients with MS[6] Floor effects: • Not present when administered to in-patients with MS[6]
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • Amato et al[9] reported that while a change in 1 point on the FSS is often accepted as clinically important change, this may reflect variability (due to limited reliability) rather than actual change; thus, they recommend a change of ≥ 2 as a more reliable indication of clinical change • Francis[10] reported that 95% of raters scored within 1.5 points of the correct value on the EDSS, but noted greater variability of scores for EDSS levels < 6.0 as compared to those with higher EDSS levels • Goodkin et al[5] reached 100% agreement on EDSS scores when agreement was defined as within 1.0 EDSS and FSS points (intra-rater) and 1.5 EDSS and 3 FSS points (inter-rater) • In stable patients, scores on EDSS varied within 1 point, indicating that changes of at least 1 point for EDSS < 6.0 and 0.5 points for EDSS > 6.0 be considered to represent reliable change[16] MCID:

	• Other responsiveness values: • EDSS effect size has been reported to be 0.10,[6] 0.11,[11] and 0.239[15] indicating poor responsiveness • Using a signal-to-noise ratio, Syndulko et al[11] determined that, for the most part, the EDSS has poorer responsiveness (R1 values of 2.09 for all patients, 2.34 for patients with EDSS < 5.5, and 1.70 for patients with EDSS ≥ 5.5) as compared to neuroperformance composites (global, lower and upper extremity), Ambulation Index, two components of the Incapacity Status Scale composites Normative Data: •
Instrument use	• Neurologic Evaluation of MS
Equipment required	• FSS and EDSS forms • Pen or pencil
Time to complete	• 15 to 20 minutes
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• The EDSS is scored on a 1 – 10 scale (1 = normal neurological exam {all grade – in functional systems; cerebral grade 1 acceptable}) to 10 (death due to MS)[3] • Each of the 8 items is scored on an ordinal clinical rating scale from 0 - 5 or 0 - 6.
Level of client participation required (is proxy participation available?)	• Client participation is required to complete the FSS and EDSS • While the measure is largely performance based, Lechner-Scott et al[1] developed and tested a version of the EDSS administered via phone that can be administered to the patient or caregiver
Limitations	• The EDSS has been reported to be less able to predict overall disability at higher EDSS levels (i.e., > 5.0), as a small range of EDSS scores were associated with a wider range of ADL disability,[13] however Noseworthy et al found similar degrees of agreement between lower and higher EDSS levels[8] • Albrecht et al[17] determined that day to day variability in walking distance was great in 29 patients with stable MS; they noted fluctuations of > 1 point on the EDSS over a 4-day testing period; given that EDSS levels 4.0 – 5.5 are determined based on walking distance, a change of one point may falsely suggest a change in disease status • The EDSS is weighted heavily towards ambulation, but less on

	other issues relevant to MS (e.g., upper limb function, cognition, and fatigue)[18]

Recommendations
Practice Setting (check all that apply):
____Acute
____ Inpatient Rehab
____ Home Health
____ Skilled Nursing
____ Outpatient

Comments:
- The EDSS and FSS are feasible for any practice setting, yet clinical utility and psychometric data are poor

Level of Disability (check all that apply):
_____ EDSS 0.0 – 3.5
_____ EDSS 4.0 – 5.5
_____ EDSS 6.0 – 7.5
_____ EDSS 8.0 – 9.5

Comments:
- The EDSS covers the spectrum of MS disability, however, evidence exists showing that reliability is low, particularly for lower EDSS levels (< 5.0)[9] and the measure lacks responsiveness; thus do not recommend for use in clinical practice as more measures are likely to be more useful and reliable.

Should this tool be required for entry-level curricula?
_____ Yes _x____ No
Comments:
-

Is this tool appropriate for research purposes?
_____ Yes __x___ No
Comments:
- Although it may be useful to classify patients according to EDSS level

Attachments:
- Score Sheets: __x___ Uploaded on website _____ Available but copyrighted _____ Unavailable

  http://www.nationalmssociety.org/for-professionals/researchers/clinical-study-measures/fss-and-edss/index.aspx
- Instructions: __X___ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Reference list: _____ Uploaded on website

Second Reviewer Comments: • Agree with primary review.
Overall Taskforce Agreement with Recommendations: •

Practice Setting	**4**	**3**	**2**	**1**	**Comments**
Acute				X	•
Inpatient Rehab				X	•
Home Health				X	•
Skilled Nursing				X	•
Outpatient				X	•
Overall Comments: • While the EDSS is feasible for any practice setting, the clinical utility and psychometric data are poor (see below)					
Level of Disability	**4**	**3**	**2**	**1**	**Comments**
EDSS 0.0 – 3.5				X	•
EDSS 4.0 – 5.5				X	•
EDSS 6.0 – 7.5				X	• Lower reliability at lower EDSS levels
EDSS 8.0 – 9.5				X	• As above
Overall Comments: • The EDSS pertains to various constructs across ICF levels. It does not provide detailed information about any one body system, limiting its clinical utility. Although ample psychometric data is available, the reliability of the EDSS and FSS has been shown to be moderate at best in many studies, and it has been shown to be unresponsive to change, making it a poor choice as an evaluative measure. Thus, do not recommend for use in clinical practice, as other measures are likely to be more useful and reliable.					

Entry-Level Criteria	**Students should learn to administer tool**	**Students should be exposed to tool (e.g. to read literature)**	**Do not recommend**	**Comments**
Should this tool be required for entry level			X	• It might be beneficial to make students aware of the existence and purpose

curricula?				of the measure, given its use in many research studies.

Research Use	YES	NO	Comments
Is this tool appropriate for research purposes?		X	• The limited responsiveness data makes the EDSS an inappropriate measure by which to measure change; therefore, not recommended as an evaluative measure in research, but might be useful to describe the sample studied

References:

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Instrument name: Fatigue Descriptive Scale (FDS)	
Reviewer: Kathleen Brandfass, MS, PT	**Date of review:** 5/15/11

ICF domain (check all that apply):

_x____ Body function/structure x_____ Activity _x____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance	_____ Balance/falls	__x Health and wellness
_____ Ataxia	_____ Bed mobility	_____ Home management
_____ Cardiovascular/pulmonary status	_____ Gait	_____ Leisure
_____ Coordination (non-equilibrium)	_____ Reach and grasp	_____ Quality of life
_____ Dizziness/vestibular	_____Self care	_____ Role function
__x___ Fatigue	_____ Transfers	_____ Shopping
_____ Flexibility	_____ Wheelchair skills	__x____ Social function
_____ Muscle performance		___x___ Work
_____ Muscle tone / spasticity		
_____ Pain		
_____ Posture		
_____ Sensory integration		
_____ Somatosensation		

Other:
Effect of hot temperature on fatigue symptoms

Type of Measure:
_____ Performance based ___X___ Self –report

Comment: Questions are asked by interview.

Instrument description:

- FDS is a 5 category interview-based scale used to assess fatigue in three categories: fatigue associated with asthenia (fatigue at rest), fatigue with exercise and fatigue with worsening symptoms. Scale is scored for initiative, modality, severity, frequency and presence or absence of Uhthoff's phenomenon). Most of the questions are scored on 0-3. Score range is 0-17.

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: Kappa 0.53 (1) • Inter-rater: • Test-retest: •
Validity (concurrent, criterion-related,	Concurrent validity: • Correlated with Fatigue Severity Scale r-0.87 p< 0.001

predictive)	Predictive validity:n/a • Discriminative validity:n/a • Sensitivity/Specificity/Predictive Values/Likelihood Ratios:. • EDSS pyramidal tract involvement had 85.5% sensitivity with fatigue. Anxiety and sleep disorders 80% specificity associated with fatigue
Ceiling/floor effects	Ceiling effects: n/a • Floor effects: n/a •
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: n/a • MCID: n/a • Other responsiveness values: • Normative Data: •
Instrument use	• Research/ clinical
Equipment required	• form
Time to complete	• 15 to 20 minutes
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• Total for entire scale possible of 17 points. • Total score = initiative X (modality + frequency + severity) + Uhthoff's. Range is 0-3 for each question • Responses are scored by interviewer. • The lower the score the less fatigue related disability
Level of client participation required (is proxy participation available?)	• Questions are asked by interviewer
Limitations	• Decreased cognitive ability

Recommendations
Practice Setting (check all that apply):

__X__ Acute
__X__ Inpatient Rehab
__X__ Home Health
__X__ Skilled Nursing
__X__ Outpatient

Comments:

- FDS is not related to specific practice setting. The scale could potentially be utilized in any setting where fatigue is limiting a person's physical performance

Level of Disability (check all that apply):

__X__ EDSS 0.0 – 3.5
__X___ EDSS 4.0 – 5.5
__X___ EDSS 6.0 – 7.5
__X___ EDSS 8.0 – 9.5

Comments:

- FDS is not directly related to EDSS score; although the more fatigue was reported at EDSS levels of 3.5 and greater

Should this tool be required for entry-level curricula?

_____ Yes __X___ No

Comments:

-

Is this tool appropriate for research purposes?

_____ Yes __x___ No

Comments:

- Lack of psychometric data in MS, so do not recommend for use in research at this point in time.
- Recommend investigating psychometric properties in MS.

Attachments:

- Score Sheets: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable Available in original article by Iriarte J[6]
- Instructions: _____ Uploaded on website ____ Available but copyrighted _____ Unavailable Available in original article by Iriarte J[6]
- Reference list: _____ Uploaded on website

Second Reviewer Comments:

- The questionnaire is a bit complicated to use. I would concur that it is not appropriate for use with students, and I would score it a 2 for research because some of the questions are ambiguous.

Overall Taskforce Agreement with Recommendations:

-

Practice Setting	**4**	**3**	**2**	**1**	**Comments**
Acute			X		•

Fatigue Descriptive Scale

Inpatient Rehab			X		•
Home Health			X		•
Skilled Nursing			X		•
Outpatient			X		•

Overall Comments:

- FDS specifically defines fatigue related to occurring at rest and with performance. This scale does have the potential to facilitate an understanding of an individual's response to clinical intervention and pharmacology.
- Rating reflects lack of psychometric data in individuals with MS

Level of Disability	4	3	2	1	Comments
EDSS 0.0 – 3.5			X		•
EDSS 4.0 – 5.5			X		•
EDSS 6.0 – 7.5			X		•
EDSS 8.0 – 9.5			X		•

Overall Comments:

- As fatigue is the emphasis for the scale FDS could be utilized at any EDSS level.

Entry-Level Criteria	Students should learn to administer tool	Students should be exposed to tool (e.g. to read literature)	Do not recommend	Comments
Should this tool be required for entry level curricula?			X	• This tool has research and clinical relevance but would have limited application in entry-level curricula.

Research Use	YES	NO	Comments
Is this tool appropriate for research purposes?		X	• Lack of psychometric data in MS, so do not recommend for use in research at this point in time. • Recommend investigating psychometric properties in MS. • FDS does define specific fatigue entities. In research the usefulness would be in the scale's ability to capture intervention's

			effect on fatigue. However, there may be better scales on fatigue to capture this information.

References:

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Instrument name: Fatigue Scale for Motor and Cognitive Functions (FSMC)	
Reviewer: Gail L. Widener, PT, PhD	**Date of review:** 8/11

ICF domain (check all that apply):

__X__ Body function/structure _____ Activity _____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance	_____ Balance/falls	_____ Health and wellness
_____ Ataxia	_____ Bed mobility	_____ Home management
_____ Cardiovascular/pulmonary status	_____ Gait	_____ Leisure
_____ Coordination (non-equilibrium)	_____ Reach and grasp	_____ Quality of life
_____ Dizziness/vestibular	_____ Transfers	_____ Role function
__X__ Fatigue	_____ Wheelchair skills	_____ Shopping
_____ Flexibility		_____ Social function
_____ Muscle performance		_____ Work
_____ Muscle tone		
_____ Pain		
_____ Posture		
_____ Sensory integration		
_____ Somatosensation		

Other:

Type of measure:

_____ Performance-based __X__ Self-report

Instrument properties:

- The FSMC[1] is a 20-item scale developed as a measure of cognitive and motor fatigue for people with MS (pwMS). Instructions refer to a general time frame rather than a fixed time frame. This measure has been translated into 20 languages.[1]

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • Inter-rater: • Test-retest: • Bivariate correlations showed strong correlations for total (r=0.86), motor (r=0.86) and cognitive (r=0.85)
Validity (concurrent, criterion-related,	**Convergent** validity: • FSMC correlated with fatigue severity scale (FSS) (r=0.797) and

predictive)	the modified fatigue impact scale (MFIS) (r=0.829) and with neurologist's rating of fatigue (r=0.508)[1] • FSMC-M (motor) tested against the MSFC-9HPT and -25FTW were both r=0.22[1], and correlated with the EDSS (r=0.38); correlated with the MSIF-M (motor) was r=0.804. • FSMC-C (cognitive) correlated with the paced auditory serial addition test (PASAT) (r=-0.27), with MSIF-C (cognitive) was r=0.832. • FSMC total score, FSMC-M and FSMC-C correlated with depression measured by the Beck Depression Inventory r=0.49, 0.42 and 0.47 respectively.[1] <u>Predictive validity:</u> • <u>Discriminative validity:</u> • <u>Sensitivity/Specificity/Predictive Values/Likelihood Ratios:</u> • FSMC total score had 88.7 sensitivity and 83.7 specificity in differentiating pwMS from healthy controls[1], the FSMC-M score had slightly higher sensitivity (89.0) and specificity (86.4) using logistic regression[1], these values were higher than those found for either the MSIF (sens = 87.1, spec = 71.4) or the FSS (sens = 86.7, spec = 69.4).
Ceiling/floor effects	<u>Ceiling effects:</u> • <u>Floor effects:</u> •
Sensitivity to change (responsiveness, MCID, MDC) / normative data	<u>MDC:</u> • <u>MCID:</u> • <u>Other responsiveness values:</u> • <u>Normative Data:</u> •
Instrument use	• Questionnaire
Equipment required	• None
Time to complete	• 5 minutes
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• Total score (20 point), with cognitive (10 items) and motor (10 items) subscales
Level of client participation required (is proxy participation available?)	• Completed by the individual.
Limitations	• All validity testing (and test-retest reliability) has been

	completed by one research group.[1] Reliability testing, other than test-retest, has not yet occurred. The single study included mean EDSS scores of 3.4 (SD 1.63) and therefore may not have included many people with higher levels of disability. In addition, don't know if measure is able to distinguish pwMS with and without fatigue.

Recommendations
Practice Setting (check all that apply):

__X__ Acute
__X__ Inpatient Rehab
__X__ Home Health
__X__ Skilled Nursing
__X__ Outpatient

Comments:
- Could be easily used in all settings.

Level of Disability (check all that apply):

__X__ EDSS 0.0 – 3.5
__X__ EDSS 4.0 – 5.5
__X__ EDSS 6.0 – 7.5
__X__ EDSS 8.0 – 9.5

Comments:
- Help to complete questionnaire may be needed for people with higher levels of disability.

Should this tool be required for entry-level curricula?

__X__ Yes _____ No

Comments:
- This appears to be a superior method of assessing MS-related fatigue to other measures currently available.

Is this tool appropriate for research purposes?

__X__ Yes _____ No

Comments:
- This test might offer a more specific and sensitive measure of cognitive and motor aspects of fatigue than other measures available (MSIF, FSS)

Attachments:

- Score Sheets: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Instructions: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable

- Reference list: _____ Uploaded on website

Second Reviewer Comments:

- Agree with primary reviewer; could be used as fatigue assessment tool for individuals with MS.

Overall Taskforce Agreement with Recommendations:

-

Practice Setting	4	3	2	1	Comments
Acute		X			•
Inpatient Rehab		X			•
Home Health		X			•
Skilled Nursing		X			•
Outpatient		X			•

Overall Comments:

- FSMC appears to be a good and quick measure of fatigue in pwMS

Level of Disability	4	3	2	1	Comments
EDSS 0.0 – 3.5		X			•
EDSS 4.0 – 5.5		X			•
EDSS 6.0 – 7.5		X			•
EDSS 8.0 – 9.5		X			•

Overall Comments:

- Rated a 3 since all psychometric properties have been completed by one research group.

Entry-Level Criteria	Students should learn to administer tool	Students should be exposed to tool (e.g. to read literature)	Do not recommend	Comments
Should this tool be required for entry level curricula?	X			• A quick questionnaire that may help clinicians understand how a person with MS is impacted by fatigue.

Research Use	YES	NO	Comments

Is this tool appropriate for research purposes?	X		•

References:

1. Penner IK, Raselli C, Stocklin M, Opwis K, Kappos L, Calabrese P. The fatigue scale for motor and cognitive functions (FSMC): validation of a new instrument to assess multiple sclerosis-related fatigue. *Mult Scler.* 2009;15(12):1509-1517.

Instrument name: Four Square Step Test (FSST)

Reviewer: Evan Cohen, PT, MA, PhD, NCS | **Date of review:** 8/11

ICF domain (check all that apply):

_____ Body function/structure __X__ Activity _____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance
_____ Ataxia
_____ Cardiovascular/pulmonary status
_____ Coordination (non-equilibrium)
_____ Dizziness/vestibular
_____ Fatigue
_____ Flexibility
_____ Muscle performance
_____ Muscle tone / spasticity
_____ Pain
_____ Posture
_____ Sensory integration
_____ Somatosensation
__x___ Balance/falls
_____ Bed mobility
_____ Gait
_____ Reach and grasp
_____ Self care
_____ Transfers
_____ Wheelchair skills
_____ Health and wellness
_____ Home management
_____ Leisure
_____ Quality of life
_____ Role function
_____ Shopping
_____ Social function
_____ Work

Other: Cognition – sequence recall

Type of measure:

__X___ Performance-based _____ Self-report

Instrument description:

Description: The FSST is a timed test of multidirectional stepping. Four sticks (90 cm length by 2.5 cm height) are laid on the floor at 90-degree angles to one another to create a cross/plus-sign pattern. Quadrants are numbered as identified in the image below, and are given instructions by Dite et al[1]

1	2
4	3

The individual begins by standing in square 1, facing square 2. The individual is instructed to step as fast as possible into each square in the following sequence: 2, 3, 4, 1, 4, 3, 2, 1. Timing begins with first contact of the foot into square 2 and finishes when both feet return to square 1. The individual is given the following instructions: "Try to complete the sequence as fast as possible without touching the sticks. Both feet must make contact with the floor in each square. If possible, face forward during the entire sequence"[1]. The sequence is then demonstrated to the individual. The individual then performs one practice trial and two timed trials. The score is the best (lowest) time of the two measured trials. The high test-retest reliability supports the use of a single timed trial[2].

	Intra-rater: Inter-rater: • ICC = .99 in community-dwelling older adults[1] Test-retest: • In 14 PWMS (EDSS mean = 3.5, range 0-6), ICC = 0.97[3] • ICC = .98 in community-dwelling older adults[1] and .93 (95% CI .86-.96) in people with balance deficits due to vestibular dysfunction[2].
Validity (concurrent, criterion-related, predictive)	Concurrent validity: • In a group of 14 PWMS (EDSS mean = 3.5, range 0-6), the FSST had significant correlations with Berg Balance Scale Score (r = -.85), Dynamic Gait Index (r=-.86), ABC (r= -.65), and EDSS (r = .84,)[3]. • Correlated with Step Test (r = -.83), TUG (r = .88), and FRT (r=-.47) in community-dwelling older adults[1], and with TUG (r = .69), gait speed (r = .65), and DGI (r = .51) in individuals with vestibular dysfunction[2]. Predictive validity: A FSST time of ≥ 16.9 seconds had a positive predictive value of 81% and a negative predictive value of 53%In a group of 76 PWMS (EDSS range 3.0-6.5)[4] A FSST time of ≥ 15 seconds had a positive predictive value of 86% and a negative predictive value of 94% in differentiating community-dwelling older adults who are multiple fallers from other groups[1]. A FSST time of ≥ 12 seconds had a positive predictive value of 80% and a negative predictive value of 92% in identifying individuals with vestibular dysfunction with at least one risk factor for falls[2]. Discriminative validity: Sensitivity/Specificity/Predictive Values/Likelihood Ratios: Predicting falls in PWMS (EDSS range 3.5-6.0) • Sensitivity = 60% and specificity = 75%[4] In community-dwelling older adults • Identifying multiple fallers (≥ 2 falls in previous 6 months) sensitivity = 89%, non-multiple fallers (<2 falls in previous 6 months) specificity = 85%[1]

Ceiling/floor effects	Ceiling effects: • None Floor effects: • No score if individual cannot successfully complete the test
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • MDC was found to be 32.4%, with a standard error of the mean of 11.7% in a group of PWMS (EDSS mean = 3.5, range 0-6)[3]. MCID: • Other responsiveness values: • Normative Data: •
Instrument use	•
Equipment required	• Four sticks (or canes) measuring 90cm x 2.5 cm • Stopwatch
Time to complete	• Less than five minutes[1]
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• Timed test (number of seconds of most quickly completed trial) • Anecdotally, many clinicians use the FSST as an opportunity to conduct an observational analysis of forward, backward and lateral stepping ability.
Level of client participation required (is proxy participation available.)	• Person must be present
Limitations	• Tests multidirectional stepping ability

Recommendations
Practice Setting (check all that apply):

__X___ Acute
__X___ Inpatient Rehab
__X___ Home Health
__X___ Skilled Nursing
__X___ Outpatient

Comments:
•

Level of Disability (check all that apply):

___X__ EDSS 0.0 – 3.5
___X__ EDSS 4.0 – 5.5
___X_ EDSS 6.0 – 7.5
_____ EDSS 8.0 – 9.5

Comments:

- May be useful through EDSS of 6.5

Should this tool be required for entry-level curricula?

__X__ Yes _____ No

Comments:

- A simple to apply tool with adequate psychometric properties.

Is this tool appropriate for research purposes?

____ Yes __x___ No

Comments:

- May be useful for some research, although there is currently limited evidence of sensitivity/predictive validity of the FSST in PWMS.

Attachments:

- Score Sheets: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Instructions: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Reference list: _____ Uploaded on website

Second Reviewer Comments:

- Agree with primary review

Overall Taskforce Agreement with Recommendations:

-

Practice Setting	4	3	2	1	Comments
Acute			X		•
Inpatient Rehab		X			•
Home Health			X		•
Skilled Nursing			X		•
Outpatient		X			• Seems most appropriate for this setting

Overall Comments:

- Test has excellent clinical utility, but limited ability to differentiate fallers from non-

fallers.					
Level of Disability	**4**	**3**	**2**	**1**	**Comments**
EDSS 0.0 – 3.5			X		•
EDSS 4.0 – 5.5		X			• Best evidence for this range
EDSS 6.0 – 7.5		X			• Examined in EDSS up to 6.5[3,4]
EDSS 8.0 – 9.5				X	•
Overall Comments: •					

Entry-Level Criteria	**Students should learn to administer tool**	**Students should be exposed to tool (e.g. to read literature)**	**Do not recommend**	**Comments**
Should this tool be required for entry-level curricula?		X		• Excellent clinical utility with adequate psychometric properties.

Research Use	**YES**	**NO**	**Comments**
Is this tool appropriate for research purposes?		X	• Has limited sensitivity/predictive validity. May be useful as part of a larger battery of outcomes.

References

1. Dite W, Temple VA. A clinical test of stepping and change of direction to identify multiple falling older adults. *Archives of Physical Medicine & Rehabilitation.* Nov 2002;83(11):1566-1571.

2. Whitney SL, Marchetti GF, Morris LO, Sparto PJ. The reliability and validity of the Four Square Step Test for people with balance deficits secondary to a vestibular disorder. *Archives of Physical Medicine & Rehabilitation.* Jan 2007;88(1):99-104.

3. Wagner JM, Norris RA, Van Dillen LR, et al. The Psychometric Properties of the Four Square Step Test in People with Multiple Sclerosis. Paper presented at: Annual Meeting of the Consortium of Multiple Sclerosis Centers2011; Montreal, Quebec, CA.

4. Nilsagard Y, Lundholm C, Denison E, Gunnarsson LG. Predicting accidental falls in people with multiple sclerosis -- a longitudinal study. *Clinical Rehabilitation.* Mar 2009;23(3):259-269.

Instrument name: Fullerton Advanced Balance Scale

Reviewer: Gail L. Widener, PT, PhD | **Date of review:** 3/10/11

ICF domain (check all that apply):

_____ Body function/structure __x__ Activity _____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance	__x__ Balance/falls	_____ Health and wellness
_____ Ataxia	_____ Bed mobility	_____ Home management
_____ Cardiovascular/pulmonary status	_____ Gait	_____ Leisure
_____ Coordination (non-equilibrium)	_____ Reach and grasp	_____ Quality of life
_____ Dizziness/vestibular	_____ Self care	_____ Role function
_____ Fatigue	_____ Transfers	_____ Shopping
_____ Flexibility	_____ Wheelchair skills	_____ Social function
_____ Muscle performance		_____ Work
_____ Muscle tone / spasticity		
_____ Pain		
_____ Posture		
_____ Sensory integration		
_____ Somatosensation		

Other:

Type of measure:

__x__ Performance-based _____ Self-report

Instrument description:

- 10 performance-based activities that are scored on a 5-point ordinal scale (0-4).

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • Tested in older adult population, Spearman's rho measured total score and individual item variation. Total score rho=0.93-1.00, individual item rho=0.51-1.00[1] Inter-rater: • Tested in older adult population, rho ranged from 0.22-1.00, 0.60-1.00 for 6 of the 10 items[1] • Aiken homogeneity coefficient analysis (a measure of internal consistency of rater scores) revealed a range of 0.75-1.00 among the 10 test items[1] Test-retest: • Tested in older adult population, total score rho= 0.96 individual items ranged from rho=0.52-0.82[1]
Validity (concurrent, criterion-related,	Convergent validity: • Older adult population had a moderate correlation with Berg

predictive)	Balance Scale (rho=0.75)[1] Predictive validity: • Determined for older adults using a retrospective self-report fall history with scores on the FAB using logistic regression; cutoff score of 25/40 predicts fallers.[2] Discriminative validity: • None yet Sensitivity/Specificity/Predictive Values/Likelihood Ratios: • Older adult fallers were indicated by a cut-off score of 25/40 with a of sensitivity 74.6% and a specificity of 52.6%.[2]
Ceiling/floor effects	Ceiling effects: • Item 1 may have a ceiling effect for independent functioning older adults, all participants scored the maximum score (4)[1] Floor effects: •
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • MCID: • Other responsiveness values: • For older adults an odds ratio of 9.02 for sustaining a fall was calculated such that every 1 point lowering of FAB score indicated an 8% increase in fall risk.[2] Normative Data: • None yet reported
Instrument use	• A multidimensional balance assessment developed for use with higher functioning independent older adults.[1-3]
Equipment required	• Stop watch; 36” ruler; pen or pencil; 6” bench; metronome; 2 airex pads and one or more 12 inch lengths of non-slip material
Time to complete	• 10-12 minutes
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• 10 items scored 0-4 (0=unable, 4=best performance) • Total test score of 40 points • There are no subscales
Level of client participation required (is proxy participation available?)	• Client must perform all 10 items on the test.
Limitations	• These are high-level balance challenges and therefore, not applicable to people with poor balance.
Recommendations **Practice Setting (check all that apply):** __x__ Acute __x__ Inpatient Rehab __x__ Home Health	

__x__ Skilled Nursing
__x__ Outpatient

Comments:

- The appropriateness of the test is dependent on the age and functional abilities of the patient.

Level of Disability (check all that apply):

__x__ EDSS 0.0 – 3.5
__x__ EDSS 4.0 – 5.5
_____ EDSS 6.0 – 7.5
_____ EDSS 8.0 – 9.5

Comments:

- Due to the activities performed, people with EDSS scores over 6.5 would not be able to perform the test

Should this tool be required for entry-level curricula?

____ Yes __x___ No

Comments:

- Students might benefit from being exposed to this test for older adults with balance dysfunction, but it is not recommended for education related to patients with MS due to the lack of psychometrics on the measure at this point in time.

Is this tool appropriate for research purposes?

_____ Yes __x__ No

Comments:

- Because this is an ordinal scale, it is less suitable for research purposes, however it has been used in a study of elderly adults[3]

Attachments:

- Score Sheets: _____ Uploaded on website __x__ Available but copyrighted _____
  http://hhd.fullerton.edu/csa/CenterProducts/centerproducts_assessment.htm

  Instructions: _____ Uploaded on website __x__ Available but copyrighted _____
  http://hhd.fullerton.edu/csa/CenterProducts/centerproducts_assessment.htm

- Reference list: _____ Uploaded on website

Second Reviewer Comments:

- Agree with ratings and recommendations. The FAB is a clinically useful measure, but data is lacking supporting its use in patients with MS at this point in time.

Overall Taskforce Agreement with Recommendations:

-

Practice Setting	4	3	2	1	Comments
Acute			X		•
Inpatient Rehab			X		•
Home Health			X		•
Skilled Nursing			X		•
Outpatient			X		•

Overall Comments:

- This tool could be used in all settings if the patients are high functioning
- Ratings reflect lack of psychometric data specific to patients with MS

Level of Disability	4	3	2	1	Comments
EDSS 0.0 – 3.5			X		• No studies in pwMS
EDSS 4.0 – 5.5			X		• No studies in pwMS
EDSS 6.0 – 7.5				X	• Not applicable, too high level
EDSS 8.0 – 9.5				X	• Not applicable, too high level

Overall Comments:

-

Entry-Level Criteria	Students should learn to administer tool	Students should be exposed to tool (e.g. to read literature)	Do not recommend	Comments
Should this tool be required for entry level curricula?			X	• Not recommended for educational content related to MS due to lack of studies supporting the use of the FAB in this patient population

Research Use	YES	NO	Comments
Is this tool appropriate for research purposes?		X	• Lack of psychometric data in MS, so do not recommend for use in research at this point in time. • Recommend investigating psychometric

			properties in MS.

References:

1 Rose DJ, Lucchese N, Wiersma LD. Development of a multidimensional balance scale for use with functionally independent older adults. *Arch Phys Med Rehabil.* 2006; 87:1478-1485.

2 Hernandez D, Rose DJ. Predicting which older adults will or will not fall using the Fullerton advanced balance scale. *Arch Phys Med Rehabil.* 2008; 89:2309-2315.

3 Westlake KP, Culham EG. Sensory-specific balance training in older adults: effect on proprioceptive reintegration and cognitive demands. *Phys Ther.* 2007;87(10):1274-1283.

Instrument name: Function In Sitting Test (FIST)	
Reviewer: Susan E. Bennett, PT, DPT, EdD, NCS, MSCS	**Date of review:** 4/15/2011

ICF domain (check all that apply):

_____ Body function/structure __x__ Activity _____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance	__x__ Balance/falls	_____ Health and wellness
_____ Ataxia	_____ Bed mobility	_____ Home management
_____ Cardiovascular/pulmonary status	_____ Gait	_____ Leisure
_____ Coordination (non-equilibrium)	__x__ Reach and grasp	_____ Quality of life
_____ Dizziness/vestibular	_____ Self care	_____ Role function
_____ Fatigue	_____ Transfers	_____ Shopping
_____ Flexibility	_____ Wheelchair skills	_____ Social function
__X__Muscle performance		_____ Work
_____ Muscle tone / spasticity		
_____ Pain		
__X_ Posture		
_____ Sensory integration		
_____ Somatosensation		

Other: functional activities performed in a seated posture which requires trunk muscle performance and posture.

Type of measure:

__x__ Performance-based _____ Self-report

Instrument description:

- Performance based, 14-item balance measure aimed at comprehensive, specific, efficient, and functional assessment of sitting balance.

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • Coefficient α for 14 item FIST = .98 • Item to item rho ranged from 0.61- 0.97 • Item to total score rho ranged from 0.82 to 0.93. All correlations were moderate to excellent and statistically significant. • Rho= .92 between expected item difficulty and observed item difficulty • Rho= .97 between estimated respondent location and observed item difficulty.[1] Inter-rater: • Person separation reliability = .98 [1]

	Test-retest: •
Validity (concurrent, criterion-related, predictive)	Concurrent validity: • Static and dynamic sitting balance was significantly correlated with the FIST rho = 0.93 • Tested in patients with stroke, the total Fist Score was negatively correlated to the Modified Rankin Scale (mRS), ($p<0.01$, rho =- 0.76)[1] Predictive validity: • Discriminative validity: • Sensitivity/Specificity/Predictive Values/Likelihood Ratios: •
Ceiling/floor effects	Ceiling effects: • Predicted in people with post-neurological insult that have higher levels of functional skill, for example, people with standing and ambulation ability. Floor effects: •
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • Not tested MCID: • Not tested Other responsiveness values: • Normative Data: •
Instrument use	• For the bedside assessment of sitting balance in acute post-stroke adults with moderate to severe neurologic impairments.
Equipment required	• Standard hospital bed, step stool
Time to complete	• Less than 15 minutes
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• 14 items scored 0-4 (0= complete assistance, 4= independent) • Total test score of 56 • There are no subscales
Level of client participation required (is proxy participation available?)	• Client must perform all 14 items on the test.
Limitations	• Limited research available. Further testing with larger sample sizes and follow up reviews are needed.

	• Has only been tested in an acute post-stroke population, with moderate to severe disability. • Not applicable to higher functioning individuals.

Recommendations
Practice Setting (check all that apply):

__x__ Acute
__x__ Inpatient Rehab
__x__ Home Health
__x__ Skilled Nursing
_____ Outpatient

Comments:
•

Level of Disability (check all that apply):

_____ EDSS 0.0 – 3.5
_____ EDSS 4.0 – 5.5
_____ EDSS 6.0 – 7.5
__X__ EDSS 8.0 – 9.5

Comments:
• Not tested yet on subjects with MS, only stroke

Should this tool be required for entry-level curricula?

____ Yes __x___ No

Comments:
• May be useful for education related to stroke, but not MS

Is this tool appropriate for research purposes?

____ Yes ___x__ No

Comments:
• Lack of psychometric data in MS, so do not recommend for use in research at this point in time.
• Recommend investigating psychometric properties in MS.

Attachments:

• Score Sheets: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable

• Instructions: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable

- Reference list: _____ Uploaded on website in JNPT

Second Reviewer Comments:

- I agree with primary reviewers' presentation of information regarding this scale. However, despite lack of published evidence of use in a population with MS, I recommend use of this scale once validated in the clinician's population.

Overall Taskforce Agreement with Recommendations:

-

Practice Setting	4	3	2	1	Comments
Acute			X		• Rating reflects lack of psychometric data in MS
Inpatient Rehab			X		• As above
Home Health			X		• As above
Skilled Nursing			X		• As above
Outpatient				X	• Not appropriate for individuals who are ambulatory

Overall Comments:

- Not tested in MS at this point

Level of Disability	4	3	2	1	Comments
EDSS 0.0 – 3.5				X	•
EDSS 4.0 – 5.5				X	•
EDSS 6.0 – 7.5				X	•
EDSS 8.0 – 9.5			X		• Potentially useful across settings for populations that can sit but are non-ambulatory

Overall Comments:

-

Entry-Level Criteria	Students should learn to administer tool	Students should be exposed to tool (e.g. to read literature)	Do not recommend	Comments
Should this tool			X	• Not necessarily for MS

be required for entry level curricula?				(due to lack of psychometric data), but may be applicable for other patient populations.

Research Use	YES	NO	Comments
Is this tool appropriate for research purposes?		X	• Lack of psychometric data in MS, so do not recommend for use in research at this point in time. • Recommend investigating psychometric properties in MS.

References:

1) Gorman SL, Radtka S, Melnick ME, et al. Development and validation of the Function in Sitting Test in adults with acute stroke. *J Neurol Phys Ther*. 2010 Sep;34(3): 150-60.

Instrument name: Functional Assessment of Multiple Sclerosis (FAMS)

Reviewer: Amy M. Yorke, PT, NCS | **Date of review:** 5/5/11

ICF domain (check all that apply):

___x__ Body function/structure __x___ Activity ___x__ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance
_____ Ataxia
_____ Cardiovascular/pulmonary status
_____ Coordination (non-equilibrium)
_____ Dizziness/vestibular
__x___ Fatigue
_____ Flexibility
__x___ Muscle performance
_____ Muscle tone
___x__ Pain
_____ Posture
_____ Sensory integration
_____ Somatosensation
_____ Balance/falls
_____ Bed mobility
_____ Gait
_____ Reach and grasp
_____ Transfers
_____ Wheelchair skills
_____ Health and wellness
_____ Home management
__x___ Leisure
__x___ Quality of life
_____ Role function
_____ Shopping
__x___ Social function
__x___ Work

Other: emotional well-being, general contentment, cognition, family/social well-being, sleep, bowel/bladder, sex, muscle spasms, side effects of treatment

Type of measure:

_____ Performance-based ___x__ Self-report

Instrument properties:

- Quality of life instrument for use in people with MS[1]
- Consists of 59 items (44 of which are scored) in six quality of life domains[1]
  - Mobility (7 items)
  - Symptoms (7 items)
  - Emotional well-being (7 items)
  - General Contentment (7 items)
  - Thinking/Fatigue (9 items)
  - Family/Social Well-being (7 items)
- Additional Concerns subscale (15 items) consists of items that fall outside the six domains but that may provide further clinical value[1]
- Persons completing the tool answer items on a 5 point Likert scale with "0" meaning "not at all" to "4" meaning "very much"
- Embedded within the FAMS is a 28-item cancer quality of life questionnaire[1]
- Higher scores indicate better quality of life[1,2]

Reliability (test-retest, intra-rater, inter-rater)	Internal Consistency: • Good internal consistency with the subscales (alphas 0.82-96)[1] • FAMS Mobility scale alpha=0.78 and FAMS Emotional scale alpha=0.90[3] Intra-rater: • Inter-rater: • Test-retest: • Subscales test-retest reliability ranged from 0.85-0.91 in 56 patients with MS[1]
Validity (concurrent, criterion-related, predictive)	Concurrent validity: • High association of SF-36 Physical Component Scale (PCS) and FAMS Mobility scale (r=0.62-0.78)[1] • High association of SF-36 Mental Component Scale (MCS) with FAMS Emotional scale (r=0.59-0.62)[1] • FAMS Mobility highly correlated with MSIS-29 physical (r=-0.71) and SF-36 PCS (r=0.65)[3] • FAMS Emotional highly correlated with MSIS-29 psychological (r=-0.70) and SF-36 MCS (r=-0.75) • FAMS items highly correlated with Incapacity Status Scale and Environmental Scale with mobility (r=0.90), symptoms (r=0.90), and emotional well-being (r=0.76); non-significant correlations with general contentment, thinking and fatigue, family/social well-being, and additional concerns ($r \leq 0.40$)[4] Predictive validity: • Discriminative validity: • Patients that have progressive disease have lower QOL then patients that have relapsing remitting ($p<0.001$)[1] • FAMS Mobility score means are significantly different in patients with EDSS scores ≤ 6.0 as compared to those that are > 6.0 ($p<0.001$)[1] Sensitivity/Specificity/Predictive Values/Likelihood Ratios: •
Ceiling/floor effects	Ceiling effects: • When tested in 121 patients with MS, 0% reached the ceiling in the FAMS Mobility and 2.5% in the FAMS Emotional[3] Floor effects: • When tested in 121 patients with MS, 6% reached the floor in the FAMS Mobility and 1.7% in the FAMS Emotional[3] • FAMS did not show a floor effect on physical functioning in contrast to MSQOL-54[5]

Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • MCID: • Other responsiveness values: • Reported effect size FAMS total = 1.06[1] o Mobility, effect size=1.24 o Symptoms, effect size=0.73 o Emotional Well-Being, effect size=0.79 o General Contentment, effect size=0.78 o Thinking/Fatigue, effect size=0.87 o Family/Social Well-Being, effect size=0.56 • Effect size FAMS mobility 0.64[3] • Effect size FAMS Emotional 0.45[3] Normative Data: Scores published during development of test[1] • Survey Sample (n=377) (mean ± SD) o Mobility 13.9 ± 7.6 o Symptoms 19.7 ± 5.9 o Emotional Well-Being 17.9 ± 6.8 o General Contentment 16.0 ± 6.8 o Thinking/Fatigue 20.6 ± 8.4 o Family/Social Well-being 19.4 ± 5.9 o FAMS total 107.5 ± 32.9 • Clinical Sample (n=56) o Mobility 13.7 ± 6.5 o Symptoms 20.0 ± 5.9 o Emotional Well-Being 19.6 ± 5.5 o General Contentment 16.5 ± 6.8 o Thinking/Fatigue 20.3 ± 7.9 o Family/Social Well-being 20.6 ± 5.8 o FAMS total 110.6 ± 27.4
Instrument use	• To be utilized in persons with MS to capture information regarding quality of life
Equipment required	• Score sheets
Time to complete	• 20 minutes
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• FAMS Total score (range 0-176) is derived by adding the Mobility (range 0-28), Symptoms (range 0-28), Emotional Well-Being (0-28), General Contentment (range 0-28), Thinking and Fatigue (range 0-36), and Family/Social Wellbeing (range 0-28) • Additional Concerns (range 0-56) are not included in the total FAMS score • For guidelines on handling missing data and scoring option, refer to the FAMS Administration and Scoring Guidelines found online

	at www.facit.org
Level of client participation required (is proxy participation available?)	• Self-report
Limitations	• Original validation of the scale did not demonstrate a diverse population based on race, gender, and educational status[1] • Increased weight on the psychosocial consequences of the disease[6]

Recommendations
Practice Setting (check all that apply):

_____ Acute
___x__ Inpatient Rehab
___x__ Home Health
___x__ Skilled Nursing
___x__ Outpatient

Comments:
-

Level of Disability (check all that apply):

__x___ EDSS 0.0 – 3.5
__x___ EDSS 4.0 – 5.5
__x___ EDSS 6.0 – 7.5
__x___ EDSS 8.0 – 9.5

Comments:
-

Should this tool be required for entry-level curricula?

__X___ Yes _____ No

Comments:
- Exposure only.

Is this tool appropriate for research purposes?

__x___ Yes __ ___ No

Comments:
- Developed from measurements of chronic illness

Attachments:

- Score Sheets: ___x__ Uploaded on website _____ Available but copyrighted _____ Unavailable http://www.facit.org/FACITOrg/Questionnaires
- Instructions: ___x__ Uploaded on website _____ Available but copyrighted _____ Unavailable

http://www.facit.org/FACITOrg/Questionnaires

- Reference list: _____ Uploaded on website

Second Reviewer Comments:

- Agree with ratings and recommendations. The FAMS is specific to patients with MS and likely to be a useful measure. Some reliability, validity, and responsiveness values exist & the effect sizes suggest it may be useful as an evaluative measure. The large number of items to complete the FAMS and a 20-minute completion time may be somewhat prohibitive in some settings or for some patients.

Overall Taskforce Agreement with Recommendations:

-

Practice Setting	4	3	2	1	Comments
Acute				X	•
Inpatient Rehab		X			•
Home Health		X			•
Skilled Nursing		X			•
Outpatient		X			•

Overall Comments:

- Rating of 1 in acute care reflects the likelihood that a patient with a changing status may impact the reliability of the test result.

Level of Disability	4	3	2	1	Comments
EDSS 0.0 – 3.5		X			•
EDSS 4.0 – 5.5		X			•
EDSS 6.0 – 7.5		X			•
EDSS 8.0 – 9.5		X			•

Overall Comments:

-

Entry-Level Criteria	Students should learn to administer tool	Students should be exposed to tool (e.g. to read literature)	Do not recommend	Comments
Should this tool be required for		X		•

entry level curricula?				
Research Use	**YES**	**NO**	**Comments**	
Is this tool appropriate for research purposes?	X		•	

References:

1. Cella DF, Dineen K, Arnason B, Reder A, Webster KA, Karabatsos G, Chang C, Lloyd S, Mo F, Stewart J, Stefoski D. Validation of the functional assessment of multiple sclerosis quality of life instrument. *Neurology.* 1996;47(1):129-139.
2. Webster K, Cella D, Yost K. The functional assessment of chronic illness therapy (FACIT) measurement system: properties, applications, and interpretation. *Health and Quality of Life Outcomes.* 2003;1:79.
3. Riazi A, Jobart JC, Lamping DL, Fitzpatric R, Thompson AJ. Evidence-based measurement of multiple sclerosis: the psychometric properties of the physical and psychological dimensions of three quality of life rating scales. *Multiple Sclerosis.* 2003;9:411.
4. Modrego PJ, Pina MA, Simon A, Azuara MC. The interrelations between disability and quality of life in patients with multiple sclerosis in the area of Bajo Aragon, Spain: A geographically based survey. *Neurorehabilitation and Neural Repair*. 2001;15:69-73.
5. Nicholl CR, Lincoln NB, Francis VM, Stephan TF. Assessing quality of life in people with multiple sclerosis. *Disabil Rehabil.* 2001;23:597-603.
6. Benito-Leon J, Moral JM, Rivera-Navarros J, Mitchell AJ. A review about the impact of multiple sclerosis on health-related quality of life. *Disability and Rehabilitation.* 2003;25(23):1291-1303.

Instrument name: Functional Gait Assessment (FGA)

Reviewer: Kirsten Potter, PT, DPT, MS, NCS | **Date of review:** 5/5/11

ICF domain (check all that apply):

_____ Body function/structure __x___ Activity _____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance
_____ Ataxia
_____ Cardiovascular/pulmonary status
_____ Coordination (non-equilibrium)
_____ Dizziness/vestibular
_____ Fatigue
_____ Flexibility
_____ Muscle performance
_____ Muscle tone / spasticity
_____ Pain
_____ Posture
_____ Sensory integration
_____ Somatosensation
__x___ Balance/falls
_____ Bed mobility
__x___ Gait
_____ Reach and grasp
_____ Self care
_____ Transfers
_____ Wheelchair skills
_____ Health and wellness
_____ Home management
_____ Leisure
_____ Quality of life
_____ Role function
_____ Shopping
_____ Social function
_____ Work

Other:

Type of measure:

__x___ Performance-based _____ Self-report

Instrument description:

- The FGA is based on the Dynamic Gait Index. It was developed to overcome problematic issues related to the DGI (e.g., ceiling effect; lack of clear administration and scoring procedures)[1]
- 10 items, 7 of which were included in the DGI, plus 3 new items (gait with narrow base of support; ambulating backwards; gait with eyes closes)

Reliability (test-retest, intra-rater, inter-rater)

Intra-rater:

- Not reported in MS
- Vestibular disorders: total FGA ICC = 0.83; K = 0.50; % agreement = 67% when administered by untrained raters; lower reliability (k ≤ .40) found for: 3 (gait with horizontal head turns); 4 (gait with vertical head turns); 5 (gait and pivot turns); 7 (gait with narrow base of support); 8 (gait with eyes closed)[1]
- Community dwelling adults aged 50 – 89: ICC =0.93; mean % of agreement = 87%[2]

Inter-rater:

- Not reported in MS
- Vestibular disorders: total FGA ICC = 0.84; K = 0.50; % agreement

	= 58) when administered by untrained raters; lowest reliability (k ≤ .40) on items 2 (change in gait speed) and 5 (gait and pivot turn)[1] • Community dwelling adults: ICC = 0.93 (p < 0.001); percentage of agreement: mean = 87% (range 78.5 – 96.0%; mean Kappa = 0.63 (range 0.43 – 0. 77)[2] • Parkinson's disease: ICC = 0.93 (95% CI = 0.84 – 0.98)[3] <u>Test-retest:</u> • Not reported in MS • Parkinson's disease: ICC = 0.80 (95% CI = 0.58 – 0.91) and ICC = 0.91 (95% CI = 0.80 – 0.965) when administered by student physical therapists and physical therapists, respectively[3] • Stroke: ICC = 0.95 (0.91 – 0.97) <u>Internal consistency:</u> • Not reported in MS • Vestibular disease: Chronbach alpha values = .81 and .77 for individual trials 1 and 2, respectively; .79 across 2 trials; item to corrected item correlations ranged .12 - .80; items 7 (gait with narrow base of support), 8 (gait with eyes closed); and 10 (steps) showed weakest correlations with total FGA (range .12 - .31)[1]
Validity (concurrent, criterion-related, predictive)	<u>Concurrent validity:</u> • Not reported in MS • Vestibular disorders: the FGA correlates moderately with Activities Specific Balance Confidence Scale (r = 0.64); Dizziness Handicap Inventory (r = -0.64); perception of dizziness symptoms (r = -0.70); number of falls (r = - 0.66); Timed Up and Go (r = -0.50); and Dynamic Gait Index (r = 0.80)[1] • FGA correlates negatively with age (Spearman rho = -0.64); mean scores decreased with increased age, especially after age 70; SD increased with increased age[2] • Parkinson's disease: FGA correlated with ABC (rho = 0.707), Berg Balance Scale (rho = 0.783), and BESTest (rho = 0.882)[3] • Stroke: FGA correlates highly with the DGI and DGI-4 (rho > 0.91)[4] • Community dwelling older adults: FGA correlates significantly with the ABC (rho = 0.53, p < 0.001), Berg Balance Scale (rho = 0.84, p < 0.000), Timed Up and Go (rho = -0.84, p < 0.000), and Dynamic Gait Index (rho = 0.94, p < 0.000)[5] <u>Predictive validity:</u> • Not reported in MS • FGA better at predicting prospective falls, in individuals with

	Parkinson's disease, as compared to Timed Up and Go and Dynamic Gait Index (see below for values)[5] Discriminative validity: • Sensitivity/Specificity/Predictive Values/Likelihood Ratios: • Not reported in MS • Parkinson's disease at cut off score ≤ 15/30 for predicting falls: sensitivity = 0.72 and specificity = 0.78; post-test probability with test ≤ cut off value = 59.6%; post-test probability with test > cut off value = 14.1%; LR+ = 3.24 (95% CI = 1.86 – 5.65); LR - = 0.36 (95% CI = 0.19 – 0.69)[3] • Community dwelling older adults: at cut off of ≤ 22 for predicting prospective falls: sensitivity = 100%, specificity = 72%, + LR = 3.6, - LR = 0.0, + predictive value = 43%, - predictive value = 100%[5]
Ceiling/floor effects	Ceiling effects: • Vestibular disorders: range of scores on the FGA models those found with the ABC Scale and DGI, and appears to have eliminated the ceiling effect noted with the DGI[1] • Parkinson's disease: lack of ceiling effect (13% of subjects scored in top 10%)[3] • Stroke: FGA had lowest ceiling effect (0.0% to 5.7%) when compared with DGI and DGI – 4 [4] Floor effects: •
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • Not reported in MS • Stroke: MDC = 4.2; MDC % = 14.1% MCID: • Other responsiveness values: • Not reported in MS • Stroke: ES = 0.50 from first week to 2 months and = 0.54 from first week to 5 months (P < 0.01) Normative Data: • The mean score (with SD) for all subjects was 26.1 (4.0). Mean scores (with SD) for subjects within decade cohorts:[4] Age 40 - 49: 28.9 (1.5) Age 50 - 59: 28.4 (1.6)

	Age 60 - 69: 27.1 (2.3) Age 70 - 79: 24.9 (3.6) Age 80 - 89: 20.8 (4.7)
Instrument use	• The FGA has been used with patients with vestibular disorders, stroke, Parkinson's disease, and community dwelling adults
Equipment required	• Scoring form • A marked 6-m (20-ft) walkway that is marked with a 30.48-cm (12-in) width • Stopwatch • Shoe box • Stairs with railing • Walker et al[2] also used a vinyl gait grid (EFI Total Gym; San Diego, CA)
Time to complete	• 15 – 20 min.
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• Scoring focuses on changes in balance or changes in gait patterns during the various walking tasks • Instructions for each item are included on the scoring form • Each item is scored from 0 – 3; scores range from 0 (worst performance) to 30 (best performance)
Level of client participation required (is proxy participation available?)	• Requires the patient to perform challenging gait tasks
Limitations	• To date, no studies have examined the use of the FGA in individuals with MS

Recommendations
Practice Setting (check all that apply):
__x___ Acute
__x___ Inpatient Rehab
__x___ Home Health
__x___ Skilled Nursing
__x___ Outpatient

Comments:
- It is appropriate for use in any setting, provided a 20-foot walkway is feasible
- It appears that the FGA is a more reliable measure as compared to the DGI. Also, the mean values per decade cohort may improve the interpretability of the measure, as compared to the DGI

- The FGA has not been studied in individuals with MS

Level of Disability (check all that apply):
__x___ EDSS 0.0 – 3.5
__x___ EDSS 4.0 – 5.5
_____ EDSS 6.0 – 7.5
_____ EDSS 8.0 – 9.5

Comments:
- A useful measure to assess the ability of an individual to change gait to meet various task demands; hence, appropriate for higher functioning individuals

Should this tool be required for entry-level curricula?
_____ Yes __x___ No
Comments:
- Due to lack of psychometric data when administered to people with MS

Is this tool appropriate for research purposes?
_____ Yes __x___ No
Comments:
- The FGA has not yet been studied on individuals with MS; hence, not an appropriate measure if determining the effect of an intervention
- However, research on the psychometrics of the FGA for individuals with MS is warranted, as the test has applicability to this patient population

Attachments:
- Score Sheets: __x___ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Instructions: __x___ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Reference list: _____ Uploaded on website

Second Reviewer Comments:
- Reviewed and agree with comments and scores given for practice setting and EDSS Score

Overall Taskforce Agreement with Recommendations:
-

Practice Setting	4	3	2	1	Comments
Acute			X		•
Inpatient Rehab			X		•
Home Health			X		•

Skilled Nursing			X		•
Outpatient			X		•
Overall Comments: • Limited due to lack of psychometric data for patients with MS; however, the FGA is likely feasible for use in all practice settings					

Level of Disability	**4**	**3**	**2**	**1**	**Comments**
EDSS 0.0 – 3.5			X		•
EDSS 4.0 – 5.5			X		•
EDSS 6.0 – 7.5				X	•
EDSS 8.0 – 9.5				X	•
Overall Comments: • Scores of 2 for EDSS levels 0.0 – 5.5 reflect lack of psychometric data					

Entry-Level Criteria	**Students should learn to administer tool**	**Students should be exposed to tool (e.g. to read literature)**	**Do not recommend**	**Comments**
Should this tool be required for entry level curricula?			X	• Not recommended at this time due to lack of psychometric data

Research Use	**YES**	**NO**	**Comments**
Is this tool appropriate for research purposes?		X	• Lack of psychometric data in MS, so do not recommend for use in research at this point in time. • Recommend investigating psychometric properties in MS.

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Instrument name: Functional Independence Measure (FIM)

Reviewer: Kirsten Potter, PT, DPT, MS, NCS | **Date of review:** 4/15/11

ICF domain (check all that apply):

__x___ Body function/structure __x___ Activity __x___ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance
_____ Ataxia
_____ Cardiovascular/pulmonary status
_____ Coordination (non-equilibrium)
_____ Dizziness/vestibular
_____ Fatigue
_____ Flexibility
_____ Muscle performance
_____ Muscle tone / spasticity
_____ Pain
_____ Posture
_____ Sensory integration
_____ Somatosensation
_____ Balance/falls
__x___ Bed mobility
__x___ Gait
_____ Reach and grasp
__x___ Self care
__x___ Transfers
__x___ Wheelchair skills
_____ Health and wellness
_____ Home management
_____ Leisure
_____ Quality of life
_____ Role function
_____ Shopping
__x___ Social function
_____ Work

Other: Cognition, communication, bowel and bladder

Type of measure:

__x___ Performance-based _____ Self-report

- The FIM is a performance based measure, but has been administered via self-report (see Reliability section)

Instrument description:

- The FIM is part of the Uniform Data System for Medical Rehabilitation (http://www.udsmr.org/)
- Generic measure used to rate the amount of assistance required to perform basic activities of daily living.
- 18 items: 13 for FIM – motor scale and 5 for FIM – social-cognitive scale

Motor Domain:

1. Self-care (6 items)
   - Eating
   - Grooming
   - Bathing
   - Dressing-upper body
   - Dressing-lower body
   - Toileting
2. Sphincter control (2 items)
   - Bladder management

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- Bowel management

3. Transfers (3 items)
   - Bed/chair/wheelchair
   - Toilet
   - Tub/shower
4. Locomotion (2 items)
   - Walk/wheelchair
   - Stairs

Cognitive Domain:

5. Communication (2 items)
   - Comprehension
   - Expression
6. Social cognition (3 items)
   - Social interaction
   - Problem solving
   - Memory

Alternative versions of FIM:

- WeeFIM: functional abilities in the pediatric population
- 5-level FIM: created for its use in large population studies[1]
- AlphaFIM: shorter, 6-item version of FIM designed for acute setting[2]

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<tr><td>Reliability (test-retest, intra-rater, inter-rater)</td><td>

<u>Intra-rater:</u>

- ICC = 0.94, K = 0.28, and repeatability coefficient = 6.1 points for total FIM in 64 individuals with MS (mean EDSS = 4.5; range 0.0 - 7.5); on different scale items, intra-rater reliability values ranged ICC = 0.60 – 1.0, K = 0.55 = 1.0, and repeatability coefficients = 0.0 – 2.2; intra-rater agreement on sum scores = 37, 92, and 100% when agreement was defined as no difference, ≤ 5 points, and ≤ 9 points, respectively[3]
- ICC = 0.98 (FIM total), 0.95 (FIM – motor), and 0.95 (FIM – cognitive) in in-patients with stroke and MS (various forms; EDSS not described)[4]

<u>Inter-rater:</u>

- Total FIM ICC = 0.83 in MS subjects (mean EDSS = 6.09 with range 0.0 – 9.5)[5]
- FIM – motor subsection: Kappa values ranged 0.50 – 0.70 with exception of 0.16 for walking (= 0.16) when administered via interview to patients with MS; Kappa values ranged 0.33 – 0.67 when administered via interview to caregiver[5]
- FIM – communication and social cognition subsections: Kappa values ranged 0.14 – 0.53 when administered via interview to patients with MS; Kappa values ranged 0.13 – 0.28 when

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	administered via interview to caregiver[5] • ICC = 0.99, K = 0.21, and repeatability coefficient = 8.1 points for total FIM in 64 individuals with MS (mean EDSS = 4.5; range 0.0 - 7.5); individual scale items ICC ranged from ICC = 0.56 – 0.99 and K = 0.26 – 0.88; inter-rater agreement on sum scores = 25, 86, 95.2 and 100% when agreement was defined as no difference, ≤ 5 points, ≤ 9 points, and ≤ 13 points, respectively[3] • ICC = 0.97 for FIM – motor and 0.88 for FIM – cognitive; subscales ranged 0.70 – 0.78 in 64 patients with MS[6] • Meta analysis of 11 studies on the FIM showed median and mean reliability = 0.95 and 0.92, respectively, when administered to 1,348 patients with various diagnoses, including MS; median values for subscales ranged 0.78 for social cognition to 0.95 for self care; cognitive domain items showed lower reliability (0.93) than motor domain items (0.97); individual FIM items ranged from 0.61 (comprehension) to 0.90 (toilet transfer); reliability not affected by rater experience or training, or the subjects' medical diagnoses[7] • Meta analysis of FIM showed high reliability when administered to 81 individuals with MS: median and mean reliability = 0.93 and 0.91, respectively[7] • Median FIM score when assessed by multidisciplinary team using objective information was 63 (range 24 – 83) versus when assessed by an individual rater using subjective information = 66 (range 31 – 83) at admission; at discharge, median scores were 73 (range 31 – 90) and 68 (range 35 – 100), with a median change of 8 (-1 – 37) and 4 (-3 – 35), respectively; FIM and Barthel Index are comparably reliable; no reliability coefficients were provided[8] • No significant difference exists between clinician and self-report ratings (t = 0.279, p = 0.781); scores were highly correlated (r = 0.828, p < 0.0001); patients with spinal cord injury[9] <u>Test-retest:</u> • ICC = 0.95 for FIM – motor and 0.84 for FIM – cognitive; subscales ranged 0.79 – 0.98 in 64 patients with MS[6] • Meta analysis of FIM showed high test-retest reliability when administered to 127 patients with various diagnoses: median and mean reliability = 0.95 and 0.92, respectively[7] <u>Internal consistency:</u> • Chronbach's alpha = 0.89 for FIM – motor and 0.68 for FIM – cognitive in individuals with MS[10] • FIM total shows excellent internal consistency when administered to patients with MS: Chronbach's alpha = 0.94 –

	0.95,[5] 0.92,[3] and 0.94[6] • Item-total correlations ranged 0.53 – 0.87 for FIM total, 0.60 FIM – motor, and 0.63 FIM – cognitive; Mean inter-item correlation = 0.51 FIM total, 0.56 – 0.91 FIM – motor, and 0.72 – 0.80 FIM – cognitive; Alpha coefficient = 0.95 FIM total, 0.95 FIM – motor and 0.89 FIM – cognitive in subjects with stroke and MS (various forms; EDSS not described)[4] • Chronbach's alpha ranged 0.88 – 0.97 for total FIM, 0.86 – 0.97 for FIM motor, and 0.86 – 0.57 for total FIM when administered to patients with various diagnoses[11]
Validity (concurrent, criterion-related, predictive)	<u>Concurrent validity:</u> • Strong association between FIM total and EDSS across all subjects (r = -0.907, p < 0.0001); in in-patients (r = -0.709, p < 0.0001); in out-patients (r = -0.818, p < 0.0001) in MS subjects (mean EDSS = 6.09 with range 0.0 – 9.5)[5] • Between FIM walk and EDSS across all subjects (r = -0.580, p < 0.0001); in in-patients (r = -0.395, p < 0.0001); in out-patients (r = -0.689, p < 0.0001) in MS subjects (mean EDSS = 6.09 with range 0.0 – 9.5)[5] • Relationship between FIM items and help in minutes/day: transferring (tub/shower) R = -0.84; transferring (bed/chair) R = -0.82; bathing R = -0.81; transferring (toilet) R = -0.80; dressing upper body R = -0.70; dressing lower body R = -0.78; walking or wheelchair locomotion R = -0.78; climbing stairs R = -0.74[12] • FIM and FIM + FAM and Barthel Index all measure similar constructs; Pearson's r = 0.96 – 0.966 and ICC = 0.95 – 0.995[4] • FIM correlates with the EDSS (r = -0.87), Scripps Neurological Rating Scale (r = 0.87), Cambridge MS Basic Score disability (r = -0.85) and handicap (r = -0.65), and Ambulation Index (r = -0.73), all p < 0.001[3] • FIM correlates with Barthel Index (r = 0.88, p < 0.001); London Handicap Scale (r = 0.43, p < 0.001); EuroQOL VAS (r = 0.69, p < 0.001); SF – 36 physical functioning (r = 0.88, p < 0.001) and physical role limitation (r = 0.36, p = 0.01 – 0.02); and social functioning (r = 0.43, p = 0.001 – 0.008), vitality (r = 0.38, p = 0.001 – 0.008), bodily pain (r = 0.34, p = 0.001 – 0.008) and general health perception (r = 0.41, p = 0.001 – 0.008)[3] • Two factors account for 89.4% of the total variance of FIM (cumulative percentage of 83 and 89.4%; eigenvalues of 14.9 and 1.2 respectively); motor factor correlated with FIM motor items and cognitive factor correlated with FIM communication and social cognition items; cognitive items account for only 6.4% of the total variance[3] • FIM correlates with Expanded Barthel Index (EBI) rho = 0.9705

	and 0.9704 at admission and discharge to rehab, respectively ($p < 0.001$); FIM and EDSS correlate rho = -0.7624 ($p < 0.001$); tested on 100 patients with MS, mean EDSS = 6.9 (range 1 – 9.5)[13] • FIM and Barthel Index correlate K = 0.92 and 0.88 when administered to 25 patients (12 with MS) upon admission and discharge to an inpatient rehabilitation unit; correlation of change score K = 0.78[8] • FIM, FIM + FAM, and Barthel Index all measure similar constructs (r = 0.96 – 0.996; ICC = 0.95 – 0.995); FIM total and motor show strong relationship with measure of disability (Office of Population Censuses and Surveys Disability Scales in in-patients with stroke and MS (various forms; EDSS not described)[4] • In patients with mixed neurological conditions (excludes stroke, TBI, and SCI) item to total FIM correlations range from r = 0.38 (stairs) to r = 0.73 (lower body dressing and toileting)[11] • Admission FIM – motor and FIM – cognitive scores relate (r = 0.40) in patients with various neurological conditions[14] <u>Predictive validity:</u> • FIM is equally effective to Incapacity Status Scale, Environmental Status Scale, and Barthel Index at predicting the assistance needed, in minutes, per day by another in the home for people with MS (R^2 values ranged from .50 - .96 ($p < .001$) with FIM R^2 = .77); all were more predictive of needed help in minutes as compared to Brief Symptom Inventory[12] • FIM items that predicted help in minutes (individuals with MS): transferring to bed/chair, memory, walking or wheelchair locomotion, dressing lower body, bladder management and eating ($R^2 = 0.9982$, $p < .00000$)[12] • Change of total FIM = 1 point relates to an average of 3.38 minutes of help per day (individuals with MS)[12] • Admission FIM – motor scores predict discharge function and motor function in various patient groups; admission FIM – cognitive scores relates to discharge motor function in patients with neurologic dysfunction; admission FIM - cognitive function predicts discharge cognitive function[14] • Admission FIM – motor function is the most important predictor of length of stay in all patient groups; lower cognitive function in patients with various neurological conditions predicted shorter length of stay[14] <u>Discriminative validity:</u> • FIM total, motor, and cognitive shown to measure different constructs from measures of handicap, physical and mental

	health status, and global cognitive function (r values ranging 0.01 – 0.51) in in-patients with stroke and MS (various forms; EDSS not described)[4] • FIM scores differ among patients with various health conditions / impairments, indicating an ability to distinguish among heterogeneous groups[11] <u>Construct Validity:</u> • Rasch and factor analyses show that the FIM - motor and FIM - cognitive are distinct from one another; items within each subscale define two statistically and clinically different phenomena[11, 15] • Rasch analysis shows that FIM items rank in difficulty and show acceptable item fit and coherence; FIM motor: feeding and grooming (easiest) to stair climbing, tub/shower transfers and locomotion (hardest) and FIM cognitive: comprehension and expression (easiest) to problem solving (hardest)[15-17] • FIM can detect variations in patterns that occur among different patient groups and item difficulties vary among groups in an expected manner (e.g., verbal expression was able to distinguish between patients with right and left hemiplegia)[16, 17] <u>Sensitivity/Specificity/Predictive Values/Likelihood Ratios:</u> •
Ceiling/floor effects	<u>Ceiling effects:</u> • Ceiling effect found for FIM motor (23%) and FIM cognitive (36%) in individuals with MS living independently at home[10] • FIM did not demonstrate a ceiling effect when administered to 149 in-patients with stroke and various forms of MS (n = 64; EDSS not described)[4] • Ceiling effect found for FIM – cognitive, but not FIM total or motor when administered to individuals with moderate to severe MS (EDSS 5.0 – 9.0)[18] • No ceiling effect found when administered to 84,537 patients with various health conditions[11] <u>Floor effects:</u> • FIM did not demonstrate a floor effect when administered to 149 in-patients with stroke and various forms of MS (n = 64; EDSS not described)[4] • FIM total and motor: no floor effect when administered to individuals with moderate to severe MS (EDSS 5.0 – 9.0)[18] • Floor effect not found when administered to patients with "general neurological conditions" (excludes stroke, TBI, and

	SCI)[11]
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • MCID: • Other responsiveness values: • FIM total (ES = 0.30)and motor (ES = 0.34) found to be responsive to change in individuals with moderate to severe MS (EDSS 5.0 – 9.0); statistically significant change scores from admission to discharge in in-patient rehab (mean change scores = 6.9 {SD = 8.3} for FIM total and = 6.9 {SD = 7.2} FIM motor; p < 0.0001); FIM cognitive not responsive to change[18] • In individuals with MS (mean EDSS = 5.5; range 0.0 – 7.5), total FIM ES = 0.46, p < 0.001; many motor items had statistically significant, yet weak to moderate ES (range 0.25 – 0.67, p = 0.044 – 0.039); no cognitive FIM items were responsive[3] • FIM and EBI are equally responsive to change and FIM is more responsive to change as compared to EDSS; over 4 week rehabilitation program, 68% of patients with MS remained unchanged on the FIM, 25% improved, and 7% worsened; no MDC values provided, however[13] • ES = 0.32 when administered to in-patients with moderate to severe MS (mean EDSS = 7.1; range 5.0 – 9.0)[19] • FIM is more responsive to change in patients with neurological conditions (including MS) as compared to Barthel Index (84% and 67% of patients improved on FIM and BI, respectively), but no responsiveness values provided[8] Normative Data: •
Instrument use	• FIM has been used in many patient populations, including MS; is commonly used in in-patient rehabilitation settings • FIM provides a more global measure of disability, as compared to EDSS[5]
Equipment required	• Any items that the subject uses to carry out their activities of daily living.
Time to complete	• 30-45 minutes
How is the instrument scored? (e.g., total score,	• All items are measured on a 7-point scale ranging from 1 (total assistance) to 7 (complete independence).

are there subscales, etc…)	• Total FIM scores range from 18 – 126; Motor – FIM subscale ranges 13 – 91; Cognitive – FIM subscale range 5 – 35.
Level of client participation required (is proxy participation available?)	• Although ratings are based on performance, FIM scoring can be done by observation, patient interview, telephone interview or looking at medical records.
Limitations	• The FIM must be administered by a trained and certified evaluator and ideally scored by consensus with a multi-disciplinary team. • Specific MS-related issues (e.g., balance deficits, dexterity, constipation, visual problems, sexual dysfunction) are not assessed by the FIM[3, 5]

Recommendations
Practice Setting (check all that apply):
_____ Acute
__x___ Inpatient Rehab
_____ Home Health
__x___ Skilled Nursing
_____ Outpatient

Comments:
- Used most commonly in inpatient rehab setting as admission FIM ratings are used to formulate Medicare reimbursement under to prospective payment system since 2002.[2, 20, 21] Perhaps the least feasible in acute setting due to time consuming nature of FIM rating.
- Ceiling effect found in individuals with MS living independently at home may limit usefulness of FIM in out-patient settings

Level of Disability (check all that apply):
__x___ EDSS 0.0 – 3.5
__x___ EDSS 4.0 – 5.5
__x___ EDSS 6.0 – 7.5
__x___ EDSS 8.0 – 9.5

Comments:
- The scale of the FIM (complete dependence to complete independence) allow for rating individuals at any level of the EDSS
- FIM shows good to excellent reliability and validity across the spectrum of EDSS levels

Should this tool be required for entry-level curricula?
__x___ Yes _____ No
Comments:
- As most students are required to do internship in inpatient rehabilitation setting, knowing FIM would be very beneficial before starting internships.

Is this tool appropriate for research purposes?
__x___ Yes _____ No
Comments:

- FIM is a reliable and valid measure for individuals with MS
- FIM total and motor are responsive, yet the effect sizes are weak to moderate which may limit the ability of the FIM to detect change; FIM – cognitive not responsive which limit utility for research

Attachments:

- Score Sheets: _____ Uploaded on website __x___ Available but copyrighted _____ Unavailable
- Instructions: _____ Uploaded on website __x___ Available but copyrighted _____ Unavailable
- Reference list: _____ Uploaded on website

Second Reviewer Comments:

- Agree with practice setting and EDSS recommendations

Overall Taskforce Agreement with Recommendations:

-

Practice Setting	4	3	2	1	Comments
Acute				X	•
Inpatient Rehab		X			• Ability of the FIM to predict minutes of help needed per day may be useful to therapists working in in-patient rehab settings
Home Health				X	•
Skilled Nursing		X			•
Outpatient				X	• Ceiling effect may limit usefulness in a higher functioning patient population

Overall Comments:

- Limited responsiveness data: lack of MDC and MCID values; effect sizes are weak to moderate

Level of Disability	4	3	2	1	Comments
EDSS 0.0 – 3.5		X			•
EDSS 4.0 – 5.5		X			•
EDSS 6.0 – 7.5		X			•
EDSS 8.0 – 9.5		X			•

Overall Comments: • FIM is appropriate for patients at all levels of EDSS; rating reflects limited responsiveness data, training required, and copyright issues				
Entry-Level Criteria	**Students should learn to administer tool**	**Students should be exposed to tool (e.g. to read literature)**	**Do not recommend**	**Comments**
Should this tool be required for entry level curricula?	X			• Given the widespread use of the FIM, particularly in in-patient rehab facilities, students should learn to administer the test

Research Use	**YES**	**NO**	**Comments**
Is this tool appropriate for research purposes?	X		• Recommended with reservations: weak to moderate effect sizes may limit the ability of the FIM total and motor to detect change in individuals with MS; FIM – cognitive is not responsive to change

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Instrument name: Functional Reach (FR)

Reviewer: Kathleen Brandfass, MS, PT | **Date of review:** 8/28/11

ICF domain (check all that apply):

_____ Body function/structure _x____ Activity _____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance
_____ Ataxia
_____ Cardiovascular/pulmonary status
_____ Coordination (non-equilibrium)
_____ Dizziness/vestibular
_____ Fatigue
_____ Flexibility
_____ Muscle performance
_____ Muscle tone / spasticity
_____ Pain
_____ Posture
_____ Sensory integration
_____ Somatosensation
__X___ Balance/falls
_____ Bed mobility
_____ Gait
_____ Reach and grasp
_____ Self care
_____ Transfers
_____ Wheelchair skills
_____ Health and wellness
_____ Home management
_____ Leisure
_____ Quality of life
_____ Role function
_____ Shopping
_____ Social function
_____ Work

Other:

Type of measure:

___X__ Performance-based _____ Self-report

Instrument description:

- FR measures the distance of an individual's maximal forward reach from a fixed position while standing. Individual stands next to a yardstick secured to the wall at shoulder height.[1] Arm is flexed forward to 90 degrees; hand in a fist. Instructed to reach as far forward as possible without heels rising from the floor or taking a step. The distance is recorded at the third metacarpal head on the yardstick.
- There are variations on FR in the literature: lateral FR,[2, 3] seated FR,[4-6] multi-directional reach test,[7] and one versus two arm FR.[8] This review will focus on the standing forward reach test.

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • Not reported in MS • In Parkinson's disease: ICC = 0.74[9] • 1161 subjects with cognitive impairments ICC=0.92[10] • 128 elderly volunteers (age range 21-87) ICC=0.92[11] • 8 healthy subjects (age range 64-87) ICC=0.96[12] Inter-rater: • 8 persons with moderate MS (EDSS level 4 – 6): inter-rater reliability determined via calculation of mean differences

	between assessor ratings: left = -0.5; right = -0.25[13] • 28 subjects: in 14 ambulatory individuals with MS, ICC=0.89[14] • In Parkinson's disease: ICC = 0.64[9] • 17 healthy subjects (age range 20-87) ICC=0.98[1] <u>Test-retest:</u> • 28 subjects: 14 with MS - AM to PM test-retest: (cm) 31.49/33.21 and 14 healthy controls- AM to PM test-retest: (cm) 39.19/39.92[14] • 11 persons with MS – three test sessions over two week interval r= 0.864 to 0.919[15] • In Parkinson's disease: ICC = 0.73[16] and ICC = 0.86[17] • In mild to moderate stage Alzheimer's disease: ICC = 0.84[18] • 45 healthy subjects r=0.89[19]
Validity (concurrent, criterion-related, predictive)	<u>Concurrent validity:</u> • 11 persons with MS: FR correlated with 5 minute walk test at second and third test sessions- r=0.649 and 0.792[15] • In Parkinson's disease: forward FR correlated significantly with Berg Balance Scale r = 0.50, p < 0.05; forward FR not significantly correlated with backward FR, Timed Up and Go, and comfortable and fast gait speed[17] • 81 community dwelling individuals 65 + years of age : FR correlated with four square step test -0.47; FR correlated with Timed Up and Go Test -0.47[20] • 128 volunteers FR correlated with Center of Pressure measure 0.71[1] • 75 patients post stroke FR correlates with Berg Balance Scale in total number of patients r=0.78; with Patients with moderate stroke impairments r=0.80; with patients with severe motor impairments post stroke r=0.24[21] • FR correlated with the balance subscale of the Performance Oriented Mobility Assessment r=0.48[22] • 45 healthy subjects FR correlated with: Duke Mobility Skills Protocol: r=0.65 Gait speed r=0.71 Tandem walking r=0.67 Single leg stance r=0.64[19] <u>Predictive validity:</u> • Not reported in MS • 217 community dwelling males. Identified fallers from non-fallers: reported scores in inches

	0 inches- 8 times more likely to have 2 falls in 6 months as compared to person with 10 inch reach. FR< or equal to 6 inches: 4 times more likely to have 2 falls in 6 months as compared to person with 0 inch reach. FR > 6 inches but < 10 inches 2 times more likely to have 2 falls[11] <u>Discriminative validity:</u> • <u>Sensitivity/Specificity/Predictive Values/Likelihood Ratios:</u> • Not reported in MS • In 54 community dwelling individuals over the age of 65: sensitivity 63%/specificity 59% using 25 cm cut off to identify multiple fallers vs non multiple fallers[20] • 30 community dwelling fallers using<18.5 cm as fall risk; able to identify falls: sensitivity- 75%/ specificity 67% (95% CI)[23]
Ceiling/floor effects	<u>Ceiling effects:</u> • Not reported in MS <u>Floor effects:</u> • Not reported in MS
Sensitivity to change (responsiveness, MCID, MDC) / normative data	<u>MDC:</u> • Not reported in MS • In Parkinson's disease: MDC_{95} = 9 cm.[16] • In mild to moderate Alzheimer's disease: MDC_{95} = 3.15[18] <u>MCID:</u> • <u>Other responsiveness values:</u> • In Parkinson's disease: SDD = 11.5 cm[9] • In male veterans aged 40 – 105, responsiveness index = 0.97[24] <u>Normative Data:</u> • Men mean FR (SD): age 20 – 40 = 16.7" (1.9); 41 – 69 = 14.9" (2.2); 70 – 89 = 13.2" (1.6)[1] • Women mean FR (SD): age 20 – 40 = 14.6"(2.2); 41 – 69 = 13.8" (2.2); 70 – 89 = 10.5" (3.5)[1]
Instrument use	• Balance measure; falls risk
Equipment required	• Yardstick • Velcro or tape (to secure yardstick to wall)

Time to complete	• 1-5 minutes
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• Individual stands next to a wall; yardstick secured at shoulder height. Person is perpendicular to yardstick with shoulder flexed to 90 degrees hand in fist. Person instructed to reach as far forward as possible without lifting heels or taking a step. Reach recorded from the position of the third metacarpal head on the yardstick. Test usually includes practice trial. Test can include 2-3 trials with average reported. Several studies have also reported results in centimeters.
Level of client participation required (is proxy participation available?)	• Active client participation
Limitations	• Person must be able to stand independently for approximately one minute. • Cognitive dysfunction affects outcome,[10] but the test has been shown to have adequate test-retest reliability in individuals with mild to moderate Alzheimer's disease[18]

Recommendations
Practice Setting (check all that apply):
__X___ Acute
__X___ Inpatient Rehab
__X___ Home Health
__X___ Skilled Nursing
__X___ Outpatient

Comments:
- Accuracy of test dependent on individual being able to stand independently for approximately one minute.

Level of Disability (check all that apply):
__X__EDSS 0.0 – 3.5
__X__ EDSS 4.0 – 5.5
_____ EDSS 6.0 – 7.5
_____ EDSS 8.0 – 9.5

Comments:
- The need for the patient to stand independently for approximately one minute limits clinical utility at EDSS levels > 6.0

Should this tool be required for entry-level curricula?
___X__ Yes _____ No
Comments:
- Valid and reliable balance tool. Appropriate for use in elderly populations and multiple

diagnoses, including MS.

Is this tool appropriate for research purposes?
__X___ Yes _____ No
Comments:

- Appropriate for clinical research in MS.

Attachments:

- Score Sheets: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Instructions: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Reference list: _____ Uploaded on website

Second Reviewer Comments:

- Agree with the ratings and recommendation. Some data exists to support the use of the FR in patients with MS, but responsiveness data is currently lacking and would be helpful in clinical practice and research. The FR has high clinical utility for patients with EDSS levels ≤ 6.0 and is feasible for use in any setting.

Overall Taskforce Agreement with Recommendations:

-

Practice Setting	4	3	2	1	Comments
Acute		X			•
Inpatient Rehab		X			•
Home Health		X			•
Skilled Nursing			X		• Patients in SNF settings are more likely to have higher levels of disability, limiting utility of the FR in this setting
Outpatient		X			•

Overall Comments:

- Depends on the ability of the individual with MS to stand independently without an assistive device for about one minute, but is feasible for use in any practice setting.
- In a systematic review of various measures for individuals with neurological conditions, Tyson[25] reported that the FR is psychometrically robust and clinically useful
- Rating of a 3 reflects lack of responsiveness data in MS and somewhat limited validity data specific to individuals with MS

Level of Disability	4	3	2	1	Comments
EDSS 0.0 – 3.5		X			•
EDSS 4.0 – 5.5		X			•
EDSS 6.0 – 7.5				X	•
EDSS 8.0 – 9.5				X	•

Overall Comments:

- Balance dysfunction can occur at any stage of MS ; and it is often present very early in the diagnosis.[26] FR could be a very appropriate tool to utilize throughout an individual's MS diagnosis .
- Rating of a 3 for EDSS levels < 5.5 reflects lack of responsiveness data in MS and somewhat limited validity data specific to individuals with MS

Entry-Level Criteria	Students should learn to administer tool	Students should be exposed to tool (e.g. to read literature)	Do not recommend	Comments
Should this tool be required for entry level curricula?	X			•

Research Use	YES	NO	Comments
Is this tool appropriate for research purposes?	X		•

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Instrument name: Goal Attainment Scale or Scaling (GAS)

Reviewer: Evan Cohen, PT, MA, PhD, NCS | **Date of review:** 8/11

ICF domain (check all that apply):

__X__ Body function/structure __X__ Activity __X__ Participation

Constructs measured: (check all that apply):

__x__ Aerobic capacity/endurance	__x__ Balance/falls	__x__ Health and wellness
__x__ Ataxia	__x__ Bed mobility	__x__ Home management
__x__ Cardiovascular/pulmonary status	__x__ Gait	__x__ Leisure
__x__ Coordination (non-equilibrium)	__x__ Reach and grasp	__x__ Quality of life
__x__ Dizziness/vestibular	__x__ Transfers	__x__ Role function
__x__ Fatigue	__x__ Wheelchair skills	__x__ Shopping
__x__ Flexibility		__x__ Social function
__x__ Muscle performance		__x__ Work
__x__ Muscle tone		
__x__ Pain		
__x__ Posture		
__x__ Sensory integration		
__x__ Somatosensation		

Other: Goals are determined and prioritized by the people with multiple sclerosis (PWMS), thus may include any/all of the above.

Type of measure:

__X__ Performance-based __x__ Self-report

Instrument properties:

- GAS is a tool by which the PWMS (and, or along with the clinician) identifies a baseline standard of several tasks that the person deems important and achievable with therapy, then sets and prioritizes individualized, measurable goals against which to grade change. Change is graded using a 5-point scale (described below)

Reliability (test-retest, intra-rater, inter-rater)	No reliability study done in PWMS. Inter-rater reliability: In people with brain injury: • High reliability (r=0.92 at admission and r=0.94 at discharge)[1]. In people with LE amputation • Adequate/good reliability (ICC=0.67)[2]. In infants with motor delays • Good reliability (kappa coefficient=0.89)[3,4].

	In children with cerebral palsy • Good to excellent reliability (kappa coefficient=0.82 for children's therapists and 0.64 for independent raters)[5].
Validity (concurrent, criterion-related, predictive)	<u>Concurrent validity:</u> In PWMS • High correlation with Clinical Global Impression scale (CGI) (ρ = -0.86, p < 0.001), but not with Barthel Index (BI) and FIM[6]. In people with stroke • GAS was moderately correlated with London Handicap Scale (ρ between - 0.45 and -0.51, p < 0.005) but not with the FIM[7]. • Following a program of botulinum toxin injection for spasticity in the affected UE, GAS was correlated with a reduction in spasticity on the Modified Ashworth Scale (ρ = 0.36, *p* = 0.001) and on a measure of global assessment of benefit (ρ = 0.45, *p* < 0.001), but not with Hospital Anxiety and Depression Scale, pain, Assessment of Quality of Life, Patient Disability score and Carer Burden score[8]. In infants with motor delay • Low correlation with Peabody gross and fine (r=0.44 and r=0.18, respectively) motor scale age-equivalent change scores[4,9]. • In people with brain injury • High correlation (r=0.84) with CGI but not with IADL, Milwaukee evaluation of daily living skills, Spitzer quality of life index, Rappaport disability rating, and Kohlman evaluation of daily living skills[1]. In people with lower extremity amputation • Moderate correlation with BI (r=0.44) and Locomotor Capabilities Index (LCI) of the Prosthetic Profile of the Amputee (r=0.35)[2]. <u>Predictive validity:</u> • <u>Discriminative validity:</u> • <u>Sensitivity/Specificity/Predictive Values/Likelihood Ratios:</u> • In a mixed neurological population (N=18, n of PWMS = 2), a GAS change score of 10 or more predicted those who responded positively to a spasticity management intervention with 91% sensitivity and 86% specificity[10]; however, the GAS scoring in this

	study was conducted retrospectively.
Ceiling/floor effects	Ceiling effects: • Floor effects: •
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • MCID: In PWMS • a 17-point change in GAS was associated with a clinically significant change on the Clinical Global Impression scale[6]. In a mixed neurological population (N=18, n of PWMS = 2) ▪ A change of 10 points was associated with clinically significant change[10]; however, the GAS scoring in this study was conducted retrospectively. Other responsiveness values: In PWMS ▪ GAS was more responsive to change, and had substantially higher effect size than BI and FIM[6]. In people with stroke • GAS was more responsive than Assessment of Quality of Life and Hospital Anxiety and Depression Scale[8]. In people with brain injury • GAS was more responsive than BI, FIM, and Functional Assessment Measure (FIM+FAM) [11] In people with LE amputation • GAS was more responsive than BI and LCI[2]. In infants with motor delays • GAS was a more responsive measure of motor change when compared with behavioral objective [3,9] Normative Data: • N/A
Instrument use	
Equipment required	• Individualized based on person's goals
Time to complete	• Approximately 15-20 minutes to set an average of four goals per patient[1]. Approximately eight additional minutes may be required if the PWMS has cognitive impairments (personal

	communication with Khan, 2011). • Additional time is needed to test the performance of the identified goals at baseline and subsequent measurement points.
How is the instrument scored? (e.g., total score, are there subscales, etc…)	There are two methods of scoring which depend on the baseline measure[12]. If the PWMS has some ability to perform the task at baseline, then the scale of goal achievement is measured as follows: • A lot better than expected = +2 • A little better than expected = +1 • Achieved as expected = 0 • No change = -1 • Worse = -2 If the PWMS has no ability to perform the task at baseline (i.e. no possible declination), then goal achievement is measured as follows: • A lot better than expected = +2 • A little better than expected = +1 • Achieved as expected = 0 • Partially achieved = -1 • No change = -2 The measure of change over time is computed as T-score with a mean equal to 50 and a standard deviation of 10[12]. A scoring sheet can be found on the web at the following website: marson-and-associates.com/GAS/goal_attainment_scaling_excel.html
Level of client participation required (is proxy participation available?)	• Clients should be included in deciding what goals are important to pursue and determine how meaningful those goals are to them. As GAS is individualized, client participation is generally required; however, it seems possible that a proxy could participate if the PWMS is unable to set goals.
Limitations	• Not a standardized outcome measure, thus likely to be better at detecting individual rather than population changes.

Recommendations
Practice Setting (check all that apply):

_____ Acute
__x__ Inpatient Rehab
__x__ Home Health
__x__ Skilled Nursing
__x__ Outpatient

- Comments: Does not seem appropriate for the acute setting because of the time-consuming

nature of the tool and the short time frame for the typical episode of acute care.
Level of Disability (check all that apply): __X__ EDSS 0.0 – 3.5 __X__ EDSS 4.0 – 5.5 __X__ EDSS 6.0 – 7.5 __X__ EDSS 8.0 – 9.5 Comments: •
Should this tool be required for entry-level curricula? _____ Yes __X__ No Comments: •
Is this tool appropriate for research purposes? __X__ Yes _____ No Comments: • GAS seems a useful and sensitive tool for identifying changes that may be missed by standardized outcomes. There are a few drawbacks to its use in research including the inconsistency of scoring between blinded and unblinded raters [13].
Attachments: • Score Sheets: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable Can be found at www.marson-and-associates.com/GAS/goal_attainment_scaling_excel.html • Instructions: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable • Reference list: _____ Uploaded on website
Second Reviewer Comments: • Agree with first reviewer's assessment.
Overall Taskforce Agreement with Recommendations: •

Practice Setting	**4**	**3**	**2**	**1**	**Comments**
Acute				X	•
Inpatient Rehab		X			•

Goal Attainment Scale or Scaling

Home Health		X			•
Skilled Nursing		X			•
Outpatient		X			•
Overall Comments: •					

Level of Disability	**4**	**3**	**2**	**1**	**Comments**
EDSS 0.0 – 3.5		X			•
EDSS 4.0 – 5.5		X			•
EDSS 6.0 – 7.5		X			•
EDSS 8.0 – 9.5		X			•
Overall Comments: •					

Entry-Level Criteria	**Students should learn to administer tool**	**Students should be exposed to tool (e.g. to read literature)**	**Do not recommend**	**Comments**
Should this tool be required for entry level curricula?			X	•

Research Use	**YES**	**NO**	**Comments**
Is this tool appropriate for research purposes?	X		•

References:

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Instrument name: Guy's Neurological Disability Scale	
Reviewer: Susan E. Bennett, PT, DPT, EdD, NCS, MSCS	**Date of review:** 4/23/2011

ICF domain (check all that apply):

__x__ Body function/structure _____ Activity __x__ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance	_____ Balance/falls	_____ Health and wellness
_____ Ataxia	_____ Bed mobility	_____ Home management
_____ Cardiovascular/pulmonary status	__x__ Gait	_____ Leisure
_____ Coordination (non-equilibrium)	_____ Reach and grasp	_____ Quality of life
__x__ Dizziness/vestibular	__x__ Self care	_____ Role function
__x__ Fatigue	_____ Transfers	_____ Shopping
_____ Flexibility	_____ Wheelchair skills	_____ Social function
__x__ Muscle performance		_____ Work
__x__ Muscle tone / spasticity		
__x__ Pain		
_____ Posture		
_____ Sensory integration		
_____ Somatosensation		

Other:

Type of measure:

_____ Performance-based __x__ Self-report

Instrument description:

A comprehensive multidimensional clinical disability scale designed to assess the wide range of disability in patients with multiple sclerosis. It is a questionnaire driven by patient interview and can be applied by any health care personnel.[1,2]

Reliability (test-retest, intra-rater, inter-rater)

Intra-rater:

- In a study of 50 patients with MS, it showed to be internally consistent with Cronbach's alpha coefficient of 0.87.
- Intra-rater reliability of 0.96.
- Cronbach's alpha ranged from 0.78 to .80, indicating good internal consistency.[3]

Inter-rater:

- In 50 patients with MS, ICC = 0.99.[4]

Test-retest:

- Test-retest reliability of the GNDS total score (r = 0.972) and each of its components (r varied from 0.685 to 0.987) was good. Test-retest when administered via mail (r= 0.90).[5]

	• Strong relationship (r= 0.91, p= .000), indicating an excellent reliability.[3]
Validity (concurrent, criterion-related, predictive)	Concurrent validity: • High correlations with other disability (Functional Independence Measure r =-0.81), impairment (EDSS r = 0.75, Scripps Disability Status Scale r =-0.78), handicap scales (London Handicap Scale r = 0.52) and Health-related Quality of Life scales (Physical functioning domain of the Short Form 36 r = -0.81).[4] • Compared with the EDSS or the Barthel Index, the GNDS had good validity (r = 0.636 and r = -0.757).[5] • All items of the GNDS were significantly correlated and ranged between 0.30 and 0.70.[3] • Convergent validity of the Americanized GNDS was supported by significant inverse relationship with the eight subscales of the SF-36 and the ADL Self-Care for MS Scale. Correlations ranged from -0.33 to -0.66.[3] • There was a significant correlation between GNDS disability score and service costs (0.341, p<0.001) and total costs (including lost employment) (0.393, p<0.001).[6] • The correlation between GNDS and EDSS scores were strong (r=0.73).[2] • Strong correlation between GNDS and MSFC (r= -0.68)[2] Predictive validity: • Using the EDSS score as the dependent variable, the GNDS subcategories lower-limb function (partial correlation: $r = 0.79; p < 0.001$), bladder function (partial correlation: $r = 0.22; p < 0.001$), upper-limb function (partial correlation: $r = 0.19; p = 0.001$) and fatigue (partial correlation: $r = 0.15; p = 0.013$) revealed a valuable contribution for predicting the EDSS with an adjusted R^2 of 0.80.[2] Discriminative validity: • Sensitivity/Specificity/Predictive Values/Likelihood Ratios: •
Ceiling/floor effects	Ceiling effects: • Floor effects: •
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • MCID: • Level of change score for clinical significance is 3.[4]

	Other responsiveness values: • The GNDS sum score was found to be moderately responsive to clinical change with an effect size of 0.58, P =<0.001.[1] Normative Data: • The mean total score of 1,942 people with MS was 21.3, with a median of 21 and a range of 0 to 51.[6] • Mean score 14.6 (SD, 7.9)[2]
Instrument use	•
Equipment required	•
Time to complete	• 4 min 30 seconds to 7 min 37 seconds (S2) • 9 minutes +/- 3, with an additional 5 minutes for scoring [5] • 5-10 minutes[3]
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• Questionnaire with 12 separate categories with an interview and scoring section. The questions are directed to assess the disability in the previous one month. • The disability subscales are: o Cognition o Mood o Vision o Speech o Swallowing o Upper limb function o Lower Limb Function o Bladder Function o Bowel Function o Sexual Function o Fatigue o 'Others' • Each subscale is assessed using four to eight questions and for each question the patient must answer yes or no. In four sections (memory, mobility, speech, mood) there are also questions asking the opinion of another person. • Severity for each subscale is graded from 0 (normal function) to 5 (total loss of function) based according to severity and impact on the individual. The total GNDS score is the sum of the 12 separate scores ranging between 0 (no disability) and 60 (maximum possible disability).
Level of client participation required (is proxy participation available?)	• Be able to communicate efficiently to participate
Limitations	• There may be difficulties with some patients that have severe impairment in one skill. For example, memory and cognition or

	communication. • The GNDS is an inadequate screen of cognitive function.[2]

Recommendations
Practice Setting (check all that apply):

__X__ Acute
__X__ Inpatient Rehab
__X__ Home Health
__X__ Skilled Nursing
__X__ Outpatient

Comments:
•

Level of Disability (check all that apply):

__x__ EDSS 0.0 – 3.5
__x__ EDSS 4.0 – 5.5
__x__ EDSS 6.0 – 7.5
__x__ EDSS 8.0 – 9.5

Comments:
• Tested in patients ranging from 0-7.5 (S2)

Should this tool be required for entry-level curricula?

__X___ Yes ____ No

Comments:
• Exposure to the Guy's Neurologic Scale as a measure in MS

Is this tool appropriate for research purposes?

__X___ Yes _____ No

Comments:
• Self report covering a very wide range of areas. Could be used in conjunction with other performance based measures

Attachments:

• Score Sheets: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable

• Instructions: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable

• Reference list AND INSTRUCTIONS: _____ Uploaded on website

http://msj.sagepub.com.gate.lib.buffalo.edu/content/5/4/223.full.pdf+html
Second Reviewer Comments: • Consider explaining why not appropriate for entry level, because below you had written recommended exposure. • Number references up above in the text • Agree with recommendations
Overall Taskforce Agreement with Recommendations: •

Practice Setting	**4**	**3**	**2**	**1**	**Comments**
Acute		X			• Is MS Specific and self report, could be of value in determining patient's perception of disability
Inpatient Rehab		X			• As above
Home Health		X			• As above
Skilled Nursing		X			• As above
Outpatient		X			• As above
Overall Comments: •					

Level of Disability	**4**	**3**	**2**	**1**	**Comments**
EDSS 0.0 – 3.5		X			• MS Specific, self report of perception of disability
EDSS 4.0 – 5.5		X			• As above
EDSS 6.0 – 7.5		X			• As above
EDSS 8.0 – 9.5		X			• As above
Overall Comments: •					

Entry-Level Criteria	**Students should learn to administer tool**	**Students should be exposed to tool (e.g. to read literature)**	**Do not recommend**	**Comments**
Should this tool				• Awareness only of the tool

be required for entry level curricula?		X		
Research Use	**YES**	**NO**	**Comments**	
Is this tool appropriate for research purposes?	X		• Could be used in conjunction with other performance based measures	

References:

1) Sharrack B, Hughes R. The Guy's Neurological Disability Scale (GNDS): a new disability measure for multiple sclerosis. *Mult Scler*. 1999 Aug;5(4):223-33.

2) Hoogervorst E, van Winsen LML, et al. Comparisons of patient self-report, neurologic examination, and functional impairment in MS. *Neurology*. 2001 April; 56(7): 934-937.

3) Fraser C, McGurl J. Psychometric Testing of the American Version of the Guy's Neurological Scale. *Journal of Neuroscience Nursing*. 2007 Feb; 39(1): 13-9.

4) Sharrack B, Hughes R. Scale Development and Guy's Neurological Disability Scale. J Neurol. 1999 (246:226.

5) Rossier P, Wade D. The Guy's Neurological Disability Scale in patients with multiple sclerosis: a clinical evaluation of its reliability and validity. Clinical Rehabilitation. 2002;16: 75-95.

6) McCrone P, Heslin M, Knapp M, et al. Multiple Sclerosis in the UK: Service use, costs, quality of life and disability. *Pharmacoeconomics*. 2008; 26(10): 847-860.

Instrument name: (Hauser) Ambulation Index (AI)

Reviewer: Susan E. Bennett, PT, DPT, EdD, NCS, MSCS | **Date of review:** 9/17/11

ICF domain (check all that apply):

_____ Body function/structure ___X__ Activity _____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance	_____ Balance/falls	_____ Health and wellness
_____ Ataxia	_____ Bed mobility	_____ Home management
_____ Cardiovascular/pulmonary status	__X_ Gait	_____ Leisure
_____ Coordination (non-equilibrium)	_____ Reach and grasp	_____ Quality of life
_____ Dizziness/vestibular	_____ Self care	_____ Role function
_____ Fatigue	__x___ Transfers	_____ Shopping
_____ Flexibility	_____ Wheelchair skills	_____ Social function
_____ Muscle performance		_____ Work
_____ Muscle tone / spasticity		
_____ Pain		
_____ Posture		
_____ Sensory integration		
_____ Somatosensation		

Other:

Type of measure:

__X_ Performance-based _____ Self-report

Instrument description:

- An ordinal scale designed to quantify changes in gait.[1]
- Has also been referred to as the Hauser Deambulation Index[2]
- Score range 0 = no symptoms to 9 = restricted to wheelchair, unable to transfer independently

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • ICC = 0.93, K = 0.59, and repeatability coefficient = 1.5 points in 64 individuals with MS (mean EDSS = 4.5; range 0.0 - 7.5); intra-rater agreement = 66, 94, 97, and 100% when agreement was defined as no difference, ≤ 1 point, ≤ 2 points, and ≤ 3 points, respectively[3] Inter-rater: • ICC = 0.96, K = 0.73, and repeatability coefficient = 1 point in 64 individuals with MS (mean EDSS = 4.5; range 0.0 -

	7.5); inter-rater agreement = 77% and 100% when agreement was defined as no difference and ≤ 1 points, respectively[3] • According to National MS Society webpage (http://www.csp.org.uk/outcome-measures/hauser-ambulation-index) inter-rater is good but no references cited • Amato and Ponziani[4] reported that the AI is more precise and has better inter-rater reliability as compared to the EDSS, but no data provided Test-retest: • As above (National MS Society webpage) reported to be good, no references cited • Amato and Ponziani[4] reported that the AI might have questionable test-retest reliability, especially for patients with EDSS scores between 2.0 – 3.0 and 4.0 – 5.0, as scores in these ranges may change by one point in a short time period, but no data provided • Reliability coefficient = 0.91[5]
Validity (concurrent, criterion-related, predictive)	Concurrent validity: • When administered to inpatients with MS (mean EDSS = 6.6 ± 1.7), Hauser's Ambulation Index correlates significantly to Rivermead Mobility Index (for groups of MS subjects with various walking capabilities: normal, slow, unable); rho ranged from -0.45, $p < 0.01$ for the normal walk group to -0.96, $p < 0.001$ for all groups[6] • In 63 individuals with MS (able to stand independently for > 3 seconds and walk 6 m with/without an assistive device), AI correlated with Berg Balance Scale (rho = -0.74), Dynamic Gait Index (rho = -0.80), Timed Up and Go (rho = 0.74), Activities-specific Balance Confidence Scale (rho = -0.45) and Dizziness Handicap Inventory (rho = 0.32)[2] • In MS (mean EDSS = 4.5; range 0.0 - 7.5): AI correlated significantly with EDSS (0.68); Scripps Neurological Rating Scale (-0.67); Functional Independence Measure (-0.73); Cambridge MS Basic Score disability (0.54) and handicap (0.55); Barthel Index (-0.72); London Handicap Scale (-0.72); EuroQoL VAS (-0.73); SF – 36 physical functioning (-0.87) and physical role limitation (-0.52); and social functioning (-0.42), vitality (-0.39), and general health perception (-0.38)

	(all p < 0.001 – 0.008); did not correlate significantly to SF-36 emotional role limitation, and social functioning (mental health bodily pain, and health change)[3] • AI correlated significantly to patient's ability to work (0.59), do housework (0.55), disability rank (0.88) at p < 0.001 and look after themselves/independence (0.35) at p < 0.01-0.02[3] <u>Predictive validity:</u> • AI is unable to predict handicap as measured by London Handicap Scale and quality of life impairment as measured by Functional Assessment of MS[7] <u>Discriminative validity:</u> • Able to discriminate among in-patients with MS who have normal walking capability vs. slow walk vs. unable to walk (mean AI scores for the 3 groups were 2.2 ± 0.9, 5.1 ± 1.0, and 8.5 ± 0.8, p < 0.001)[6] • In 63 individuals with MS (able to stand independently for > 3 seconds and walk 6 m with/without an assistive device): AI unable to discriminate between non-fallers and fallers[2] • Able to discriminate among individuals with MS according to EDSS levels: mean (SD) EDSS levels were 0.8 (0.7) for EDSS = 1 – 2.5, 3.1 (1.3) for EDSS = 3.0 – 6.0, and 7.0 (1.5) for EDSS levels > 6.0[8] <u>Sensitivity/Specificity/Predictive Values/Likelihood Ratios:</u> •
Ceiling/floor effects	<u>Ceiling effects:</u> • Vaney et al[6] found a significant ceiling effect: 28% of subjects with MS (mean EDSS = 6.6 ± 1.7) reached the maximum score of 9 on the AI • No significant ceiling effect (7.8%) found in a study of 63 individuals with MS (able to stand independently for > 3 seconds and walk 6 m with/without an assistive device[2] <u>Floor effects:</u> • No significant floor effect in MS (mean EDSS = 6.6 ± 1.7)[6]
Sensitivity to change (responsiveness, MCID, MDC) / normative data	<u>MDC:</u> • <u>MCID:</u> • <u>Other responsiveness values:</u> • The AI is reported to be more able to detect change as compared to 10 m walk test and EDSS, but less responsive

	than the Rivermead Mobility Index; the AI was able to detect changes in 18.5% of patients with MS (RMI was able to detect changes in 39%, 10 m walk test 16.5% and EDSS 7.5%)[6] • Using a signal-to-noise ratio, Syndulko et al[6] determined that the AI has responsiveness values (R1) = 2.37 for all patients, 2.65 for patients with EDSS < 5.5, and 2.14 for patients with EDSS ≥ 5.5;), indicating better sensitivity to change as compared to the EDSS and two components of the Incapacity Status Scale composites, but not as responsive as neuroperformance composites (global, lower and upper extremity) • Effect size in individuals with MS (mean EDSS = 4.5; range 0.0 - 7.5) = 0.20 (p = 0.039) indicating limited responsiveness to change[3] <u>Normative Data:</u> •
Instrument use	• Ordinal data based on trained observer evaluating gait
Equipment required	• Stop watch, patients self selected assistive device
Time to complete	• 1 – 5 minutes
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• 0 = asymptomatic; fully active • 1 = walks normally, but reports fatigue that interferes with athletic or other demanding activities • 2 = abnormal gait or episodic imbalance; gait disorder is noticed by family and friends; able to walk 25 feet (8 meters) in 10 seconds or less • 3 = walks independently, able to walk 25 feet in 20 seconds or less • 4 = requires unilateral support (cane or single crutch) to walk; walks 25 feet in 20 seconds or less • 5 = requires bilateral support (canes, crutches or walker) and walks 25 feet in 20 seconds or less; or requires unilateral support but needs more then 20 seconds to walk 25 feet • 6 = requires bilateral support and more then 20 seconds to walk 25 feet; may use wheelchair on occasion • 7 = walking limited to several steps with bilateral support; unable to walk 25 feet; may use wheelchair for most activities • 8 = restricted to wheelchair; able to transfer independently • 9 = restricted to wheelchair; unable to transfer

	independently
Level of client participation required (is proxy participation available?)	• Client must be fully engaged
Limitations	• The timed 25 foot walk has replaced the Hauser Ambulation Index as a record of the exact time it takes the patient to walk 25 feet is measured

Recommendations
Practice Setting (check all that apply):

__X__ Acute
__X__ Inpatient Rehab
__X__ Home Health
__x__ Skilled Nursing
__X__ Outpatient

Comments:
- *Could be used* in these settings but timed 25 foot walk has replaced Hauser Ambulation Index

Level of Disability (check all that apply):

__X__ EDSS 0.0 – 3.5
__X__ EDSS 4.0 – 5.5
__X__ EDSS 6.0 – 7.5
__x__ EDSS 8.0 – 9.5

Comments:
-

Should this tool be required for entry-level curricula?

_____ Yes __X__ No

Comments:
- The AI is clinically feasible as it is quick and easy to administer, but is less widely known and used as compared to other measures (e.g., timed walk tests)

Is this tool appropriate for research purposes?

_____ Yes __X__ No

Comments:
-

Attachments:

- Score Sheets: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Instructions: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable

  http://nationalmssociety.org/search-results/index.aspx?q=Hauser+Ambulation+Index&sitesearch=&start=0&num=20

- Reference list: _____ Uploaded on website

Second Reviewer Comments:

- Agree with ratings and recommdendations.

Overall Taskforce Agreement with Recommendations:

-

Practice Setting	4	3	2	1	Comments
Acute		X			•
Inpatient Rehab		X			•
Home Health		X			•
Skilled Nursing		X			•
Outpatient		X			•

Overall Comments:

- The AI is a reliable and valid measure for individuals with MS, but has limited responsiveness to change; it may be useful as a quick screening tool, but is not recommended as an evaluative measure to determine treatment effectiveness

Level of Disability	4	3	2	1	Comments
EDSS 0.0 – 3.5		X			•
EDSS 4.0 – 5.5		X			•
EDSS 6.0 – 7.5		X			•
EDSS 8.0 – 9.5		X			•

Overall Comments:

-

Entry-Level Criteria	Students should learn to administer tool	Students should be exposed to tool (e.g. to read	Do not recommend	Comments

		literature)		
Should this tool be required for entry level curricula?			X	• More objective measures with psychometric properties have replaced the Ambulation Index

Research Use	**YES**	**NO**	**Comments**
Is this tool appropriate for research purposes?		X	• Due to poor responsiveness in MS

References:

1. Hauser SL, Dawson DM, Lehrich JR, et al. Intensive immunosuppression in progressive multiple sclerosis. A randomized, three-arm study of high-dose intravenous cyclophosphamide, plasma exchange, and ACTH. *N Engl J Med.*1983;308(4):173-180.

2. Cattaneo D, Regola A, Meotti M, Cattaneo D, Regola A, Meotti M. Validity of six balance disorders scales in persons with multiple sclerosis. *Disabil Rehabil.*2006;28(12):789-795.

3. Sharrack B, Hughes RA, Soudain S, Dunn G. The psychometric properties of clinical rating scales used in multiple sclerosis. *Brain.*1999;122(Pt 1):141-159.

4. Amato MP, Ponziani G. Quantification of impairment in MS: discussion of the scales in use. *Mult Scler.*1999;5(4):216-219.

5. Syndulko K, Ke D, Ellison GW, Baumhefner RW, Myers LW, Tourtellotte WW. Comparative evaluations of neuroperformance and clinical outcome assessments in chronic progressive multiple sclerosis: I. Reliability, validity and sensitivity to disease progression. Multiple Sclerosis Study Group. *Mult Scler.*1996;2(3):142-156.

6. Vaney C, Blaurock H, Gattlen B, Meisels C. Assessing mobility in multiple sclerosis using the Rivermead Mobility Index and gait speed. *Clin Rehabil.*1996;10:216-226.

7. Provinciali L, Ceravolo MG, Bartolini M, Logullo F, Danni M. A multidimensional assessment of multiple sclerosis: relationships between disability domains. *Acta Neurologica Scandinavica.*1999;100(3):156-162.

8. Schwartz CE, Vollmer T, Lee H. Reliability and validity of two self-report measures of impairment and disability for MS. North American Research Consortium on Multiple Sclerosis Outcomes Study Group. *Neurology.*1999;52(1):63-70.

Instrument name: High-Level Mobility Assessment Tool (HiMAT)	
Reviewer: Kathleen Brandfass, MS, PT	**Date of review:** 8/20/11

ICF domain (check all that apply):

___x__ Body function/structure __X___ Activity _____ Participation

Constructs measured: (check all that apply):

__x__ Aerobic capacity/endurance
_____ Ataxia
_____ Cardiovascular/pulmonary status
_____ Coordination (non-equilibrium)
_____ Dizziness/vestibular
_____ Fatigue
_____ Flexibility
_____ Muscle performance
_____ Muscle tone / spasticity
_____ Pain
_____ Posture
_____ Sensory integration
_____ Somatosensation
__x__ Balance/falls
_____ Bed mobility
__X__ Gait
_____ Reach and grasp
_____ Self care
_____ Transfers
_____ Wheelchair skills
_____ Health and wellness
_____ Home management
_____ Leisure
_____ Quality of life
_____ Role function
_____ Shopping
_____ Social function
_____ Work

Other: The HiMAT specifically focuses on high level mobility (i.e., skills beyond level surface ambulation)

Type of measure:

__X___ Performance-based _____ Self-report

Instrument description:

- HiMAT developed to quantify high level mobility outcomes following traumatic brain injury (TBI), but is reported to have potential applicability for patients with other neurological conditions, particularly in young adults[1]
- A systematic process was used in the development of the HiMAT, including use of Rasch analysis to identify and reduce items with similar levels of difficulty[1, 2]
- The HiMAT requires independent ambulation without an assistive device. It is reported to be suitable for patients with varying cognitive abilities.[2]
- 13 item scale including walking forward, walk backwards, walk on toes, walk over obstacle, running, skipping, hop, bounding (on more and less effected leg), and ascending/descending stairs.
- A revised 8-item HiMAT measure (no stair items) has been studied;[3] this review will focus on the 13-item HiMAT

Reliability (test-retest, intra-rater, inter-rater)	Internal Consistency: • Not studied in MS • In TBI, Chronbach's alpha = 0.99[2] and 0.97[4]

	Intra-rater: • Not studied in MS • 20 subjects with acquired brain injury tested 2 days apart ICC=0.99[4] Inter-rater: • Not studied in MS • 17 subjects with acquired brain injury ICC=0.99 for both the raw data obtained for each item and coded score total HiMAT scores[4] Test-retest: • Not studied in MS • In healthy young adults: ICC = 0.88[5] • 59 subjects with acquired brain injury completed retest ICC 0.88[5]
Validity (concurrent, criterion-related, predictive)	Concurrent validity: • Not studied in MS • 103 subjects with acquired brain injury HiMAT moderately correlated with motor Functional Independence Measure (FIM): r=0.53 p<0.001[6] • 103 subjects with acquired brain injury highly correlated with Rivermead Index (RMI) r=0.87 p<0.001[6] Predictive validity: • None reported Discriminative validity: • Not studied in MS • In TBI, the HiMAT is reported to have confirmed discriminability as evidenced by the range of item difficulties found via Rasch analysis; it is reportedly better able to discriminate among high functioning individuals as compared to the Rivermead Mobility Index and the motor Functional Independence Measure[2] • The HiMAT is reported to be discriminative in healthy young females[5] Construct validity: • Not studied in MS • In TBI, unidemsionality and a hierarchical ordering of items for motor performance difficulty has been determined for the HiMAT[2] Sensitivity/Specificity/Predictive Values/Likelihood Ratios: •
Ceiling/floor effects	Ceiling effects:

	• Not studied in MS • Found in healthy young males[5] • In TBI, the HiMAT is reportedly less susceptible to a ceiling effect as compared to the gross function Rivermead Mobility Assessment (a.k.a. Rivermead Mobility Index and the motor Functional Independence Measure, but) no quantitative values (e.g., % values) were provided[2, 6] Floor effects: • Not studied in MS • Requirement of independent ambulation without an assistive device
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • Not studied in MS • In TBI, MDC_{95}: improvement by 4 points or deterioration by 2 points;[4,6] HiMAT found to be more responsive than the motor Functional Independence Measure and gross function Rivermead Mobility Assessment MCID: • Not studied in MS Other responsiveness values: • In TBI, SEM = 1.36[4]; effect size > 1.08 and 1.89 (calculated via modified Liang and Liang methods, respectively)[6] Normative Data: • In healthy young males, aged 18 – 25 years: median HiMAT score = 54/54 (inter-quartile range 53-54)[5] • In healthy young females, aged 18 – 25 years: median HiMAT score = 51/54 (inter-quartile range =48-53)[5]
Instrument use	• Assess high level mobility
Equipment required	• Stop watch • Tape measure • House brick or similar sized block • 20-m walkway • Flight of 14 stairs
Time to complete	• 5 to 15 minutes
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• 13 items summed; possible total score 54. • Performance is noted in time (in seconds) or distance and then each item is converted to a score of 1 – 4 (exception: a 1 – 5

	point scale is used for stair items)[2, 5] • Patients are asked to perform each task at his/her maximum safe speed except for the bounding and stair items
Level of client participation required (is proxy participation available?)	• The HiMAT requires a high level of physical performance of participant • Orthosis use is permitted during testing
Limitations	• Ability to ambulate independently without an assistive device.

Recommendations
Practice Setting (check all that apply):
_____ Acute
__X__ Inpatient Rehab
_____ Home Health
_____ Skilled Nursing
__X__ Outpatient

Comments:
- Requires independent ambulation without an assistive device

Level of Disability (check all that apply):

__x__ EDSS 0.0 – 3.5
__x__ EDSS 4.0 – 5.5
_____ EDSS 6.0 – 7.5
_____ EDSS 8.0 – 9.5

Comments:
- Current reliability/validity in brain injury; no published psychometric data for MS.

Should this tool be required for entry-level curricula?
_____ Yes __X___ No
Comments:
- The HiMAT was developed to assess high level mobility following TBI; currently no evidence exists to support its use in MS
- The HiMAT was one of 7 measures recommended for use in clinical practice in patients with TBI in a systematic review of walking and mobility measures; it is reported to have sufficient clinical utility and good psychometric properties, so may be appropriate for inclusion in curricula related to TBI[7]

Is this tool appropriate for research purposes?
_____ Yes __x___ No
Comments:
- Due to the lack of psychometric data on the HiMAT in individuals with MS, do not recommend it for use in research at this point in time. However, research to assess the reliability and validity

in individual's with MS with high level physical performance with goals appropriate to return to work, leisure activities and sports is warranted.
Attachments: • Score Sheets: _X____ Uploaded on website _____ Available but copyrighted _____ Unavailable http://www.tbims.org/combi/himat/index.html • Instructions: _X____ Uploaded on website _____ Available but copyrighted _____ Unavailable • Reference list: _X____ Uploaded on website
Second Reviewer Comments: • The HiMAT has limited utility in MS at this point in time, due to the lack of psychometric data. It might have clinical feasibility at the early stages of MS, but given the progressive nature of the disease, it is likely to have limited usefulness over the long-term. Agree with the ratings and recommendations.
Overall Taskforce Agreement with Recommendations: •

Practice Setting	**4**	**3**	**2**	**1**	**Comments**
Acute				X	• Not appropriate for patients with acute medical conditions due to high level mobility items
Inpatient Rehab			X		•
Home Health				X	• Due to high level mobility items
Skilled Nursing				X	• As above
Outpatient			X		•

Overall Comments:
- Requires independent ambulation. In-patient rehab and outpatient were the practice setting for the HiMAT studies with acquired brain injury.
- Ratings for inpatient rehab and outpatient reflect lack of psychometric data in individuals with MS

Level of Disability	**4**	**3**	**2**	**1**	**Comments**
EDSS 0.0 – 3.5			X		•
EDSS 4.0 – 5.5			X		•
EDSS 6.0 – 7.5				X	•
EDSS 8.0 – 9.5				X	•

Overall Comments: • Currently no data to support its use in MS, but it might have clinical utility at lower EDSS levels.

Entry-Level Criteria	**Students should learn to administer tool**	**Students should be exposed to tool (e.g. to read literature)**	**Do not recommend**	**Comments**
Should this tool be required for entry level curricula?			X	• See above comment

Research Use	**YES**	**NO**	**Comments**
Is this tool appropriate for research purposes?		X	• Lack of psychometric data in MS, so do not recommend for use in research at this point in time. • Recommend investigating psychometric properties in MS.

References:

1. Williams G, Robertson V, Greenwood K, Goldie P, Morris ME. The high-level mobility assessment tool (HiMAT) for traumatic brain injury. Part 1: Item generation. *Brain Inj.*2005;19(11):925-932.

2. Williams GP, Robertson V, Greenwood KM, Goldie PA, Morris ME. The high-level mobility assessment tool (HiMAT) for traumatic brain injury. Part 2: content validity and discriminability. *Brain Inj.*2005;19(10):833-843.

3. Williams G, Pallant J, Greenwood K. Further development of the High-level Mobility Assessment Tool (HiMAT). *Brain Inj.*2010;24(7-8):1027-1031.

4. Williams GP, Greenwood KM, Robertson VJ, et al. High-Level Mobility Assessment Tool (HiMAT): interrater reliability, retest reliability, and internal consistency. *Phys Ther.*2006;86(3):395-400.

5. Williams GP, Rosie J, Denisenko S, Taylor D. Normative values for the high-level mobility assessment tool (HiMAT). *International Journal of Therapy and Rehabilitation.*2009;16(7):370-374.

6. Williams G, Robertson V, Greenwood K, et al. The concurrent validity and responsiveness of the high-level mobility assessment tool for measuring the mobility

limitations of people with traumatic brain injury. *Arch Phys Med Rehabil.*2006;87(3):437-442.

7. Tyson S, Connell L, Tyson S, Connell L. The psychometric properties and clinical utility of measures of walking and mobility in neurological conditions: a systematic review. *Clin Rehabil.*2009;23(11):1018-1033.

Instrument name: Maximal Inspiratory Pressure (MIP) and Maximal Expiratory Pressure (MEP)

Reviewer: Evan Cohen, PT, MA, PhD, NCS | **Date of review:** 9/11

ICF domain (check all that apply):

__X__ Body function/structure _____ Activity _____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance
_____ Ataxia
__X__ Cardiovascular/pulmonary status
_____ Coordination (non-equilibrium)
_____ Dizziness/vestibular
_____ Fatigue
_____ Flexibility
__X__ Muscle performance
_____ Muscle tone
_____ Pain
_____ Posture
_____ Sensory integration
_____ Somatosensation
_____ Balance/falls
_____ Bed mobility
_____ Gait
_____ Reach and grasp
_____ Transfers
_____ Wheelchair skills
_____ Health and wellness
_____ Home management
_____ Leisure
_____ Quality of life
_____ Role function
_____ Shopping
_____ Social function
_____ Work

Other:

Type of measure:

__X__ Performance-based _____ Self-report

Instrument properties:

- MIP and MEP, also called PI_{max} and PE_{max}, respectively, are indirect measures of strength of the inspiratory and expiratory respiratory muscles. Pressure is measured at the mouth during maximal inspiratory or expiratory effort. It is typically reported either as a raw value of pressure, or as the percentage of predicted values. Pressures are typically measured with a mouthpiece or tube that is connected to a data recorder (e.g. an analog recorder using a paper strip or a digital recorder) that collects the pressure measurement. MIP is typically measured at the starting point of lung residual volume (RV), and MEP is typically measured at the starting point of total lung capacity (TLC)[1].

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • Inter-rater: • Test-retest: • Smeltzer and colleagues examined the reliability of MIP and MEP

	measurements in a group of 72 PWMS and found that two practice sessions were required in order to produce reliable values during the third testing session, and that three accurate measurements are required during the third testing session to obtain reliable MIP and MEP values[2].
Validity (concurrent, criterion-related, predictive)	<u>Concurrent validity:</u> EDSS Scores • MIP has been correlated with EDSS score (r range from -.52 to -.66)[3,4]. MIP as a percentage of predicted has also been correlated with EDSS score (r = -.52)[3]. • MEP has been correlated with EDSS score (r range from -.329 to -.72)[3-6]. MEP as a percentage of predicted value has also been correlated with EDSS score (r = -.64)[3]. Disease Duration • MIP and MEP have been correlated with MS disease duration (r = -.43 and -.41, respectively)[7]. Other measures of respiratory function in PWMS ▪ MIP and MEP have been correlated with Cough Peak Flow (a measure of cough efficiency, r = .66 and .78, respectively)[3]; minute ventilatory volume (MVV) (r = .60 and .61, respectively)[4]; inspiratory capacity as a percentage of predicted value (r = .56 and 61, respectively)[8]; and with residual volume as a percentage of predicted value (r = -.32 and -.42, respectively)[8]. ▪ MIP has been correlated with Forced Vital Capacity (FVC) (r range from .41 - .60[4,7,9], as has MIP as a percentage of predicted FVC value (r=.62)[8]. MEP has also been correlated with FVC (r range from .48 - .77)[4,6,9], as has MEP as a percentage of predicted FVC value (r = .56)[8]. ▪ MIP has been correlated with maximum work capacity (r=.49)[7]. ▪ MIP and MEP have been correlated with endurance time of MIP and MEP (an inability to sustain pressure for longer than three consecutive breaths, r=.5 and .55, respectively)[7] ▪ MEP correlates with basal respiratory rate (r=.57)[7], forced expiratory volume at one second (FEV_1) (r range = .37 -.38)[9,10], and with a Pulmonary Dysfunction Index (r range = -.43 - -.47)[6,9]. <u>Predictive validity:</u> <u>Discriminative validity:</u> • In a group of 40 PWMS (EDSS median 7.0, range 2-9) MEP was able to discriminate participants with and without certain clinical findings. Participants with upper extremity weakness had mean

	MEP values of 44.3 +/- 18.3, while those without upper extremity weakness had mean MEP values of 68 +/- 25.9. Participants with dysarthria had mean MEP values of 35.5 +/- 15.7), while those without dysarthria had mean MEP values of 57.6 +/- 22.3)[8]. Sensitivity/Specificity/Predictive Values/Likelihood Ratios: • MEP values could best be predicted by the combination of Pulmonary Dysfunction Index, the presence of upper extremity weakness and MVV (adjusted R-squared = .60)[8].
Ceiling/floor effects	Ceiling effects: • Floor effects: •
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • MCID: • Other responsiveness values: • Normative Data: • Formulae for calculating expected values for healthy adults can be found in the literature[1,11]. • Although no normative values for PWMS have been published, some information can be extracted from the literature. MIP and MEP values in healthy older adults can be calculated with formulas found in the literature[1,11]. Some studies collected variable data on MIP and MEP measures as a percentage of expected value (MIP% and MEP%, respectively). In two groups of people with mild to moderate MS-related disability (EDSS mean 3.96 and 3.36, ranges 2-6.5) mean MIP% were 53.4% and 72.6%, and mean MEP% were 46.4% and 52.6%[5]. Another group of PWMS with a similar level of disability (mean EDSS of 4.34 +/- 1.39), MIP% was 77% and MEP% was 60% [9]. In two studies of people with more advanced MS-related disability (ranges 5-9.5[4], and 6.5-9.5[6], respectively) MIP% was 40% and 27%, and MEP% was 60% and 18%. Another group of PWMS with a median EDSS of 7.0 (range 2-9) had MIP% of 74% and MEP% of 51%[8].
Instrument use	
Equipment required	• Mouthpieces and tubing, and a pressure measurement device connected to an analog or digital recorder.
Time to complete	• Anecdotally, a single testing session to collect MIP and MEP values on a naïve patient/client (including equipment setup and patient orientation) runs approximately 30 to 60 minutes. No

	specific information about time to test PWMS was found; however, based on Smeltzer's recommendation, the initial test should take place over a period of days to ensure reliability of measurements[2].
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• MIP and MEP are measured in pressure values of cm of H20, and can be reported as raw values or as a percentage of predicted values.
Level of client participation required (is proxy participation available?)	• Client must participate
Limitations	• MIP and MEP are indirect measures of respiratory muscle strength. They are dependent on the person's motivation, and on the person putting forth consistent, maximal effort during the testing procedure to ensure accurate measurement[1,6,11]. Two practice sessions are recommended prior to true testing[2], thus a good deal of time might be required to complete MIP/MEP testing. Special equipment is also required and may be somewhat expensive. The time and equipment required to conduct these tests limits their clinical utility.

Recommendations
Practice Setting (check all that apply):

__X__ Acute
__X__ Inpatient Rehab
__X__ Home Health
__X__ Skilled Nursing
__X__ Outpatient

Comments:

- May be appropriate across all practice settings

Level of Disability (check all that apply):

__X__ EDSS 0.0 – 3.5
__X__ EDSS 4.0 – 5.5
__X__ EDSS 6.0 – 7.5
__X__ EDSS 8.0 – 9.5

Comments:

- Exposure only.

Should this tool be required for entry-level curricula?

__X__ Yes _____ No

Comments:

• For use in the MS population as well as others.
Is this tool appropriate for research purposes? __X__ Yes _____ No Comments: •
Attachments: • Score Sheets: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable • Instructions: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable Instructions and recommendations can be found in the literature[1,2]. • Reference list: _____ Uploaded on website
Second Reviewer Comments: • Concur with the primary reviewer.
Overall Taskforce Agreement with Recommendations: •

Practice Setting	**4**	**3**	**2**	**1**	**Comments**
Acute		X			•
Inpatient Rehab		X			•
Home Health		X			•
Skilled Nursing		X			•
Outpatient		X			•
Overall Comments: •					
Level of Disability	**4**	**3**	**2**	**1**	**Comments**
EDSS 0.0 – 3.5		X			•
EDSS 4.0 – 5.5		X			•
EDSS 6.0 – 7.5		X			•
EDSS 8.0 – 9.5		X			•
Overall Comments: • Evidence of usefulness across all levels of disability; ratings of 3 reflect need for specialized equipment					

Entry-Level Criteria	Students should	Students should be	Do not recommend	Comments

	learn to administer tool	exposed to tool (e.g. to read literature)		
Should this tool be required for entry level curricula?		X		• The level of tester expertise recommended by ATS/ERS[1] indicates that the administration of this test may constitute advanced practice.

Research Use	YES	NO	Comments
Is this tool appropriate for research purposes?	X		• As an indirect measure of strength of the inspiratory and expiratory respiratory musculature.

References:

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11. Evans JA, Whitelaw WA. The assessment of maximal respiratory mouth pressures in adults. *Respir Care.* Oct 2009;54(10):1348-1359.

Instrument name: Maximal Oxygen Uptake: $VO_{2\ max}$ and $VO_{2\ peak}$

Reviewer: Evan Cohen, PT, MA, PhD, NCS | **Date of review:** 9/11

ICF domain (check all that apply):

__X__ Body function/structure _____ Activity _____ Participation

Constructs measured: (check all that apply):

__X__ Aerobic capacity/endurance	_____ Balance/falls	_____ Health and wellness
_____ Ataxia	_____ Bed mobility	_____ Home management
_____ Cardiovascular/pulmonary status	_____ Gait	_____ Leisure
_____ Coordination (non-equilibrium)	_____ Reach and grasp	_____ Quality of life
_____ Dizziness/vestibular	_____ Transfers	_____ Role function
_____ Fatigue	_____ Wheelchair skills	_____ Shopping
_____ Flexibility		_____ Social function
_____ Muscle performance		_____ Work
_____ Muscle tone		
_____ Pain		
_____ Posture		
_____ Sensory integration		
_____ Somatosensation		

Other:

Type of measure:

__X__ Performance-based _____ Self-report

Instrument properties:

- Maximal oxygen uptake ($VO_{2\ max}$) is a widely reported measure of aerobic fitness. $VO_{2\ max}$ is assessed during a graded maximal exercise test. This test is traditionally conducted using a treadmill, a lower extremity ergometer, an upper extremity ergometer, or a combination upper and lower extremity ergometer[1]. $VO_{2\ max}$ is the point at which oxygen uptake no longer increases (or increases only marginally) with an increase in workload. In the case that a plateau in oxygen uptake is never reached, this is a submaximal exercise test in which $VO_{2\ peak}$ is recorded. $VO_{2\ peak}$ has been used to predict $VO_{2\ max}$ based on published formulas[2,3] although the accuracy of these predictive models in PWMS and in healthy controls is in question[4,5]. A review of submaximal aerobic exercise tests (not specific to PWMS) was reported by Noonan & Dean in 2000[6].

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • Inter-rater: • Test-retest: • No data was found examining test-retest reliability of VO_2

	$_{max}$ and $VO_{2\ peak}$ testing in PWMS, however, in one study more than half of a control group of PWMS who underwent pre and post testing of oxygen consumption without intervention showed an increase in $VO_{2\ peak}$ [7] raising the question of reliability of $VO_{2\ max}$ and $VO_{2\ peak}$ testing in PWMS.
Validity (concurrent, criterion-related, predictive)	<u>Concurrent validity:</u> In PWMS • $VO_{2\ peak}$ has been correlated with EDSS in a mixed gender population of 112 PWMS with an EDSS score of 3.07 +/- 1.68 (r = -.46)[8]. A separate study found that $VO_{2\ peak}$ correlated with EDSS in a group of 59 women with MS with a mean EDSS score of 2.2 (range 1-4) (r = -.31) and in a group of 33 men with MS with a mean EDSS score of 3.0 (range 1-5.5) (r = -.50)[9]. • $VO_{2\ peak}$ has been correlated with the Barthel Index (r = .40), and the physical subscale of the Multiple Sclerosis Quality of Life-54 (r = .32), and inversely correlated with the Environment Status Scale (r = -.27)[8]. • $VO_{2\ peak}$ has been correlated (r = .52) to maximal inspiratory pressure endurance (an inability to sustain pressure for longer than three consecutive breaths)[10]. • Post-training improvements in $VO_{2\ max}$ correlated with POMS subscales for tension (r = -.50), vigor (r = -.39), fatigue (r - -.68) and confusion (r = -.40), and physical and psychosocial dimensions of the SIP (r = -.47 and -.37, respectively)[11]. <u>Predictive validity:</u> • Each 1-point increase in EDSS is associated with a decrease in relative $VO_{2\ peak}$ of about 2 ml/kg/min[9]. • "In people with or without known cardiovascular disease, low VO 2peak is a strong, independent risk factor for all-cause and cardiovascular mortality[2]. For each 1 mLkg/min increase in VO 2peak, there is a 9-10% reduction in cardiac mortality[2]" (From Kluding's $VO_{2\ max}$ review from the Stroke EDGE Summary) <u>Discriminative validity:</u> • <u>Sensitivity/Specificity/Predictive Values/Likelihood Ratios:</u>

	•
Ceiling/floor effects	Ceiling effects: • Not specifically reported in PWMS, but seems unlikely as aerobic fitness can continually improve with training. Floor effects: • Some PWMS may be unable successfully complete the test due to fatigue or other symptoms.
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • MCID: • Other responsiveness values: • Normative Data: • $VO_{2\ max}$ values and their percentile rankings by gender and age grouping can be found in the ACSM guidelines[2]
Instrument use	•
Equipment required	• $VO_{2\ max}$ is most accurately measured during a maximal exercise test with an open-circuit spirometer. The test is conducted on a treadmill or ergometer. Computerized systems are typically used. Data is collected and can provide a printout of test results[2]. • Submaximal exercise tests can be used to measure $VO_{2\ peak}$ and/or estimate $VO_{2\ max}$. Please see the review by Noonan & Dean[6] for an overview of equipment required for some of these tests. • If the client is identified as "high risk" because of cardiovascular issues or autonomic dysfunction, then it is recommended that there are "[s]ite personnel certified in basic life support and automated external defibrillator training, with certification in first aid and advanced cardiac life support preferred. Equipment to monitor blood pressure and ECG changes" (From Kluding's $VO_{2\ max}$ review from the Stroke EDGE Summary)
Time to complete	• Approximately one hour is required for setup and orientation, the exercise test (~15-20 minutes), and a cool down period.
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• $VO_{2\ max}$ is recorded in ml/kg/min, or is predicted from formulas based on $VO_{2\ peak}$ and other variables.

Level of client participation required (is proxy participation available?)	• Client must participate
Limitations	• $VO_{2\ max}$ and $VO_{2\ peak}$ testing are physically demanding. MS-related fatigue may limit the individual's ability to participate in the testing. • As PWMS have varied clinical presentations, the mode of exercise testing (upper vs. lower extremity ergometry, upright vs. recumbent seating, etc) must be matched to the person's abilities. • Careful consideration must be given to any comorbidities that might place the individual at risk. Particular attention must be paid to abnormalities in exercise response due to autonomic involvement. The ACSM recommends a medical examination and the introduction of graded exercise before maximal testing is conducted[2]. • Although $VO_{2\ max}$ and $VO_{2\ peak}$ are commonly used measures of aerobic fitness in PWMS, two studies raise significant limitations for their use. Agiovlastis, Motl and Fernhall[4] found that the formulas by the ACSM[2] and by van der Walt and Wyndham[3] underestimated $VO_{2\ max}$ in a sample of PWMS and in healthy controls. The discrepancy between actual and predicted oxygen consumption values increased with higher workloads. Another study found that $VO_{2\ max}$ was overestimated based on some submaximal ($VO_{2\ peak}$) testing models. This was explained by the reduced heart rate (HR) response to the increasing workload in the sample of PWMS.[5] The confounding effect of the abnormal HR response was minimized by the use of a $VO_{2\ max}$ prediction equation which excluded HR from the model, but which requires a maximal exercise test protocol[12]. Clinicians and researchers who use $VO_{2\ max}$ and peak testing in PWMS must carefully consider the predictive models upon which their calculations are based.
Recommendations **Practice Setting (check all that apply):** _____ Acute _____ Inpatient Rehab _____ Home Health _____ Skilled Nursing __x__ Outpatient	

Comments:

- Most appropriate for outpatient setting

Level of Disability (check all that apply):

__x__ EDSS 0.0 – 3.5
__x__ EDSS 4.0 – 5.5
__x__ EDSS 6.0 – 7.5
_____ EDSS 8.0 – 9.5

Comments:

- Widest use in EDSS range of 0-5.5. May be useful with higher EDSS scores through submaximal testing with an appropriate ergometry device.

Should this tool be required for entry-level curricula?

___x__ Yes ____ No

Comments:

- Exposure only.

Is this tool appropriate for research purposes?

__X__ Yes _____ No

Comments:

-

Attachments:

- Score Sheets: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Instructions: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Reference list: _____ Uploaded on website

Second Reviewer Comments:

- Concur with primary reviewer's recommendations.

Overall Taskforce Agreement with Recommendations:

-

Practice Setting	4	3	2	1	Comments
Acute				X	•
Inpatient Rehab				X	•

Maximal Oxygen Uptake: $VO_{2\ max}$ and $VO_{2\ peak}$

Home Health				X	•
Skilled Nursing				X	•
Outpatient		X			•

Overall Comments:

- From Kluding's review of $VO_{2\ max}$ in the Stroke EDGE Summary: "Maximal tests are not recommended for clinical practice because of limited feasibility: tests require extensive knowledge of exercise physiology, ECG interpretation, ability to respond to cardiac complications, expensive equipment, and physician supervision. However, referral to cardiac rehab settings for these tests is appropriate before initiating a moderate/vigorous aerobic training program. "
- The terms $VO_{2\ max}$ and $VO_{2\ peak}$ are often used interchangeably, however, they are distinct. True $VO_{2\ max}$ is measured less often than $VO_{2\ peak}$. Researchers and readers of the literature must be careful to correctly apply and interpret these terms.

Level of Disability	4	3	2	1	Comments
EDSS 0.0 – 3.5		X			•
EDSS 4.0 – 5.5		X			•
EDSS 6.0 – 7.5			X		•
EDSS 8.0 – 9.5				X	•

Overall Comments:

- Most widely used on PWMS with EDSS of 0-5.5

Entry-Level Criteria	Students should learn to administer tool	Students should be exposed to tool (e.g. to read literature)	Do not recommend	Comments
Should this tool be required for entry level curricula?		x		• Not appropriate for general use in the MS population, but $VO_{2\ max}$ and $VO_{2\ peak}$ are commonly used measures of aerobic fitness.

Research Use	YES	NO	Comments
Is this tool appropriate for research purposes?	X		• Caution must be taken in using $VO_{2\ peak}$ to predict $VO_{2\ max}$ in the MS population.

References:

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10. Foglio K, Clini E, Facchetti D, et al. Respiratory muscle function and exercise capacity in multiple sclerosis. *Eur Respir J.* Jan 1994;7(1):23-28.
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Instrument name: Modified Ashworth Scale (MAS)

Reviewer: Susan E. Bennett, PT, DPT, EdD, NCS, MSCS | **Date of review:** 9/16/11

ICF domain (check all that apply):

__x__ Body function/structure _____ Activity _____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance
_____ Ataxia
_____ Cardiovascular/pulmonary status
_____ Coordination (non-equilibrium)
_____ Dizziness/vestibular
_____ Fatigue
_____ Flexibility
_____ Muscle performance
__x__ Muscle tone / spasticity
_____ Pain
_____ Posture
_____ Sensory integration
_____ Somatosensation

_____ Balance/falls
_____ Bed mobility
_____ Gait
_____ Reach and grasp
_____ Self care
_____ Transfers
_____ Wheelchair skills

_____ Health and wellness
_____ Home management
_____ Leisure
_____ Quality of life
_____ Role function
_____ Shopping
_____ Social function
_____ Work

Other:

Type of measure:

__x__ Performance-based _____ Self-report

Instrument description:

- Six-category ordinal scale used to assess spasticity by grading the resistance encountered during passive muscle stretching. The assessor rates the perceived amount of resistance or tone encountered during the range of motion.

Reliability (test-retest, intra-rater, inter-rater)

Intra-rater:

- In hemiplegia Kappa=0.590[1]
- In spinal cord injury lower extremity muscles ranged from fair to perfect with kappa ranging from 0.2-1.0, and differed between raters[2]
- In CP scores ranged from poor to good, ICC:0.36-0.83[3]
- Acute stroke weighted kappa elbow=0.83, wrist=0.80, knee 0.77, ankle=0.59 [4]
- Acute and chronic stroke Kendall's tau-b for MAS overall=0.57, calf=0.44, soleus=0.58, quads=0.66 [5]

	• Subjects with MS percentage of agreement for combined upper limb MAS is 93.4%, and 71.1% for lower extremity.[6]
	• Subjects with brain injury Kappa for MAS overall=0.47-0.62. [7]
	  o Shoulder flexion=0.55, Shoulder Ext Rot=0.47
	  o Elbow flexor=0.47, elbow extensor=0.53
	  o wrist flexor=0.58, wrist extensor=0.51
	  o hip flexor=0.53, hip extensor=0.49
	  o knee flexor=0.52, hip extensor=0.55
	  o ankle ext(knee flexed)=0.62, ankle ext(knee extended)=0.47
	<u>Inter-rater:</u>
	• Kappa= 0.514 (hemiplegia)[1]
	• Poor to moderate k<0.6 for all muscle groups (SCI)[2]
	• Hip flexors ICC=0.71, Hip adductors=0.83, Hip Internal Rotators=0.84, Hamstrings=0.76, Gastrocs=0.64 in children with CP.[3]
	• MAS elbow flexors: Kendall's tau= 0.847, kappa=0.826. (Intracranial lesions)[8]
	• MAS overall: Kendall's tau=0.857, kappa=0.74. (Stroke)[9]
	• Spearman's rho=0.56-0.90 for the elbow, 0.26-0.62 for the knee. (Stroke)[10]
	• Weighted kappa elbow=0.96, wrist=0.89, knee=0.79, ankle=0.51 (acute stroke)[4]
	• Weighted kappa for elbow flexors=0.868 (Stroke)[11]
	• Kendall's tau-b for MAS overall=0.06, calf=0.15, soleus=0.19, quads=0.28 (Acute and chronic stroke)[5]
	• Kendall's tau coefficients of .55 or lower were found for the adductor and internal rotator muscles of the hip, .70 and .77 for the soleus, .67 and .72 for the gastrocs, .86 and .71 for the psoas major muscle, .63 and .36 for the quads. (Multiple Sclerosis)[12]
	• Further research is needed to assess reliability measurements with extensive training, and studies with greater numbers of examiners are needed.[5]
	• Kappa for MAS overall=0.16-0.42(Brain Injury)[7]
	
	<u>Test-retest:</u>
	•

Validity (concurrent, criterion-related, predictive)	<u>Concurrent validity:</u> • Passive ROM at the elbow using Spearman's rho =0.511 (Stroke)[13] • MAS and surface electromyography, spearman's rho=0.21 (stroke)[14]

	• 80% of EMG measurements for knee flexion and extension correlated significantly with the MAS. (SCI)[15] • Spearman's rho between MAS and (Chronic stroke)[16] electromyography=0.77-0.80 o Torque response -0.25 at rest, 0.26-0.21 active o Velocity sensitivity 0.52-0.57 o Fugl-Meyer -0.83 to -0.85 o Box and Block Test -0.83 to -0.73 o Active ROM -.74 to -0.62 o Grip Strength -0.86 to -0.85 <u>Predictive validity:</u> • <u>Discriminative validity:</u> • <u>Sensitivity/Specificity/Predictive Values/Likelihood Ratios:</u> •
Ceiling/floor effects	<u>Ceiling effects:</u> • <u>Floor effects:</u> •
Sensitivity to change (responsiveness, MCID, MDC) / normative data	<u>MDC:</u> • <u>MCID:</u> • <u>Other responsiveness values:</u> • <u>Normative Data:</u> •
Instrument use	•
Equipment required	• Mat table, chair, paper and writing utensil
Time to complete	• Dependent on number of muscles being tested
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• Move limb through its full range of motion at a stretching velocity by timing the extension of the limb (counting 'one thousand and one…'). It is recommended that repeated movement cycles be kept to a minimum. • Modified Ashworth Scale o 0 No increase in tone o 1 Slight increase in muscle tone, manifested by a catch and release or by minimal resistance at the end of the range of motion when the affected part(s) is(are) moved in flexion or extension o 1+ Slight increase in muscle tone, manifested by a catch

Modified Ashworth Scale

	followed by minimal resistance through the remainder of the range of motion but the affected part(s) is(are) easily moved. o 2 More marked increase in muscle tone through most of the range of movement, but the affected part(s) is easily moved. o 3 Considerable increases in muscle tone, passive movement difficult. o 4 Affected part(s) is(are) rigid in flexion or extension • Modified Modified Ashworth Scale[18] o Modification consists of removing the 1+ and redefining the grade as a 2; subsequent grades are elevated accordingly
Level of client participation required (is proxy participation available?)	• Client needs to be present and compliant
Limitations	• UE measurement is more reliable than LE measurement.[10] • When assessing the LE's of patients with SCI, there was poor inter-rater and inter-session reliability, which limits the MAS's validity.[2] • No significant difference in resistance to passive movement between grades 1, 1+, and 2. Not valid at lower grades. Ambiguity exists with the addition of the 1+ grade.[13] • No quantification of resistance to the quick stretch in absolute units. Lack of biomechanical definitions regarding 'catch' and 'release'. • The resistance to passive movement is not significantly influenced by reflex-mediated neural activity unless the velocity of passive range of motion is high.[17] • May provide a valid measure of the resistance to passive movement but does not provide an exclusive measure of spasticity. There may be a non-reflex contribution to resistance to passive movement due to changes in the physical properties of the muscle and connective tissues.[14, 17] • No standardization regarding test position, number of repetitions, testing time (morning/afternoon) or right-left test order in a case of bilateral involvement.[11] • Overall is limited for high-functioning MS subjects[6]
Recommendations **Practice Setting (check all that apply):** __X__ Acute __X__ Inpatient Rehab	

Modified Ashworth Scale

__X__ Home Health
__X__ Skilled Nursing
__X__ Outpatient

Comments:

-

Level of Disability (check all that apply):

__X__ EDSS 0.0 – 3.5
__X__ EDSS 4.0 – 5.5
__X__ EDSS 6.0 – 7.5
__X__ EDSS 8.0 – 9.5

Comments:

-

Should this tool be required for entry-level curricula?

____ Yes __x___ No

Comments:

- Due to lack of psychometric data specific to MS, but may be appropriate for other patient populations.

Is this tool appropriate for research purposes?

____ Yes __x___ No

Comments:

- Other than Tardieu only clinical tool to measure spasticity and though there are limitation it is most often used and cited in research studies.
- However, there is a lack of psychometric data in MS, so do not recommend for use in research at this point in time.
- Recommend investigating psychometric properties in MS.

Attachments:

- Score Sheets: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Instructions: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Reference list: _____ Uploaded on website

Second Reviewer Comments:

- I agree with primary reviewer's comments.

Overall Taskforce Agreement with Recommendations:

Modified Ashworth Scale

•

Practice Setting	4	3	2	1	Comments
Acute			X		•
Inpatient Rehab			X		•
Home Health			X		•
Skilled Nursing			X		•
Outpatient			X		•

Overall Comments:

- Appropriate for any setting; rating reflects lack of psychometric data in individuals with MS

Level of Disability	4	3	2	1	Comments
EDSS 0.0 – 3.5			X		• May lack response if patient does not demonstrate changes in muscle tone at a low EDSS level
EDSS 4.0 – 5.5			X		•
EDSS 6.0 – 7.5			X		•
EDSS 8.0 – 9.5			X		•

Overall Comments:

- Rating reflects lack of psychometric data in individuals with MS

Entry-Level Criteria	Students should learn to administer tool	Students should be exposed to tool (e.g. to read literature)	Do not recommend	Comments
Should this tool be required for entry level curricula?			X	• Recommendation is based on lack of psychometric data in individuals with MS, but may be appropriate for use with other patient populations

Research Use	YES	NO	Comments
Is this tool appropriate		X	• Lack of psychometric data in MS, so do

for research purposes?			not recommend for use in research at this point in time. • Recommend investigating psychometric properties in MS.

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Instrument name: Modified Fatigue Impact Scale (MFIS)

Reviewer: Gail L. Widener, PT, PhD | **Date of review:** 7/26/11

ICF domain (check all that apply):

__X__ Body function/structure __X__ Activity _____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance
_____ Ataxia
_____ Cardiovascular/pulmonary status
_____ Coordination (non-equilibrium)
_____ Dizziness/vestibular
_X__ Fatigue
_____ Flexibility
_____ Muscle performance
_____ Muscle tone
_____ Pain
_____ Posture
_____ Sensory integration
_____ Somatosensation
_____ Balance/falls
_____ Bed mobility
_____ Gait
_____ Reach and grasp
_____ Transfers
_____ Wheelchair skills
_____ Health and wellness
_____ Home management
_____ Leisure
_____ Quality of life
_____ Role function
_____ Shopping
_____ Social function
_____ Work

Other:

Type of measure:

_____ Performance-based __X__ Self-report

Instrument properties:

A modification of the Fatigue Impact Scale,[1] created during development of the MS Quality of Life Inventory (MSQLI)[2] assesses, via self-report, the effects of fatigue on physical, cognitive and psychosocial functioning in people with MS (pwMS). There are 21 items, with an abbreviated version that includes 5 items.

A recent study using Rasch analysis of the measure claims that the affects of fatigue on physical and cognitive function are the only ones measured and that the total score should not be used.[3]

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • Inter-rater: • . Test-retest: • ICC total score 0.85, physical 0.73, cognitive 0.88 and psychosocial 0.81 in pwMS[4]
Validity (concurrent, criterion-related, predictive)	Concurrent validity: • Moderate correlations between MFIS and the Fatigue Severity Scale (FSS) (r=0.66[5] and r=.68[6] and the Checklist Individual

	Strength (r=0.54)[5] in pwMS Predictive validity: • Physical subscale of MFIS predicted FSS score in pwMS[6] Discriminative validity: • MFIS able to distinguish between pwMS with and without fatigue[7] with cutoff scores of 4.6 (without fatigue) and 38 (with fatigue). Sensitivity/Specificity/Predictive Values/Likelihood Ratios: •
Ceiling/floor effects	Ceiling effects: • No ceiling effects in pwMS[4] Floor effects: • No floor effects in pwMS[4]
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • Total score 19.3%, physical 24.7%, cognitive 20%, psychosocial 28.8% in pwMS[5] MCID: • Other responsiveness values: • Smallest detectable difference (points change) was total 16.2, physical 8.9, cognitive 8.0, psychosocial 2.3 in pwMS[5] Normative Data: •
Instrument use	• Self-report questionnaire. Rietberg et al.[5] suggest that due to low response to change, measures should be repeated multiple times rather than only pre-post assessments.
Equipment required	• None
Time to complete	• 5-10 minutes for full version, 2-3 minute for abbreviated version.
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• Each item is rated on a 5-point likert scale (0-4). Total score (0-84) and subscales for physical (0-36), cognitive (0-40) and psychosocial functioning (0-8). The 5 item version is scored (0-20). Higher numbers indicate greater fatigue.
Level of client participation required (is proxy participation available?)	• Self report questionnaire, but can be used as an interview for people with visual or upper extremity dysfunction
Limitations	•
Recommendations **Practice Setting (check all that apply):** __X__ Acute __X__ Inpatient Rehab __X__ Home Health __X__ Skilled Nursing __X__ Outpatient	

Comments:

-

Level of Disability (check all that apply):

__X__ EDSS 0.0 – 3.5
__X__ EDSS 4.0 – 5.5
__X__ EDSS 6.0 – 7.5
_____ EDSS 8.0 – 9.5

Comments:

-

Should this tool be required for entry-level curricula?

__X__ Yes _____ No

Comments:

- Students should at least be exposed to this outcome measure since it is commonly used in pwMS

Is this tool appropriate for research purposes?

__X__ Yes _____ No

Comments:

- MFIS has been found to show change after intervention.[1] Kos et al.[4] found that after a 4-week rehabilitation program, the MFIS did change, but the FSS did not. Given the Rasch analysis, Mills et al.[3] suggest that the physical and cognitive subscales should be used separately eliminating questions 4, 14, 17 from the physical and questions 1-3, 5, and 11. In addition, the authors suggest the total score not be used.

Attachments:

- Score Sheets: _____ Uploaded on website _____ Available but copyrighted _____ Questionnaire available through the NMSS website: www.nationalmssociety.org/for-professionals/researchers/clinical-study-measures/msqli/index.aspx
- Instructions: _____ Uploaded on website _____ Available but copyrighted _____ pdf downloaded from the above website includes instructions for scoring

- Reference list: _____ Uploaded on website

Second Reviewer Comments:

- Agree with comments of primary review

Overall Taskforce Agreement with Recommendations:

-

Practice Setting	4	3	2	1	Comments
Acute		X			•
Inpatient Rehab		X			•
Home Health		X			•
Skilled Nursing		X			•
Outpatient		X			•

Overall Comments:

- Good for any setting if the person with MS is experiencing fatigue

Level of Disability	4	3	2	1	Comments
EDSS 0.0 – 3.5		X			•
EDSS 4.0 – 5.5		X			•
EDSS 6.0 – 7.5		X			•
EDSS 8.0 – 9.5				X	•

Overall Comments:

- Due to the low activity level of persons with EDSS scores of 8 and above, this questionnaire may not be as useful.

Entry-Level Criteria	Students should learn to administer tool	Students should be exposed to tool (e.g. to read literature)	Do not recommend	Comments
Should this tool be required for entry level curricula?		X		• Students should at least be exposed to this outcome measure since it is commonly used in pwMS

Research Use	YES	NO	Comments
Is this tool appropriate for research purposes?	X		• Given the Rasch analysis,[3] the physical and cognitive subscales should be used separately eliminating questions 4, 14, 17 from the physical and questions 1-3, 5, and 11. However, care should be used since no psychometrics are available for this suggested version of the questionnaire.

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2. Fischer JS, LaRocca NG, Miller DM, Ritvo PG, Andrews H, Paty DW. Recent developments in the assessment of quality of life in multiple sclerosis. *Mult Scler.* 1999;5(4):251-259.
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6. Tellez N, Rio J, Tintore M, Galan I, Montalban X. Does the modified fatigue impact scale offer a more comprehensive assessment of fatigue in MS? *Mult Scler.* 2005;11:198-202.
7. Flachenecker P, Kumpfel T, Kallmann B, Gottshalk M, Grauer O, Reickmann P, Trenkwalder C, Toyka KV. Fatigue in multiple sclerosis: a comparison of different rating scales and correlation to clinical parameters. *Mult Scler.* 2002;8:523-526.

Instrument name: Motion Sensitivity Test

Reviewer: Amy M. Yorke, PT, NCS | **Date of review:** 5/5/11

ICF domain (check all that apply):

___x__ Body function/structure _____ Activity _____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance
_____ Ataxia
_____ Cardiovascular/pulmonary status
_____ Coordination (non-equilibrium)
___x__ Dizziness/vestibular
_____ Fatigue
_____ Flexibility
_____ Muscle performance
_____ Muscle tone
_____ Pain
_____ Posture
_____ Sensory integration
_____ Somatosensation
_____ Balance/falls
_____ Bed mobility
_____ Gait
_____ Reach and grasp
_____ Transfers
_____ Wheelchair skills
_____ Health and wellness
_____ Home management
_____ Leisure
_____ Quality of life
_____ Role function
_____ Shopping
_____ Social function
_____ Work

Other:

Type of measure:

_____ Performance-based ___x__ Self-report

Instrument properties:

- Evaluates symptoms of motion provoked dizziness by moving the patient in 16 different positions.[1]
- Developed to be used as a basis to develop an individualized exercise program for patients that have motion provoked dizziness[1-4]

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • Inter-rater: • ICC= 0.99[5] Test-retest: • ICC= 0.98 for testing 90 minutes apart[5] • ICC= 0.96 for testing 24 hours apart[5]
Validity (concurrent, criterion-related,	Concurrent validity: •

predictive)	Predictive validity: • Discriminative validity: • Sensitivity/Specificity/Predictive Values/Likelihood Ratios: • Test sensitivity = 100%[5] • Test specificity= 80%[5]
Ceiling/floor effects	Ceiling effects: • Floor effects: • Patients with mild dizziness and low MST quotients (<10) had minimal variability, likely due to floor effects[5]
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • MCID: • Other responsiveness values: • Normative Data: •
Instrument use	•
Equipment required	• Score sheet • Stop watch • Plinth or mat table for patient to lie on
Time to complete	• Approximately 15 minutes
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• Patient rates symptoms on a scale of 0 (no symptoms) to 5 (severe symptoms) at baseline • Intensity of symptoms on a scale of 0 (no symptoms) to 5 (severe symptoms) is recorded after every movement • Baseline symptoms (if any) are subtracted from the intensity of symptoms immediately after every movement • Duration (seconds) of symptoms is timed and recorded until the intensity returns to baseline • Duration of symptoms is assigned a point score (0-4 seconds = 0, 5-10 seconds = 1, 11-29 seconds = 2, > 30 seconds = 3). • The intensity (if any change from baseline, range 1-5) and duration scores (0-3) are added together for each of the 16 positions • Movements are as follows: o Sit to supine o Roll supine to left o Roll supine to right o Supine to sit o Left Dix-Hallpike position

	o Return to sit from left Dix-Hallpike position o Right Dix-Hallpike position o Return to sit rom right Dix-Hallpike position o Sitting, head tipped to left knee o Head up from left knee o Sitting, head tipped to right knee o Head up from right knee o Sitting, turn head horizontally 5 times o Sitting, turn head vertically 5 times o Standing, turn 180° to the right o Standing, turn 180° to the left • A Motion Sensitivity Quotient (MSQ) is calculated by multiplying the number of positions that provoked symptoms (change in baseline) by the total of the intensity and duration scores, and divided by 2048 (maximum possible score) • MSQ of 0 means no symptoms and 100 means severe, continuous symptoms with all movements
Level of client participation required (is proxy participation available?)	• Patient needs to be able to quantify their subjective complaint of dizziness and differentiate changes in symptoms with position changes
Limitations	• Number of movements completed may be difficult for patients that have mobility limitations • Number of movements completed may increase symptoms making it more difficult for the patient to return to baseline
Recommendations **Practice Setting (check all that apply):** __x___ Acute __x___ Inpatient Rehab __x___ Home Health __x___ Skilled Nursing __x___ Outpatient Comments: • Used when a patient has symptoms of motion provoked dizziness	
Level of Disability (check all that apply): __x___ EDSS 0.0 – 3.5 __x___ EDSS 4.0 – 5.5 __x___ EDSS 6.0 – 7.5 _____ EDSS 8.0 – 9.5 Comments: • Used when a patient has symptoms of motion provoked dizziness	
Should this tool be required for entry-level curricula?	

_____ Yes __x___ No

Comments:

- Only test available that systematically evaluates changes in symptoms based on movement; however, there is a lack of psychometric data in MS

Is this tool appropriate for research purposes?

_____ Yes __x___ No

Comments:

- Only test available that systematically evaluates changes in symptoms based on movement
- However, there is a lack of psychometric data in MS, so do not recommend for use in research at this point in time.
- Recommend investigating psychometric properties in MS.

Attachments:

- Score Sheets: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Instructions: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Reference list: _____ Uploaded on website Attached to this form

Second Reviewer Comments:

- Practice Settings: could be used in all settings, patient admitted acutely with motion provoked dizziness
- Application to MS questionable as most patients with MS with brainstem lesions have dizziness constantly – not just motion provoked. Level of Disability: agree
- Agree with all other comments

Overall Taskforce Agreement with Recommendations:

-

Practice Setting	4	3	2	1	Comments
Acute			X		•
Inpatient Rehab			X		•
Home Health			X		•
Skilled Nursing			X		•
Outpatient			X		•

Overall Comments:

- Used when a patient has symptoms of motion provoked dizziness
- Rating reflects lack of psychometric data in individuals with MS

Level of Disability	4	3	2	1	Comments
EDSS 0.0 – 3.5			X		•
EDSS 4.0 – 5.5			X		•
EDSS 6.0 – 7.5			X		•
EDSS 8.0 – 9.5				X	•

Overall Comments:

- Used when a patient has symptoms of motion provoked dizziness
- Rating of 2 for EDSS levels 0.0 – 7.5 reflects lack of psychometric data in individuals with MS

Entry-Level Criteria	Students should learn to administer tool	Students should be exposed to tool (e.g. to read literature)	Do not recommend	Comments
Should this tool be required for entry level curricula?			X	• Recommendation reflects lack of psychometric data in individuals with MS and highly specialized nature of the measure, but may be useful for other patient populations • Results are utilized to develop a habituation exercise program[1-4]

Research Use	YES	NO	Comments
Is this tool appropriate for research purposes?		X	• Lack of psychometric data in MS, so do not recommend for use in research at this point in time. • Recommend investigating psychometric properties in MS. • Results are utilized to develop a habituation exercise program[1-4] • Has been used for research purposes in other populations[2-4]

References:

Motion Sensitivity Test

1. Smith-Wheelock M, Shepard NT, Telian SA. Physical therapy program for vestibular rehabilitation. *The American Journal of Otology*. 1991;12(3):218-225.
2. Shepard NT, Telian SA. Programmatic vestibular rehabilitation*. Otolaryngol Head Neck Surg.* 1995;112:173-182.
3. Shepard NT, Telian SA, Smith-Wheelock M, Raj A. *Vestibular and balance rehabilitation therapy.* 1993;102:198-205.
4. Shepard NT, Telian SA, Smith-Wheelock M. Habituation and balance retraining therapy. *Neurologic Clinics.* 1990;8(2):459-475.
5. Akin F., Davenport MJ. Validity and reliability of the Motion Sensitivity Test. *Journal of Rehabilitation Research and Development.* 2003 40;(5): 415-422.

Instrument name: Movement Ability Measure (MAM)

Reviewer: Kirsten Potter, PT, DPT, MS, NCS | **Date of review:** 10/11

ICF domain (check all that apply):

__X___ Body function/structure _____ Activity _____ Participation

Constructs measured: (check all that apply):

__x___ Aerobic capacity/endurance
_____ Ataxia
_____ Cardiovascular/pulmonary status
__x___ Coordination (non-equilibrium)
_____ Dizziness/vestibular
_____ Fatigue
__x___ Flexibility
__x___ Muscle performance
_____ Muscle tone / spasticity
_____ Pain
_____ Posture
_____ Sensory integration
_____ Somatosensation
_____ Balance/falls
_____ Bed mobility
_____ Gait
_____ Reach and grasp
_____ Self care
_____ Transfers
_____ Wheelchair skills
_____ Health and wellness
_____ Home management
_____ Leisure
_____ Quality of life
_____ Role function
_____ Shopping
_____ Social function
_____ Work

Other:

- Within coordination, the MAM items pertain to accuracy, speed, and adaptability.
- Items within each dimension are related to the impact on movement and activity (for example: "I am so strong that I can lift or carry extra heavy loads.").

Instrument description:

_____ Performance-based __X___ Self-report

Instrument properties:

- Based on the Movement Continuum Theory[1] which identifies 6 dimensions of movement: flexibility, strength, accuracy, speed, adaptability, and endurance
- The MAM allows subjects to interpret movement as a whole or to differentiate movement into the dimensions within the context of their own life
- Applicable to a broad range of subjects across movement ability levels and those with/without pathological conditions

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • Inter-rater: • Test-retest: • ICC = 0.92[2]: tested on 34 subjects; mean age = 54 (range 19 –

	78); none were receiving or about to start physical therapy (not stated if any subjects had MS) Internal consistency: • 0.94[2]; tested on subjects with wide range of ability; most had no acute conditions, but did have ongoing medical diagnoses of various systems (not stated if any subjects had MS) Person separation reliability: • 0.94[2] (see above under internal consistency for patient population)
Validity (concurrent, criterion-related, predictive)	Content validity: • Evidence of content validity exists[2] in a varied subject population (not stated if any subjects had MS) Construct validity: • Evidence of construct validity exists[2] (item response theory analysis indicated that each movement ability threshold was distinct from one another and movement ability level thresholds were ordered as hypothesized) in a varied subject population (not stated if any subjects had MS) Concurrent validity: In patients with MS (mean EDSS = 4; range 0.0 – 6.0): • Average current ability correlated significantly with other self-report measures (MS Walking Scale – 12 (MSWS – 12) r = -0.79, Activities-specific Balance Confidence Scale (ABC) r = 0.77, Modified Fatigue Impact Scale (MFIS) r = 0.68, MSQOL – 54 physical composite r = 0.83, MSQOL pain r = 0.65, MSPOL – physical function r = 0.81, and report of falls r = -0.56; also correlated with EDSS r = -0.62, Berg Balance Scale (BBS) r = 0.40[3] • Average gap in current and preferred movement ability correlated with several measures: EDSS r = 0.46; MSWS-12 r = 0.45; and MSQOL – physical composite r = -0.38 and pain subscale r = -0.56[3] • Flexibility correlated significantly with handheld dynamometry, 4 Square Step Test, 25-Foot Timed Walk Test, 6 Minute Walk Test (6MWT), Dynamic Gait Index (DGI), and MSQOL – QOL subscale; r values ranged -0.46 - 0.70; flexibility did not correlate with spasticity measured by Modified Ashworth Scale (MAS)[3] • Strength correlated significantly with handheld dynamometry, heel rises, and 6MWT, r values ranged 0.48 – 0.58[3] • Accuracy correlated significantly with Scale for the Assessment and Rating of Ataxia (SARA), 4 Square Step Test, 6MWT, and DGI, r values ranged 0.54 – 0.66[3]

	• Speed correlated significantly with handheld dynamometry, 25-Foot Timed Walk Test, 6MWT, and DGI, r values ranged -0.37 – 0.66[3] • Adaptability correlated significantly with 6MWT and DGI, r = 0.51 and 0.64, respectively; did not correlate to light touch and vibration sensation[3] • Endurance correlated significantly with MSQOL – physical composite, handheld dynamometry, 6MWT, DGI, and MFIS, r values ranged from 0.56 – 0.84[3] • Moderate to strong correlations exist between the average current movement ability measured by the MAM and scores on the 6 separate dimensions; average gap between current and preferred movement abilities correlated with pain (r = -0.56) and a scale of current ability (r = 0.46)[3] In other populations: • Correlation with the California Functional Evaluation measure: r = 0.76[2] in a varied subject population (not stated if any subjects had MS) • Evidence of concurrent validity of the MAM with self reported health exists for subjects in the healthy and non-healthy groups (p<.00005)[2] (not stated if any subjects had MS) • Concurrent validity of the MAM with self reported movement problems exists[2] (not stated if any subjects had MS) <u>Predictive validity:</u> • <u>Discriminative validity:</u> • <u>Sensitivity/Specificity/Predictive Values/Likelihood Ratios:</u> •
Ceiling/floor effects	<u>Ceiling effects:</u> • Not found in a varied subject population (not stated if any subjects had MS)[2] <u>Floor effects:</u> • As above
Sensitivity to change (responsiveness, MCID, MDC) / normative data	<u>MDC:</u> • <u>MCID:</u> • In patients with orthopedic conditions, MCID = 0.61 logit[4]

	Other responsiveness values: • In individuals with various orthopedic conditions: ES = 0.90, SRM – 0.93, and responsiveness index = 5.62[4] Normative Data: •
Instrument use	• The MAM has been used in a heterogeneous group of adults, including individuals with a variety of ongoing health conditions[2] and in people with orthopedic conditions[4] • The MAM has been used to assess rehabilitation outcomes by evaluating the gap between current and perceived movement ability[5]
Equipment required	• MAM form • Writing instrument
Time to complete	• 20 minutes
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• 24 items in total: 4 items representing each of the 6 dimensions • Each item consists of 6 statements indicating levels of movement ability from low (score of 1) to high (score of 6) capability • For each item, respondents provide 2 ratings on the 1 – 6 scale: current (i.e., how they move now) and preferred (i.e., how they would like to move) movement capability • Raw score ranges from 24 – 144 (higher scores indicating better perceived ability)
Level of client participation required (is proxy participation available?)	• Writing of the MAM is rated at a grade level of 8.2[2] • A proxy may complete the MAM for individuals who do not read English or for those lacking the physical capability to complete the measure
Limitations	• The individual scoring the MAM must be able to understand the abstract ideas of current and preferred movement capabilities, they must be able to pay attention
Recommendations **Practice Setting (check all that apply):** __x___ Acute __x___ Inpatient Rehab __x___ Home Health __x___ Skilled Nursing __x___ Outpatient Comments:	

-

Level of Disability (check all that apply):
__x___ EDSS 0.0 – 3.5
__x___ EDSS 4.0 – 5.5
__x___ EDSS 6.0 – 7.5
__x___ EDSS 8.0 – 9.5

Comments:

- Scaling of the MAM ranges from severe impairment, requiring the assistance of others, to exceptional performance making the MAM applicable to patients with varying movement capabilities; this may make the MAM useful when tracking the long-term changes in movement in individuals with MS
- The 6 dimensions assessed by the MAM are all applicable to individuals with MS
- The MAM is a unique measure, as it quantifies a patient's current and preferred movement ability; as such, it may be very useful in understanding a patient's goals as related to their current ability and when monitoring progress related to goal attainment

Should this tool be required for entry-level curricula?
_____ Yes __x___ No
Comments:

- Although this is a unique measure that has broad patient applicability, recommend not including in entry-level education until more research is published on the MAM's psychometrics in individuals with MS

Is this tool appropriate for research purposes?
_____ Yes ___x__ No
Comments:

- At the current time, further research is needed on the psychometrics of the MAM in individuals with MS

Attachments:

- Score Sheets: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable

  The MAM is property of the author; may be used royalty free by permission of the author.[2]

- Instructions: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable

- Reference list: _____ Uploaded on website

Second Reviewer Comments:

-

Overall Taskforce Agreement with Recommendations:

-

Practice Setting	4	3	2	1	Comments
Acute			X		•
Inpatient Rehab			X		•
Home Health			X		•
Skilled Nursing			X		•
Outpatient			X		•

Overall Comments:

- See below

Level of Disability	4	3	2	1	Comments
EDSS 0.0 – 3.5			X		•
EDSS 4.0 – 5.5			X		•
EDSS 6.0 – 7.5			X		• The MAM has not been studied in individuals with EDSS > 6.0
EDSS 8.0 – 9.5			X		• See above

Overall Comments:

- Psychometric data exists to support the validity of the MAM in patients with MS, but reliability and responsiveness data is not reported (hence the rating of 2)
- The 6 dimensions assessed by the MAM are all applicable to individuals with MS
- Scaling of the MAM ranges from severe impairment, requiring the assistance of others, to exceptional performance making the MAM applicable to patients with varying movement capabilities; this may make the MAM useful when tracking the long-term changes in movement in individuals with MS
- The MAM is a unique measure, as it quantifies a patient's current and preferred movement ability; as such, it may be very useful in understanding a patient's goals as related to their current ability and when monitoring progress related to goal attainment

Entry-Level Criteria	Students should learn to administer tool	Students should be exposed to tool (e.g. to read literature)	Do not recommend	Comments
Should this tool be required for entry level curricula?			X	• Although this is a unique measure that applicable for patients with MS, regardless of EDSS level,

				psychometric data on individuals is lacking
Research Use	**YES**	**NO**	**Comments**	
Is this tool appropriate for research purposes?		X	• Lack of psychometric data in MS, so do not recommend for use in research at this point in time. • Recommend investigating psychometric properties in MS.	

References:

1. Allen DD. Proposing 6 dimensions within the construct of movement in the movement continuum theory. *Phys Ther.*2007;87(7):888-898.
2. Allen DD. Validity and reliability of the movement ability measure: a self-report instrument proposed for assessing movement across diagnoses and ability levels. *Phys Ther.*2007;87(7):899-916.
3. Allen DD, Wagner JM. Assessing the gap between current movement ability and preferred movement ability as a measure of disability. *Phys Ther.*2011;91:xxx-xxx.
4. Allen DD. Responsiveness of the movement ability measure: a self-report instrument proposed for assessing the effectiveness of physical therapy intervention. *Phys Ther.*2007;87(7):917-924.
5. Allen DD, Cott CA. Evaluating rehabilitation outcomes from the client's perspective by identifying the gap between current and preferred movement ability. *Disability and Rehabilitation* 2010;32(6):452-461.

Instrument name: Multi-component Fatigue Scale (a.k.a. Physical and Cognitive Fatigue scale)	
Reviewer: Evan Cohen, PT, MA, PhD, NCS	**Date of review:** 8/11

ICF domain (check all that apply):

__x__ Body function/structure __x__ Activity __x__ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance	_____ Balance/falls	_____ Health and wellness
_____ Ataxia	_____ Bed mobility	_____ Home management
_____ Cardiovascular/pulmonary status	_____ Gait	_____ Leisure
_____ Coordination (non-equilibrium)	_____ Reach and grasp	_____ Quality of life
_____ Dizziness/vestibular	_____ Transfers	__x__ Role function
__x__ Fatigue	_____ Wheelchair skills	_____ Shopping
_____ Flexibility		_____ Social function
_____ Muscle performance		_____ Work
_____ Muscle tone		
_____ Pain		
_____ Posture		
_____ Sensory integration		
_____ Somatosensation		

Other: Cognition

Type of measure:

_____ Performance-based __x__ Self-report

Instrument properties:

- The Multi-Component Fatigue Scale (MFS) has two subscales: the Cognitive Fatigue Scale (7 items) and the Physical Fatigue Scale (8 items). Each item is answered on a scale of 1 ("not at all") to 5 ("a great deal").

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • Inter-rater: • Test-retest: •
Validity (concurrent, criterion-related,	Concurrent validity: •

predictive)	Predictive validity: • Discriminative validity: • PWMS scored greater at baseline on the physical fatigue subscale (2.65 +/- 1.24) than did controls (1.49 +/- 0.56), and on the cognitive fatigue subscale (2.56 +/- 1.07) than did controls (1.6 +/- 0.67) (F (1, 56) >12.59 p < .001).[1] • The MFS was not able to differentiate cognitive fatigue from physical fatigue.[1] Sensitivity/Specificity/Predictive Values/Likelihood Ratios: •
Ceiling/floor effects	Ceiling effects: • Floor effects: •
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • MCID: • Other responsiveness values: • After intervention to induce fatigue, PWMS has significantly greater increases in the physical fatigue subscale (median = 3.75) than did controls (median = 3.00) ($\chi 2$ [1, N = 58] = 13.93, p < .001) and on the cognitive fatigue subscale (median = 3.57) than did controls (median = 3.14) ($\chi 2$ [1, N = 58] = 5.01, p < .05)[1] Normative Data: •
Instrument use	
Equipment required	• The questionnaire
Time to complete	• 5 minutes (estimated)
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• The MFS is essentially two separate descriptive scales: one for cognitive fatigue, and one for physical fatigue. PWMS answer the series of questions (7 for the cognitive fatigue scale and 8 for the physical fatigue scale). At baseline, items are measured on a scale of 1 (not at all) to 5 (a great deal). At follow-up, questions are altered slightly so that the PWMS rates the perceived change compared to a previous rating. The authors provide an example where the baseline question of "Do you currently have problems concentrating?" changes to "Compared to your first rating

	are you having trouble concentrating?" Change scores range from 1 (much less) to 5 (much more). A score of 3 indicates "no change".[1]
Level of client participation required (is proxy participation available?)	• The MFS is a self-report measure of perceived fatigue, thus patient participation is required
Limitations	• The MFS is a measure of perceived fatigue across two domains. There is no description of how the questions in the scale were developed and no validity testing. Further research on the MFS is required to determine its usefulness for research and practice.

Recommendations
Practice Setting (check all that apply):

_____ Acute
_____ Inpatient Rehab
_____ Home Health
_____ Skilled Nursing
_____ Outpatient

Comments:
- Not recommended

Level of Disability (check all that apply):

_____ EDSS 0.0 – 3.5
_____ EDSS 4.0 – 5.5
_____ EDSS 6.0 – 7.5
_____ EDSS 8.0 – 9.5

Comments:
- Not recommended because too little evidence is presented, the range of disability scores for pwMS who participated is unavailable.

Should this tool be required for entry-level curricula?

_____ Yes __X__ No

Comments:
- The paucity of evidence of psychometric properties limits the usefulness of this tool in clinical practice, and should not be required for entry-level curricula.

Is this tool appropriate for research purposes?

_____ Yes __X__ No

Comments:

- Limited data regarding psychometric properties of this tool limit its usefulness for research. Researchers might consider further exploring the properties of the MFS to determine if it might be a useful tool to measure in PWMS.

Attachments:

- Score Sheets: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
  Test and instructions are available in the Paul article.
- Instructions: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Reference list: _____ Uploaded on website

Second Reviewer Comments:

- I agree with the primary reviewer. Given the number of other tests that measure fatigue with psychometric properties defined, at this time the MFS has limited usefulness.

Overall Taskforce Agreement with Recommendations:

-

Practice Setting	4	3	2	1	Comments
Acute				X	•
Inpatient Rehab				X	•
Home Health				X	•
Skilled Nursing				X	•
Outpatient				X	•

Overall Comments:

- Not recommended

Level of Disability	4	3	2	1	Comments
EDSS 0.0 – 3.5				X	•
EDSS 4.0 – 5.5				X	•
EDSS 6.0 – 7.5				X	•
EDSS 8.0 – 9.5				X	•

Overall Comments:

- Not recommended

Entry-Level Criteria	Students should learn to	Students should be exposed to	Do not recommend	Comments

	administer tool	**tool (e.g. to read literature)**		
Should this tool be required for entry level curricula?			X	•

Research Use	**YES**	**NO**	**Comments**
Is this tool appropriate for research purposes?		X	•

References:

1 Paul, R.H., Beatty, W.W., Schneider, R. (1998) Cognitive and Physical Fatigue in Multiple Sclerosis: Relations Between Self-Report and Objective Performance. *Applied Neuropsychology 5*(3) 143-148.

Instrument name: Multiple Sclerosis Functional Composite - MSFC

Reviewer: Kathleen Brandfass, MS, PT | **Date of review:** 8/2/11

ICF domain (check all that apply):

__x___ Body function/structure __x___ Activity _____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance	_____ Balance/falls	_____ Health and wellness
_____ Ataxia	_____ Bed mobility	_____ Home management
_____ Cardiovascular/pulmonary status	__x__ Gait	_____ Leisure
_____ Coordination (non-equilibrium)	__x___ Reach and grasp	_____ Quality of life
_____ Dizziness/vestibular	_____ Self care	_____ Role function
_____ Fatigue	_____ Transfers	_____ Shopping
_____ Flexibility	_____ Wheelchair skills	_____ Social function
_____ Muscle performance		_____ Work
_____ Muscle tone / spasticity		
_____ Pain		
_____ Posture		
_____ Sensory integration		
_____ Somatosensation		

Other: ambulation, upper extremity function, and cognition

Type of measure:

___x__ Performance-based _____ Self-report

Instrument description:

- The MSFC was developed by the National Multiple Sclerosis Society Task Force to address limitations and unidimensionality of prior existing functional status outcomes such as the EDSS.
- The MSFC consists of three component parts: The Timed 25-foot Walk Test (T25FW), the 9-Hole Peg Test (9HPT) and the 3-second version of the Paced Auditory Serial Addition Test (PASAT-3).[1]

Reliability (test-retest, intra-rater, inter-rater)

Intra-rater:

- In a sample of 10 PWMS (EDSS mean 5.2, range 3.5-6.5), the ICC over 6 repeated tests was .88.[2] ICC improved to .97 between trials 4 and 5 after practice effects stabilized.[2]
- In sample of 32 PWMS (EDSS mean 4.5, range 2.0-7.0), ICC over 4 repeated tests was .97 (95% CI .94-.98).[3]

Inter-rater:

	• In a sample of 10 PWMS (EDSS mean 5.2, range 3.5-6.5) ICC was .95-.96.[2] • In another sample of 32 PWMS, (EDSS mean 4.5, range 2.0-7.0) ICC was .96 (95% CI .92-.98).[3] <u>Test-retest:</u> • 0.96 ICC[4] • ICC over 4 test cycles in a sample of 426 PWMS with EDSS mean score of 5.2 +/- 1.1 was .87, with ICC of .90 between tests 3 and 4.[4] This indicates a learning effect requiring practice trials before measuring baseline. Solari et al examined practice effects of the individual components of the MSFC and recommend a single pretesting trial of the T25WT, 3 pretest trials of the PASAT-3, and 4 pretest trials of the 9HPT.[3]
Validity (concurrent, criterion-related, predictive)	<u>Concurrent validity:</u> Correlations between the MSFC and the EDSS • In the total population: -.47 to -.80.[4-9] • In people with Primary Progressive MS: -.316 to -.69.[8,10,11] In people with Secondary Progressive MS: - .60.[8] In people with Relapsing Remitting MS: -.38[8] Correlations between MSFC change and EDSS change • Changes in the two measures correlated at 1 year (r= -.22 to -.24,[7,12]and at 8.1 years (r = -.45).[11] Different correlations were found when a sample was stratified by EDSS scores, with r = -.18 for the group with EDSS of ≤3.5, and r = -.30 for the group with EDSS of >3.5 indicating better concurrent validity in the group with more disability.[12] Correlations between the MSFC and MRI findings • With T1-weighted hypointense lesion load R= -0.24.[13] • With T2-weighted lesion load R= -0.25.[13] • T1/T2 lesion load, brain atrophy, magnetic transference ratio and mean diffusion correlated r< 0.50[3] • With ventricular fraction (r = -.40).[14] • With brain parenchymal fraction (BPF) (r = .36 - .498), [11,14,15] and with delayed measures of BPF (r = .42 to .52).[11] Change over time in MSFC also correlated with change over time in BPF (r = .23 to .30).[11,15] MSFC and Other Measures: • The MSFC correlates with the Short Form Health Survey (SF-36)

Physical Component Summary score (r=0.41) but not with the SF-36 total score.[9]

- Correlations (Spearman's *r*) of MSFC with Sickness Impact Profile (SIP) and its subscales by EDSS range are tabulated below.[9]

EDSS Range	SIP Composite	SIP Physical	SIP Psychosocial
0-8.5	-.62	-.71	-.34
0-3.0	-.35	-.34	-.29
3.5-6.5	-.34	-.37	-.18
7.0-8.5	-.29	- .28	Not significant

- MSFC correlated with the Fatigue Impact Scale (FIS) and the FIS physical subscale (r = -.13 and -.12, respectively) across EDSS ranges and with those within an EDSS range of 0-3 (r = -.21 and -.15) but not with those within an EDSS range of 3.5-6.5 or 7.0-8.5.[9]
- MSFC correlated with self-reported employment status (employed full time, employed part time, or not employed) across EDSS ranges (r = .43), and in those within EDSS range of 0-3 and 3.5-6.5 (r = .21 and r = .32, respectively).[9]
- MSFC and Guys Neurological Disability Scale measures correlated at two data points (r = -.58 and r = -.57) in a group of 188 PWMS with a mean EDSS score of 4.2 +/- 2.0, although change scores of the two measures over time did not correlate.[16]
- In a combined sample of 172 PWMS with a mean EDSS of 4.4 (range 0-9.5) and 102 PWMS with a mean EDSS of 3.9 (range 0-7.5), the MSFC correlated with the MS Impact Scale-29 (r = .577).[17]

<u>Predictive validity:</u>

- MSFC predicted MSFC and MRI status at 8 years with comparison to MRI status at 2 years.[11]
- Across MS disease type and severity, a 1 standard deviation change in MSFC over a 1-year period results in a 1.6 odds ratio of a sustained worsening in EDSS.[12,15]
- Baseline MSFC had an OR of 2.72 (95% CI 1.42-5.21) for predicting EDSS score at 8 years, and MSFC change between baseline and 2-year follow-up had an OR of 3.05 (95% CI 1.61-5.78) for predicting EDSS score at 8 years.[11]
- Baseline MSFC had an OR of 4.37 (95% CI 1.96-9.71) to predict severe brain atrophy (BPF < 0.80) at 8 years, and MSFC change between baseline and 2-year follow-up had an OR of 3.10 (95% CI 1.45-6.62) to predict severe brain atrophy at 8 years.[11]

	• Baseline MSFC had an OR of 2.20 (95% CI 1.13-4.27) to predict a change from relapsing-remitting to secondary progressive disease type at 8 years, and MSFC change score between baseline and 2-year follow-up had an OR of 3.86 (95% CI 1.89-7.94) to predict a change from relapsing-remitting to secondary progressive disease type at 8 years.[11] Discriminative validity: • The MSFC was more precise than the EDSS in detecting between-groups differences across four MRI markers. The EDSS was 23% as precise as the MSFC in discrimination by T1 lesion volume, 58% as precise in discrimination by T2 lesion volume, 35% as precise in discrimination by brain parenchymal fraction, and 33% as precise in discrimination by ventricular fraction.[6] Sensitivity/Specificity/Predictive Values/Likelihood Ratios: • In a sample of people with primary progressive MS (N=161) with EDSS median score of 5.0 (range 2.0-6.5), a worsening of MSFC from baseline to 1-year follow-up predicted later worsening of EDSS with a sensitivity of .49 (95% CI .37-.62), specificity of .55 (95% CI .45-.64), a positive predictive validity of .39 (95% CI .36-.58), a negative predictive validity of .65 (95% CI .55-.74), a positive likelihood ratio of 1.09 (95% CI 0.78-1.53), and a negative likelihood ratio of 0.93 (95% CI 0.68-1.26).[10] The MSFC at baseline also predicted short- and long-term worsening of the MSFC.[10] -
Ceiling/floor effects	Ceiling effects: • T25FW and 9 HPT are timed and therefore do not have ceiling effects • Floor effects: • There is the possibility of a floor effect on the T25FW if person is unable to complete the walk safely.[3]
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • MCID: • Most literature describes a 20% change in composite score as the MCID,[6,18,19] although a 15% change was more sensitive at detecting disease progression.[19] A 20% change has also been described as the MCID for individual item scores for the 9HPT and the T25FW [18,20] There is some conflict over MCID for the PASAT-3. Some studies found no clearly identified MCID,[18] while others suggest that a change of 0.5 standard deviations is a

	MCID for the PASAT-3.[20] Other responsiveness values: • Normative Data: • Scores from the NMSS Task Force database can be found on in MSFC Administration and Scoring Manual,[1] otherwise, the comparison data set is generated from baseline data collected from the group being examined.[1]
Instrument use	• Research and limited clinical assessment in multiple sclerosis centers
Equipment required	• Measured 25-foot walkway, 9HPT kit, stopwatch, and PASAT-3 audiocassette or CD, forms to record data, and a calculator with simple statistical functions.
Time to complete	• Estimates range from 10 minutes (by a well-trained examiner)[21] to 20 minutes.[2] • Examiner training takes approximately 4 hours.
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• The full MSFC consists of 2 trials of the T25FW, 4 trials (2 on each hand) of the 9HPT, and 1 trial of the PASAT-3. The T25FW score is the average of the 2 T25FW trials. The PASAT-3 score is the number of correct answers. The 9HPT score is somewhat more complicated: the mean score of the two 9HPT trials for each hand is calculated, and then the reciprocal of the mean times for each hand is averaged. The composite score is created by converting the score for each component into a Z-score and then averaging the Z-scores. A reference population is required to create the Z-score. Component scores are entered into a formula with scores from the reference population in order to derive the means and standard deviations required to determine Z-scores. A detailed description of scoring methods can be found in the MSFC Administration and Scoring Manual.[1] • A score of +1 indicates that, on average, an individual scored 1 SD better than the reference population and a score of -1 indicates that an individual scored 1 SD worse than the reference population.[8,11] • It is suggested that the reference population be drawn from within the study/clinical group, however, existing reference group information can be used to facilitate between-studies comparisons of MSFC scores.[1]
Level of client participation required (is proxy participation available?)	• Client participation is required.
Limitations	• Each component test requires active participation. A lack of ability or motivation to walk, to perform upper extremity

	functions and/or to participate in the cognitive test will all contribute to limitations in information. • For research purposes, it is recommended that the reference data be created from baseline data from the sample under study (NMSS Manual). While this provides useful information for Z-score calculation within the sample, it limits the generalizability of the results.[22] Using a broader reference database (e.g., the NMSS reference database) may improve generalizability, but may result in Z-scores that do not accurately reflect individual performance. Care must be taken in the choice of reference database as information compared to different reference databases can have a marked impact on the MSFC Z-score to the point of altering statistical sensitivity.[23] Although the MSFC was created as a multidimensional measure, it does not measure some important constructs such as vision[22]. Limitations of the PASAT-3 as a component of the MSFC have been described. Different versions of the MSFC which include the T25WT, the 9HPT and a different measure of cognitive function (e.g., the Symbol Digit Modalities Test) was more sensitive than the original MSFC in discriminating impairments in cognition.[24]

Recommendations
Practice Setting (check all that apply):

_____ Acute
__X__ Inpatient Rehab
__X__ Home Health
__X__ Skilled Nursing
__X__ Outpatient

Comments:
- The MSFC has limited clinical utility. Its use is primarily recommended for research or in population-level clinical care.

Level of Disability (check all that apply):

__X__ EDSS 0.0 – 3.5
__X__ EDSS 4.0 – 5.5
__X__ EDSS 6.0 – 7.5
__X__ EDSS 8.0 – 9.5

Comments:
- The MSFC has been found to have adequate psychometric properties across levels of the EDSS, although individuals with EDSS scores of 7.0 or higher will be unable to complete the T25FW portion of the test.

Should this tool be required for entry-level curricula?

_x____ Yes _____ No

Comments:

- Exposure only.

Is this tool appropriate for research purposes?

_x____ Yes _____ No

Comments:

-

Attachments:

- Score Sheets: NMSS (1) _X____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Instructions: NMSS (1)__X___ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Reference list: NMSS (1)_X____ Uploaded on website

Second Reviewer Comments:

- Concur.

Overall Taskforce Agreement with Recommendations:

-

Practice Setting	4	3	2	1	Comments
Acute				X	•
Inpatient Rehab		X			•
Home Health		X			•
Skilled Nursing		X			•
Outpatient	X				•

Overall Comments:

- MSFC tests require the measured walkway, the 9HPT equipment and the recording of the PASAT-3 and a quiet place in which to conduct the testing. Having the component parts of the test and setting conducive to completing will be the limiting factors. As noted above, the clinical utility of the tool limits its usefulness in the clinic from day-to-day, but may be useful when considering population measurement in clinical care.

Level of Disability	4	3	2	1	Comments
EDSS 0.0 – 3.5		X			•
EDSS 4.0 – 5.5		X			•
EDSS 6.0 – 7.5		X			•
EDSS 8.0 – 9.5		X			•

Overall Comments:

- . There is robust evidence for the usefulness of the MSFC across EDSS levels.

Entry-Level Criteria	Students should learn to administer tool	Students should be exposed to tool (e.g. to read literature)	Do not recommend	Comments
Should this tool be required for entry level curricula?		X		• The MSFC is a somewhat complicated tool to use. Although the component tests are simple, the mathematical formulas required to calculate individual and composite Z-scores, and the need to identify a suitable reference population from which Z-scores are determined makes the application of this tool an advanced skill. With the future 20% change for the individual scores and composite score indicating real change the MSFC will be a useful clinical tool, so entry-level students should be exposed to it.

Research Use	YES	NO	Comments
Is this tool appropriate for research purposes?	X		• To maximize psychometric properties of the tool, the MSFC Z-scores should be calculated from the baseline data collected from the research sample. A general reference population has been defined[1] to improve generalizability of the MSFC in both

			pharmacological and clinical research.

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Instrument name: Multiple Sclerosis Impact Scale (MSIS-29)

Reviewer: Diane D. Allen, PT, PhD | **Date of review:** 7/25/11

ICF domain (check all that apply):

_____ Body function/structure _____ Activity __x___ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance
_____ Ataxia
_____ Cardiovascular/pulmonary status
__x___ Coordination (non-equilibrium)
_____ Dizziness/vestibular
__x___ Fatigue
__x___ Flexibility
__x___ Muscle performance
__x___ Muscle tone / spasticity
_____ Pain
_____ Posture
_____ Sensory integration
_____ Somatosensation
___x__ Balance/falls
_____ Bed mobility
_____ Gait
__x___ Reach and grasp
___x__ Self care
_____ Transfers
_____ Wheelchair skills
__x___ Health and wellness
_____ Home management
__x___ Leisure
__x___ Quality of life
__x___ Role function
_____ Shopping
__x___ Social function
__x___ Work

Other:
Tremor, using transport (car, bus, etc), doing things spontaneously, needing to go to the toilet urgently, sleeping, worries related to MS, feeling anxious or tense, feeling irritable or short-tempered, problems concentrating, lack of confidence, feeling depressed

Type of measure:

_____ Performance-based __x___ Self-report

Instrument description:

- The multiple sclerosis impact scale (MSIS-29) is a 29-item self-report measure with 20 items associated with a physical scale and 9 items with a psychological scale.[1] Items ask about the impact of MS on day-to-day life in the past two weeks. All items have 5 response options: 1 "not at all" to 5 "extremely". Each of the two scales are scored by summing the responses across items, then converting to a 0-100 scale where 100 indicates greater impact of disease on daily function (worse health).
- The items were selected via a standardized psychometric process: generating a large item pool from patient interviews and professional judgment, winnowing down to the current items based on pilot and field testing.[1]

Reliability (test-retest, intra-rater, inter-rater)	Internal consistency: • In 703 people with MS, the Cronbach's alpha was .96 for the physical scale and .91 for the psychological scale.[1] • Person separation index (comparable to Cronbach's alpha) was .91 for the psychological scale and .93 for the physical scale

	when performing a Rasch analysis of responses from 92 people with MS. Item fit was acceptable, with improved ordering of response options when the middle 3 options on all physical items were collapsed to make a 1-3 score rather than 1-5 score. Both subscales were unidimensional and free from item bias for sex and age.[2] Inter-rater: • In a comparison of patient and proxy reports, proxies generally reported lower change scores on both scales following steroidal treatment but the standard deviations were high; ICC between raters was .58 for physical and .34 for the psychological scale.[3] Test-retest: • In 128 people with MS, reliability between two administrations of the MSIS-29 with a 10-day interval was .94 for the physical scale and .87 for the psychological scale.[1] • In 58 people with MS who took the MSIS-29 a second time 6 months later, 36 stated their condition had remained stable in that time, and there was no difference in MSIS-29 scores between the two times. For the 12 people who thought their condition had deteriorated, the MSIS-29 physical scale had increased by 7.98 points (SD 15.15, p=.034); for the 4 people who thought their condition had improved, the MSIS-29 had decreased by 13.4 points (p=.017). There was no change in the psychological scale on the MSIS-29.[4] • 30 partners of people with MS completed the MSIS-29 by proxy, with test-retest ICC (2-week interval) of .87 for the physical scale and .83 for the psychological scale.[5]
Validity (concurrent, criterion-related, predictive)	Concurrent validity: • In about 250 people with MS, Pearson's r for correlation of the physical scale with: SF-36 physical function is -.79; Barthel Index -.71; mobility component of the FAMS is -.88. Pearson's r for correlation of the psychological scale with: SF-36 mental health is -.76; FAMS thinking and fatigue is -.73.[1] • In 53 hospitalized people with MS undergoing rehabilitation, the correlation with EDSS scores was .27 for the physical scale and .14 for the psychological scale. The correlation was -.52 between SF-36 physical function scale and physical scale and -.73 between mental health on the SF-36 and the psychological scale of the MSIS-29.[6] • In 200 people with MS, Spearman rho correlation of the physical scale with EDSS was .68, with MSFC was -.53, and with Guy's Neurological Disability Scale (GNDS) was .79. Correlation of the psychological scale was .22 with EDSS, -.30 with MSFC, and .58

	with GNDS.[7] • In 230 people with MS, EDSS 0-9.5, MSIS-29 had a Spearman rho correlation with fatigue (Neurological Fatigue Index-Multiple Sclerosis) that was .77 for the physical scale and .72 for the psychological scale.[8] Predictive validity: • Discriminative validity: • In 248 people with MS, average physical scale scores were significantly different for people at different levels of disability as recorded by EDSS: 25.9 (20.5) at EDSS 0-3; 48.0 (20.9) at EDSS 3.5-5.5; and 63.9 (24.7) at EDSS 6-9.5.[9] Sensitivity/Specificity/Predictive Values/Likelihood Ratios: • For EDSS range 0-5.0, a change score of 7 on the MSIS-29 physical scale had a sensitivity of 78 and specificity of 51 for predicting a one-step change in EDSS. For EDSS range 5.5-8, a change score of 8 had a sensitivity of 87 and specificity of 67 for predicting a .5 –step change in EDSS.[10] • In 42 patients who had indicated with a global transition question whether they had improved or not, a cut-off point of 8.13 on the physical scale had a sensitivity of 76 and a specificity of 76; a cut-off point of 5.56 on the psychological scale had a sensitivity of 72 and specificity of 65. In 42 proxy partners, a cut-off point of 6.88 on the physical scale had a sensitivity of 80 and a specificity of 71; a cut-off point of 4.17 had a sensitivity of 64 and a specificity of 71.[3]
Ceiling/floor effects	Ceiling effects (more of an impact from MS): • In 703 people with MS, 3.9% scored at the maximum on the physical scale, and 1.9% scored at the maximum on the psychological scale.[1] Floor effects (less of an impact from MS): • In 703 people with MS, .9% scored at the minimum on the physical scale, and 1.7% scored at the minimum on the psychological scale.[1]
Sensitivity to change (responsiveness, MCID, MDC) / normative data	SEM: • Ranged from 5.2 to 6.0 in community and hospital groups of people with MS for physical scale; ranged from 6.9 to 8.8 for the psychological scale.[6] MDC:

	• MCID: • A change score of 8 points on the MSIS-29 is clinically significant in 214 patients with MS when examined at baseline and up to 4 years later.[10] Other responsiveness values: • In 55 people with MS who underwent steroidal treatment or rehabilitation, both scales of MSIS-29 dropped by about 18 points at re-test after about 6 weeks, revealing an effect size of .82 for the physical scale and .66 for the psychological scale.[1] • In 57 people with MS who underwent steroidal treatment or rehabilitation, effect size on the MSIS-29 was .91 on the physical scale and .62 on the psychological scale at discharge or 6 weeks, compared to .37 on the physical function scale of the SF-36 and .40 on the mental health scale of the SF-36.[11] • In 56 people with MS who underwent one-hour physical therapy sessions 5 days a week for 4 weeks focused on balance and gait, MSIS improved significantly in both physical (18 points) and psychological (13 points) scales. MSIS improvements were not retained at 3 and 6 months post treatment although walking and balance tests retained significant improvements.[12] • In 104 people with MS, EDSS scores 1-7.5, undergoing steroidal treatment for exacerbation, the standardized response mean was .58 on the physical scale and .45 on the psychological scale of the MSIS-29, with significant area under the curve (AUC) of .60 to .68 for determining significant change from the patient's and physician's point of view.[13] Normative Data: • In 553 people with MS, EDSS 0-9.0, over an interval of at least 300 days, the average change in MSIS-29 physical scale was 0.9 points (SD 13.9); 137 people reported worsening by 8 points or more on the MSIS-29 physical over that time.[14]
Instrument use	•
Equipment required	• MSIS-29 scale, pen/pencil
Time to complete	• 10-15 minutes
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• Sum the scores across all items, subtract by the number of items, divide by the total possible, then multiply by 100. Thus, for the physical items (1-20) assuming all items have a response: sum, subtract 20, divide by 80, and multiply by 100. And for the

	psychological items (21-29) assuming all items have a response: sum, subtract 9, divide by 36, multiply by 100.
Level of client participation required (is proxy participation available?)	• A proxy version showed similar reliability and concurrent validity as the patient version of the MSIS-29, although responsiveness was poor for detecting change over time.[5]
Limitations	• The two scales are distinct and should not be combined. • The items ask for the impact of MS on daily life in the past 2 weeks. Sensitivity to change will be limited in short intervals.

Recommendations
Practice Setting (check all that apply):
__x___ Acute
__x___ Inpatient Rehab
__x___ Home Health
__x___ Skilled Nursing
__x___ Outpatient

Comments:
•

Level of Disability (check all that apply):
__x___ EDSS 0.0 – 3.5
__x___ EDSS 4.0 – 5.5
__x___ EDSS 6.0 – 7.5
__x___ EDSS 8.0 – 9.5

Comments:
•

Should this tool be required for entry-level curricula?
_____ Yes __x___ No
Comments:
• Exposure only, as it is a good example of a well-documented self-report measure.

Is this tool appropriate for research purposes?
__x___ Yes _____ No
Comments:
•

Attachments:
• Score Sheets: _____ Uploaded on website __x___ Available but copyrighted _____ Unavailable
• Instructions: _____ Uploaded on website ___x__ Available but copyrighted _____ Unavailable

- Reference list: _____ Uploaded on website

Second Reviewer Comments:

- Agree with ratings/recommendations.

Overall Taskforce Agreement with Recommendations:

-

Practice Setting	4	3	2	1	Comments
Acute	X				•
Inpatient Rehab	X				•
Home Health	X				•
Skilled Nursing	X				•
Outpatient	X				•

Overall Comments:

-

Level of Disability	4	3	2	1	Comments
EDSS 0.0 – 3.5	X				•
EDSS 4.0 – 5.5	X				•
EDSS 6.0 – 7.5	X				•
EDSS 8.0 – 9.5	X				•

Overall Comments:

- Proxy version available for patients unable to complete for themselves.

Entry-Level Criteria	Students should learn to administer tool	Students should be exposed to tool (e.g. to read literature)	Do not recommend	Comments
Should this tool be required for entry level curricula?		X		•

Research Use	YES	NO	Comments
Is this tool appropriate	X		•

for research purposes?			

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Instrument name: MS International Quality of Life Questionnaire (MusiQoL)	
Reviewer: Kirsten Potter, PT, DPT, MS, NCS	**Date of review:** 5/18/11

ICF domain (check all that apply):

_____ Body function/structure _____ Activity __x___ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance	__x___ Balance/falls	_____ Health and wellness
_____ Ataxia	_____ Bed mobility	_____ Home management
_____ Cardiovascular/pulmonary status	__x___ Gait	__x___ Leisure
_____ Coordination (non-equilibrium)	_____ Reach and grasp	__x___ Quality of life
_____ Dizziness/vestibular	__x___ Self care	__x___ Role function
_____ Fatigue	_____ Transfers	_____ Shopping
_____ Flexibility	_____ Wheelchair skills	__x___ Social function
_____ Muscle performance		_____ Work
_____ Muscle tone / spasticity		
_____ Pain		
_____ Posture		
_____ Sensory integration		
_____ Somatosensation		

Other: Psychological well-being and coping, memory, vision, satisfaction with care received by health care professionals

Type of measure:

_____ Performance-based __x___ Self-report

Instrument description:

- A 31-item self-administered, multi-dimensional, health related quality of life (QOL) measure designed specifically for individuals with MS, developed in consultation with individuals with MS[1]
- 9 dimensions of QOL: activities of daily living (ADL, 8 items); psychological well-being (PWB, 4 items); symptoms (SPT, 3 items); friends relationships (RFr, 4 items); family relationships (RFa, 3 items), satisfaction with health care (RHCS, 3 items); sentimental and sexual life (SSL, 2 items), coping (COP, 2 items), and rejection (REJ, 2 items)[1]
- International effort for development and testing: France, Germany, Italy, Spain, UK, Argentina, Brazil, Canada, Greece, Israel, Lebanon, Norway, Russia, South Africa, Sweden, Turkey, and USA[1]

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • Inter-rater: •

	Test-retest: • Simeoni et al (1,992 patients from numerous countries; mean EDSS = 3.2; SD = 2.1): when answered by the patient or physician assessment, ICC for dimension and scores ranged from 0.63 – 0.89 and ICC for total MusiQoL score was 0.86 (patient) and 0.89 (physician); paired t-tests showed no differences between 2 assessments[1] • Greek version (92 patients): ICC ranged 0.69 – 0.99 and 0.72 – 0.99 for patient's answers and physician assessments[2] • Norwegian version (140 patients with mean EDSS = 5.0 (range 1.0 – 8.5): ICC ranged 0.43 – 0.86 for patients who reported stable disease, 0.42 – 0.84 for patients defined as stable by the physician assessments, and 0.36 – 0.82 for those defined as stable by EDSS score[3] • "Satisfactory" reproducibility reported for Polish (no data provided in conference proceeding)[4] and French (no data provided in abstract – article written in French)[5] versions Internal consistency: • Simeoni et al (1,992 patients from numerous countries; mean EDSS = 3.2; SD = 2.1): Cronbach's alpha coefficients ranged 0.68 – 0.92 for the whole sample; 0.60 – 0.90 for relapsing remitting form, 0.68- 0.92 for primary progressive, and 0.67- 0.87 for secondary progressive.[1] • Asian version (81 patients with mean EDSS 3.4): Cronbach's alpha values ranged 0.71 – 0.94 (Singapore and Malaysia data) and 0.49 – 0.92 (India data)[6] • Cronbach's alpha values ranged 0.63 – 0.94 (Greek version)[2] and 0.44 – 0.87 (Norwegian version)[3] • Polish[4] and French[5] versions: "Satisfactory" internal consistency (no data reported in conference proceedings and abstract, respectively)
Validity (concurrent, criterion-related, predictive)	Concurrent validity: • In multi-international patient population: MusiQoL scores were at the most moderately correlated with SF-36 scores, except for ADL and physical functioning (rho = 0.78, $p < 0.01$) and PWB and mental health (rho = 0.65, $p < 0.01$); ADL dimension significantly correlated to EDSS (rho = -0.64, $p < 0.01$) and Ambulation Index (rho = -0.63, $p < 0.001$)[1] • Asian version: MusiQoL scores weakly to moderately correlated to SF-36; ADL most strongly correlated to physical functioning (rho = 0.56, $p < 0.001$); PWB to mental health (rho = 0.61, $p <$ 0.001); SPT to vitality (rho = 0.49, p , 0.001); RFa to vitality (rho = 0.42, $p < 0.01$); COP to mental health, role-emotional, and vitality (rho = 0.65, 0.62, and 0.58 respectively, $p < 0.001$); and

	REJ to role-physical (rho = 0.43, p < 0.001)[6] • Greek version: total MusiQoL score correlates significantly but moderately with SF 36 scores (rho correlations range 0.43 – 0.76; exception: bodily pain rho = 0.17); ADL correlated strongly to physical functioning (rho = 0.85), social functioning (rho = 0.74), vitality (rho = 0.69); PWB with mental health (rho = 0.68)[2] • Norwegian version: total MusiQoL score correlates significantly with SF-36 dimensions (exception physical functioning; rho = 0.051; NS) with rho values ranging from 0.294 – 557 (p < 0.001); several dimension scores correlate significantly, yet weakly to moderately with SF 36 dimensions (strongest correlation: ADL with physical functioning, rho = 0.642); EDSS correlates to ADL (rho = -0.499; p < 0.001) and PWB (rho = 0.225; p = 0.023); Ambulation index correlates to ADL (rho = -0.543; p < 0.001) and PWB (rho = 0.229, p = 0.023)[3] • Polish version: Correlates "well" to EDSS, Functional Assessment of Multiple Sclerosis, and Multiple Sclerosis Impact Scale – 29 (no correlation coefficients reported in conference proceedings)[4] • German version: moderate, but significant, correlations between dimension scores and SF-36; ADL dimension most closely related to EDSS score (data not available due to article in German)[7] • Not strongly correlated to cognitive tests (Brief Repeatable Battery of Neuropsychological Tests or subtests), but is related to depression (Beck Depression Inventory; rho = -0.53, p , 0.01) (tested in 124 patients with mean EDSS = 4.75; range 1.0 – 8.0)[8] • Various associations exist between dimension scores and fatigue (ADL with Modified Physical Impact Scale rho = -0.58, p < 0.01) and EDSS (correlated with ADL, rho = -0.40, p < 0.001)[8] • ADL and total MusiQoL correlate with EDSS at baseline and 6 and 12 month follow-up assessments (r ~ -0.70 and -0.35, respectively)[9] • Significantly correlates to T1 and T2 MRI lesion load (better correlations noted between T1 and physical dimensions and T2 with mental dimensions); data not available due to article written in French[10] <u>Predictive validity:</u> • Factors predictive of total MusiQoL score include marital status (β = 0.526, p = 0.007), EDSS (β = 0.633, p = 0.006), and Beck Depression Inventory (β = -0.413, p = 0.018)[8] <u>Discriminative validity:</u> • In multi-international patient population: MusiQoL is able to discriminate among different groups of patients: Person Separation Index (PSI) ranged from 0.7 = 0.9 for all dimensions except RHCS (PSI = 0.6); statistically significant differences found

	in MusiQoL scores (dimension and total) for patients with 4 forms of MS (with exception of RFa); MusiQoL scores (dimension and total) also able to discriminate among patients with mild, moderate, and severe MS (except PWB, RFr, and RHCS)[1] • Unemployed patients show significantly lower MusiQoL scores as compared to employed patients, except for RFr and RFa[1] • MusiQoL doesn't discriminate between female vs male patients except for PWB and SPT (males higher), and PFr (females higher)[1] • MusiQoL able to discriminate by gender (men score higher on PWB, SPT, and REJ), educational level (higher educated individuals scored higher on SPT but lower on RHCS), people in partnerships/married scored higher on RFa, RHCS, SSL and total MusiQoL), those living in personal home vs. friend/family home scored higher on PWB, employed individuals scored higher in ADL, and statistically significant differences exist among MS subtype[8] • MusiQoL scores (dimension and total) were significantly higher for patients with higher educational levels, except for RFa[1] • Asian version: Males showed higher scores on PWB, SPT, and RFr compared to females; employed patients scored significantly higher on ADL, PWB, COP, and REJ; ADL dimension score significantly higher in patients with mild disease, as compared to moderate/severe[6] • Norwegian version: statistically significant differences found among patients with various MS forms for ADL, PWB, and SPT; ADL, SSL, and total MusiQoL for patients with different MS severity levels; employed patients scored significantly higher on ADL and SPT; patients with higher education levels had higher values on RHCS; patients who were part of a couple had higher levels of RFa; and age was significantly associated with SPT and SSL[3] • German version: "satisfactory" discriminate validity in regards to gender, socioeconomic status, and health status (no data reported due to article written in German)[7] <u>Sensitivity/Specificity/Predictive Values/Likelihood Ratios:</u> • <u>Construct Validity:</u> • In multi-international patient population: good overall scalability; most items show good fit to Rasch model within each dimension; no items show INFIT statistic outside acceptable range[1] • Using Rasch and confirmatory factor analyses, Simeoni et al[1] found that the MusiQoL was valid by country and clinical form of

	MS; Rasch analysis confirmed unidimensionality of Greek version, indicating all items within same dimension measure same concept[2] • Asian,[6] Greek,[2] and Norweigan[3] versions: construct validity confirmed through analysis of item internal consistency and item discriminate consistency; satisfactory scaling success achieved on majority of items indicating MusiQoL items relate to hypothesized related dimensions and are different from hypothesized unrelated dimensions •
Ceiling/floor effects	<u>Ceiling effects:</u> • Simeoni et al (1,992 patients from numerous countries; mean EDSS = 3.2; SD = 2.1): Found for RFa, RHCS, COP, REJ[1] • Asian version (81 patients with mean EDSS 3.4): Found for RFa, RHCS, and REJ in Singapore and Malaysia, and for RFr, RFa, RHCS, SSL, and REJ for India data[6] • Norwegian version (140 patients with mean EDSS = 5.0 (range 1.0 – 8.5): Found for COP and REJ in Norwegian patients[3] <u>Floor effects:</u> • In multi-international patient population: no floor effect[1] • Asian[6] or Norwegian[3] populations: no floor effect
Sensitivity to change (responsiveness, MCID, MDC) / normative data	<u>MDC:</u> • <u>MCID:</u> • <u>Other responsiveness values:</u> • In multi-international patient population: in patients who improved, small to moderate, but significant ES were found for ADL (0.27 and 0.30) and PWB (0.36 and 0.37) dimensions, and total MusiQoL (0.22 and 0.41 via patient and physician report, respectively); in patients who worsened, MusiQoL dimensions ADL(ES = -0.67) and PWB (ES = -0.23) were particularly sensitive to change[1] • Small to moderate effect sizes found when administered to patients receiving Rebif therapy, computing ES relative to 3 different external criteria (only ES reported was for MusiQoL = 0.55 when calculated relative to Hospital Anxiety & Depression – Depression Scale)[11] • In 474 patients with mean (SD) EDSS = 2.9 (1.9), ES were 0.03 for all patients and -0.08 for patients who worsened[9] <u>Normative Data:</u> •
Instrument use	• The MusiQoL is appropriate for patients from various cultural

	backgrounds
Equipment required	• Questionnaire • Pen or pencil
Time to complete	• Mean time to complete = 10.6 ± 22.9 minutes[1] • Norwegian sample reported time to complete = 14.0 min (range 5 – 44 min.)[3]
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• Scored on a 6-point likert scale: 1 = never/not; 2 = rarely/a little; 3 = sometimes/somewhat; 4 = often/a lot; 5 = always/very much; 6 = not applicable[1] • Negatively worded item scores are reversed so that higher scores indicate higher levels of QOL • Dimension scores and a total score are computed as follows:[1] a score for each dimension is obtained by computing the mean of the item scores within the dimension; if less than half of the items are missing, the mean of the non-missing items is substituted for the missing items; all dimension scores are linearly transformed to a 0 – 100 scale; a global index score (range: 0 – 100) is computed as the mean of the dimension scores
Level of client participation required (is proxy participation available?)	• Client must be able to answer the questions; however, the MusiQoL has been completed according to physician impressions.[1] • The survey has been used in patients with cognitive problems, but not dementia.
Limitations	• Scoring may be confusing as the rater needs to reverse the scores for negatively worded items

Recommendations
Practice Setting (check all that apply):

__x___ Acute
__x___ Inpatient Rehab
__x___ Home Health
__x___ Skilled Nursing
__x___ Outpatient

Comments:

- Could be used by patients in any setting, but a Middle East MS Advisory Committee recommends that assessments be made when patients are relapse-free to avoid confounding effects[12]

Level of Disability (check all that apply):

__x___ EDSS 0.0 – 3.5
__x___ EDSS 4.0 – 5.5

__x___ EDSS 6.0 – 7.5
__x___ EDSS 8.0 – 9.5

Comments:

-

Should this tool be required for entry-level curricula?

_____ Yes __x___ No

Comments:

- Although the MusiQoL is clinically feasible, reliable, and valid, it is not as well known or commonly reported as other MS-specific QOL measures.

Is this tool appropriate for research purposes?

_____ Yes __x___ No

Comments:

- May be appropriate if studying patients from diverse cultural backgrounds.
- However, small effect sizes suggest limited responsiveness

Attachments:

- Score Sheets: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable Available in article by Simeoni et al.[1]
- Instructions: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Reference list: _____ Uploaded on website

Second Reviewer Comments:

- Although some interesting and potentially valuable HRQL constructs specific to MS are addressed in this measure, small to moderate effect sizes in the cited literature indicate that responsiveness is not a strong point. Thus, this measure is better at describing current status than outcome. I agree with the recommendation level of 3.

Overall Taskforce Agreement with Recommendations:

-

Practice Setting	4	3	2	1	Comments
Acute		X			•
Inpatient Rehab		X			•
Home Health		X			•
Skilled Nursing		X			•

Outpatient		X			•

Overall Comments:

- The MusiQoL is unique in that it was developed in consultation with individuals with MS and has been tested in people from various cultural backgrounds
- The items comprising the MusiQoL relate to several aspects of quality of life that can be impacted by MS
- Reliable and valid in international population, but data specific to U.S. patients not reported
- Effect sizes indicate limited responsiveness (MDC and MCID not reported), so do not recommend as an evaluative measure at this point in time yet, it has good discriminative and concurrent validity, and Rasch analysis provides support for the construct validity of the MusiQoL
- Time to complete may exceed 20 minutes for some individuals; however, the scale is simple, which should enhance ease of completion by patients

Level of Disability	4	3	2	1	Comments
EDSS 0.0 – 3.5		X			•
EDSS 4.0 – 5.5		X			•
EDSS 6.0 – 7.5		X			•
EDSS 8.0 – 9.5		X			•

Overall Comments:

- See comments under practice settings (above)

Entry-Level Criteria	Students should learn to administer tool	Students should be exposed to tool (e.g. to read literature)	Do not recommend	Comments
Should this tool be required for entry level curricula?			X	• Although the MusiQoL is clinically feasible, reliable, and valid, it is relatively new, so not as well known or commonly reported as other MS-specific QOL measures.

Research Use	YES	NO	Comments
Is this tool appropriate		X	• May be appropriate if studying patients

for research purposes?			from diverse cultural backgrounds. • Do not recommend at this time as small effect sizes suggest limited responsiveness; however, the MusiQoL may be useful for studies involving patients with varied cultural backgrounds and studies published in international journals

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11. O'Brien J, Lee L, Moore F, Myles ML, Feinstein A, Vickrey B. CoMPaRe - comparing MusiQoL and MSQoL-54 in MS patients on long-term Rebif® therapy: responsiveness to change at the 6-month follow-up. Paper presented at: 25th Congress of the European Committee for the Treatment and Research in Multiple Sclerosis (ECTRIMS); September 11, 2009; Düsseldorf, Germany.

12. Al-Tahan AM, Al-Jumah MA, Bohlega SM, et al. The importance of quality-of-life assessment in the management of patients with multiple sclerosis. Recommendations from the Middle East MS Advisory Group. *Neurosciences (Riyadh).*2011;16(2):109-113.

Instrument name: Multiple Sclerosis Quality of Life (MS-QOL 54)	
Reviewer: Diane D. Allen, PT, PhD	**Date of review:** 4/30/11

ICF domain (check all that apply):

_____ Body function/structure __x___ Activity __x___ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance
_____ Ataxia
_____ Cardiovascular/pulmonary status
_____ Coordination (non-equilibrium)
_____ Dizziness/vestibular
__x___ Fatigue
_____ Flexibility
_____ Muscle performance
_____ Muscle tone / spasticity
__x___ Pain
_____ Posture
_____ Sensory integration
_____ Somatosensation

_____ Balance/falls
_____ Bed mobility
_____ Gait
_____ Reach and grasp
_____ Self care
_____ Transfers
_____ Wheelchair skills

__x___ Health and wellness
_____ Home management
_____ Leisure
__x___ Quality of life
__x___ Role function
_____ Shopping
__x___ Social function
_____ Work

Other: Cognitive function, sexual function

Type of measure:

_____ Performance-based __x___ Self-report

Instrument description:

- The MSQOL-54 is a multidimensional health-related quality of life measure that combines both generic and MS-specific items into a single instrument.[1]
- The generic items are from the SF-36 to which 18 items were added to provide more information regarding MS-specific issues.[2] No overall summary score is used: the MSQOL-54 consists of 12 subscales, two combined summary scores, and two single-item measures. The subscales are: physical function, role limitations-physical, role limitations-emotional, pain, emotional well-being, energy, health perceptions, social function, cognitive function, health distress, overall quality of life, and sexual function. The summary scores are the physical health composite summary and the mental health composite summary. The single item measures are satisfaction with sexual function and change in health.

Reliability (test-retest, intra-rater, inter-rater)	Internal consistency (Cronbach's alpha): • .75-.96 among 12 subscales[1]; 0.69 to 0.95[3]; 0.84[4] Intra-rater:

	• Inter-rater: • Test-retest: • ICC 0.66 to 0.96[1]
Validity (concurrent, criterion-related, predictive)	Concurrent validity: • Subscales significantly related to EDSS: -0.75 (physical health) to -0.15 (cognitive functioning)[3]; from -0.64 (physical composite) to -0.29 (sexual function)[5] • Using regression analysis, abnormalities on MRI were able to predict role limitations due to physical dysfunction, role limitations due to emotional dysfunction, sexual function, and mental health composite[5] • Physical component of MSQOL significantly related to UE function (9 hole peg test) -0.375 dominant and -0.372 non-dominant hand[6] Predictive validity: • Discriminative validity: • The physical function and role limitations-physical subscales were the ones that best discriminated between MS patients and the normative U.S. population. The MSQOL-54 also showed significant associations with MS symptom severity during the prior year, level of ambulation, employment limitations due to health problems, and hospital admissions during the prior year.[1] • Significant differences in scores between subjects with mild vs. moderate self-report of symptom severity in the past year.[1] • Significant difference in subscale scores between those with relapsing remitting and secondary progressive MS on all except: fatigue, cognitive function and sexual function[5] Sensitivity/Specificity/Predictive Values/Likelihood Ratios: • Area under the curve for physical health composite is .67 and mental health composite is .70 to distinguish between those who did vs. did not improve over the 8 weeks monitored following an exacerbation[7]
Ceiling/floor effects	Ceiling effects: • Role limitations physical and role limitations emotional sub-scales[8]; physical health composite[7] Floor effects: • Role limitations physical and role limitations emotional sub-scales[8]
Sensitivity to change	MDC:

(responsiveness, MCID, MDC) / normative data	• MCID: • Other responsiveness values: • MSQOL-54 more sensitive to change than generic QOL (WHO QOL Brief from Turkish version) measure in patients with MS receiving methylprednisolone treatment[9] • In people with MS, EDSS scores 5.5-8.0, both physical and mental health composite scores of the MSQOL-54 improved after 12 weeks of body-weight supported treadmill training.[10] • In a randomized controlled trial of people with MS, EDSS scores 1.0-5.5, function and gait speed improved in the treatment group but EDSS scores and MSQOL-54 did not change following a 6-month exercise treatment[4] Normative Data: •
Instrument use	• The MSQOL-54 is a structured, self-report questionnaire that the patient can generally complete with little or no assistance. It may also be administered by an interviewer. However, patients with visual or upper extremity impairments may need to have the MSQOL-54 administered as an interview. Interviewers should be trained in basic interviewing skills and in the use of this instrument.
Equipment required	• none
Time to complete	• 11-18 minutes
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• There is no single overall score for the MSQOL-54. Two summary scores - **physical health** and **mental health** - can be derived from a weighted combination of scale scores. There are 12 subscales: **physical function, role limitations-physical, role limitations-emotional, pain, emotional well-being, energy, health perceptions, social function, cognitive function, health distress, overall quality of life**, and **sexual function**. Sub-scale scores require a scoring key because of reverse scoring on some items. There are also two single-item measures: **satisfaction with sexual function and change in health.**
Level of client participation required (is proxy participation available?)	• Self-report
Limitations	• Validity is limited if there is a high percentage of missing data, such as in the two sexual scales.[11] The scale can take 10-20 minutes to score because each sub-scale must be scored and weighted separately in the composite summary scores.
Recommendations **Practice Setting (check all that apply):**	

__x___ Acute
__x___ Inpatient Rehab
__x___ Home Health
__x___ Skilled Nursing
__x___ Outpatient

Comments:

- Recommend creating a computerized scoring mechanism so that when patient responses are entered, the scales and composite scores are computed automatically.

Level of Disability (check all that apply):

__x___ EDSS 0.0 – 3.5
__x___ EDSS 4.0 – 5.5
__x___ EDSS 6.0 – 7.5
__x___ EDSS 8.0 – 9.5

Comments:

-

Should this tool be required for entry-level curricula?

__x___ Yes _____ No

Comments:

- Or one of the other health-related quality of life instruments

Is this tool appropriate for research purposes?

__x___ Yes _____ No

Comments:

-

Attachments: For permission to use the MSQOL-54, please contact Dr. Barbara Vickrey at bvickrey@ucla.edu.

- Score Sheets: _____ Uploaded on website __x___ Available but copyrighted _____ Unavailable
- Instructions: _____ Uploaded on website ___x__ Available but copyrighted _____ Unavailable
- Reference list: _____ Uploaded on website

Second Reviewer Comments:

- I agree with the recommendations of the primary reviewer.

Overall Taskforce Agreement with Recommendations:

•

Practice Setting	4	3	2	1	Comments
Acute		X			• Scored lower because of time it takes to complete.
Inpatient Rehab	X				•
Home Health	X				•
Skilled Nursing	X				•
Outpatient	X				•

Overall Comments:

- Hungarian, Persian, Serbian, Spanish, Turkish, French Canadian, Japanese version
- http://www.nationalmssociety.org/for-professionals/researchers/clinical-study-measures/msqol-54/index.aspx

Level of Disability	4	3	2	1	Comments
EDSS 0.0 – 3.5	X				•
EDSS 4.0 – 5.5	X				•
EDSS 6.0 – 7.5	X				•
EDSS 8.0 – 9.5	X				•

Overall Comments:

-

Entry-Level Criteria	Students should learn to administer tool	Students should be exposed to tool (e.g. to read literature)	Do not recommend	Comments
Should this tool be required for entry level curricula?	X			• Or, use one of the other health-related quality of life tools

Research Use	YES	NO	Comments
Is this tool appropriate for research purposes?	X		• Used to represent health-related quality of life in many research trials in people with MS

References:

1. Vickrey BG, Hays RD, Harooni R, Myers LW, Ellison GW. A health-related quality of life measure for multiple sclerosis. *Qual Life Res.* 1995;4:187-206.
2. Vickrey BG, Hays RD, Genovese BJ, Myers LW, Ellison GW. Comparison of a generic to disease-targeted health-related quality of life measures for multiple sclerosis. *J Clin Epidemiol.* 1997;50:557-569.
3. Miller A, Dishon S. Health-related quality of life in multiple sclerosis: psychometric analysis of inventories. *Mult Scler.* 2005;11:450-458.
4. Heiskanen S, Merilainen P, Pietila A-M. Health-related quality of life--testing the reliability of the MSQOL-54 instrument among MS patients. *Scand J Caring Sci.* 2007;21:199-206.
5. Janardhan V, Bakshi R. Quality of life and its relationship to brain lesions and atrophy on magnetic resonance images in 60 patients with multiple sclerosis. *Arch Neurol.* 2000;57:1485-1491.
6. Yozbatiran N, Baskurt F, Baskurt Z, Ozakbas S, Idiman E. Motor assessment of upper extremity function and its relation with fatigue, cognitive function and quality of life in multiple sclerosis patients. *J Neurol Sci.* 2006;246:117-122.
7. Giordano A, Pucci E, Naldi P, et al. Responsiveness of patient reported outcome measures in multiple sclerosis relapses: the REMS study. *J Neurol Neurosurg Psychiatry.* 2009;80:1023-1028.
8. Twork S, Wiesmeth S, Spindler M, et al. Disability status and quality of life in multiple sclerosis: non-linearity of the Expanded Disability Status Scale (EDSS). *Health Qual Life Outcomes.* 2010;8:55-60.
9. Ozakbas S, Akdede BB, Kosehasanogullari G, Aksan O, Idiman E. Difference between generic and multiple sclerosis-specific quality of life instruments regarding the assessment of treatment efficacy. *J Neurol Sci.* 2007;256:30-34.
10. Pilutti LA, Lelli DA, Paulseth JE, et al. Effects of 12 weeks of supported treadmill training on functional ability and quality of life in progressive multiple sclerosis: a pilot study. *Arch Phys Med Rehabil.* 2011;92:31-36.
11. Freeman JA, Hobart JC, Thompson AJ. Does adding MS-specific items to a generic measure (the SF-36) improve measurement? *Neurol.* 2001;57:68-74.

Instrument name: Multiple Sclerosis Quality of Life Inventory	
Reviewer: Amy M. Yorke, PT, NCS	**Date of review:** 7/9/11

ICF domain (check all that apply):

__x___ Body function/structure ___x__ Activity __x___ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance
_____ Ataxia
_____ Cardiovascular/pulmonary status
_____ Coordination (non-equilibrium)
_____ Dizziness/vestibular
__x___ Fatigue
_____ Flexibility
_____ Muscle performance
_____ Muscle tone
__x___ Pain
_____ Posture
_____ Sensory integration
_____ Somatosensation

_____ Balance/falls
_____ Bed mobility
__x___ Gait
_____ Reach and grasp
_____ Transfers
_____ Wheelchair skills

_____ Health and wellness
_____ Home management
_____ Leisure
___x__ Quality of life
___x__ Role function
_____ Shopping
___x__ Social function
_____ Work

Other: bowel, bladder, sexual function, vision, mental health, cognition and social support

Type of measure:

_____ Performance-based ___x__ Self-report

Instrument properties:

- MSQLI is a battery of tests consisting of 138 items organized into 10 individual scales providing a quality of life measure that is both generic and MS-specific.[1]
  - Health Status Questionnaire (SF-36): 36 items
  - Modified Fatigue Impact Scale (MFIS): 21 items*
  - MOS Pain Effects Scale (PES): 6 items
  - Sexual Satisfaction Scale (SSS): 5 items
  - Bladder Control Scale (BLCS): 4 items
  - Bowel Control Scale (BWCS): 5 items
  - Impact of Visual Impairment Scale (IVIS): 5 items
  - Perceived Deficits Questionnaire (PDQ): 20 items*
  - Mental Health Inventory (MHI): 18 items*
  - MOS Modified Social Support Survey (MSSS): 18 items*
- Several of the individual scales have been supplied in both a full length and abbreviated version* reducing the number of items to 81.[1]

• Assesses current health status from the patient's perspective.[1]	
Reliability (test-retest, intra-rater, inter-rater)	Internal Consistency • Good to excellent for the symptom specific scales (MFIS, PDQ, MHI, MSSS) (alphas = 0.77-0.97)[1,2] • Good to excellent for generic HRQL Summary Scales (alphas = 0.89-0.95) [1,2] • Good to excellent for SF-36 subscales (alphas = 0.75-0.94) except social functioning (alpha = 0.67) [1,2] Intra-rater: • Inter-rater: • Test-retest: • Good for PCS/SF-36 (.69) and MHI (.90).[3]
Validity (concurrent, criterion-related, predictive)	Concurrent validity: • SF-36 Physical Component and Sickness Impact Profile (SIP) strong correlation (r = - 0.62)[2] • SF-36 Mental Component Summary and SIP Psychosocial dimension (r = -0.51) [2] • BLCS, BWCS, SSS, IVIS, PES, MSSS demonstrated moderate correlations with measures of different constructs (r values $\leq \lvert 0.40 \rvert$)[2] • MFIS, PDQ, and MHI correlated strongly with each other (r values > $\lvert 0.45 \rvert$)[2] • BLCS and BWSC correlated moderately with the Bladder and Bowel FSS[2] • IVIS correlated moderately with visual acuity, visual and brainstem FSS, and EDSS[2] Predictive validity: • Discriminative validity: • Sensitivity/Specificity/Predictive Values/Likelihood Ratios: •
Ceiling/floor effects	Ceiling effects: • Floor effects: •
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • MCID: •

	Other responsiveness values: • Normative Data: •
Instrument use	• Recommended that the instrument be used in its entirety on an annual basis[3]
Equipment required	• Score sheets
Time to complete	• 45 minutes full version, 30 minutes abbreviated version
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• Each scale is scored separately, representing a different aspect of quality of life[1] o Health Status Questionnaire (SF-36): Score range 0-100, higher score indicating better health ▪ Physical Functioning: Score range 0-100 ▪ Role-Physical: Score range 0-100 ▪ Bodily Pain: Score range 0-100 ▪ General Health: Score range 0-100 ▪ Vitality: Score range 0-90 ▪ Social Functioning: Score range 12.5-100 ▪ Role-Emotional: Score range 0-100 ▪ Mental Health: Score range 0-100 ▪ Physical Component Summary Score: Score range 13.6-61.9 ▪ Mental Component Summary Score: Score range 15.6-70.0 o Modified Fatigue Impact Scale (MFIS): Score range 0-100, higher scores indicate greater impact of fatigue on patients' activities. Can be broken down into 3 subscales ▪ Physical Subscale, score range 0-36 ▪ Cognitive Subscale, score range 0-40 ▪ Psychosocial Subscale, score range 0-84 o MOS Pain Effects Scale (PES): Score range 6-30 with higher scores indicating a greater impact of pain on a patient's mood and behavior o Sexual Satisfaction Scale (SSS): Score range 4-24, higher score indicate greater problems with sexual satisfaction o Bladder Control Scale (BLCS): Scores range 0-22, higher scores indicating greater bladder problems o Bowel Control Scale (BWCS): Scores range 0-25, higher scores indicating greater bowel control problems o Impact of Visual Impairment Scale (IVIS): Scores range 0-15, higher scores indicate greater impact of visual problems on daily activities o Perceived Deficits Questionnaire (PDQ): Scores ranges 0-80 with higher scores indicate greater perceived

	cognitive impairment. Can be broken down into 4 subscales: ▪ Attention/concentration, score range 0-20 ▪ Retrospective Memory, score range 0-20 ▪ Prospective Memory, score range 0-20 ▪ Planning/Organization, score range 0-20 o Mental Health Inventory (MHI): Score range 0-100, with higher scores indicating better mental health. Can be broken down into 4 subscales: ▪ Anxiety, score range 0-100 ▪ Depression, score range 0-100 ▪ Behavioral Control, score range 0-100 ▪ Positive Affect, score range 0-100 o MOS Modified Social Support Survey (MSSS): Score range 0-100 with higher scores indicating greater perceived support. Can be broken down into 4 subscales: ▪ Tangible Support, score range 0-100 ▪ Emotional/Information Support, score range 0-100 ▪ Affectionate Support , score range 0-100 ▪ Positive Social Interaction, score range 0-100
Level of client participation required (is proxy participation available?)	• Self-report of current health status, can be self-administered or interviewer administered if the person with MS has physical impairments that impede their ability to accurately complete the test
Limitations	• Does not provide a single number to summarize quality of life; however, it provides several scores, of which each one represents a specific aspect of quality of life

Recommendations
Practice Setting (check all that apply):

_____ Acute
_____ Inpatient Rehab
_____ Home Health
_____ Skilled Nursing
___x__ Outpatient

Comments:
- Due to the length of time to complete, outpatient scenario would be best suited for the MSQLI

Level of Disability (check all that apply):

_x____ EDSS 0.0 – 3.5
_x____ EDSS 4.0 – 5.5

_x____ EDSS 6.0 – 7.5
_x____ EDSS 8.0 – 9.5

Comments:

Should this tool be required for entry-level curricula?

_____ Yes __x___ No

Comments:

- Tool is complex and requires the knowledge and ability to utilize 10 different subscales

Is this tool appropriate for research purposes?

___x__ Yes _____ No

Comments:

- Designed to assess a wide range of outcomes

Attachments:

- Score Sheets: __x___ Uploaded on website _____ Available but copyrighted _____ Unavailable http://www.nationalmscossociety.org/for-professionals/researchers/clinical-study-measures/msqli/download.aspx?id=260
- Instructions: ___x__ Uploaded on website _____ Available but copyrighted _____ Unavailable http://www.nationalmssociety.org/for-professionals/researchers/clinical-study-measures/msqli/download.aspx?id=260
- Reference list: _____ Uploaded on website

Second Reviewer Comments:

- I agree with recommendation for use in outpatient setting primarily. The full scale is long (40 minutes) and even the abbreviated scale has 81 items. Users should be sure they are not duplicating data: this scale contains the SF-36 and the MFIS (fatigue scale) along with a MHI (mental health inventory).

Overall Taskforce Agreement with Recommendations:

-

Practice Setting	4	3	2	1	Comments
Acute				X	•
Inpatient Rehab				X	•
Home Health				X	•
Skilled Nursing				X	•

Outpatient		X			•
Overall Comments: • Test most appropriate for those being seen in an outpatient setting where changes would be monitored over weeks or months instead of days.					
Level of Disability	**4**	**3**	**2**	**1**	**Comments**
EDSS 0.0 – 3.5		X			•
EDSS 4.0 – 5.5		X			•
EDSS 6.0 – 7.5		X			•
EDSS 8.0 – 9.5		X			•
Overall Comments: • Length of time to complete the measure is the largest barrier for clinical utility					

Entry-Level Criteria	**Students should learn to administer tool**	**Students should be exposed to tool (e.g. to read literature)**	**Do not recommend**	**Comments**
Should this tool be required for entry level curricula?			X	• Tool is complex and requires the knowledge and ability to utilize 10 different subscales

Research Use	**YES**	**NO**	**Comments**
Is this tool appropriate for research purposes?	X		• Designed to assess numerous outcomes for MS related research that are related to general and specific quality of life issues that affect people with MS

References:

1. National Multiple Sclerosis Society: *Multiple Sclerosis Quality of Life Inventory: A User's Manual.* Available at http://www.nationalmssociety.org/for-professionals/researchers/clinical-study-measures/msqli/download.aspx?id=260. Accessed July 2011.
2. Fischer JS, LaRocca NG, Miller DM, Ritvo PG, Andrews H, Paty D. Recent developments in the assessment of quality of life in multiple sclerosis (MS). *Multiple Sclerosis.* 1999;5:251-259.
3. Miller DM, Allen R. Quality of life in multiple sclerosis: Determinants, measurement, and use in clinical practice. *Curr Neurol Neurosci Rep.* 2010;10:397-406.

Instrument name: Multiple Sclerosis Spasticity Scale (MSSS-88)

Reviewer: Kathleen Brandfass, MS, PT | **Date of review:** 3/14/11

ICF domain (check all that apply):

__x___ Body function/structure ___x__ Activity ___X__ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance
_____ Ataxia
_____ Cardiovascular/pulmonary status
_____ Coordination (non-equilibrium)
_____ Dizziness/vestibular
_____ Fatigue
_____ Flexibility
_____ Muscle performance
___X__ Muscle tone / spasticity
___X__ Pain
_____ Posture
_____ Sensory integration
_____ Somatosensation
_____ Balance/falls
___X__ Bed mobility
___X__ Gait
_____ Reach and grasp
___X__ Self care
_X___ Transfers
_____ Wheelchair skills
__X___ Health and wellness
_____ Home management
_____ Leisure
_____ Quality of life
__X___ Role function
_____ Shopping
___X__ Social function
_____ Work

Other: The MSSS-88 assesses the impact of spasticity on various aspects of body function/structure, activity, and participation.

Type of measure:

_____ Performance-based _X____ Self-report

Instrument description:

- The MSSS-88[1] is a self report measure designed to capture the individual's perception of disease related spasticity on daily life.
- Eight subscales: muscle stiffness, pain/discomfort, muscle spasms, activities of daily living, walking, body movements, emotional health, and social functioning.

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • Inter-rater: • Test-retest: • Person separation indices: • MSSS-88 subsections demonstrate excellent reliability: muscle stiffness = 0.95; pain and discomfort = 0.95; muscle spasms = 0.93; activities of daily living = 0.95; walking = 0.96; body movement = 0.96; emotional health = 0.96; social functioning =

	0.95[1]
Validity (concurrent, criterion-related, predictive)	Concurrent validity: • Entire Scale and Subscales were correlated to existing self report measures: MSIS-29 physical ranged from 0.51 – 0.77; MSIS-29 psychological 0.34 – 0.79; SF-36 physical function 0.29 – 0.72; SF-36 mental health 0.32 – 0.77; Functional Assessment of MS (FAMS) mobility 0.23 – 0.54; FAMS emotional health 0.33 – 0.81; General health quesionniare-12 0.27 – 0.71; and Barthel Index 0.14 – 0.73$_1$; among MSSS-88 subscales ranged 0.35 – 0.83.[1] Predictive validity: • Discriminative validity: • Sensitivity/Specificity/Predictive Values/Likelihood Ratios: •
Ceiling/floor effects	Ceiling effects: • No ceiling effect noted[1] Floor effects: • No floor effect noted[1]
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: not included • MCID: not included • Other responsiveness values: • Normative Data: •
Instrument use	• Clinical and research self report
Equipment required	• Questionnaire • Pen/pencil
Time to complete	• Not indicated
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• 88 item questionnaire; 4 response options: 1- not bothered, 2- a little bothered, 3-moderately bothered, 4- extremely bothered. • Three methods for scoring: • 1- Sum entire questionnaire to generate an ordinal level total score. Missing responses can be with the mean score if 50% or more of items completed • 2-Compute subscale scores individually • 3-Utilize Rasch analysis software
Level of client participation required (is proxy participation available?)	• Individual completes questionnaire
Limitations	• Length of time to complete questionnaire due to 88 items • To generate interval-level measurements software is required.

Recommendations
Practice Setting (check all that apply):

_____ Acute
__X___ Inpatient Rehab
__X___ Home Health
_____ Skilled Nursing
__X___ Outpatient

Comments:
-

Level of Disability (check all that apply):

__X__ EDSS 0.0 – 3.5
__X___ EDSS 4.0 – 5.5
__X___ EDSS 6.0 – 7.5
_____ EDSS 8.0 – 9.5

Comments:
-

Should this tool be required for entry-level curricula?

_____ Yes __X___ No

Comments:
- Not recommended due to limited focus of the measure (impact of spasticity) and lack of psychometric data

Is this tool appropriate for research purposes?

_____ Yes ___x__ No

Comments:
- Due to uncertain reliability and responsiveness, do not recommend for studies examining the effectiveness of interventions; the measure would benefit from research examining it's psychometrics

Attachments:

- Score Sheets: _____ Uploaded on website __x___ Available but copyrighted _____ Unavailable http://brain.oxfordjournals.org/content/suppl/2006/04/12/awh675.DC1/awh675supp.pdf
- Instructions: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Reference list: _____ Uploaded on website

Second Reviewer Comments:

• Agree with ratings and recommendations. While the MSSS-88 seems to be a valid measure in MS and has broad applicability for patients with MS (is appropriate for patients at all EDSS levels and in all settings), psychometric data is lacking. Additionally, the test is lengthy which may limit clinical utility and the focus on the impact of the patient's spasticity may be of limited relevance. Nevertheless, more psychometric data is warranted.
Overall Taskforce Agreement with Recommendations: •

Practice Setting	**4**	**3**	**2**	**1**	**Comments**
Acute			X		•
Inpatient Rehab			X		•
Home Health			X		•
Skilled Nursing			X		•
Outpatient			X		•
Overall Comments: •					

Level of Disability	**4**	**3**	**2**	**1**	**Comments**
EDSS 0.0 – 3.5			X		•
EDSS 4.0 – 5.5			X		•
EDSS 6.0 – 7.5			X		•
EDSS 8.0 – 9.5			X		•
Overall Comments: •					

Entry-Level Criteria	**Students should learn to administer tool**	**Students should be exposed to tool (e.g. to read literature)**	**Do not recommend**	**Comments**
Should this tool be required for entry level curricula?			X	• Not recommended due to limited focus of the measure (impact of spasticity) and lack of psychometric data

Research Use	**YES**	**NO**	**Comments**

Is this tool appropriate for research purposes?		X	• Due to uncertain reliability and responsiveness, do not recommend for studies examining the effectiveness of interventions; the measure would benefit from research examining it's psychometrics

References:

1. Hobart JC, Riazi A, Thompson AJ., et al. Getting the measure of spasticity in multiple sclerosis: The Multiple Sclerosis Spasticity Scale (MSSS-88). *Brain* 2006; 129: 224-234.

Instrument name: Neuropathic Pain Scale (NPS)

Reviewer: Kathleen Brandfass, MS, PT | **Date of review:** 8/13/11

ICF domain (check all that apply):

_X____ Body function/structure _____ Activity _____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance
_____ Ataxia
_____ Cardiovascular/pulmonary status
_____ Coordination (non-equilibrium)
_____ Dizziness/vestibular
_____ Fatigue
_____ Flexibility
_____ Muscle performance
_____ Muscle tone / spasticity
__X__ Pain
_____ Posture
_____ Sensory integration
_____ Somatosensation

_____ Balance/falls
_____ Bed mobility
_____ Gait
_____ Reach and grasp
_____ Self care
_____ Transfers
_____ Wheelchair skills

_____ Health and wellness
_____ Home management
_____ Leisure
_____ Quality of life
_____ Role function
_____ Shopping
_____ Social function
_____ Work

Other:

Type of measure:

_____ Performance-based __X___ Self-report

Instrument description:

- Developed to assess distinct pain qualities associated with neuropathic pain (described in an introduction to the measure and intended to facilitate an understanding of how pain may present sensations differently and how unpleasantness differs from intensity)[1]
- The scale includes 11 items of neuropathic pain: two items that describe global aspects of pain (intensity and unpleasantness), eight items that describe specific pain qualities (sharp, hot, dull, cold, sensitive, itchy, deep, and surface) and one item asking the individual to describe the temporal sequence of pain.
- The NPS has been translated into 24 languages[2]

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • Inter-rater: • Test-retest: • Short-term (~ 1-week time period between 2 test

	administrations): individuals diagnosed with MS completed the NPS, administered via postal service and then in the clinic; NPS scores demonstrated a 1 point difference on total NPS score; 95% limits of agreement were -12 to 14[3] • Long-term: 79 individuals diagnosed with stable MS completed the NCS on two occasions (mean of 33 days apart; range 18 to 126 days); ICC for total NPS score was 0.71 and individual item ICC values ranged from 0.45 to 0.78[3] • Rog et al[3] also performed test-retest reliability with 21 – 42 day interval (simulating intervals used in pain clinical trials); total NPS ICC = 0.72 with a range from 0.32 – 0.84 for individual NPS items
Validity (concurrent, criterion-related, predictive)	<u>Concurrent validity:</u> • NPS 10 item total: correlated with Short Form McGill Pain Questionnaire (SFMPQ) rho = 0.63; SFMPQ present pain intensity rho = 0.48, and SFMPQ visual analog scale rho = 0.49; also correlated with Short Form 36 Health Survey (SF-36) bodily pain subscale rho = -0.49 (all $p < 0.001$); NPS did not correlate significantly with the EDSS, other SF-36 subscales, or Hospital Anxiety and Depression Scale[3] <u>Predictive validity:</u> • <u>Discriminative validity:</u> • <u>Sensitivity/Specificity/Predictive Values/Likelihood Ratios:</u> •
Ceiling/floor effects	<u>Ceiling effects:</u> • No ceiling effects demonstrated[3] <u>Floor effects:</u> • NPS items cold, itchy, and sensitive exceeded recommended criteria of 20% therefore demonstrating floor effects[3]
Sensitivity to change (responsiveness, MCID, MDC) / normative data	<u>MDC:</u> • <u>MCID:</u> • <u>Other responsiveness values:</u> •

	Normative Data: •
Instrument use	• The NPS was developed for patients with neuropathic pain due to a variety of conditions (e.g., diabetic neuropathy, complex regional pain syndrome, and peripheral mononeuropathy) and it has been used for patients with MS
Equipment required	• NPS scale • Pen/pencil
Time to complete	• 5-10 minutes
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• Except for the descriptive question, the 10 items are scored on a 0 to 10 scale. Individual items are scored as well as total score.[1, 3] • To measure the multidimensional aspects of neuropathic pain, Galer et al[4] combined items to form four different NPS composite scores: the NPS 10 (sum of all 10 NPS items, on a 0 – 100 scale), NPS 8 (a standardized average score of all NPS items except intensity and unpleasant, normalized to a range of 0 – 100), NPS nonallodynic (NPS NA: a standardized average score defined as the sum of the scores of all 8 sub-items no including allodynia/hyperalgesia {i.e., other than skin sensitivity and surface pain} normalized to a range of 0 – 100 point), and NPS 4 (a standardized average score of the sum of scores of 4 descriptors – sharp, hot, dull, and deep pain, normalized to a range of 0 – 100)
Level of client participation required (is proxy participation available?)	• Either acceptable[3]
Limitations	• Completion of the NPS could be limited by visual or cognitive limitation • Lin et al[5] examined pain descriptors in patients with MS and spinal cord injury and reported that the NPS (developed specifically for patients with neuropathic pain) appears to have inadequate validity for assessing the universe of most commonly used pain descriptors for patients who may have neuropathic and nociceptive pain; of 14 pain descriptors, the NPS includes items pertinent to 5
Recommendations **Practice Setting (check all that apply):** __X___ Acute __X___ Inpatient Rehab __X___ Home Health	

__X___ Skilled Nursing
__X___ Outpatient

Comments:

- NPS and the MS study included individuals independently ambulating, ambulating with an assistive device and nonambulatory. Therefore utilizing NPS will be determined by presence of neuropathic pain not practice setting.[3]

Level of Disability (check all that apply):

__X___ EDSS 0.0 – 3.5
__X___ EDSS 4.0 – 5.5
__X___ EDSS 6.0 – 7.5
__X___ EDSS 8.0 – 9.5

Comments:

- The EDSS has been studied in individuals with a range of EDSS scores and is appropriate for any patient with MS, regardless of EDSS level

Should this tool be required for entry-level curricula?
_____ Yes _X ____ No
Comments:

- This level of neuropathic pain scrutiny is beyond entry level

Is this tool appropriate for research purposes?
_____ Yes __x___ No
Comments:

- Tool appropriate for clinical research; future iterations may be able direct an understanding of the specific central cause of the neuropathic pain.
- However, there is a lack of psychometric data in MS, so do not recommend for use in research at this point in time.
- Recommend investigating psychometric properties in MS.

Attachments:

- Score Sheets: in original article (1) _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Instructions: in original article (1)_____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Reference list: _____ Uploaded on website

Second Reviewer Comments:

- Agree with ratings and recommendations.

Overall Taskforce Agreement with Recommendations:

•

Practice Setting	4	3	2	1	Comments
Acute			X		•
Inpatient Rehab			X		•
Home Health			X		•
Skilled Nursing			X		•
Outpatient			X		•

Overall Comments:

- The NPS has good clinical utility, so can be easily used in any practice setting; rating reflects limited psychometric data (moderate reliability and validity; no responsiveness data; some evidence of floor effects).

Level of Disability	4	3	2	1	Comments
EDSS 0.0 – 3.5			X		•
EDSS 4.0 – 5.5			X		•
EDSS 6.0 – 7.5			X		•
EDSS 8.0 – 9.5			X		•

Overall Comments:

- The NPS can be utilized at for patients at any EDSS level; rating reflects limited psychometric data (moderate reliability and validity; no responsiveness data; some evidence of floor effects). Additionally pain in MS is present across all subtypes, so assessment of pain can be of value to the PT[3]

Entry-Level Criteria	Students should learn to administer tool	Students should be exposed to tool (e.g. to read literature)	Do not recommend	Comments
Should this tool be required for entry level curricula?			X	• NPS is a comprehensive scale devoted to defining neuropathic pain; this outcome measure is beyond entry level criteria.

Research Use	YES	NO	Comments
Is this tool appropriate		X	• Lack of psychometric data in MS, so do

for research purposes?			not recommend for use in research at this point in time. • Recommend investigating psychometric properties in MS.

References:

1. Galer BS, Jensen MP. Development and preliminary validation of a pain measure specific to neuropathic pain: the Neuropathic Pain Scale. *Neurology.*1997;48(2):332-338.
2. Jensen MP, Jensen MP. Review of measures of neuropathic pain. *Curr Pain Headache Rep.*2006;10(3):159-166.
3. Rog DJ, Nurmikko TJ, Friede T, et al. Validation and reliability of the Neuropathic Pain Scale (NPS) in multiple sclerosis. *Clin J Pain.*2007;23(6):473-481.
4. Galer BS, Jensen MP, Ma T, et al. The lidocaine patch 5% effectively treats all neuropathic pain qualities: results of a randomized, double-blind, vehicle-controlled, 3-week efficacy study with use of the neuropathic pain scale. *Clin J Pain.*2002;18(5):297-301.
5. Lin CP, Kupper AE, Gammaitoni AR, Galer BS, Jensen MP. Frequency of chronic pain descriptors: Implications for assessment of pain quality. *European Journal of Pain.*2011;15:628-633.

Instrument name: Nottingham Sensory Assessment (NSA)	
Reviewer: Gail L. Widener, PT, PhD	**Date of review:** 5/14/11

ICF domain (check all that apply):

__x___ Body function/structure _____ Activity _____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance
_____ Ataxia
_____ Cardiovascular/pulmonary status
_____ Coordination (non-equilibrium)
_____ Dizziness/vestibular
_____ Fatigue
_____ Flexibility
_____ Muscle performance
_____ Muscle tone / spasticity
_____ Pain
_____ Posture
_____ Sensory integration
__x___ Somatosensation
_____ Balance/falls
_____ Bed mobility
_____ Gait
_____ Reach and grasp
_____ Self care
_____ Transfers
_____ Wheelchair skills
_____ Health and wellness
_____ Home management
_____ Leisure
_____ Quality of life
_____ Role function
_____ Shopping
_____ Social function
_____ Work

Other:

Type of measure:

__x___ Performance-based _____ Self-report

Instrument description:

- Nottingham Sensory Assessment (NSA) is a standardized scale to measure initial proprioception, two point discrimination and stereognosis in people post stroke and monitor change over time. Many items in the initial scale (1991) were found to be unreliable.[1] The scale was shortened, revised and retested in 1998 (rNSA).[2] The rNSA test was further standardized with more specific instructions in 2006 (EmNSA)[3] resulting in improved reliability scores.

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • NSA was tested in 23 people post stroke - 'good' over a 2-3 week period[1] • EmNSA was tested in 18 people with intracranial disorders - Kappa coefficients between 0.58-1.00 for tactile sensations, sharp/blunt and proprioception, two-point discrimination was .11-.63[3] Inter-rater: • rNSA tested in people post stroke (20 with two PTs and 25 with physician and PT) – 'poor reliability' for both[2] • rNSA tested in 27 people post-stroke: Kappa coefficients showed acceptable agreement in 12 of 86 items.[2] • EmNSA had a Kappa of 0.46-1.00 for tactile sensations, sharp/blunt and proprioception (people with intracranial disorders)[3] • EmNSA had a Kappa was .10-.66 for two-point discrimination[3] Test-retest: •
Validity (concurrent, criterion-related, predictive)	Concurrent validity: • Predictive validity: • Somatosensory tested initially [post-stroke,] was significantly related to somatosensory ability at six months, accounting for 46-71% of the variance.[6] Discriminative validity: • Sensitivity/Specificity/Predictive Values/Likelihood Ratios: •
	Ceiling effects: • Floor effects: •
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • MCID: • Other responsiveness values: • Normative Data: •
Instrument use	• Developed to test somatosensation in people post stroke
Equipment required	• Cotton ball, *neurotip, test tubes of hot water and cold water, talcum powder, blindfold, 3 coins of different denominations

	(dime, nickel, quarter), pencil, pen, comb, scissors, sponge, wash cloth, cup, glass. (translated objects found in England to those found in the US) *Neurotips are sterile single use neurological examination pins that avoid the risk of infection and skin puncture.
Time to complete	60 minutes depending on the client's level on sensory deficit
How is the instrument scored? (e.g., total score, are there subscales, etc…)	EmNSA: <u>For tactile sensation</u> (light touch, pressure, pinprick, temperature, tactile localization, bilateral simultaneous touch are each scored according to this <u>)</u>→ 0 - *Absent* -fails to identify the test sensation on 3 trials 1 - *Impaired* - identifies the test sensation, but not on all 3 trials in each region of the body or feels duller 2 - *Normal* - correctly identifies the test sensation on 3 trials 9 – *Unable to test* <u>For kinesthesia</u> → 0 - *Absent*- no appreciable movement taking place. 1 –*Appreciation of movement taking place* – patient indicates on each movement that a movement takes place by the direction is incorrect. 2 –*Direction of movement sense* – patient is able to appreciate and mirror the direction of the test movement taking place each time, but is inaccurate in its new position. 3 – *Joint position sense* – accurately mirrors the test movement within 10^0 of the new test position. 9 – *Unable to test* <u>For stereognosis</u> → 2 – *Normal* – item is correctly named or matched. 1 - *Impaired* – some features of object identified or attempts at descriptions of objects. 0 – *Absent* – unable to identify the object in any manner. 9 – *Unable to test.*
Level of client participation required (is proxy participation available?)	• Client participation is required.
Limitations	
Recommendations **Practice Setting (check all that apply):** _____ Acute _____ Inpatient Rehab _____ Home Health _____ Skilled Nursing _____ Outpatient	

Comments:

- Could be appropriate in any setting ,but there is a lack of psychometric data to support its use in MS.

Level of Disability (check all that apply):

_____ EDSS 0.0 – 3.5
_____ EDSS 4.0 – 5.5
_____ EDSS 6.0 – 7.5
_____ EDSS 8.0 – 9.5

Comments:

- Could be appropriate for individuals at any EDSS level, but there is a lack of psychometric data to support its use in MS.
- Recommend investigating psychometric properties in MS.

Should this tool be required for entry-level curricula?

_____ Yes __x___ No

Comments:

- This test provides a standardized way of performing commonly taught assessments of somatosensation.

Is this tool appropriate for research purposes?

__x___ Yes _____ No

Comments:

- Schyns et al.[4] have used the NSA to evaluate somatosensory impairment in people with MS, however, given the lower reliability values in people post-stroke and the absence of any psychometric testing in the MS population, other measures might be more useful.

Attachments:

- Score Sheets: _____ Uploaded on website _____ Available but copyrighted _____
-
- Instructions: __X__ Uploaded on website _____ Available but copyrighted _____

www.nottingham.ac.uk/iwho/documents/nsa_instructions_revised.pdf

- Reference list: _____ Uploaded on website

Second Reviewer Comments:

- Agree that the NSA as a whole is not currently recommended for people with MS although the standardized instructions and scoring for components of this measure that are specific to different sensory modalities may be useful when screening for sensory deficits.

Overall Taskforce Agreement with Recommendations:

-

Practice Setting	4	3	2	1	Comments
Acute				X	•
Inpatient Rehab				X	•
Home Health				X	•
Skilled Nursing				X	•
Outpatient				X	•
Overall Comments: •					

Level of Disability	4	3	2	1	Comments
EDSS 0.0 – 3.5				X	•
EDSS 4.0 – 5.5				X	•
EDSS 6.0 – 7.5				X	•
EDSS 8.0 – 9.5				X	•
Overall Comments:					

Entry-Level Criteria	Students should learn to administer tool	Students should be exposed to tool (e.g. to read literature)	Do not recommend	Comments
Should this tool be required for entry level curricula?			X	• Not recommended due beyond entry level, and concerns regarding clinical utility

Research Use	YES	NO	Comments
Is this tool appropriate for research purposes?		X	• This has been used in people with MS and people post stroke,[4,5] however, lack of psychometric data in MS, so do not recommend for use in research at this point in time. • Recommend investigating psychometric properties in MS.

References:

1. Lincoln NB, Crow JL, Jackson JM, Waters GR, Adams SA, Hodgson P. The unreliability of sensory assessments. *Clin Rehabil.* 1991; 5:273-282.
2. Lincoln NB, Jackson JM, Adams SA. Reliability and revision of the Nottingham sensory assessment for stroke patients. *Physiother.* 1998; 84(8):358-365.
3. Stolk-Hornsveld F, Crow JL, Hendriks EP, van der Baan R, Harmeling-van der Wal BC. The Erasmus MC modifications to the Nottingham sensory assessment: a reliable somatosensory assessment measure for patients with intracranial disorders. *Clin Rehabil.* 2006;20:160-172.
4. Schyns R, Paul L, Finlay K, Ferguson C, Noble E. Vibration therapy in multiple sclerosis: a pilot study exploring its effects on tone, muscle force, sensation and functional performance. *Clin Rehabil.* 2009;23:771-718.
5. Hedman LD, Sullivan JE. An initial exploration of the perceptual threshold test using electrical stimulation to measure arm sensation following stroke. *Clin Rehabil.* 22 Mar., 2011; Doi: 10.1177/0269215511399475.
6. Connell LA, Lincoln NB, Redford KA. Somatosensory impairment after stroke: frequency of different deficits and their recovery. *Clin Rehabil.* 2008;22:758-767.

Instrument name: Patient-specific Functional Scale

Reviewer: Evan Cohen, PT, MA, PhD, NCS | **Date of review:** 8/11

ICF domain (check all that apply):

_____ Body function/structure __X__ Activity __X__ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance	_____ Balance/falls	_____ Health and wellness
_____ Ataxia	_____ Bed mobility	_____ Home management
_____ Cardiovascular/pulmonary status	_____ Gait	_____ Leisure
_____ Coordination (non-equilibrium)	_____ Reach and grasp	_____ Quality of life
_____ Dizziness/vestibular	_____ Transfers	_____ Role function
_____ Fatigue	_____ Wheelchair skills	_____ Shopping
_____ Flexibility		_____ Social function
_____ Muscle performance		_____ Work
_____ Muscle tone		
_____ Pain		
_____ Posture		
_____ Sensory integration		
_____ Somatosensation		

Other: Goals are determined by the patient and can include any activity and participation constructs.

Type of measure:

_____ Performance-based __X__ Self-report

Instrument properties:

- The Patient-specific Functional Scale (PSFS) is a patient-specific tool with patient-determined outcomes. Upon initial administration of the PSFS, the individual identifies up to five activities perceived as difficult due to their health condition. Two studies limited the number of activities to three[1,2]. The single identified study that used the PSFS on a sample of individuals with MS limited the number to one or two[3]. The patient then rates the level of difficulty for each of the identified activities on a scale from 0 (unable to perform the activity) to 10 (able to perform the activity at the "pre-injury" level. The tool's creators suggest changing "pre-injury" to a term appropriate for the individual being tested[4]. For follow-up measurements, the patient is asked to rate the current level of difficulty with the same activities.

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • Inter-rater: •

	Test-retest: • Test-retest reliability is high for PSFS average scores in a variety of populations including people with mechanical low back pain (ICC = .97)[4], knee dysfunction (ICC = .97)[5], neck dysfunction (ICC = .92)[2] and cervical radiculopathy (ICC = .82)[1]. Where reported, test-retest reliability is also high for individual PSFS items with ICC ranging from .84[5] to .91[2].
Validity (concurrent, criterion-related, predictive)	Concurrent validity: • In a case series of 13 PWMS (EDSS range 1.0-7.5) who underwent a program of therapeutic horseback riding, clinical evidence of concurrent validity was found between PSFS score(s) (on one to two items) and the Role-Emotional scale of the Health Status Questionnaire (SF-36)[3]. • Concurrent validity was found between PSFS average scores and the Roland-Morris questionnaire in people with mechanical low back pain (ρ = -.55 - -.74, p < .001)[4], the Neck Disability Index in people with cervical dysfunction[2] and cervical radiculopathy[1] (ICC = .82, and Pearson correlation coefficient of .82, respectively), and with the Global Rating of Change Scale (ICC =.77) and certain dimensions of the SF-36 in people with knee dysfunction[5]. Predictive validity: • Discriminative validity: • Sensitivity/Specificity/Predictive Values/Likelihood Ratios: • The PSFS was more sensitive to change on the Global Rating of Change Scale (ρ = -.77, 95% CI .61-.89) than the SF-36 in people with knee dysfunction[5], but was no more sensitive to change on a prognostic rating scale than the Neck Disability Index in people with neck dysfunction[2].
Ceiling/floor effects	Ceiling effects: • Floor effects: • The PSFS seems to offer a basis to measure improvement but may have a floor effect if the PWMS is having an active increase in disability (Paul Stratford, DipPT, MSc, oral communication, 2011).
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • 90% confidence interval MDC values for PSFS average scores

	varied from .96 in people with mechanical low back pain[2], .99 in people with neck dysfunction[2], 1.5 in people with knee dysfunction[5] and 2.1 in people with cervical radiculopathy [1]. 90% confidence interval MDC values for PSFS individual item scores ranged from 1.18 in people with neck dysfunction[2] to 2.5 in people with knee dysfunction[5]. <u>MCID:</u> • The general estimate of MCID of the PSFS is 2.5 points[6]. The PSFS had sensitivity of .95 (95% CI, .77-.92) and specificity of 1.0 (95% CI, .82-1.0) for an MCID of 2.0 in people with cervical radiculopathy[1]. <u>Other responsiveness values:</u> • In a case series of 13 PWMS (EDSS range 1.0-7.5) who underwent a program of therapeutic horseback riding, there was evidence of clinically significant change in PSFS[3] • In people with neck dysfunction, PSFS average change scores correlated with Neck Disability Index change scores (95% CI = .83) and with a prognostic rating scale (95% CI = .52)[2]. PSFS individual change scores also correlated with the Neck Disability Index with 95% CI ranging from .79-.81[2]. <u>Normative Data:</u> •
Instrument use	
Equipment required	• PSFS form or blank paper and a writing implement
Time to complete	• 4 minutes (+/- 1.9)[5].
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• Scores can be used for each patient identified goal or an average score for all patient identified goals.
Level of client participation required (is proxy participation available.)	• Clients should be included in deciding what goals are important to pursue and determine how meaningful those goals are to them. As PSFS is individualized, client participation is generally required; however, it seems possible that a proxy could participate if the patient or client is unable to set goals.
Limitations	• Not a standardized outcome measure, thus likely to be better at detecting individual rather than population changes. There is little information about the tool's psychometric properties in PWMS.
Recommendations **Practice Setting (check all that apply):**	

_____ Acute
__X__ Inpatient Rehab
__X__ Home Health
__X__ Skilled Nursing
__X__ Outpatient

Comments:

- Does not seem appropriate for the acute setting because of the short time frame for the typical episode of acute care PT.
- Participants in the referenced studies typically rated their difficulty in performing the identified problems low (means of approximately 3-4) at baseline. This means that the scale allows for measurement of substantial improvement, but may be properly sensitive in measuring decline (Paul Stratford, DipPT, MSc, oral communication, 2011). This may be problematic in using the PSFS in PWMS who are having a declining disease course.

Level of Disability (check all that apply):

__X__ EDSS 0.0 – 3.5
__X__ EDSS 4.0 – 5.5
__X__ EDSS 6.0 – 7.5
__X__ EDSS 8.0 – 9.5

Comments:

- The PSFS seems like it might be useful across levels of MS-related disability, but there is minimal evidence of its use currently in PWMS.

Should this tool be required for entry-level curricula?

_____ Yes __X__ No

Comments:

-

Is this tool appropriate for research purposes?

_____ Yes __X__ No

Comments:

- The PSFS may be a useful tool for identifying changes that may be missed by standardized outcomes; however, further examination of the tool's psychometric properties in PWMS should be conducted as this tool is applied for research use.

Attachments:

- Score Sheets: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable

- Instructions: _____ Uploaded on website __X__ Available but copyrighted _____ Unavailable Can be found in Stratford PW, Gill C, Westaway MD, Binkley JM. Assessing Disability and Change on Individual Patients: A Report of a Patient Specific Measure. Physiotherapy Canada. Fall 1995;47(4):258-263.
- Reference list: _____ Uploaded on website

Second Reviewer Comments:

- I agree with the recommendations of the primary reviewer.

Overall Taskforce Agreement with Recommendations:

-

Practice Setting	4	3	2	1	Comments
Acute				X	•
Inpatient Rehab			X		•
Home Health			X		•
Skilled Nursing			X		•
Outpatient			X		•

Overall Comments:

- The only evidence for the use of the PSFS in PWMS was a case series of PWMS who attended an outpatient therapy program.

Level of Disability	4	3	2	1	Comments
EDSS 0.0 – 3.5			X		•
EDSS 4.0 – 5.5			X		•
EDSS 6.0 – 7.5			X		•
EDSS 8.0 – 9.5			X		•

Overall Comments:

- There is some published evidence for the use of the PSFS for PWMS with an EDSS of 1.0-7.5. This tool, with patient-specified (or caregiver-specified) activities or tasks of interest, might be the only one applicable for PWMS at EDSS 8.0-9.5 since other tools might have too much of a floor effect. Currently there is no evidence of the tool's psychometric properties in patients with severe levels of disability.

Entry-Level Criteria	Students should learn to administer tool	Students should be exposed to tool (e.g. to read	Do not recommend	Comments

		literature)		
Should this tool be required for entry level curricula?			X	•
Research Use	**YES**	**NO**	**Comments**	
Is this tool appropriate for research purposes?		X	• Additional research on the psychometric properties of this tool needs to be completed so that it can be recommended for use in research.	

References:

1. Cleland JA, Fritz JM, Whitman JM, Palmer JA. The reliability and construct validity of the Neck Disability Index and patient specific functional scale in patients with cervical radiculopathy. *Spine.* Mar 1 2006;31(5):598-602.

2. Westaway MD, Stratford PW, Binkley JM. The patient-specific functional scale: validation of its use in persons with neck dysfunction. *J Orthop Sports Phys Ther.* May 1998;27(5):331-338.

3. Hammer A, Nilsagard Y, Forsberg A, Pepa H, Skargren E, Oberg B. Evaluation of therapeutic riding (Sweden)/hippotherapy (United States). A single-subject experimental design study replicated in eleven patients with multiple sclerosis. *PHYSIOTHER. THEORY PRACT.* Jan-Mar 2005;21(1):51-77.

4. Stratford PW, Gill C, Westaway MD, Binkley JM. Assessing Disability and Change on Individual Patients: A Report of a Patient Specific Measure. *Physiotherapy Canada.* Fall 1995;47(4):258-263.

5. Chatman AB, Hyams SP, Neel JM, et al. The Patient-Specific Functional Scale: measurement properties in patients with knee dysfunction. *Physical Therapy.* Aug 1997;77(8):820-829.

6. Finch E, Brooks D, Stratford PW, Mayo NE. *Physical Rehabilitation Outcome Measures: A Guide to Enhanced Clinical Decision Making*. 2nd ed. Philadelphia: Lippincott Williams & Wilkins; 2002.

Instrument name: Physiological Cost Index

Reviewer: Gail L. Widener, PT, PhD | **Date of review:** 5/13/11

ICF domain (check all that apply):

__X__ Body function/structure _____ Activity _____ Participation

Constructs measured: (check all that apply):

__X*_ Aerobic capacity/endurance
_____ Ataxia
_____ Cardiovascular/pulmonary status
_____ Coordination (non-equilibrium)
_____ Dizziness/vestibular
_____ Fatigue
_____ Flexibility
_____ Muscle performance
_____ Muscle tone / spasticity
_____ Pain
_____ Posture
_____ Sensory integration
_____ Somatosensation
_____ Balance/falls
_____ Bed mobility
_____ Gait
_____ Reach and grasp
_____ Self care
_____ Transfers
_____ Wheelchair skills
_____ Health and wellness
_____ Home management
_____ Leisure
_____ Quality of life
_____ Role function
_____ Shopping
_____ Social function
_____ Work

Other: *Energy expenditure

Type of measure:

__x___ Performance-based _____ Self-report

Instrument description:

- The Physiological Cost Index (PCI) is an estimate of energy expenditure. The concept was initially developed initially to measure change in energy expenditure for people with rheumatoid arthritis in drug trials,[1] it has since been validated in other groups of people.[2-3]

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • Measured in 40 healthy subjects on a 12m (r=0.73) and 20m track (r=0.79)[4] Inter-rater: • Measured in 13 healthy subjects on a 12m (r=0.62) and 20m track (r=0.66)[4] Test-retest: • PCI taken in steady state, non-steady state and using post exercise HR values taken one week apart in 15 healthy college aged females were r=.773, .868 and .796, respectively. [3]
Validity (concurrent, criterion-related, predictive)	Concurrent validity: • Correlations between working heart rate and VO_2 with the 20m (r=.365) and 12m tracks (r=.431) in healthy subjects.[4] Predictive validity: • Discriminative validity: • Sensitivity/Specificity/Predictive Values/Likelihood Ratios: •
Ceiling/floor effects	Ceiling effects: • None reported Floor effects: • None reported
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • MCID: • Other responsiveness values: • True change determined to be 52% on 20m track or 43.4% on the 12m track in healthy normal people.[4] Normative Data: •
Instrument use	• PCI calculation
Equipment required	HR monitor, track (12 or 20 m) or treadmill

Time to complete	
How is the instrument scored? (e.g., total score, are there subscales, etc…)	Time it takes to walk at a preferred pace on a treadmill or a track to reach non-steady state or steady state (1-4 minutes). Heart rate is monitored is recorded every 10 seconds. Velocity of walk is recorded. Scored as heart beats per meter using this equation: PCI (beats/meter)= HR walk – HR rest (beats per min) / Velocity (meters/min)
Level of client participation required (is proxy participation available?)	• Client participation is required.
Limitations	It is an estimate of energy expenditure.

Recommendations
Practice Setting (check all that apply):
_____ Acute
_____ Inpatient Rehab
_____ Home Health
_____ Skilled Nursing
_____ Outpatient

Comments:
- Could be appropriate for use in an out-patient setting, but there is a lack of psychometric data to support its use in individuals with MS.

Level of Disability (check all that apply):
_____ EDSS 0.0 – 3.5
_____ EDSS 4.0 – 5.5
_____ EDSS 6.0 – 7.5
_____ EDSS 8.0 – 9.5

Comments:
- Could be appropriate for EDSS levels 0.0 – 5.5, but there is a lack of psychometric data to support its use in individuals with MS.
- Recommend investigating psychometric properties in MS.

Should this tool be required for entry-level curricula?
_____ Yes ___X___ No
Comments:
-

Is this tool appropriate for research purposes?
_____ Yes ___x__ No
Comments:
- If strict guidelines for obtaining resting HR are used. It is a less expensive way to obtain an estimate of energy expenditure than classic methods that measure oxygen uptake. Several studies comparing intervention to no intervention, have used PCI to investigate energy

expenditure in people with neurological disorders including MS.[5-7]

- However, there is a lack of psychometric data in MS, so do not recommend for use in research at this point in time.
- Recommend investigating psychometric properties in MS.

Attachments:

- Score Sheets: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Instructions: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Reference list: _____ Uploaded on website

Second Reviewer Comments:

- Agree with primary reviewer

Overall Taskforce Agreement with Recommendations:

-

Practice Setting	4	3	2	1	Comments
Acute				X	•
Inpatient Rehab				X	•
Home Health				X	•
Skilled Nursing				X	•
Outpatient				X	•

Overall Comments:

-

Level of Disability	4	3	2	1	Comments
EDSS 0.0 – 3.5				X	•
EDSS 4.0 – 5.5				X	•
EDSS 6.0 – 7.5				X	• lower end of this range (6-6.5)
EDSS 8.0 – 9.5				X	• too disabled to use

Overall Comments:

-

Entry-Level Criteria	Students should learn to administer	Students should be exposed to tool (e.g. to	Do not recommend	Comments

	tool	**read literature)**		
Should this tool be required for entry level curricula?			X	• Do not recommend due to beyond entry-level and lack of psychometrics in individuals with MS

Research Use	**YES**	**NO**	**Comments**
Is this tool appropriate for research purposes?		X	• Lack of psychometric data in MS, so do not recommend for use in research at this point in time. • Recommend investigating psychometric properties in MS.

References:

1. Steven MM, Capell HA, Sturrock RD, MacGregor J. The physiological cost of gait (PCG): a new technique for evaluating non-steroidal anti-inflammatory drugs in rheumatoid arthritis. *Br J Rheumatol*. 1983;22:141-145.
2. Rose J, Gamble, JG, Burgos A, Medeiros J, and Hassle WL. Energy expenditure index of walking for normal children and children with cerebral palsy. *Devel Med and Child Neurol*. 1990; 32: 33-340
3. Bailey MJ, and Ratcliffe CM. Reliability of physiological cost index measurements in walking normal subjects using steady-state, non-steady state and post exercise heart rate recording. *Physiother*. 1995; 81: 618-623.
4. Graham RC, Smith NM, White CM. The reliability and validity of the physiological cost index in healthy subjects while walking on 2 different tracks. *Arch Phys Med Rehabil*. 2005;86:2041-2046.
5. Zamparo P, Pagliaro P. The energy cost of level walking before and after hydro-kinesio therapy in patients with spastic paresis. *Scand J Med Sci Sports.* 1998; 8:222-228.
6. Taylor PN, Burridge JH, Dunkerley AL, et al. Clinical use of the Odstock dropped foot stimulator: its effect on the speed and effort of walking. *Arch Phys Med Rehabil.* 1999; 80:1577-1583.
7. Stein RB, Everaert DG, Thompson AK, et al. Long-term therapeutic and orthotic effects of a foot drop stimulator on walking performance in progressive and nonprogressive neurological disorders. *Neurorehabil Neural Repair.* 2010; 24(2):152-167.

Instrument name: Rivermead Assessment of Somatosensory Performance (RASP)

Reviewer: Diane D. Allen, PT, PhD | **Date of review:** 5/3/11

ICF domain (check all that apply):

__x___ Body function/structure _____ Activity _____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance
_____ Ataxia
_____ Cardiovascular/pulmonary status
_____ Coordination (non-equilibrium)
_____ Dizziness/vestibular
_____ Fatigue
_____ Flexibility
_____ Muscle performance
_____ Muscle tone / spasticity
_____ Pain
_____ Posture
_____ Sensory integration
__x___ Somatosensation

_____ Balance/falls
_____ Bed mobility
_____ Gait
_____ Reach and grasp
_____ Self care
_____ Transfers
_____ Wheelchair skills

_____ Health and wellness
_____ Home management
_____ Leisure
_____ Quality of life
_____ Role function
_____ Shopping
_____ Social function
_____ Work

Other:

Type of measure:

__x___ Performance-based _____ Self-report

Instrument description:

- The RASP is a multi-modal sensory tool that tests 5 sensations (sharp/dull discrimination, surface pressure, tactile localization, temperature discrimination, joint movement and movement discrimination), and 2 secondary sensations (bilateral touch discrimination and two-point discrimination). Sensation is tested on the face, hand and foot.

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • Inter-rater: • Tested in 15 people post-stroke: r=0.92[1] Test-retest: • Overall test-retest in 12 people post-stroke (r=0.92); varies among subtests from 0.96 (surface localization) to 0.50 (proprioception direction)[1]
Validity (concurrent, criterion-related, predictive)	Concurrent validity: • Low correlations in 100 people post-stroke with the Rivermead Mobility Index (r=0.08 to 0.36 depending on subtest); Rivermead Motor Assessment (r=0.05 to 0.32); and Barthel Index (r=0.09 to 0.31)[1] Predictive validity: • Discriminative validity: • Sensitivity/Specificity/Predictive Values/Likelihood Ratios: •
Ceiling/floor effects	Ceiling effects: • Floor effects: •
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • MCID: • Other responsiveness values: • Normative Data: •
Instrument use	•
Equipment required	In an effort to improve reliability of sensory testing, custom equipment were developed for the test, including the

<table>
<tr><td></td><td>

“neurometer” – a pen shaped device that allows consistent amount of pressure to be applied to an area,
“neurotemp” which has temperature displays standardization of temperature stimuli, and the
“two-point neurodiscriminator” - a 4-pointed fixed distance discriminator used to test 2-point discrimination on the finger pads
Although customized of equipment may improve reliability, the tools are only available commercially.

</td></tr>
<tr><td>Time to complete</td><td>20-45 minutes depending on the client’s level on sensory deficit</td></tr>
<tr><td>How is the instrument scored? (e.g., total score, are there subscales, etc…)</td><td>“Sham” tests (no stimuli applied) are first done using 2 subtests. If the client responds that they feel stimuli during the “sham” tests, it is concluded that the client is not reliable and testing does not proceed. For each stimulus correctly identified, a score of 1 is assigned. Within each test area, a client can score a maximum of 6.
Normative performance and suggestive cut-off scores for each sub-test are below.[2]

Table 2b: Sharp/dull discrimination – normative performance and impairment cutoff
<table>
<tr><th>Subtest 1
Sharp/dull discrimination</th><th>Control performance
Left side (n = 50)</th><th>Right side (n = 46)</th></tr>
<tr><td>Max score (30)</td><td></td><td></td></tr>
<tr><td>Mean</td><td>26.6</td><td>26.5</td></tr>
<tr><td>s.d.</td><td>2.6</td><td>2.5</td></tr>
<tr><td>Range</td><td>18–30</td><td>21–30</td></tr>
<tr><td>Suggested Impairment cutoff</td><td>less than 22</td><td></td></tr>
</table>
Table 3b: Surface touch – normative performance and impairment cutoff
<table>
<tr><th>Subtest 2
Surface pressure touch</th><th>Control performance
left side (n = 50)</th><th>right side (n = 50)</th></tr>
<tr><td>Max score (30)</td><td></td><td></td></tr>
<tr><td>Mean</td><td>29.9</td><td>29.9</td></tr>
<tr><td>s.d.</td><td>0.3</td><td>0.7</td></tr>
<tr><td>Range</td><td>28–30</td><td>25–30</td></tr>
<tr><td>Suggested Impairment cutoff</td><td>less than 29</td><td></td></tr>
</table>

</td></tr>
</table>

	Table 4b: Surface localization – normative performance and impairment cutoff Subtest 3 Surface localization / Control performance: Left side (n = 50) / Right side (n = 50) Max score (30) Mean: 29.9 / 29.8 s.d.: 0.4 / 1.1 Range: 27–30 / 22–30 Suggested Impairment cutoff: less than 29 / less than 28 • Table 6a: Two-point discrimination – index finger performance controls Subtest 5 Reliable Two-point discrimination Right hand controls (n = 48): 3mm 16; 4mm 18; 5mm 14 Left hand-controls (n = 49): 3 mm 18; 4 mm 15; 5 mm 16 • Table 7b: Temperature discrimination–normative performance and impairment cutoff Subtest 6 Temperature discrimination / Controls: Left side(n = 48) / Right side(n = 48) Max score (30) Mean: 28.4 / 28.6 s.d.: 1.7 / 1.8 Range: 24–30 / 23–30 Suggested Impairment cutoff: less than 25 • Table 8b: Proprioceptive movement discrimination – normative performance and impairment cutoff Subtest 7a Proprioception movement discrimination / Controls: RBD Left side affected (n = 50) / LBD Right side affected (n = 50) Max score (30) Mean: 29.9 / 30 s.d.: 0.8 / 0.1 Range: 24–30 / 29–30 Impairment cutoff: less than 28 / less than 30 • Table 9b: Proprioceptive direction discrimination – normative performance and impairment cutoff Subtest 7b Proprioception direction discrimination / Controls: Left side (n = 50) / Right side (n = 50) Max score (30) Mean: 29.8 / 29.8 s.d.: 0.9 / 0.9 Range: 24–30 / 24–30 Impairment cutoff: less than 28 •
Level of client participation required (is proxy participation available?)	• Client participation is required.

Limitations	Current literature indicates test has only been used in people post-stroke.[3-5] Test requires special equipment. The full testing manual and equipment are available commercially: The Thames Valley Test Company 7–9 The Green, Flempton Bury St Edmunds, Suffolk IP28 6EL UK (http://www.tvtc.com/tvtc/index.html)

Recommendations

Practice Setting (check all that apply):

_____ Acute
_____ Inpatient Rehab
_____ Home Health
_____ Skilled Nursing
_____ Outpatient

Comments:

- The need for special equipment limits the clinical utility of this test, but could be appropriate for any setting.

Level of Disability (check all that apply):

_____ EDSS 0.0 – 3.5
_____ EDSS 4.0 – 5.5
_____ EDSS 6.0 – 7.5
_____ EDSS 8.0 – 9.5

Comments:

- The need for special equipment limits the clinical utility of this test, but could be appropriate for patients at any EDSS level.

Should this tool be required for entry-level curricula?

_____ Yes __x___ No

Comments:

- However, this test provides a standardized way of performing commonly taught assessments of somatosensation.

Is this tool appropriate for research purposes?

_____ Yes __x___ No

Comments:

- The inclusion of a sensory outcome measure in clinical trials could advance knowledge by identifying those interventions that are associated with sensory improvement as well as helping to determine those client characteristics (beyond motor and functional status) that are associated with improvement following selected interventions. This information would assist clinicians to target appropriate interventions based on client baseline characteristics.
- However, there is a lack of psychometric data in MS, so do not recommend for use in research at this point in time.

- Recommend investigating psychometric properties in MS.

Attachments:

- Score Sheets: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Instructions: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Reference list: _____ Uploaded on website

Second Reviewer Comments:

- Agree with the primary reviewer's assessment

Overall Taskforce Agreement with Recommendations:

-

Practice Setting	4	3	2	1	Comments
Acute				X	•
Inpatient Rehab				X	•
Home Health				X	•
Skilled Nursing				X	•
Outpatient				X	•

Overall Comments:

- Clinical utility is poor due to the time to complete, the use of customized equipment, and the need to buy standardized equipment set.

Level of Disability	4	3	2	1	Comments
EDSS 0.0 – 3.5				X	•
EDSS 4.0 – 5.5				X	•
EDSS 6.0 – 7.5				X	•
EDSS 8.0 – 9.5				X	•

Overall Comments:

- Clinical Utility is poor due to the time to complete, the use of customized equipment, and the need to buy the test

Entry-Level Criteria	Students should learn to administer tool	Students should be exposed to tool (e.g. to read	Do not recommend	Comments

		literature)		
Should this tool be required for entry level curricula?			X	• Do not recommend due to beyond entry-level and lack of psychometrics in individuals with MS

Research Use	**YES**	**NO**	**Comments**
Is this tool appropriate for research purposes?		X	• Lack of psychometric data in MS, so do not recommend for use in research at this point in time. • Recommend investigating psychometric properties in MS.

References:

1. Winward CE, Halligan PW, Wade DT. The Rivermead Assessment of Somatosensory Performance (RASP): standardization and reliability data. *Clin Rehabil.* 2002;16:523-533.
2. Winward CE, Halligan PW, Wade DT. Rivermead Assessment of Somatosensory Performance. Suffolk, England: Thames Valley Test Company Limited; 2000.
3. Winward CE, Halligan PW, Wade DT. Somatosensory recovery: A longitudinal study of the first 6 months after unilateral stroke. *Disabil Rehabil.* 2007;29:293-299.
4. Busse M, Tyson SF. How many body locations need to be tested when assessing sensation after stroke? An investigation of redundancy in the Rivermead Assessment of Somatosensory Performance. *Clin Rehabil.* 2009;23:91-95.
5. Tyson SF, Hanley M, Chillala J, Selley AB, Tallis RC. Sensory Loss in Hospital-Admitted People With Stroke: Characteristics, Associated Factors, and Relationship With Function. *Neurorehabil Neural Repair.* 2008;22:166-172.

Instrument name: Rivermead Mobility Index (RMI)

Reviewer: Kirsten Potter, PT, DPT, MS, NCS | **Date of review:** 7/15/11

ICF domain (check all that apply):

_____ Body function/structure __x___ Activity _____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance
_____ Ataxia
_____ Cardiovascular/pulmonary status
_____ Coordination (non-equilibrium)
_____ Dizziness/vestibular
_____ Fatigue
_____ Flexibility
_____ Muscle performance
_____ Muscle tone / spasticity
_____ Pain
_____ Posture
_____ Sensory integration
_____ Somatosensation
__x___ Balance/falls
__x___ Bed mobility
__x___ Gait
_____ Reach and grasp
__x___ Self care
__x___ Transfers
_____ Wheelchair skills
_____ Health and wellness
_____ Home management
_____ Leisure
_____ Quality of life
_____ Role function
_____ Shopping
_____ Social function
_____ Work

Other:

Type of measure:

__x___ Performance-based (question 5) __x___ Self-report (all other questions)

Comment:

-

Instrument description:

- The Rivermead Mobility Index (RMI) was developed for individuals with head injury and stroke, and is based on the gross function subscale of the Rivermead Motor Assessment
- The RMI was developed to meet the following characteristics: a focus on disability, simple and quick to administer; able to be used in hospital and home settings; span a wide range of reduction in mobility (turning over in bed to running); be sensitive to clinically relevant change; and have known reliabilty[1]
- The original version of the RMI included two scales: RMI Fundamental (RMI – F) which included common activities that are typically independent of choice, culture, or class (e.g., turning over in bed) and RMI Elective (RMI – E) which examines "elective" mobility tasks (e.g., shopping and gardening); the RMI Elective was found to have inadequate reliability and validity, thus was not included in the final version of the RMI; the RMI – F is now known as the RMI[1]
- A modified RMI (MRMI)was developed to expand the scoring scale with the aim to improve responsiveness; studies show that the MRMI is not more responsive than the RMI;[2, 3] this review focuses on the original RMI

• Italian[4] and German[5] versions of the RMI exist and have been validated in subjects with stroke • The majority of studies have examined the RMI when applied to patients with stroke; this review focuses predominately on MS, but data from studies using other patient populations is reported when no data on subjects with MS exists	
Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • Not reported in MS. Inter-rater: • In 23 patients with neurological conditions (stroke, head injury, status-post neurosurgery), rho = 0.94, ($p < 0.001$); in another group of 20 patients (including 11 with MS), the differences in total RMI scores showed agreement within 2 points[1] • In stroke, total RMI ICC = 0.92; weighted kappa statistic for individual RMI items ranged 0.37 – 0.94[2] Test-retest: • In 46 patients with various neurological conditions (1 with MS), test retest reliability = 0.96[3] • In stroke: 90% of total RMI scores did not differ by more than 1 point; % agreement for individual RMI items ranged 86% (stairs and walking outside even ground) to 100% (5 items); kappa values for ranged from 0.49 (walking outside even ground) to 1.0 (turning in bed); unable to determine Kappa values for 4 items[6] Internal consistency: • In stroke (Italian version): Chronbach's alpha = 0.93; item to total RMI correlations ranged from 0.36 (bathing) to 0.83 (walking inside, with an aid if needed), $p < 0.003$ (note: item running was not considered for this analysis)[4]
Validity (concurrent, criterion-related, predictive)	Concurrent validity: • When administered to inpatients with MS (mean EDSS = 6.6 ± 1.7), RMI correlates significantly (for all groups of MS subjects) to Hauser's Ambulation Index (rho ranges from -0.45, $p < 0.01$ for the normal walk group to -0.96, $p < 0.001$ for all subjects) and Kurtzke's EDSS (rho ranges from -0.70, $p < 0.001$ for the slow walk group to -0.96, $p < 0.001$ for all subjects); RMI correlated significantly to 10 meter walking time for all subjects (rho = -0.8, $p < 0.001$) and those in the slow walk group (rho = 0.64, $p < 0.001$), but did not correlate in the normal walk group[7] • In 46 patients with various neurological conditions (1 with MS), RMI correlates significantly to MRMI (0.95), 10-meter walk test (-0.52), and 2-minute walk distance (0.75)[3] Predictive validity:

	• In 83 patients with MS (EDSS ranging from 0.5 – 8.5), multiple regression analysis showed that the RMI was the best predictor of handicap as measured by London Handicap Scale; the RMI was also a predictor of quality of life impairment as measured by the Functional Assessment of MS[8] Discriminative validity: • Able to discriminate among in-patients with MS who have normal walking capability vs. slow walk vs. unable to walk (mean RMI scores for the 3 groups were 13.6 ± 0.9, 10.5 ± 2.4, and 2.0 ± 1.8, $p < 0.001$)[7] • In 83 patients with MS (EDSS ranging from 0.5 – 8.5), RMI was able to discriminate among those with EDSS scores < 3.5, 3.5 – 6.0, and > 6.0 ($p = 0.0001$); mean RMI scores for the 3 groups were 14.4 ± 0.8, 11.1 ± 3.1, and 4.2 ± 3.8, respectively[8] • In 46 patients with various neurological conditions (1 with MS), able to discriminate between those requiring aid to walk vs. no aid ($p < 0.001$) and those with sensory loss vs. without sensory loss ($p = 0.035$)[3] Sensitivity/Specificity/Predictive Values/Likelihood Ratios: • Not reported in MS. Construct validity: • The final version of the RMI has been reported to form a valid hierarchy; Guttman scale analysis showed coefficient of reproducibility = 0.93 and scalability = 0.79[1] • Rasch analysis showed that the RMI, when administered to patients with stroke, was unidimensional; all items fit the conceptual basis of the test and there were no misfitting items[9] • In stroke population, Guttman scaling showed acceptable scaleability (0.74 and 0.79 at admission and discharge, respectively) and reproducibility (0.95 at admission and discharge)[10] • In Italian stroke population, Guttman scaling showed acceptable scalability (0.67 at admission and re-test) and reproducibility (0.95 and 0.93 at admission and re-test, respectively), but the item hierarchy did not match that originally proposed by the developers of the RMI (Collen et al)[4]
Ceiling/floor effects	Ceiling effects: • 2.5% of inpatients with MS scored 15 points and 15% scored 14 points on RMI[7] Floor effects: • 12% of inpatients with MS scored 0 points and 18% scored 1

	point on RMI[7]
Sensitivity to change (responsiveness, MCID, MDC) / normative data	<u>MDC:</u> • MDC = 3; reported in studies involving patients with stroke[10] and chronic inflammatory demyelinating polyneuropathy[11] <u>MCID:</u> • Collen et al[1] determined that the RMI is reliable to a limit of 2 points; Lord et al[12] used 2 points to determine clinically significant improvement <u>Other responsiveness values:</u> • The RMI is reported to be more responsive to change in inpatients with MS, as compared to other measures: the RMI was able to detect changes in 39% of all patients compared to 18.5% for the Ambulation Index, 16.5% for 10 m walk test, and 7.5% for EDSS[7] • In stroke (Italian version): ES = 0.89; statistically different scores in RMI found between admission and re-test ($p < 0.0001$)[4] • In 58 elderly individuals, 26 with neurologic conditions (none with MS), ES = 1[13] <u>Normative Data:</u> •
Instrument use	• The RMI was developed for individuals with stroke and head injury, but has also been used for those with MS, status-post neurosurgery, cerebellar degeneration, Huntington's Chorea, and spina bifida
Equipment required	• Questionnaire • Pen/pencil
Time to complete	• < 5 minutes[10]
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• Each item is scored on a 2-point ordinal scale: 0 = No and 1 = Yes; scores range from 0 (lowest) to 15 (best)
Level of client participation required (is proxy participation available?)	• With exception of question 5 (which asks that the patient stand unsupported for 10 seconds), the RMI can be completed by the patient or a proxy • The rater must be able to understand and answer the questions; however, Antonucci et al used the RMI in patients with language disorders (including Broca's, Wernicke's, and global aphasia) and health care staff completed the ratings on all items of the RMI[9]
Limitations	• The RMI has limited utility for very immobile patients (i.e., those

	who cannot turn over in bed)[7] • Some of the questions use words (e.g., metres, caliper) commonly used in the UK, but not the U.S.

Recommendations
Practice Setting (check all that apply):
__x___ Acute
__x___ Inpatient Rehab
__x___ Home Health
__x___ Skilled Nursing
__x___ Outpatient

Comments:
•

Level of Disability (check all that apply):
__x___ EDSS 0.0 – 3.5
__x___ EDSS 4.0 – 5.5
__x___ EDSS 6.0 – 7.5
__x___ EDSS 8.0 – 9.5

Comments:
• Limited utility to EDSS levels ≥ 9, as easiest item pertains to independence with turning over in bed. Otherwise, appropriate for all other levels due to range of item difficulty.

Should this tool be required for entry-level curricula?
__x___ Yes _____ No
Comments:
• Applicable to a variety of patient populations. High clinical utility given ease of completion.

Is this tool appropriate for research purposes?
__x___ Yes _____ No
Comments:
• Reliable and valid. However, more data on the RMI's responsiveness would be helpful if used to determine treatment effectiveness.

Attachments:
• Score Sheets: _____ Uploaded on website __x___ Available but copyrighted _____ Unavailable
• Instructions: _____ Uploaded on website __x___ Available but copyrighted _____ Unavailable
• Reference list: _____ Uploaded on website

Note: Although copyrighted, it is reported to be acceptable to reproduce provided the source is acknowledged (http://www.medicaleducation.co.uk/resources/Rivmob.pdf)[1]

Second Reviewer Comments:

• Agree with ratings/recommendations
Overall Taskforce Agreement with Recommendations: •

Practice Setting	**4**	**3**	**2**	**1**	**Comments**
Acute		X			•
Inpatient Rehab		X			•
Home Health		X			•
Skilled Nursing		X			•
Outpatient		X			•

Overall Comments:
- Limited reliability data (no data specific to MS); more data on responsiveness would be beneficial; high clinical utility

Level of Disability	**4**	**3**	**2**	**1**	**Comments**
EDSS 0.0 – 3.5		X			•
EDSS 4.0 – 5.5		X			•
EDSS 6.0 – 7.5		X			•
EDSS 8.0 – 9.5		X			•

Overall Comments:
- See above (under Practice Setting recommendations)

Entry-Level Criteria	**Students should learn to administer tool**	**Students should be exposed to tool (e.g. to read literature)**	**Do not recommend**	**Comments**
Should this tool be required for entry level curricula?	X			• Applicable to a variety of patient populations. High clinical utility given ease of completion.

Research Use	**YES**	**NO**	**Comments**
Is this tool appropriate for research	X		•

purposes?			

References:

1. Collen FM, Wade DT, Robb GF, Bradshaw CM. The Rivermead Mobility Index: a further development of the Rivermead Motor Assessment. *Int Disabil Stud.*1991;13(2):50-54.
2. Hsueh IP, Wang CH, Sheu CF, et al. Comparison of psychometric properties of three mobility measures for patients with stroke. *Stroke.*2003;34(7):1741-1745.
3. Rossier P, Wade DT. Validity and reliability comparison of 4 mobility measures in patients presenting with neurologic impairment. *Arch Phys Med Rehabil.*2001;82(1):9-13.
4. Franchignoni F, Tesio L, Benevolo E, et al. Psychometric properties of the Rivermead Mobility Index in Italian stroke rehabilitation inpatients. *Clin Rehabil.*2003;17(3):273-282.
5. Schindl MR, Forstner C, Kern H, Zipko HT, Rupp M, Zifko UA. Evaluation of a German version of the Rivermead Mobility Index (RMI) in acute and chronic stroke patients. *European Journal of Neurology.*2000;7(5):523-528.
6. Green J, Forster A, Young J. A test-retest reliability study of the Barthel Index, the Rivermead Mobility Index, the Nottingham Extended Activities of Daily Living Scale and the Frenchay Activities Index in stroke patients. *Disabil Rehabil.*2001;23(15):670-676.
7. Vaney C, Blaurock H, Gattlen B, Meisels C. Assessing mobility in multiple sclerosis using the Rivermead Mobility Index and gait speed. *Clin Rehabil.*1996;10:216-226.
8. Provinciali L, Ceravolo MG, Bartolini M, Logullo F, Danni M. A multidimensional assessment of multiple sclerosis: relationships between disability domains. *Acta Neurologica Scandinavica.*1999;100(3):156-162.
9. Antonucci G, Aprile T, Paolucci S, Antonucci G, Aprile T, Paolucci S. Rasch analysis of the Rivermead Mobility Index: a study using mobility measures of first-stroke inpatients. *Arch Phys Med Rehabil.*2002;83(10):1442-1449.
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11. Molenaar DS, van Doorn PA, Vermeulen M. Pulsed high dose dexamethasone treatment in chronic inflammatory demyelinating polyneuropathy: a pilot study. *J Neurol Neurosurg Psychiatry.*1997;62(4):388-390.
12. Lord SE, Wade DT, Halligan PW. A comparison of two physiotherapy treatment approaches to improve walking in multiple sclerosis: a pilot randomized controlled study. *Clin Rehabil.*1998;12(6):477-486.
13. Wright J, Cross J, Lamb S. Physiotherapy outcome measures for rehabilitation of elderly people: Responsiveness to change of the Rivermead Mobility Index and Barthel Index. *Physiotherapy* 1998;84(5):216-221.

Instrument name: Scale for the Assessment and Rating of Ataxia (SARA)

Reviewer: Susan E. Bennett, PT, DPT, EdD, NCS, MSCS | **Date of review:** 4/12/11

ICF domain (check all that apply):

__x__ Body function/structure __x__ Activity _____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance
_X___ Ataxia
_____ Cardiovascular/pulmonary status
_X__ Coordination (non-equilibrium)
_____ Dizziness/vestibular
_____ Fatigue
_____ Flexibility
_____ Muscle performance
_____ Muscle tone / spasticity
_____ Pain
_____ Posture
_____ Sensory integration
_____ Somatosensation
_____ Balance/falls
_____ Bed mobility
__X__ Gait
_____ Reach and grasp
_____ Self care
_____ Transfers
_____ Wheelchair skills
_____ Health and wellness
_____ Home management
_____ Leisure
_____ Quality of life
_____ Role function
_____ Shopping
_____ Social function
_____ Work

Other: Item 2 is standing balance ranging from tandem stand >10 sec to unable to stand ; and Item 3 static sit unsupported >10 sec to unable to sit without continuous support

Type of measure:

__x__ Performance-based _____ Self-report

Instrument description:

- 8-item performance-based test yielding a total score ranging from 0 (no ataxia) to 40 (severe ataxia). Ordinal measure scale based on observation of patient performance of gait, stance, sitting, speech, finger chase, nose-finger test, fast alternating hand movements, and heel-shin slide. All studies referenced examined subjects with Spinal Cerebellar Ataxia or Friedreich Ataxia. See attached form for instructions on performance and grading of tests.

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • Cronbach's alpha = .89 [1] • Cronbach's alpha = .94 [3] Inter-rater: • ICC = .98 for SARA total score [3] • ICC> .80 for single items with the exception of item 6 performed

	on the left (ICC=.76) and item 8 on the left (ICC= .74) [3] • ICC = .951 in total SARA score [5] • ICC > .80 for 6 single items (gait, stance, sitting, speech, nose-finger and heel-shin slide) [5] • ICC = .98 for total SARA score [4] • ICC>.80 for single items except item 6 right [4] • ICC = .998 (P<0.0001) [1] • ICC = .96 (P<0.0001) [2] Test-retest: • ICC = .90 [3] • ICC = .99 [4]
Validity (concurrent, criterion-related, predictive)	Concurrent validity: • Two clinical trials in large groups: Trial 1 compared with ataxia disease stages, ICARS and the Barthel 167 patients with SCA and 8 controls; Trial 2 compared with ataxia disease stages, Barthel, and part IV of the Unified Huntington's Disease Rating Scale [UHDRS] with 119 patients and 110 controls • SARA score increased with disease stage $p < 0.0001$ • SARA and Barthel $r = -0.80$ $p < 0.0001$ • SARA and UHDRS $r = -0.89$ $p < 0.0001$ [3] Predictive validity: • Discriminative validity: • Sensitivity/Specificity/Predictive Values/Likelihood Ratios: •
Ceiling/floor effects	Ceiling effects: • Negligible in testing with patients: 1 patient received the max score Floor effects: • None reported
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • Not tested MCID: • Not tested Other responsiveness values: • Responsiveness = 0.615 [2] Normative Data: • Control group 0.4 ± 1.1 (range 0 to 7.5) [3]
Instrument use	• Coordination assessment tool that has been used with

	autosomal dominant spinocerebellar ataxia (SCA), non-SCA patients, and spinocerebellar degeneration (Machado-Joseph Disease, Spinocerebellar ataxia, dominantly inherited cortical cerebellar atrophy, sporadic cortical cerebellar atrophy, multiple system atrophy-cerebellar type). [1,3,4,5]
Equipment required	• Stopwatch, 10 m walkway, examination table
Time to complete	• Mean time 14.2 ± 7.5 (range 5 to 40 minutes in patients and 7.2 ± 2.6 minutes (range 3 to 13) in controls [3] • 4 min (mean ± SD; 4.30± .63 min) [5]
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• 8 items graded with a total score ranging from 0 (no ataxia) to 40 (severe ataxia) • Gait (score 0-8) • Stance (score 0-6) • Sitting (score 0-4) • Speech disturbances (score 0-6) • Finger chase (score 0-4) • Nose-finger test (score 0-4) • Fast alternating hand movements (score 0-4) • Heel-shin slide (score 0-4) • All limb kinematic functions are rated independently for both sides and arithmetic mean of both sides is included in the total score.
Level of client participation required (is proxy participation available?)	• Patient must perform or attempt to perform all items of the test
Limitations	• SARA only rates ataxia-related symptoms and does not consider non-ataxia symptoms that often occur in patients with SCA. Therefore, it is possible that disease severity in certain diseases with extracerebellar features might not be faithfully reflected in the SARA score. SARA is not an ideal clinical instrument to detect disease onset. [3] • No research yet published with patients that have Multiple Sclerosis.
Recommendations **Practice Setting (check all that apply):** _X___ Acute _X___ Inpatient Rehab _X___ Home Health _X___ Skilled Nursing _X___ Outpatient Comments:	

-

Level of Disability (check all that apply):

__X__ EDSS 0.0 – 3.5
__X__ EDSS 4.0 – 5.5
__X__ EDSS 6.0 – 7.5
__X__ EDSS 8.0 – 9.5

Comments:

- Not as appropriate for 8.0 – 9.5, but components of the 8 items could be assessed and those involving gait and stance scored at the maximum level of unable to perform

Should this tool be required for entry-level curricula?

____ Yes __x___ No

Comments:

- There are not many standardized tools available for ataxia and this addresses 8 different items/tasks
- However, there is a lack of psychometric data supporting its use in MS

Is this tool appropriate for research purposes?

____ Yes __x___ No

Comments:

- Lack of psychometric data in MS, so do not recommend for use in research at this point in time.
- Recommend investigating psychometric properties in MS.

Attachments:

- Score Sheets: __X__ Uploaded on website _____ Available but copyrighted _____ Unavailable http://www.ataxia-study-group.net/html/about/ataxiascales/sara/SARA.pdf
- Instructions: ___X_ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Reference list: _____ Uploaded on website

Second Reviewer Comments:

- I agree with primary reviewers' presentation of information regarding this scale. However, despite lack of published evidence of use in a population with MS, I recommend use of this scale once validated in the clinician's population.

Overall Taskforce Agreement with Recommendations:

-

Practice Setting	4	3	2	1	Comments
Acute			X		•
Inpatient Rehab			X		•
Home Health			X		•
Skilled Nursing			X		•
Outpatient			X		•

Overall Comments:

- No information yet in MS.

Level of Disability	4	3	2	1	Comments
EDSS 0.0 – 3.5			X		•
EDSS 4.0 – 5.5			X		•
EDSS 6.0 – 7.5			X		•
EDSS 8.0 – 9.5			X		•

Overall Comments:

- No information yet in MS.

Entry-Level Criteria	Students should learn to administer tool	Students should be exposed to tool (e.g. to read literature)	Do not recommend	Comments
Should this tool be required for entry level curricula?			X	• Not necessarily for MS (due to lack of psychometric data), but may be applicable for other patient populations.

Research Use	YES	NO	Comments
Is this tool appropriate for research purposes?		X	• Lack of psychometric data in MS, so do not recommend for use in research at this point in time. • Recommend investigating psychometric properties in MS.

References:

1. Burk K, Malzing U, Wolf S, et al. Comparison of Three Clinical Rating Scales in Friedreich Ataxia (FRDA). *Movement Disorders*. 24(12): 1779-1784, 2009.

2. Schmitz-Hubsch T, Fimmers R, Rakowicz M, et al. Responsiveness of different rating instruments in spinocerebellar ataxia patients. *Neurology*. 74(8): 678-684, February 2010.

3. Schmitz-Hubsch T, Tezenas du Montcel S, Baliko L, et al. Scale for the assessment and rating of ataxia- development of a new clinical scale. *Neurology*. 66 (11): 1717- 1720, June 13, 2006.

4. Weyer A, Abele M, Schmitz-Hubsch T, et al. Reliability and Validity of the Scale for the Assessment and Rating of Ataxia: A Study in 64 Ataxia Patients. Movement Disorders 22(11): 1633-1637, 2007.

5. Yabe I, Matsushima M, Soma H, et al. Usefulness of the Scale for Assessment and Rating of Ataxia (SARA). *Journal of the Neurological Sciences.* 266(2008) 164- 166.

Instrument name: Scripps Neurological Rating Scale (SNRS)

Reviewer: Gail L. Widener, PT, PhD | **Date of review:** 8/10/11

ICF domain (check all that apply):

__X__ Body function/structure _____ Activity _____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance
_____ Ataxia
_____ Cardiovascular/pulmonary status
_____ Coordination (non-equilibrium)
_____ Dizziness/vestibular
_____ Fatigue
_____ Flexibility
_____ Muscle performance
_____ Muscle tone
_____ Pain
_____ Posture
_____ Sensory integration
_____ Somatosensation
_____ Balance/falls
_____ Bed mobility
_____ Gait
_____ Reach and grasp
_____ Transfers
_____ Wheelchair skills
_____ Health and wellness
_____ Home management
_____ Leisure
_____ Quality of life
_____ Role function
_____ Shopping
_____ Social function
_____ Work

Other:
Assessment of neurologic function performed by a physician.

Type of measure:

__X__ Performance-based _____ Self-report

Instrument properties:

- The Scripps Neurological Rating Scale (SNRS)[1] was developed as a measure of neurologic function (impairment) in people with multiple sclerosis (pwMS). The scale is based on findings of the standard neurologic examination with added subjective categories of sexual, bowel and bladder dysfunction. Amato et al.[2] describe the scale as having an arbitrary weighting system without precise guidelines. This scale has been used in drug studies.[6]

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • In pwMS, weighted K coefficients were 0.98[2], ICCs ranged between 0.52 and 0.92.[3] Percent agreement was 6% when change was no difference and 76% when difference was ≤10 points.[3] Inter-rater: • Percent agreement with 4 neurologists was 2.6%.[1] Weighted Kappa was 0.828 (85% agreement) in a trial with pwMS[4] when agreement defined as within 10 points

	• Another study reported effect sizes of mild to moderate levels in pwMS.[5] Test-retest: •
Validity (concurrent, criterion-related, predictive)	Concurrent validity: • In pwMS, it was moderately correlated with the Barthel Index (r=0.69) and with the London Handicap Scale (r=0.71), and highly correlated with the physical functioning items of the SF-36 (0.82)[3] Predictive validity: • Discriminative validity: • Sensitivity/Specificity/Predictive Values/Likelihood Ratios: •
Ceiling/floor effects	Ceiling & Floor effects: • Sharrack[3] reports that distribution is skewed to the normal end and severely impaired end of the scale suggestive of ceiling and floor effects.
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • MCID: • Other responsiveness values: • In pwMS total score was unresponsive to clinical change regardless of disease severity.[3] In a clinical study, it was more sensitive to change than EDSS[5] Normative Data: •
Instrument use	•
Equipment required	• Equipment required for a standard neurologic exam performed by a physician
Time to complete	• Not listed
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• Range is -10 to 100 points, 100 means neurologically intact. Components of the exam (total points for each) include mentation and mood (10), cranial nerves associated with eyes (21), lower cranial nerves (5), motor (20), deep tendon reflexes (8), Babinski (4), sensory (12), cerebellar (10), gait (10); points for bowel, bladder and sexual functioning (up to 10) are subtracted from the total of the components above.
Level of client participation required (is proxy participation available?)	• Physician measurement of responses.
Limitations	• Must be performed by a neurologist

Recommendations
Practice Setting (check all that apply):

____ Acute
____ Inpatient Rehab
____ Home Health
____ Skilled Nursing
____ Outpatient

Comments:
- Could occur wherever neurologists perform examinations, but has poor clinical utility for PT.

Level of Disability (check all that apply):

____ EDSS 0.0 – 3.5
____ EDSS 4.0 – 5.5
____ EDSS 6.0 – 7.5
____ EDSS 8.0 – 9.5

Comments:
- Valuable at all levels of disability, but has poor clinical utility for PT.

Should this tool be required for entry-level curricula?

_____ Yes __X__ No

Comments:
- Students should already be familiar with a typical neurologist exam, this just adds a couple of subjective categories.

Is this tool appropriate for research purposes?

____ Yes ___x__ No

Comments:
- Not appropriate for physical therapist to administer. PTs should know how to interpret results of this exam. Could have a neurologist administer for a research study.

Attachments:

- Score Sheets: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable *https://www.cebp.nl/vault_public/filesystem/?ID=1429*
- Instructions: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Reference list: _____ Uploaded on website

Second Reviewer Comments:
-

Overall Taskforce Agreement with Recommendations:

•

Practice Setting	4	3	2	1	Comments
Acute				X	•
Inpatient Rehab				X	•
Home Health				X	•
Skilled Nursing				X	•
Outpatient				X	•
Overall Comments: • Valuable in settings in which neurologists complete exams; however, since the test requires completion by a neurologist, it has poor clinical utility for PT.					

Level of Disability	4	3	2	1	Comments
EDSS 0.0 – 3.5				X	•
EDSS 4.0 – 5.5				X	•
EDSS 6.0 – 7.5				X	•
EDSS 8.0 – 9.5				X	•
Overall Comments: • Could be valuable at any level of disability; however, since the test requires completion by a neurologist, it has poor clinical utility for PT.					

Entry-Level Criteria	Students should learn to administer tool	Students should be exposed to tool (e.g. to read literature)	Do not recommend	Comments
Should this tool be required for entry level curricula?			X	• Students should already be familiar with a typical neurologist's exam.

Research Use	YES	NO	Comments
Is this tool appropriate for research purposes?		X	• Could be valuable, but must have a neurologist complete.

References:

Scripps Neurological Rating Scale

1. Sipe JC. Knobler RL, Braheny SL, Rice GP, Panich HS, Oldstone MB. A neurologic rating scale (NRS) for use in multiple sclerosis. *Neurol.* 1984;34:1368-1372.
2. AmatoMP, Portaccio E. Clinical outcome measures in multiple sclerosis. *J Neurol Sci.* 2007;259:118-122.
3. Sharrack B, Hughes RAC, Soudain S, Dunn G. The psychometric properties of clinical rating scales used in multiple sclerosis. *Brain.* 1999;122:141-159.
4. Sipe JC, Romine JS, Koziol JA, McMillan R, Zyroff J, Beutler E. Claribine in treatment of chronic progressive multiple sclerosis. *Lancet.* 1994;344(8914): 9-14.
5. Kozial JA, Lucero A, Sipe JC, Romine JS, Beutler E. Responsiveness of the Scripps neurologic rating scale during a multiple sclerosis clinical trial. *Can J Neurol Sci.* 1999;26:283-289.
6. Walker JE, Giri SN, Margolin SB. A double-blind, randomized, controlled study of oral pirfenidone for treatment of seconday progressive multiple sclerosis. *Mult Scler.* 2005; 11:149-158.

Instrument name: Semmes-Weinstein Monofilaments

Reviewer: Diane D. Allen, PT, PhD | **Date of review:** 5/2/11

ICF domain (check all that apply):

__x___ Body function/structure _____ Activity _____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance
_____ Ataxia
_____ Cardiovascular/pulmonary status
_____ Coordination (non-equilibrium)
_____ Dizziness/vestibular
_____ Fatigue
_____ Flexibility
_____ Muscle performance
_____ Muscle tone / spasticity
_____ Pain
_____ Posture
_____ Sensory integration
__x___ Somatosensation
_____ Balance/falls
_____ Bed mobility
_____ Gait
_____ Reach and grasp
_____ Self care
_____ Transfers
_____ Wheelchair skills
_____ Health and wellness
_____ Home management
_____ Leisure
_____ Quality of life
_____ Role function
_____ Shopping
_____ Social function
_____ Work

Other:

Type of measure:

__x___ Performance-based _____ Self-report

Instrument description:

- Semmes-Weinstein monofilaments are slender fibers of different stiffness which, when pressed end-wise against the skin just until the fiber bends, can test light touch sensory (a.k.a. cutaneous pressure) thresholds.[1] A five piece Semmes-Weinstein monofilament set (2.83, 3.61, 4.31, 4.56, and 6.65 log force; equivalent to forces in grams of 0.07, 0.4, 2, 4, 447, respectively[2]) (North Coast Medical, Morgan Hill, CA) is typically used at designated locations of the body[3]; a 20 piece set is also available. The 2.83 filament is considered to represent "normal" sensitivity in most areas of the body, and the 6.65 filament is considered to represent a loss of protective sensation.[1] The most slender (smallest, most flexible) monofilament sensed at each location is recorded and given an ordinal score, using a defined scale.[4, 5] The values for each site are averaged to produce a composite sensory score, where a score of 0 represents normal somatosensation, and a score of 4 represents marked somatosensory loss (e.g., the ability to sense only deep pressure at each location).
- The Semmes-Weinstein monofilaments are a standardized development of von Frey hairs. Further development includes creation of the Weinstein Enhanced Sensory Test (WEST) that provides additional improvements including guaranteed calibration.[6]

Reliability (test-retest,	Intra-rater:

intra-rater, inter-rater)	• Inter-rater: • ICC = 0.96 in 30 subjects including peripheral nerve injury, Braille readers and healthy controls[7] Test-retest: •
Validity (concurrent, criterion-related, predictive)	Construct validity: • Not empirically tested; Weinstein[8] reports a low correlation (r=0.17) between pressure sensitivity and spatial threshold (divergent validity Concurrent validity: • r = 0.55 w/object identification in 14 subjects two years post median nerve graft [9] • r = 0.696 w/object recognition time[10] Predictive validity: • Discriminative validity: • Significant reduction in plantar surface sensation (using 8-piece S-W) noted in 14 patients with MS compared to 10 healthy controls.[11] • Significant reduction in finger-tip sensation (using 5-piece S-W) noted in 26 patients with MS compared to 30 healthy controls.[2] Sensitivity/Specificity/Predictive Values/Likelihood Ratios: •
Ceiling/floor effects	Ceiling effects: • Floor effects: •
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • MCID: • Other responsiveness values: • Responsiveness assessed in 19 patients with median and ulnar nerve injury at 3-48 months. Effect Size = 1.5 (large)[12]

	• Five-piece Semmes-Weinstein set able to show change in finger-tip sensation at 12 hours and 3 weeks following a 3- week intervention of daily TENS treatment.[2] <u>Normative Data:</u> •
Instrument use	• Testing done at designated locations on the upper or lower extremity, frequently the finger tips or plantar surface.
Equipment required	• Five piece Semmes-Weinstein monofilament set (2.83, 3.61, 4.31, 4.56, and 6.65 log force) (North Coast Medical, Morgan Hill, CA)
Time to complete	• About 15 minutes
How is the instrument scored? (e.g., total score, are there subscales, etc…)	Each filament size is assigned an ordinal score. Patient is scored according to the size of monofilament they can detect.[7] Normal = 0 (patient can feel filament 2.83) Diminished light touch (patient can feel filament 3.61) = 1 Diminished protective sensation (patient can feel filament 4.31) = 2 Loss of protective sensation (patient can feel filament 6.65)=3 Unable to feel the largest filament (6.65) = 4 This score is then averaged across the number of sites that sensation is tested.
Level of client participation required (is proxy participation available?)	• Client must state whether or not they detect the monofilament touching them.
Limitations	• Results do not directly predict function. This test only reveals the force of the smallest detectable filament; some researchers advise against reporting the results using descriptors such as "diminished light touch," for instance.[6] • The psychometric properties have been tested on individuals with peripheral nerve injuries; they have not been tested on those with MS. The Semmes-Weinstein monofilaments, however, have been used in research studies involving people post-stroke,[4, 13, 14] or with MS.[2, 11]
Recommendations **Practice Setting (check all that apply):** __x___ Acute __x___ Inpatient Rehab __x___ Home Health __x___ Skilled Nursing __x___ Outpatient	

Comments:
-

Level of Disability (check all that apply):
__x___ EDSS 0.0 – 3.5
__x___ EDSS 4.0 – 5.5
__x___ EDSS 6.0 – 7.5
__x___ EDSS 8.0 – 9.5

Comments:
-

Should this tool be required for entry-level curricula?
_____ Yes __x___ No
Comments:
- Not specifically for MS, although students should be exposed to this test for this population; possibly require for peripheral neuropathies.

Is this tool appropriate for research purposes?
_____ Yes __x___ No
Comments:
- While appropriate for research, lack of prior psychometric testing in people with MS means that researchers have a greater need to obtain reliability and validity evidence in their samples.

Attachments:
- Score Sheets: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Instructions: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Reference list: _____ Uploaded on website

Second Reviewer Comments:
- Agree with the primary reviewer's assessment

Overall Taskforce Agreement with Recommendations:
-

Practice Setting	4	3	2	1	Comments
Acute			X		•
Inpatient Rehab			X		•
Home Health			X		•

Semmes-Weinstein Monofilaments

Skilled Nursing			X		•
Outpatient			X		•
Overall Comments: • Rating reflects lack of psychometric data in individuals with MS					

Level of Disability	**4**	**3**	**2**	**1**	**Comments**
EDSS 0.0 – 3.5			X		•
EDSS 4.0 – 5.5			X		•
EDSS 6.0 – 7.5			X		•
EDSS 8.0 – 9.5			X		•
Overall Comments: • Rating reflects lack of psychometric data in individuals with MS					

Entry-Level Criteria	**Students should learn to administer tool**	**Students should be exposed to tool (e.g. to read literature)**	**Do not recommend**	**Comments**
Should this tool be required for entry level curricula?			X	• Do not recommend for education specific to patients with MS due to lack of psychometric data in MS, but may be useful related to other patient populations

Research Use	**YES**	**NO**	**Comments**
Is this tool appropriate for research purposes?		X	• Lack of psychometric data in MS, so do not recommend for use in research at this point in time. • Recommend investigating psychometric properties in MS.

References:

1. Bell JA. Semmes-Weinstein monofilament testing for determining cutaneous light touch/deep pressure sensation. *Star.* 1984;44(2):8-11, 16.

2. Cuypers K, Levin O, Thijs H, Swinnen SP, Meesen RLJ. Long-tem TENS treatment improves tactile sensitivity in MS patients. *Neurorehabil Neural Repair.* 2010;24:420-427.
3. Bell-Krotoski J, Tomancik E. The repeatability of testing with Semmes-Weinstein monofilaments *J Hand Surg [Am].* 1987;12:155-161.
4. Zackowski KM, Dromerick AW, Sahrmann SA, Thach WT, Bastian A. How do strength, sensation, spasticity and joint individuation relate to the reaching deficits of people with chronic hemiparesis? *Brain.* 2004;127:1035-1046.
5. Wagner JM, Lang CE, Sahrmann SA, Edwards DF, Dromerick AW. Sensorimotor impairments and reaching performance in subjects with poststroke hemiparesis during the first few months of recovery *Phys Ther.* 2007;87:751-765.
6. Jerosch-Herold C. Assessment of sensibility after nerve injury and repair: a systematic review of evidence for validity, reliability and responsiveness of tests. *J Hand Surg [Am].* 2005;30B:252-264.
7. Novak CB, Mackinnon SE, Williams JI, Kelly L. Establishment of reliability in the evaluation of hand sensibility. *Plast Reconstr Surg.* 1993;92:311-322.
8. Weinstein S. Fifty years of somatosensory research: from the Semmes-Weinstein monofilaments to the Weinstein enhanced sensory test. *J Hand Ther.* 1993;6:11-22.
9. Novak C, Kelly L, Mackinnon S. Sensory recovery after median nerve grafting. *J Hand Surg [Am].* 1992;17A:59-68.
10. Dellon A, Kallman C. Evaluation of functional sensation in the hand. *J Hand Surg [Am].* 1983;8:865-870.
11. Kelleher KJ, Spence WD, Solomonidis S, Apatsidis D. The effect of textured insoles on gait patterns of people with multiple sclerosis. *Gait Posture.* 2010;32:67-71.
12. Rosen B, Dahlin LB, Lundborg G-. Assessment of functional outcome after nerve repair in a longitudinal cohort. *Scand J Plast Reconstr Hand Surg.* 2000;34:71-78.
13. Lang CE, Wagner JM, Dromerick AW, Edwards DF. Measurement of upper-extremtiy function early after stroke: properties of the Action Research Arm Test. *Arch Phys Med Rehabil.* 2006;87:1605-1610.
14. Wagner JM, Lang CE, Sahrmann SA, et al. Relationships between sensorimotor impairments and reaching deficits in acute hemiparesis. *Neurorehabil Neural Repair.* 2006;20:406-416.

Instrument name: Short Form Health Survey of the Medical Outcome Study (SF-36)	
Reviewer: Susan E. Bennett, PT, DPT, EdD, NCS, MSCS	**Date of review:** 4/17/11

ICF domain (check all that apply):

_____ Body function/structure _____ Activity __x__ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance
_____ Ataxia
_____ Cardiovascular/pulmonary status
_____ Coordination (non-equilibrium)
_____ Dizziness/vestibular
__x__ Fatigue
_____ Flexibility
_____ Muscle performance
_____ Muscle tone / spasticity
__x__ Pain
_____ Posture
_____ Sensory integration
_____ Somatosensation

_____ Balance/falls
_____ Bed mobility
__x__ Gait
_____ Reach and grasp
__x__ Self care
_____ Transfers
_____ Wheelchair skills

__x__ Health and wellness
__x__ Home management
__x__ Leisure
__x__ Quality of life
__x__ Role function
__x__ Shopping
__x__ Social function
__x__ Work

Other:

Type of measure:

_____ Performance-based __x__ Self-report

Instrument description:

- Generic measurement developed to measure health-related quality of life in patients and healthy persons. Consists of 8 sub-scales that are often used separately as outcome measures of various aspects of health-related-quality of life. It measures two main health concepts: physical and mental.

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: Inter-rater: • Concordance between patient and proxy SF-36 scores were moderate to excellent except for the general health domain.[1] • Internal Consistency: • Internal consistency reliability for the 8 dimensions of the SF-36 was high with alpha coefficients between 0.77-0.94.[2] (MS population)

	Test-retest: • Highly correlated ranging from 0.74-0.93.[3] (Not MS specific)
Validity (concurrent, criterion-related, predictive)	Concurrent validity: • No significant correlation found between the SF-36 mental summary score and the EDSS score.[4] (MS population) • 4 mental SF-36 subscales were significantly correlated with the EDSS; mental health (r=-0.21, P=0.003), role-emotional (r=-0.18, P=0.015), social functioning (r=-0.48, P<0.0001), and vitality (r=-0.26, P<0.0001).[4] • SF-36 physical functioning scale showed the best correlation with the EDSS (= - 0.86, P<0.0001), and this scale shared 73% of the variation in the EDSS score.[4] • Comparisons between the general population SF-36 scales and the EDSS 4.0-6.5 and EDSS >6.5 groups are highly significant (p<0.001) for all SF-36 scales. The EDSS <4.0 group differs significantly only for general health (p<0.001) and social function (p<0.001).[1] • Statistically significant correlation between EDSS and six variables of the SF-36. The most evident association was with physical function (r = 0.62). Bodily pain, general health, social function, physical role limitation, and emotional role limitation also correlated (r =0.28-.35).[5] Predictive validity: • There was a nine-fold decrease in physical function scores between patients with MS who walked independently and those who used a wheelchair.[6] • Less physically disabled individuals had significantly higher scores (p<0.05) on all SF- 36 dimensions than those who used support when walking.[6] • Low scores on the SF-36 were significantly correlated with increased (worsened) EDSS scores 1 year later r= -0.29.[7] • In patients with relapse remitting MS there was a relative risk of 1.9 (95% CI, 1.0 to 3.5) for experiencing a worsening EDSS score between those who evaluated their health as poor or fair versus those who evaluated their health as good, very good, or excellent.[7] • Discriminative validity: • Participants with MS had lower mean scores on all dimensions of the SF-36 compared with UK norms after controlling for sociodemographic variables (p<0.001). Relative to the UK norms

	MS had the greatest impact on two physical domains of the SF-36; physical function and role limitation. (p<0.001).[6] • Multiple sclerosis patients had lower mean scores for physical function than patients with Parkinson's Disease (difference 11 points; p<0.001).[6] • Patients with MS showed significant lower mean scores for all SF-36 health dimensions compared with sex and age adjusted Italian population r = -0.38 to -0.65 (p<0.001).[8] Sensitivity/Specificity/Predictive Values/Likelihood Ratios: •
Ceiling/floor effects	Ceiling effects: • Floor effects: • In an MS population a significant floor effect was seen in the physical functioning scores for those people who walked with an aid (14.2%) and those who used wheelchairs (67.8%).[6] • Floor effects increased markedly for physical function and role limitations (both emotional and physical) at each end of the range of disability. The marked floor and ceiling effects demonstrated in half of the dimensions, and across the range of disease severity, indicate a limited ability to discriminate between patients with multiple sclerosis at a single point in time.[2]
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • Of the eight dimensions of the scale only pain (p=0.006) and physical function (p=0.01) demonstrated a statistically significant change in scores between admission and discharge of an inpatient rehabilitation program.[2] • Effect sizes for the SF-36 dimensions ranged from negligible to small (effect sizes 0.01-0.30).[2] MCID: • Other responsiveness values: • Physical functioning in the SF-36 negatively and significantly correlated with duration of MS from onset (r= -0.37; p < 0.001)[9] Normative Data: •
Instrument use	•
Equipment required	• Pencil, survey
Time to complete	• 30 minutes
How is the instrument scored? (e.g., total score,	• Nominal (yes/no) or ordinal scale, each response given a number of points.

are there subscales, etc…)	• Each of the items are weighted and therefore software used to compile scores • 8 sub-scales, all items are coded and transformed into percentage ranging from 0 (poor health) to 100 (optimal health) • Physical functioning (10 items) • Role limitations because of physical health (4 items) • Bodily pain (2 items) • Social functioning (2 items) • General mental health covering psychological distress and well-being (5 items) • Role limitations because of emotional problems (3 items) • Vitality, energy or fatigue (4 items) • General health perceptions (5 items) • Change in health status in the past year (1 item)
Level of client participation required (is proxy participation available?)	• Ability to adequately fill out the questionnaire, or have a proxy to assist in completion.
Limitations	• Is not a needs assessment tool, requires further investigation for actual management. • Has limited validity as a measure of mental health in multiple sclerosis. Evidence shows that it underestimates the impact of multiple sclerosis on mental health. • Patient variability • Large floor and ceiling effects are seen in 4 of the 8 dimensions, and do not differentiate between the dimensions of the disease. No floor or ceiling effects occur in the mental or physical summary scores.[2] • Small effect size shows the responsiveness of the SF-36 to be poor in evaluating the effectiveness of inpatient rehabilitation in people with moderate to severe disability.[2]
Recommendations **Practice Setting (check all that apply):** _____ Acute _____ Inpatient Rehab __X__ Home Health _____ Skilled Nursing __X___ Outpatient Comments: •	
Level of Disability (check all that apply):	

__x__ EDSS 0.0 – 3.5
__x__ EDSS 4.0 – 5.5
__x__ EDSS 6.0 – 7.5
____ EDSS 8.0 – 9.5

Comments:

-

Should this tool be required for entry-level curricula?

__x__ Yes _____ No

Comments:

- Exposure only

Is this tool appropriate for research purposes?

__x__ Yes _____ No

Comments:

-

Attachments:

- Score Sheets: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Instructions: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Reference list: _____ Uploaded on website

Second Reviewer Comments:

- This measure is one of the most used HRQOL tools in research and is the basis for the MSQOL-54. Psychometrics have been exhaustively studied in many populations. While the psychometrics do not seem as strong in the MS population, the solution may be to add measures to this one (or use the MSQOL-54) instead of avoiding it, because of the benefits of comparing this population to others.

Overall Taskforce Agreement with Recommendations:

-

Practice Setting	4	3	2	1	Comments
Acute				X	•
Inpatient Rehab				X	•
Home Health		X			•

Skilled Nursing				X	•
Outpatient		X			•
Overall Comments: • The questions tend to provoke thought of participation over a period of time, so may not be relevant for people with acute changes in health-related QOL.					
Level of Disability	**4**	**3**	**2**	**1**	**Comments**
EDSS 0.0 – 3.5		X			•
EDSS 4.0 – 5.5		X			•
EDSS 6.0 – 7.5		X			•
EDSS 8.0 – 9.5				X	• Not really as appropriate to this level of disability
Overall Comments: •					

Entry-Level Criteria	**Students should learn to administer tool**	**Students should be exposed to tool (e.g. to read literature)**	**Do not recommend**	**Comments**
Should this tool be required for entry level curricula?		X		•

Research Use	**YES**	**NO**	**Comments**
Is this tool appropriate for research purposes?	X		•

References:
1) Solari A, Radice D. Health status of people with multiple sclerosis: a community mail survey. *Neurol Sci*. 2001(22): 307-315.
2) Freeman JA, Hobart JC, Langdon DW, et al. Clinical appropriateness: a key factor in outcome measure selection: the 36 item short form health survey in multiple sclerosis. *J Neurol Neurosurg Psychiatry.* 2000;68:150-156.

3) Brazier JE, Harper R, Jones NMB, et al. Validating the SF-36 Health Survery Questionnaire: New Outcome Measure. *BMJ: British Medical Journal*. 1992; 305: 160-164.
4) Nortvedt M, Riise T, Myhr KH, et al. Performance of the SF-36, SF-12, and RAND-36 Summary Scales in a Multiple Sclerosis Population. *Medical Care*. 2000; 38(10): 1022-1028.
5) Isaksson AK, et al. Quality of life and impairment in patients with multiple sclerosis. *J Neurol Neurosurg Psychiatry*. 2005 (76): 64-69.
6) Riazi A, Hobart JC, Lamping DL, et al. Using the SF-36 measure to compare the health impact of multiple sclerosis and Parkinson's disease with normal population health profiles. *J Neurol Neurosurg Psychiatry*. 2003; 74: 710-714.
7) Nortvedt MW, Riise T, Myhr KM, et al. Quality of life as a predictor for change in disability in MS. *Neurology*. 2000 Jul 12;55(1): 51-4.
8) Patti F, Cacopardo M, Palermo F, et al. Health-related quality of life and depression in an Italian sample of multiple sclerosis patients. *Journal of the Neurological Sciences*. 2003 (211): 55-62.
9) Krokavcova M, Dijk J, Nagy I, et al. Perceived health status as measured by the SF-36 in patients with multiple sclerosis: a review. *Scand J Caring Sci*. 2009; 23: 529-538.

Instrument name: Static Standing Balance Test	
Reviewer: Susan E. Bennett, PT, DPT, EdD, NCS, MSCS	**Date of review:** 9/5/11

ICF domain (check all that apply):

__X__ Body function/structure _____ Activity _____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance	__X_ Balance/falls	_____ Health and wellness
_____ Ataxia	_____ Bed mobility	_____ Home management
_____ Cardiovascular/pulmonary status	_____ Gait	_____ Leisure
_____ Coordination (non-equilibrium)	_____ Reach and grasp	_____ Quality of life
_____ Dizziness/vestibular	_____ Self care	_____ Role function
_____ Fatigue	_____ Transfers	_____ Shopping
_____ Flexibility	_____ Wheelchair skills	_____ Social function
_____ Muscle performance		_____ Work
_____ Muscle tone / spasticity		
_____ Pain		
_____ Posture		
_____ Sensory integration		
_____ Somatosensation		

Other:

Type of measure:

__X__ Performance-based _____ Self-report

Instrument description:

- Static Standing balance tests include Romberg stance, Sharpened Romberg (SR) and single leg stance (one leg stance – OLS). The Romberg and Sharpened Romberg are performed eyes open and eyes closed. The study of people with MS conducted by Frzovic[1] also included static balance in steady stance (feet apart), and stride stance.

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • Inter-rater: • Test-retest: • In 14 ambulatory people with MS, no significant difference

	was found when static standing balance tests were administered in the morning vs. afternoon, despite a significant difference in perceived fatigue from am to pm[1] • OLS test on dominant leg in young healthy individuals (20-30 years) on a computerized balance platform; 3 trials averaged ICC values > 0.75; 95% CI.[2]
Validity (concurrent, criterion-related, predictive)	Concurrent validity: • Predictive validity: • Discriminative validity: • No significant difference between people with MS and control subjects for feet apart and feet together for 30 seconds.[1] Significant differences were found between healthy subjects and those with MS in regards to right and left stride stance (in the am only), right and left tandem stance (am and pm), and right and left OLS (am and pm). Subjects with MS in this study ambulated 14 M x 3 without AD or assistance. • Heitman reported for noninstitutionalized fallers the SR eyes open condition was significantly lower than those of non fallers ($p<.05$) for mean age of 73.6 yrs.[3] Sensitivity/Specificity/Predictive Values/Likelihood Ratios: •
Ceiling/floor effects	Ceiling effects: • Ceiling effects were present with all tests performed at 30 seconds maximum with eyes open for 39 healthy young adults age 20 – 30 years.[2] Briggs examined 45 seconds on the single leg stance to eliminate the ceiling effect.[4] 24% of normal subjects could stand for 30 seconds but were unable to maintain 45 seconds (eyes closed).[4] Floor effects: •
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • MCID: • Other responsiveness values: • Normative Data: • Bohannon reported men and women performing One

	Legged Stance Time averaged between right and left leg 5 trials; shoes off condition; 60 – 69 years of age 22.5 sec +/- 8.6 eyes open; 10.2 sec +/- 8.6 eyes closed; subjects 70 -79 years 14.2 sec +/- 9.3 eyes open and 4.3 sec +/- 3.0 eyes closed.[5]
Instrument use	•
Equipment required	• Stopwatch
Time to complete	•
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• Timed test recorded in seconds
Level of client participation required (is proxy participation available?)	• Patient is required to perform the test and must be able to stand with various feet positions; proxy NA
Limitations	• Patients must be ambulatory

Recommendations
Practice Setting (check all that apply):

__X__ Acute
__X__ Inpatient Rehab
__X__ Home Health
__X__ Skilled Nursing
__X__ Outpatient

Comments:
- Use of this test in Skilled Nursing may not be appropriate.

Level of Disability (check all that apply):

___X__ EDSS 0.0 – 3.5
___X__ EDSS 4.0 – 5.5
___X__ EDSS 6.0 – 7.5 **
_____ EDSS 8.0 – 9.5

Comments:
- ** Steady stance (feet 10cm apart) may be the only test appropriate for the EDSS level 6.0-7.5

Should this tool be required for entry-level curricula?

__X___ Yes _____ No

Comments:
-

Is this tool appropriate for research purposes?

_____ Yes __x___ No

Comments:

-

Attachments:

- Score Sheets: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Instructions: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Reference list: _____ Uploaded on website

Second Reviewer Comments:

- Agree with rating and recommendations. While static standing balance tests have high clinical utility and provide the PT with valuable information, there is limited psychometric data pertaining to their use in individuals with MS.

Overall Taskforce Agreement with Recommendations:

-

Practice Setting	4	3	2	1	Comments
Acute			X		•
Inpatient Rehab			X		•
Home Health			X		•
Skilled Nursing			X		•
Outpatient			X		•

Overall Comments:

- As noted above Skilled Nursing may not be appropriate

Level of Disability	4	3	2	1	Comments
EDSS 0.0 – 3.5			X		•
EDSS 4.0 – 5.5			X		•
EDSS 6.0 – 7.5			X		• Only static stand feet apart
EDSS 8.0 – 9.5				X	•

Overall Comments:

-

Entry-Level	Students	Students	Do not	Comments

Criteria	should learn to administer tool	should be exposed to tool (e.g. to read literature)	recommend	
Should this tool be required for entry level curricula?	X			• Standing balance tests are frequently utilized in a clinical setting so students should learn how to correctly administer the test and any normative data

Research Use	YES	NO	Comments
Is this tool appropriate for research purposes?		X	• Static standing tests may be utilized in clinical research for healthy individuals, however application to the MS population is limited • Further research on psychometrics in individuals with MS is warranted

References:
1. Frzocic D, Morris M, Vowels L. Clinical tests of standing balance: Performance of persons with MS. Arch Phys med Rehabil Vol 81, Feb 2000, 215-221

2. Muehlbauer T, Roth R, et al: Intra and Intersession Reliability of Balance measures during One-Leg Stance in Young Adults. J of Strength and Conditioning 25:8; 2228-2234 August 2011

3. Heitman DK, Gossman MR, et al: Balance performance and step width in noninstitutionalized, elderly, female fallers and nonfallers. Phys Ther 69: Vol 11, 923-931, Nov 1989

4. Briggs RC, Gossman MR, Birch R, et al: Balance performance among non-institutionalized elderly women. Phys Ther 69:748 – 756, 1989

5. Bohannon RW, Larkin PA, Cook AC, et al: Decrease in timed balance test scores with aging. Phys Ther 64:1067-1070; 1984

Instrument name: Tardieu Scale for Assessing Spasticity	
Reviewer: Susan E. Bennett, PT, DPT, EdD, NCS, MSCS	**Date of review:** 6/18/11

ICF domain (check all that apply):

__x__ Body function/structure _____ Activity _____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance
_____ Ataxia
_____ Cardiovascular/pulmonary status
_____ Coordination (non-equilibrium)
_____ Dizziness/vestibular
_____ Fatigue
_____ Flexibility
_____ Muscle performance
__x__ Muscle tone / spasticity
_____ Pain
_____ Posture
_____ Sensory integration
_____ Somatosensation

_____ Balance/falls
_____ Bed mobility
_____ Gait
_____ Reach and grasp
_____ Self care
_____ Transfers
_____ Wheelchair skills

_____ Health and wellness
_____ Home management
_____ Leisure
_____ Quality of life
_____ Role function
_____ Shopping
_____ Social function
_____ Work

Other:

Type of measure:

__x__ Performance-based _____ Self-report

Instrument description:

- A clinical measure of spasticity that assesses and compares the response of the muscle to passive movement at both slow and fast speeds.

Reliability (test-retest, intra-rater, inter-rater)	<u>Intra-rater:</u> • After formal training when assessing elbow flexors and ankle plantar flexors in children with CP experienced raters had an intra-rater agreement rate across all joints and parameters of 90% +/- 8%. Non-experienced raters had an intra-rater agreement rated of 80% +/- 13%.[1] • Knee flexors in children with CP X and Xv3 intra-rater scores were 77% and 74% in experienced testers and 52% and 52% in testers with no experience.[1] <u>Inter-rater:</u> • ICC= 0.66 for elbow flexors of stroke patients.[2]

	• After formal training when assessing elbow flexors and ankle plantar flexors in children with CP experienced raters had an inter-rater reliability across all joints and parameters of 81% +/- 13%. Non-experienced raters 74% +/- 16%.[1] • Knee flexors in children with CP the values of X and Xv3 inter-rater scores were 65% and 54% in experienced testers, and 44% and 44% in non-experienced testers.[1] • Kappa = 0.29- 0.53 in adults with severe brain injury.[3] • ICC > .7 for Modified Tardieu Scale hamstrings and calf in children with CP. Discrepancy in measurement of 10-15 degrees for slow PROM, and 10-18 degrees for fast ROM.[4] • Inter-rater differences in the Modified Tardieu Scale of 10 degrees for the adductors, 20 degrees for the hamstrings and 10-15 degrees for the gastrocnemius muscle.[4] <u>Test-retest:</u> • ICC = 0.86 for elbow flexors of stroke patients. [2] • In patients with severe brain injury the modified Tardieu Scale was moderate to very good Kappa = 0.52-0.87.[3] • Test-retest was significantly higher with the Modified Tardieu Scale compared to the Modified Ashworth Scale ($Z > 1.96$; $p<0.05$)[3] • In the lower limb of children with CP disparity of 6-18 degrees for the slow angular velocity and 4-19 degrees on the fast passive movement.[4] • Intersession reliability in modified Tardieu reported 90% of measurement differences were below 17 degrees at the slow velocity, 16 degrees at the gravity velocity and 25 degrees at the fast velocity in the elbow flexors of children with CP.[5,6]
Validity (concurrent, criterion-related, predictive)	<u>Concurrent validity:</u> • In identifying the presence or absence of spasticity in the elbow flexors and ankle plantarflexors, percentage of exact agreement (PEA) was 100% between the Tardieu Scale and the laboratory measure of spasticity (chance-corrected agreement statistic kappa= 1.0). (stroke)[7] • In elbow flexors there was a significant relationship between the grade of muscle reaction (X) during the fast stretch (V3) and peak stretch-induced EMG activity (r=0.86, P=0.001).[7] • Significant but moderate relationship between the Tardieu Scale and the laboratory measure of spasticity in the ankle plantarflexor (r=0.62, P=0.01). (Stroke)[7] • PEA = 94% between the Tardieu Scale and the laboratory measure of contracture of elbow flexors and ankle dorsiflexors.

	(kappa= 0.88). (Stroke)[7] • Strong, significant relationship between the angle of muscle reaction (Y) during the slow stretch (V1) and laboratory measures of contracture in both the elbow flexors(r=0.89, P=0.001) and ankle plantarflexors (r=0.84, P=0.001) (Stroke)[7] • The Tardieu Scale was more effective than the Ashworth Scale in detecting spasticity (88.9%, kappa=0.73), the presence of contracture (77.8%, kappa= 0.503), and the severity of contracture (r=0.49). (Cerebral Palsy)[8] Predictive validity: • Discriminative validity: • Sensitivity/Specificity/Predictive Values/Likelihood Ratios: •
Ceiling/floor effects	Ceiling effects: • Floor effects: •
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • MCID: • Other responsiveness values: • Normative Data: •
Instrument use	• Measures spasticity in clinical practice, distinguishes between the neural and peripheral contributions to movement resistance.
Equipment required	• Hand held goniometer
Time to complete	• Slightly longer than the Modified Ashworth Scale, around 1 minute or less per muscle or joint being measured.
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• Grading is performed at the same time of day, in a constant position of the body for a given limb. The patient is sitting for upper limbs and supine for lower limbs. • Velocity to stretch: V1: as slow as possible, V2: speed of limb falling under gravity, V3: as fast as possible (faster than the rate of the natural drop of the limb segment under gravity). V1 is used to measure the passive range of motion, V2 and V3 are used to rate spasticity. • Grading of stretch reflex: 0 = no spasticity up to 4 severe spasticity • X is the spasticity angle this is determined by Xv1 (angle of arrest

	at slow speed) – Xv2 (angle of catch at fast speed). This reflects the velocity-dependent stretch reflex. • Y is the spasticity grade, which is an ordinal variable grading scale, measuring the gain of the muscle reaction to fast stretch (V3).[1] • Modified Tardieu scale, two resulting joint angles are measured by goniometer: the R1 angle which is the 'angle of catch' after a fast velocity stretch, and the R2 angle defined as the passive joint range of movement following a slow velocity stretch. The R2–R1 value indicates the level of dynamic contracture in the joint.[5,6]
Level of client participation required (is proxy participation available?)	• Maintain neutral sitting or supine posture while testing is being performed. Patient must be compliant with instructions related to examiner moving extremity
Limitations	• Only one instance of it being used in an adult population with mediocre results. • With adult patients results may be skewed secondary to weight of the limbs, and difficulty performing the tests. • Needs further testing into the validity and reliability of the scale. • Modified Tardieu appears to be easier to perform as determining 2 angles; one at onset of resistance to quick stretch and second with end range of the muscle/joint

Recommendations
Practice Setting (check all that apply):

__X__ Acute
__X__ Inpatient Rehab
__X__ Home Health
__X__ Skilled Nursing
__X__ Outpatient

Comments:

- Could be used in all settings but has not been demonstrated to be valid and reliable in adult populations, including MS

Level of Disability (check all that apply):

__X__ EDSS 0.0 – 3.5
__X__ EDSS 4.0 – 5.5
__X__ EDSS 6.0 – 7.5
__X__ EDSS 8.0 – 9.5

Comments:

- As noted above, concern is application to adult population. Not all patients with MS display

spasticity at low EDSS of 0.0 – 3.5
Should this tool be required for entry-level curricula? ____ Yes ___x__ No Comments: • Although should be discussed in pediatric course in combination with Modified Ashworth Scale
Is this tool appropriate for research purposes? ____ Yes __x___ No Comments: • Although may be useful in a pediatric population
Attachments: • Score Sheets: _____ Uploaded on website _____ Available but copyrighted __X__ Unavailable • Instructions: __X__ Uploaded on website _____ Available but copyrighted _____ Unavailable PROVIDED IN REFERENCES • Reference list: _____ Uploaded on website
Second Reviewer Comments: • Agree with rating and recommendations.
Overall Taskforce Agreement with Recommendations: •

Practice Setting	**4**	**3**	**2**	**1**	**Comments**
Acute			X		•
Inpatient Rehab			X		•
Home Health			X		•
Skilled Nursing			X		•
Outpatient			X		•

Overall Comments:
• Information not available on use of scale in MS

Level of Disability	**4**	**3**	**2**	**1**	**Comments**
EDSS 0.0 – 3.5			X		•
EDSS 4.0 – 5.5			X		•
EDSS 6.0 – 7.5			X		•

EDSS 8.0 – 9.5			X		•
Overall Comments: • As above					

Entry-Level Criteria	Students should learn to administer tool	Students should be exposed to tool (e.g. to read literature)	Do not recommend	Comments
Should this tool be required for entry level curricula?			X	• Do not recommend for education specific to the MS population, but might be useful for the pediatric and stroke populations

Research Use	YES	NO	Comments
Is this tool appropriate for research purposes?		X	• Lack of psychometric data in MS, so do not recommend for use in research at this point in time, but may be appropriate in pediatrics or stroke. • Recommend investigating psychometric properties in MS.

References:

1) Gracies J, Brke K, Clegg N, et al. Reliability of the Tardieu Scale for Assessing Spasticity in Children With Cerebral Palsy. *Arch Phys Med Rehabil*. March 2010;91 : 421-428.

2) Paulis W, Horemans H, Brouwer B, et al. Excellent test-retest and inter-rater reliability for Tardieu Scale measurements with inertial sensors in elbow flexors of stroke patients. *Gait & Posture*. 2011(33):185-189.

3) Mehrholz J, Wagner K, et al. Reliability of the Modified Tardieu Scale and the Modified Ashworth Scale in adult patients with severe brain injury: a comparison study. *Clinical Rehabilitation*. 2005; 19: 751-759.

4) Fosang AL, Galea MP, McCoy AT, Reddihough DS, et al. Measures of muscle and joint performance in the lower limb of children with cerebral palsy. *Dev Med Child Neurol*. October 2003; 45(10): 664-70.

5) Mackey AH, Walk SE, Lobb G, Stott NS. Intraobserver reliability of the modified Tardieu scale in the upper limb of children with hemiplegia. *Dev Med Child Neurol*. April 2004; 46(4): 267-72.

6) Waninge A, Rock RA, Dijkhuizen, et al. Feasibility, test-retest reliability, and interrater reliability of the Modified Ashworth Scale and Modified Tardieu Scale in persons with profound intellectual and multiple disabilities. *Research in Developmental Disabilities*. 2011(32):613-620.

7) Patrick E, Louise A. The Tardieu Scale differentiates contracture from spasticity whereas the Ashworth Scale is confounded by it. *Clinical Rehabilitation*. 2006; 20: 173-182.

8) Alhusaini AA, Dean CM, Crosbie J, et al. Evaluation of spasticity in children with cerebral palsy using Ashworth and Tardieu laboratory measures. *J Child Neurol*. October 2010; 25(10): 1242-7.

Instrument name: Timed 25-Foot Walk (T25FW)	
Reviewer: Diane D. Allen, PT, PhD	**Date of review:** 7/20/11

ICF domain (check all that apply):

_____ Body function/structure __x___ Activity _____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance	_____ Balance/falls	_____ Health and wellness
_____ Ataxia	_____ Bed mobility	_____ Home management
_____ Cardiovascular/pulmonary status	__x___ Gait	_____ Leisure
_____ Coordination (non-equilibrium)	_____ Reach and grasp	_____ Quality of life
_____ Dizziness/vestibular	_____ Self care	_____ Role function
_____ Fatigue	_____ Transfers	_____ Shopping
_____ Flexibility	_____ Wheelchair skills	_____ Social function
_____ Muscle performance		_____ Work
_____ Muscle tone / spasticity		
_____ Pain		
_____ Posture		
_____ Sensory integration		
_____ Somatosensation		

Other:

Type of measure:

__x___ Performance-based _____ Self-report

Instrument description:

- The Timed 25-foot walk (T25FW) is one of a number of measures of gait velocity. Similar measures include timed walks of 10 meters[1] or 30 feet. The instructions may be for self-selected walking speed or fastest safe walking speed. Time may be recorded manually with a stop watch or via more mechanized equipment such as photocells. Frequently, the course is set so that the individual walks a total of 35 feet (14 meters[1]): 5 feet (or 2 meters) prior to the beginning of the timed course and 5 feet (or 2 meters) after the end of the timed course, to minimize the acceleration/deceleration period within the recorded time.
- The T25FW has been included as one of three components of the Multiple Sclerosis Functional Composite (along with the 9-hole peg test and the paced auditory serial addition test. As part of the MSFC, the T25FW has been used to monitor progression of activity limitation.[2]

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • Inter-rater:

	• ICC (95% CI) was .93 (.72-.98) for normal speed and .96 (.84-.99) for maximal speed to walk 10 meters in 9 people with MS measured in two sessions by two people, an experienced and less-experienced physiotherapist [1] • Pearson r for documenting speed of normal ambulation over 20 feet with digital stopwatch by 2 raters for 6 people with MS was 1.0.[3] <u>Test-retest:</u> • ICC (95% CI) was .91 (.81-.96) for normal speed and .95 (.90-.98) for maximal speed to walk 10 meters in 19 people with MS across 3 sessions separated by one week intervals[1] • ICC (95% CI) was .96 in 41 people with MS, EDSS between 0 and 6.5, tested at two sessions with a one-two hour interval. • Pearson r for documenting speed of normal ambulation over 20 feet with digital stopwatch two times with 15 minute interval in 24 people with MS was .97.[3]
Validity (concurrent, criterion-related, predictive)	<u>Concurrent validity:</u> • In 130 people with MS, Spearman's rho for the correlation between the seconds taken for the T25FW and: EDSS was .72; ankle dorsiflexion was -.43; hip flexion was -.52; vibration sensation at the great toe was .39.[4] • In 378 people with MS (secondary analyses of databases obtained for generating the MSFC), the change in T25FW over a one year time period correlated with the change in EDSS with a Spearman's rho of .41.[5] • In 13 people with MS, EDSS scores of 4.0-6.0, the Spearman rho correlation between seconds on the T25FW and velocity as calculated via an instrumented gait mat was -.93.[6] • In 527 people with MS, over a time period of at least one year, 143 had >20% increase in seconds required for T25FW; associated with patient-perceived worsening of daily life functioning as recorded on Guy's Neurological Disability Scale.[7] • In 151 people with MS, EDSS 0-6.5, the T25FW correlated with the MSWS-12 with a Spearman's rho of .69 and with EDSS at rho = .80.[8] • In 115 people with MS, the 10 meter walk test correlated with the Rivermead Mobility Index with a Spearman's rho of -.8.[9] • In 237 people with MS, EDSS 0-7.5, the time to (fast) walk 8 meters (26 feet) correlated with a Spearman's rho of -.79 with maximum distance walked before stopping, and .86 with EDSS.[10] The time to (fast) walk 8 meters correlated strongly with the Hauser Ambulation Index at rho = .91, but time varied considerably within each AI level.[10]

	• In 21 people with MS, EDSS 3.5 to 7.5, T25FW times ranged from 4.3 to 35.7 seconds; correlated significantly to daily step count at Spearman's rho -.64; to TUG at .85; to 6-minute walk at -.80; to DGI at -.59; insignificant correlation to BBS at -.42 and to ABC at -.37.[11] Predictive validity: • Discriminative validity: • In 343 people with MS (secondary analyses of databases obtained for generating the multiple sclerosis functional composite: MSFC), T25FW averaged below 10 seconds with limited variation for people with EDSS scores of 3.5 and below, but were higher and had greater variation for people with EDSS scores of 6 and 6.5.[5] • People with MS in the 40-80 year old age group are significantly slower than those in the 20-39 year old age group; people using assistive devices are significantly slower than those without.[8] Sensitivity/Specificity/Predictive Values/Likelihood Ratios: • In 112 people with MS, 20% improvement on the T25FW had a sensitivity of 25 (15-38) and a specificity of 90 (80-95) for association with patient perceived improvement vs little or no improvement 6 weeks after a treatment with IV methylprednisolone. Combining T25FW with the 9-hole peg test improves the sensitivity slightly.[12]
Ceiling/floor effects	Ceiling effects (high number of seconds = slow gait velocity): • The test is not useful for people unable to walk 25 feet. Floor effects (low number of seconds = fast gait velocity): • In 151 people with MS, EDSS ranging from 0 to 6.5, the time to perform the T25FW ranged from 3.5 to 22.6 seconds with a majority of people in the 4.5 to 7.5 seconds range. In 64 healthy controls, the fastest time was 2.5 seconds with a median at 4.4 seconds.[8]
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • MCID: • Other responsiveness values: • A cut-off point of 20% change in the T25FW as an indication of deterioration in activity has been supported in 161 patients with PPMS with a 2-year interval.[2] • Lord et al.[13] set 28% points on the T25FW as the minimal clinically important difference for people with MS, then demonstrated that 10 people in each of two intervention groups (facilitation and task oriented) averaged 28% and 25%

	improvement in walking speed after 15-19 one-hour treatments over 5-7 weeks. The effect sizes for the two groups were .53 and .73; neither effect size is statistically significant in these small groups. • In 115 patients with MS undergoing 4 weeks of rehabilitation, 72% improved in 10 m walk by at least 14%; 43% improved in 10 m walk by at least 28%.[9] <u>Normative Data:</u> • Normative data for healthy males, females in different decades between ages 20 and 70 have been published for the 25-foot walk at comfortable (130-146 cm/sec) and maximum (175-253 cm/sec) speeds.[14] • Median T25FW in 64 healthy controls (age 38.6 years, SD 11.8) was 4.4 seconds (SD = .6 seconds).[8] • In 12 people with MS who were independent ambulators, velocity (presumably usual or preferred velocity) over a 20-foot walk was 53% of healthy individuals, at about 72 cm/sec.[15]
Instrument use	•
Equipment required	• Measured distance for a walking course and a stop watch or other timing device.
Time to complete	• Seconds.
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• Scored in seconds: higher numbers mean slower gait speed. • When converted to velocity in meters/second or centimeters/second, higher numbers mean faster gait speed.
Level of client participation required (is proxy participation available?)	• Performance-based test; no proxy available.
Limitations	• Skewed scores (bunched at lower end with a long tail indicating that a few individuals might take a long time to walk 25 feet) so comparisons should be made using non-parametric statistics like Spearman's rho. • Can be significant variability between trials for T25FW because this measure records both ambulatory impairment AND effort.[10] High variability hinders assessment of actual change in ambulatory speed.
Recommendations **Practice Setting (check all that apply):** __x___ Acute __x___ Inpatient Rehab __x___ Home Health __x___ Skilled Nursing __x___ Outpatient	

Comments:

-

Level of Disability (check all that apply):

__x___ EDSS 0.0 – 3.5
__x___ EDSS 4.0 – 5.5
__x___ EDSS 6.0 – 7.5
_____ EDSS 8.0 – 9.5

Comments:

-

Should this tool be required for entry-level curricula?

__x___ Yes _____ No

Comments:

-

Is this tool appropriate for research purposes?

__x___ Yes _____ No

Comments:

-

Attachments:

- Score Sheets: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Instructions: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Reference list: _____ Uploaded on website

Second Reviewer Comments:

- Agree with recommendations

Overall Taskforce Agreement with Recommendations:

-

Practice Setting	4	3	2	1	Comments
Acute	X				•
Inpatient Rehab	X				•

Timed 25-Foot Walk

Home Health	X				•
Skilled Nursing	X				•
Outpatient	X				•
Overall Comments: •					

Level of Disability	**4**	**3**	**2**	**1**	**Comments**
EDSS 0.0 – 3.5	X				•
EDSS 4.0 – 5.5	X				•
EDSS 6.0 – 7.5	X				•
EDSS 8.0 – 9.5				X	• Not appropriate for non-ambulatory individuals
Overall Comments: •					

Entry-Level Criteria	**Students should learn to administer tool**	**Students should be exposed to tool (e.g. to read literature)**	**Do not recommend**	**Comments**
Should this tool be required for entry level curricula?	X			•

Research Use	**YES**	**NO**	**Comments**
Is this tool appropriate for research purposes?	X		•

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Instrument name: Timed Up & Go (TUG) w/ Cognitive & Manual	
Reviewer: Susan E. Bennett, PT, DPT, EdD, NCS, MSCS	**Date of review:** 4/28/11

ICF domain (check all that apply):

_____ Body function/structure __x_ Activity _____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance
_____ Ataxia
_____ Cardiovascular/pulmonary status
_____ Coordination (non-equilibrium)
_____ Dizziness/vestibular
_____ Fatigue
_____ Flexibility
_____ Muscle performance
_____ Muscle tone / spasticity
_____ Pain
_____ Posture
_____ Sensory integration
_____ Somatosensation

__x__ Balance/falls
_____ Bed mobility
__x__ Gait
_____ Reach and grasp
_____ Self care
__x _ Transfers
_____ Wheelchair skills

_____ Health and wellness
_____ Home management
_____ Leisure
_____ Quality of life
_____ Role function
_____ Shopping
_____ Social function
_____ Work

Other:

Type of measure:

__x__ Performance-based _____ Self-report

Instrument description:

- Performance based measure of dynamic balance. The subject stands up from a chair, walks 3m, then turns around walks back to the chair sits down. Subject is timed from the moment their pelvis lifts off of the chair and timing is stopped when the pelvis reaches the chair again.
- Timed up and go cognitive involves adding a cognitive task (subtracting 3 from a random number between 20 and 100) while performing the Timed Up and Go.
- Timed up and go manual involves performing the Timed Up and Go while holding a full cup of water.

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • ICC=0.93 (unilateral lower limb amputation) (Schoppen) Inter-rater: • ICC=0.96 (unilateral lower limb amputation) (Schoppen) • ICC=.999 (Parkinson's Disease) (Morris) • In older adults r = .98, .99, and .99 for the TUG, TUG

	manual, and TUG cognitive (Shumway-Cook) Test-retest: • Total =0.91 (0.83-0.95), EDSS </= 4: 0.84 (0.66-0.93), EDSS > 4: 0.88 (0.76-0.95) (Nilsagard 2) • ICC=.985-.988 (Alzheimer Disease) (Ries) • ICC=0.95-0.96 (Stoke) (Flansbjer, NG)
Validity (concurrent, criterion-related, predictive)	Concurrent validity: • Higher daily step count was associated with lower TUG scores (rho= -0/51, P=0.02) (Cavanaugh) • Good correlation between TUG and BBS (r=0.81) (Schoppen) • ICC= 0.83 (0.71-0.91) between TUG and 10-m walk test • ICC =0.85 (0.74-0.92) between the TUG and the 30-m walk test (Nilsagard 2) • ICC =0.99 between the mean values of the 10-m, and 30-m and TUG first attempt. (Nilsagard 2) • Good correlation between the TUG and Berg Balance Scale (r=-.76) and Tinetti Balance Scale (r=.74) (Berg) • TUG Significantly correlated with tests of gait speed (-0.86 to -0.92), stair climbing time (0.86 to 0.9), and 6 minute walk test (-0.89 to -0.92) (Flansbjer) • TUG times correlated moderately well with gait speed (r=-.55), scores on the Berg Balance Scale (r=-.72), and the Barthel Activities of Daily Living (r =-.51). (Podsiadlo) • Predictive validity: • Times of greater than or equal to 13.5 seconds have been related to increased risk of falling in older adults (Schoppen) • The TUG showed no statistical or clinical significance between fallers and non-fallers with MS. (Cattaneo) • Frail older adults who had a time difference of greater than 4.5 seconds between the TUG manual and the TUG were prone to falls during the following 6 months. (Lundin-Olsson) • On the TUG manual, classification of older adults as fallers using the time score of 14.5 seconds or longer resulted in a 90% correct prediction rate. Elderly subjects who completed the TUG cognitive in 15 seconds or longer were classified as fallers with an overall correct prediction rate of 87%. (Shumway-Cook) Discriminative validity:

	• Sensitivity/Specificity/Predictive Values/Likelihood Ratios: • Precision of error for the TUG was 5.6% (DeBolt) • TUG cognitive accurately identifies most fallers and non-fallers among the elderly with a sensitivity and specificity of 87%. (Schumway-Cook) • The TUG cognitive better identified fallers than non-fallers with a sensitivity of 73% and specificity of 54%. (Nilsagard)
Ceiling/floor effects	Ceiling effects: • Floor effects: • Present when a patient is unable to perform ambulation or transfers without assistance.
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • Alzheimer Disease= 4.09 seconds • Parkinson's Disease= 11 seconds • Elderly African Americans 4.0 seconds (Mangione) MCID: • Other responsiveness values: • For the TUG 23-24% improvement of 30-31% deterioration establishes a genuine change for the individual. (Nilsgard 2) Normative Data: • Mean best score in patients with MS = 13.9 seconds with a SD of 6.2 seconds (Nilsagard 2)
Instrument use	•
Equipment required	• Stopwatch, 47-cm-high chair with arm and back supports, cone, tape
Time to complete	• 1-2 minutes
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• Subject starts sitting in a chair that is not against a wall. The subject stands up from the chair, walks 3m, turns around a cone or a marked piece of tape and walks back to the chair and sits down. Subjects are told to perform this as quickly and as safely as possible. Assistive devices are allowed and must be documented, however physical assistance is not allowed. The test is measured in seconds. • No subscales noted. • TUG manual – same but carrying a full cup of water, seconds recorded • TUG cognitive – same but doing calculations while

	performing the task, seconds recorded
Level of client participation required (is proxy participation available?)	• No proxy participation available.
Limitations	• Does not take into account a wide variety of activities, and pays no attention to the quality of the movement, or where a subject encountered difficulty. (Cattaneo) • Subject must be able to walk and transfer without assistance (floor effect). • May not give sufficient information to guide the choice of intervention, even though it can be useful in assessing the effect of such treatment. (Botolfsen)

Recommendations
Practice Setting (check all that apply):

__X__ Acute
__X__ Inpatient Rehab
__X__ Home Health
__X__ Skilled Nursing
__X__ Outpatient

Comments:
-

Level of Disability (check all that apply):

__X__ EDSS 0.0 – 3.5
__X__ EDSS 4.0 – 5.5
__X__ EDSS 6.0 – 7.5
_____ EDSS 8.0 – 9.5

Comments:
-

Should this tool be required for entry-level curricula?

__X__ Yes _____ No

Comments:
-

Is this tool appropriate for research purposes?

__X__ Yes _____ No

Comments:

•
Attachments: • Score Sheets: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable • Instructions: __X__ Uploaded on website _____ Available but copyrighted _____ Unavailable • Reference list AND INSTRUCTIONS AT: _____ Uploaded on website http://www.unmc.edu/media/intmed/geriatrics/nebgec/pdf/frailelderlyjuly09/toolkits/timedupandgo_w_norms.pdf http://www.saskatoonhealthregion.ca/pdf/03_Timed%20Up%20and%20Go%20procedure.pdf http://www.rheumatology.org/practice/clinical/clinicianresearchers/outcomes-instrumentation/TUG.asp
Second Reviewer Comments: • Helpful when the group that was studied was listed in the bullet points, something that Kirsten has been adding is "not reported in MS" as a bullet point when there is no literature on the MS population • For formatting, just need to reference things utilizing AMA with superscripts • Other than these 2 minor things, I thought it was complete and I agree with your recommendations
Overall Taskforce Agreement with Recommendations: •

Practice Setting	**4**	**3**	**2**	**1**	**Comments**
Acute	X				•
Inpatient Rehab	X				•
Home Health	X				•
Skilled Nursing	X				•
Outpatient	X				•
Overall Comments: •					
Level of Disability	**4**	**3**	**2**	**1**	**Comments**
EDSS 0.0 – 3.5	X				•
EDSS 4.0 – 5.5	X				•
EDSS 6.0 – 7.5	X				•
EDSS 8.0 – 9.5				X	• Needs to be able to walk without assist

Overall Comments: •

Entry-Level Criteria	**Students should learn to administer tool**	**Students should be exposed to tool (e.g. to read literature)**	**Do not recommend**	**Comments**
Should this tool be required for entry level curricula?	X			•

Research Use	**YES**	**NO**	**Comments**
Is this tool appropriate for research purposes?	X		•

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17) Cavanaugh J, Gappmaier V, Dibble L, et al. Ambulatory Activity in Individuals With Multiple Sclerosis. JNPT. 2011;35:26-33.

Instrument name: Tinetti Falls Efficacy Scale (FES)	
Reviewer: Kathleen Brandfass, MS, PT	**Date of review:** 8/31/11

ICF domain (check all that apply):

_____ Body function/structure _X____ Activity ___X__ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance	___X__ Balance/falls	_____ Health and wellness
_____ Ataxia	_____ Bed mobility	_____ Home management
_____ Cardiovascular/pulmonary status	_____ Gait	_____ Leisure
_____ Coordination (non-equilibrium)	_____ Reach and grasp	_____ Quality of life
_____ Dizziness/vestibular	__X___ Self care	_____ Role function
_____ Fatigue	__X___ Transfers	___X__ Shopping
_____ Flexibility	_____ Wheelchair skills	_____ Social function
_____ Muscle performance		_____ Work
_____ Muscle tone / spasticity		
_____ Pain		
_____ Posture		
_____ Sensory integration		
_____ Somatosensation		

Other:

Type of measure:

_____ Performance-based __X___ Self-report

Instrument description:

- 10 item questionnaire to assess the contribution of fear of falling on physical performance. Each item is rated from 1= extreme confidence to 10= no confidence at all. Scores with high total indicate lower confidence with self-efficacy or fear of falling.

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: N/A Inter-rater: • N/A Test-retest: • In study with 74 patients r=0.71 (1)
Validity (concurrent, criterion-related, predictive)	Concurrent validity: • FES correlated with Activities Specific Balance Confidence Scale

	(ABC) in individual 60 years or older: high – r=0.86. (4). • FES correlated with the ABC: r= 0.84 (5) • FES correlated with 10 meter walk test in MS patients r=0.826 (6) • FES correlated with Dynamic Gait Index in MS patients r= -0.601(6) • FES correlated with Timed Up and GO in MS patients r=0.535 (6) • FES correlated with Functional Reach in MS patients r= -0.612 (6) • FES correlated with the Beck Depression Inventory in MS patients r=0.811 (6) • FES correlated with Survey and Fear of Falling in the Elderly (SAFE) in individuals 60 years or older: moderate- r=0.67 (4) Predictive validity: • FES cannot identify individuals who restrict their activity. Scores on the FES explained 28% of the variance. (4) • FES cannot identify individual with a history of falling. Scores on the FES explained on 4% of the variance. (4). Discriminative validity: • Sensitivity/Specificity/Predictive Values/Likelihood Ratios: • In a study with 53 subjects: Senstivity-59%; specificity-82%. (7).
Ceiling/floor effects	Ceiling effects: • N/A Floor effects: • N/A
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • Not reported MCID: • Not reported Other responsiveness values: • Normative Data: •
Instrument use	• Assess fear of falling in an elderly population has been utilized in individuals diagnosed with MS aged 25 to 45 (6)
Equipment required	• Questionnaire form
Time to complete	• 5 to 15 minutes
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• Each of the 10 items are added; range 0 to 100. Higher scores indicate greater fear of falling
Level of client participation required (is proxy participation available?)	• Self or by Interview
Limitations	• Cognitive dyfunction
Recommendations	

Practice Setting (check all that apply):

__X___ Acute
__X___ Inpatient Rehab
__X___ Home Health
__X___ Skilled Nursing
__X___ Outpatient

Comments:
- FES appropriate for elderly individuals at risk for falls not related to practice setting.

Level of Disability (check all that apply):

__X___ EDSS 0.0 – 3.5
__X___ EDSS 4.0 – 5.5
__X___ EDSS 6.0 – 7.5
_____ EDSS 8.0 – 9.5

Comments:
- FES related to EDSS- Fear of Falling in individuals with MS related to increased impairments, history of a fall and using an assistive device. (8).

Should this tool be required for entry-level curricula?

_____ Yes __X___ No

Comments:
- FES should be included in geriatric module; psychometric data is lacking to support its use in MS.

Is this tool appropriate for research purposes?

_____ Yes __x___ No

Comments:
- FES could be used in elderly MS population when fear of falling, and history of falls is part of the research design
- However, there is a lack of psychometric data in MS, so recommend investigating psychometric properties in MS.

Attachments:

- Score Sheets: _X___ Uploaded on website _____ Available but copyrighted _____ Unavailable http://www.wales.nhs.uk/site3/Documents/501/Tinetti's%20falls%20efficacy%20scale.doc
- Instructions: __X___ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Reference list: _____ Uploaded on website

Second Reviewer Comments:
- Agree with ratings and recommendations

Overall Taskforce Agreement with Recommendations: •

Practice Setting	**4**	**3**	**2**	**1**	**Comments**
Acute			X		•
Inpatient Rehab			X		•
Home Health			X		•
Skilled Nursing			X		•
Outpatient			X		•
Overall Comments: • FES could be utilized for practice setting where fear of falling is focus; however, rating of 2 reflects lack of psychometric data in individuals with MS.					
Level of Disability	**4**	**3**	**2**	**1**	**Comments**
EDSS 0.0 – 3.5			X		•
EDSS 4.0 – 5.5			X		•
EDSS 6.0 – 7.5			X		•
EDSS 8.0 – 9.5				X	• Individuals with MS utilizing a wheelchair as means of mobility tend to report less fear of falling.
Overall Comments: • Rating of 2 for EDSS levels 0.0 – 7.5 reflects lack of psychometric data in individuals with MS. • Additional versions: Modified Falls Efficacy Scale (9); Falls Efficacy Scale International (FES-I) (10).					

Entry-Level Criteria	**Students should learn to administer tool**	**Students should be exposed to tool (e.g. to read literature)**	**Do not recommend**	**Comments**
Should this tool be required for entry level curricula?			X	• Do not recommend for education specific to patients with MS due to lack of psychometric data in MS, but may be useful related to other patient populations

Research Use	YES	NO	Comments
Is this tool appropriate for research purposes?		X	• Lack of psychometric data in MS, so do not recommend for use in research at this point in time. • Recommend investigating psychometric properties in MS.

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Instrument name: Tinetti Performance Oriented Mobility Assessment (POMA)	
Reviewer: Kirsten Potter, PT, DPT, MS, NCS	**Date of review:** 5/30/11

ICF domain (check all that apply):

_____ Body function/structure ___x__ Activity _____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance	__x___ Balance/falls	_____ Health and wellness
_____ Ataxia	_____ Bed mobility	_____ Home management
_____ Cardiovascular/pulmonary status	__x___ Gait	_____ Leisure
_____ Coordination (non-equilibrium)	_____ Reach and grasp	_____ Quality of life
_____ Dizziness/vestibular	_____ Self care	_____ Role function
_____ Fatigue	__x___ Transfers	_____ Shopping
_____ Flexibility	_____ Wheelchair skills	_____ Social function
_____ Muscle performance		_____ Work
_____ Muscle tone / spasticity		
_____ Pain		
_____ Posture		
_____ Sensory integration		
_____ Somatosensation		

Other:

Type of measure:

__x___ Performance-based _____ Self-report

Instrument description:

- Tinetti aimed to develop a measure to screen older adults for balance and gait impairments that was feasible for use (i.e., required no equipment and no training to master), was reliable and sensitive to significant changes, and reflected position changes and gait maneuvers used during daily activities[1]
- Various versions of the POMA exist, with variations for both the name of the test and means of scoring; this review focuses on the 16 item, 28-point version of the POMA (see Compendium of Instructions for the POMA form)[2]
- Total POMA consists of 16 items: 9 balance (POMA – B) and 7 gait (POMA – G) items
- The majority of the research on the POMA has been done on older adults; this review focuses predominately on studies that have included subjects with neurological conditions

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • Not reported in MS • Parkinson's disease: ICCs for 6 raters (using videotaped assessment) ranged from 0.69 – 0.88, $p < 0.0001$; when rated by students, ICCs ranged 0.69 – 0.88; when rated by physical therapists, ICCs ranged 0.79 – 0.86[3] and POMA – G r = 0.95 for

	older adults with and without PD[4] • ALS: Kappa values for 6 raters ranged 0.40 – 1.0 with two exceptions (attempts to rise for two raters, K = 0.30 and 0.39; turning 360^0 for one rater, K = 0.31)[5] • Frail elders, including 38.8% with stroke and 24.9% with Parkinson's disease: ICC = 0.84[6] <u>Inter-rater:</u> • Not reported in MS • Parkinson's disease: ICC values all above 0.80 (P < 0.001) when administered by experienced (ICC = 0.84) and students raters (ICC = 0.89)[3] • ALS: ICC for POMA – B = 0.95; Kappa values across all items for all raters ranged 0.62 – 0.84 except eyes closed (K = 0.44); better reliability found among raters using videotaped assessments (K ranged 0.61 – 1.0) as compared to live administration and scoring (K ranged 0.43 – 0.83)[5] • Stroke: ICC for POMA – G =0.85[7] • In elderly nursing home residents, approximately 1/3 of whom had stroke or other neurologic conditions, for POMA – B, done by both novice and experienced PTs: kappa coefficient ranging from 0.40 – 1.0; no significant difference between novice and experienced PT[8] • Older adults (14.6% with stroke): POMA - B ICC = 0.692[9] • In 15 frail nursing home residents, one of which had MS (3 with Parkinson's disease, 1 with cerebral anoxia, 1 with stroke, and 2 with dementia), reliability = 0.96 for POMA – B and 0.94 for POMA - G (statistic used not reported)[10] • In nursing home residents with moderate to severe dementia (stage 5 or 6 on the Global Deterioration Scale), ICC = 0.97, 0.97, and 0. 88 for POMA – T, POMA – B, and POMA – G, respectively[11] • Older adults: rho values ranged from 0.80 – 0.93 for POMA, POMA – B, and POMA -G[12] <u>Test-retest:</u> • Not reported in MS • Stroke: ICC for POMA – G ICC = 0.91[7] and ICC = 0.874[13] • Older adults: rho values ranged from 0.72 – 0.86 for POMA, POMA – B, and POMA -G[12] • In older adults with mild dementia (Mini Mental Status Examination score ± SD = 19.1 ± 5.2) and without dementia ICC =

	0.96[14]
Validity (concurrent, criterion-related, predictive)	Concurrent validity: • Not reported in MS • Parkinson's disease: POMA scores correlate moderately to gait speed (total POMA rho = 0.53, POMA – B = 0.52, POMA – G = 0.50, all $p < 0.01$)[3] • Stroke: POMA correlates significantly to the motor domain of the FIMTM (rho = 0.646, $p < 0.001$) and gait speed (rho = 0.638, $p < 0.001$)[13] • Stroke and healthy age-matched older adults: significant negative correlation with COP-COM or distance between center of pressure and center of mass in terms of root mean square (r = -0.58 for AP direction, r = -0.57 for ML direction)[15] • Possible normal pressure hydrocephalus: POMA – G correlated with Functional Ambulatory Performance and gait velocity measured with a GAITRite Portable Walkway System; r values ranging from 0.67 – 0.82 (all statistically significant) for all subjects at baseline, subjects who would undergo shunt surgery, and post-shunt surgery, with exception of correlation between POMA – G and gait velocity (r = 0.59, $p = 0.07$) in subjects who had shunt surgery[16] • Community-dwelling older adults: POMA – B correlated with Timed Up and Go (r = -0.55), Functional Reach (r=0.48), Tinetti gait (r = 0.81), walking speed (r = -0.54), and Older Adults Resources and Services ADL scale (r = 0.60)[17] • Older adults: POMA, POMA – B, and POMA – G all correlate significantly to walking speed, Timed Up and Go, Frailty and Injuries: Cooperative Studies of Intervention Techniques (FICSIT – 4), Groningnen Activity Restriction Scale (GARS), and Longitudinal Aging Study Amsterdam Physical Activity Questionnaire (LAPAQ); with exception of LAPAQ, correlations were of moderate strength (LAPAQ correlations < 0.38)[12] • Older adults: POMA, POMA – B, and POMA – G closely relates to Activities Specific Balance Confidence Scores; r values range from 0.689 – 0.736, all $p < 0.01$[18] Predictive validity: • Not reported in MS • Parkinson's disease: at cut off score < 20, sensitivity = 76%, specificity = 66%, positive predictive value = 39%, negative predictive value = 91%, positive likelihood ratio = 2.25 and 2.4 (for falls within past week and 6 months, respectively), negative likelihood ratio = 0.37 and 0.49 (for falls within past week and 6

	months, respectively)[3] • Older adults (14.6% with stroke): at cut off score = 12, POMA – B is significant predictor of need for assistive device[9] • In nursing home residents with moderate to severe dementia (stage 5 or 6 on the Global Deterioration Scale): POMA – T (but not POMA – B or POMA – G) is a significant predictor of fall risk (adjusted hazard ratio = 1.08, 95% CI 1.01 – 1.17, $p < 0.05$)[11] • Community-dwelling older adults: lower scores on the POMA - B significantly predicted the occurrence of falling and ADL decline and improvement[17] <u>Discriminative validity:</u> • Not reported in MS • Patients with Parkinson's disease score less on POMA -G (M = 10.74, SD = 0.241) as compared to controls (M = 12), df = (1, 18), F = 9.60[4] • Chronic stroke: POMA able to discriminate among individuals who are non fallers, one-time fallers, and repeated fallers at $p < 0.001$ and between those who use a walking aid and those who do not at $p < 0.01$[19] • Older adults (14.6% with stroke): POMA – B able to discriminate between those using an assistive device and those not using a device ($p = 0.000$); older adults who used a device and had falling history scored 1.8 points lower on POMA – B as compared to those who didn't use device and didn't fall (yet, difference not significant)[9] • Frail elders, including 38.8% with stroke and 24.9% with Parkinson's disease: POMA – B able to discriminate between fallers and non-fallers ($t = 3.245$, $P = 0.003$, ES = 1.05)[6] • Community-dwelling older adults: lower scores on POMA – B found for subjects who were older, had fall history, used a walking aid, and had more ADL disability[17] • Older adults: similar discriminative abilities exist among POMA, POMA – B, and POMA – G; all able to discriminate between independent ambulators and those that use assistive devices (cane, walker, wheelchair)[12] <u>Sensitivity/Specificity/Predictive Values/Likelihood Ratios:</u> • Not reported in MS • Chronic stroke: At POMA cut off < 20, sensitivity = 66.0% and specificity = 79.2; area under the curve = 0.78; odds ratio = 1.59[19] • Older adults in residential care facilities, including 25% with neurological conditions, POMA – B at cut off = 14, sensitivity = 68%, specificity = 78% (lower values as compared to Berg Balance Scale and gait speed)[20]

	• Frail elders, including 38.8% with stroke and 24.9% with Parkinson's disease: at cut off = 11, sensitivity = 83% and specificity = 72%; OR for fall risk at score < 11 = 18.55 (95% CI: 2.05 – 167.80, p = 0.009)[6] • In nursing home residents with moderate to severe dementia (stage 5 or 6 on the Global Deterioration Scale): POMA – T at cut off score = 21, sensitivity = 85%, specificity = 56%, positive predictive value (PPV) = 38%, and negative predictive value (NPV) = 89%; POMA – B at cut off score = 11, sensitivity = 70%, specificity = 51%, PPV = 35%, and NPV = 81%; POMA – G at cut off score = 9, sensitivity = 70%, specificity = 61%, PPV = 37%, and NPV = 81%[11] • Older adults: At cut off of 19, POMA sensitivity = 64.0%, specificity = 66.1%; At cut off of 10, POMA - B sensitivity = 64.0%, specificity = 66.1%; At cut off of 9, POMA sensitivity = 64.0%, specificity = 62.5%[12] • Community dwelling older adults: POMA – B had largest area under the curve for predicting ADL decline and improvement, as compared to Timed Up and Go, one legged standing, and Functional Reach[17]
Ceiling/floor effects	<u>Ceiling effects:</u> • Not reported in MS • Possible normal pressure hydrocephalus: ceiling effect may exist for POMA – G reported, but no values provided[16] • Older adults: ceiling effect found for POMA – G (21.2%), but not POMA or POMA - B[12] <u>Floor effects:</u> • Not reported in MS • Parkinson's disease: floor effect reported, but no data provided[3] • Older adults: no floor effect found for POMA, POMA – B, or POMA - G[12]
Sensitivity to change (responsiveness, MCID, MDC) / normative data	<u>MDC:</u> • Not reported in MS • Older adults: for individual assessments, MDC_{95} = 5.0; for group assessments, $MDC_{95\ group}$ = 0.8[12] <u>MCID:</u> • Not reported in MS <u>Other responsiveness values:</u> • Not reported in MS • Parkinson's disease: ES varies by instructional cue given when administering POMA – G, ranging from 0.13 (for cues of count

	aloud or fast) to 0.25 (cue of swing arms)[4] • Possible normal pressure hydrocephalus: POMA – G may not be as responsive to change as GAITRite Portable Walking System, but no values reported[16] • In 15 frail nursing home residents, one of which had MS (3 with Parkinson's disease, 1 with cerebral anoxia, 1 with stroke, and 2 with dementia), the POMA was found to indicate statistically significant improvements in balance and gait, indicating that it is responsive to change, but no responsiveness values provided[10] • Older adults: POMA – B: ES = 0.19, 0.94, and 0.39, respectively, for ability of POMA – B to detect falls, activities of daily living (ADL) decline, and ADL improvement[17] • In older adults with mild dementia (Mini Mental Status Examination score ± SD = 19.1 ± 5.2) and without dementia, responsiveness index was 4.7 and 2.0, respectively[14] <u>Normative Data:</u> • Mean POMA scores for individuals aged 65 – 79 male = 26.21 ± 3.40, female 25.16 ± 4.30 and for those ≥ 80 years of age male = 23.29 ± 6.02, female = 17.20 ± 8.32[18] • Baloh et al studied 59 normal older adults (mean ± SD age on entry = 78.5 ±3.7 years); the mean Tinetti score at entry to the study = 27.5 (SD = 0.65); scores decreased annually and significantly by a mean of 0.50 (SD = 0.40)[21]
Instrument use	• Designed to measure balance (including fall risk) and gait function in elderly, but has also been used for patients with various conditions (including Parkinson's disease, Amyotrophic Lateral Sclerosis, normal pressure hydrocephalus, and stroke, among others); a generic measure, hence has utility for many patient populations
Equipment required	• Hard, armless chair • Stopwatch or wristwatch • 15 ft walkway
Time to complete	• 10 – 15 minutes • POMA – B: Average time to complete 160 seconds[17]
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• The POMA consists of balance and gait subscale (9 balance and 7 gait items) with total balance score = 16, gait score = 12, total POMA score = 28 • 3 point ordinal scale, ranging from 0-2, where highest score indicates independence with each test item.
Level of client participation	• Participants must be able to follow instructions and able to

required (is proxy participation available?)	ambulate short distances with assistive device.
Limitations	• Multiple versions of the POMA exist, which is potentially confusing. • The item on POMA – B, arising, may be problematic as the patient is deducted a point if using hands to stand; Mitchell and Newton[9] point out that patients are sometimes taught to use hands to stand for safety or to assist with generating power to stand; thus, the use of hands to arise may not reflect poorer balance; hence, they recommend that the instructions for arising include requesting that the individual stand without the use of hands • Feasibility issues have been reported in older adults with moderate to severe dementia (stage 5 or 6 on the Global Deterioration Scale); 41% of patients had difficulty following directions; also, inclusion of dual tasks in the POMA – B were found to be particularly difficult for these subjects[11]

Recommendations
Practice Setting (check all that apply):
__x___ Acute
__x___ Inpatient Rehab
__x___ Home Health
__x___ Skilled Nursing
__x___ Outpatient

Comments:
- Has not been studied in MS, but is feasible for any setting

Level of Disability (check all that apply):
__x___ EDSS 0.0 – 3.5
__x___ EDSS 4.0 – 5.5
__x___ EDSS 6.0 – 7.5
_____ EDSS 8.0 – 9.5

Comments:
- Patient must be able to ambulate short distances with assistive device.

Should this tool be required for entry-level curricula?

_____ Yes __x___ No

Comments:
- Limited psychometrics support its use in patients with neurologic conditions; not studied in MS

Is this tool appropriate for research purposes?

_____ Yes ___x__ No Comments: • Reliability and validity of the POMA for patients with MS is unknown and needs to be determined before use in research
Attachments: • Score Sheets: __x___ Uploaded on website _____ Available but copyrighted _____ Unavailable Available at: http://www.google.com/search?q=tinetti+POMA+form&rls=com.microsoft:en-us:IE-SearchBox&ie=UTF-8&oe=UTF-8&sourceid=ie7&rlz=1I7DMUS_enUS290 • Instructions: __x___ Uploaded on website _____ Available but copyrighted _____ Unavailable • Reference list: _____ Uploaded on website
Second Reviewer Comments: • Agree with values given for practice setting and EDSS levels
Overall Taskforce Agreement with Recommendations: •

Practice Setting	**4**	**3**	**2**	**1**	**Comments**
Acute			X		•
Inpatient Rehab			X		•
Home Health			X		•
Skilled Nursing			X		•
Outpatient			X		•
Overall Comments: • POMA is feasible for use in any of the above settings, but no data exists on the use of the POMA for individuals with MS					
Level of Disability	**4**	**3**	**2**	**1**	**Comments**
EDSS 0.0 – 3.5			X		•
EDSS 4.0 – 5.5			X		•
EDSS 6.0 – 7.5			X		•
EDSS 8.0 – 9.5				X	•
Overall Comments: • The POMA could be appropriate for ambulatory individuals with MS, but no data exists on the use of the POMA for individuals with MS					

Entry-Level Criteria	**Students should**	**Students should be**	**Do not recommend**	**Comments**

	learn to administer tool	exposed to tool (e.g. to read literature)		
Should this tool be required for entry level curricula?			X	• Based on lack of data pertaining to the use of the POMA in individuals with MS; however, it may be appropriate to teach the POMA for older adults or patients with other conditions

Research Use	YES	NO	Comments
Is this tool appropriate for research purposes?		X	• Lack of psychometric data in MS, so do not recommend for use in research at this point in time. • Recommend investigating psychometric properties in MS.

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Instrument name: Trunk Control Test	
Reviewer: Susan E. Bennett, PT, DPT, EdD, NCS, MSCS	**Date of review:** 7/15/11

ICF domain (check all that apply):

_____ Body function/structure __x__ Activity _____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance	__x__ Balance/falls	_____ Health and wellness
_____ Ataxia	__x__ Bed mobility	_____ Home management
_____ Cardiovascular/pulmonary status	_____ Gait	_____ Leisure
_____ Coordination (non-equilibrium)	_____ Reach and grasp	_____ Quality of life
_____ Dizziness/vestibular	_____ Self care	_____ Role function
_____ Fatigue	_____ Transfers	_____ Shopping
_____ Flexibility	_____ Wheelchair skills	_____ Social function
_____ Muscle performance		_____ Work
_____ Muscle tone / spasticity		
_____ Pain		
_____ Posture		
_____ Sensory integration		
_____ Somatosensation		

Other: Could infer sitting balance on item 4 of the 4 step test

Type of measure:

__x__ Performance-based _____ Self-report

Instrument description:

- Performance-based assessment of four simple aspects of trunk movement.

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • Inter-rater: • Good inter-rater reliability (Spearman's Rho= 0.76 (p<0.001) in Stroke[1] Test-retest: • In stroke: Cronbach's Index suggests that the items of the Trunk Control test describe a homogenous variable: the values at admission were alpha = 0.86, and at discharge alpha = 0.83. [2]
Validity (concurrent, criterion-related, predictive)	Concurrent validity: • Good correlation of the Trunk Control Test and Rivermead Motor Assessment Rho=0.70 at 6 weeks, 0.72 at 12 weeks, and 0.79 at

	18 weeks post stroke[1] • Score of TCT was highly correlated with Barthel Index and Fugl-Meyer balance test scores (Pearson r= 0.89 and r=0.73, p<0.0001) indicating good convergent validity in stroke.[2] • In stroke: Trunk Control Test and total FIM (adm. r = .707, discharge r = .79) and motor FIM (adm. r= .819, discharge r = .856)[2] • No statistically significant differences were observed between Trunk Control Test scores obtained in patients who recovered the ability to walk and those who did not. (Elderly patients) [3] • Correlation was inversely significant between Trunk Control Test and length of stay (r= -0.722) in stroke[4] • Trunk Control Test and ambulation time (r= -0.644) in stroke[5] • Correlation significant between initial Trunk Control Test and Berg Balance Scale (r=0.755) in stroke[4] <u>Predictive validity:</u> • Trunk Control Test at admission was highly correlated with scores at discharge (r=.831) (stroke)[5] • Trunk Control Test score at admission was a better predictor of motorFIM discharge scores better than the motorFIM scores. (Stroke) [2] • For patients with acute stroke scoring 50 or more on the Trunk Control Test at 6 weeks was predictive of recovery of walking ability by 18 weeks.[2] • The predictive value of a compound variable (Trunk Control Test and admission FIM) reaches 60% of the variation in length of stay and 66% in the FIM at discharge.[4] • Higher Trunk Control Test at admission showed less displacement (r= -0.601) and the better gait speed (r= 0.282) of computerized posturography [4] <u>Discriminative validity:</u> • <u>Sensitivity/Specificity/Predictive Values/Likelihood Ratios:</u> •
Ceiling/floor effects	<u>Ceiling effects:</u> • Only maintenance of the sitting position (T4) is likely to present a

	ceiling effect at approximately 3 months from the stroke. In this item 90% of the patients obtained the top score at discharge.[6] • Has pronounced ceiling effects therefore cannot be used as an evaluative or discriminative measure. Trunk Control Test works best around or below the "floor" of the motor FIM subscale.[6] Floor effects: •
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: MCID: • Other responsiveness values: • Normative Data: • None yet reported
Instrument use	• Used to assess the motor impairment in a patient who has had a stroke.
Equipment required	• Bed or mat table, stopwatch, stepstool
Time to complete	• 5 minutes or less[1]
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• 4 item test (minimum score 0 to maximum score 100), obtained by the addition of the scores of the four movements: • (T1): rolling from a supine position to the weak side • (T2): rolling to the strong side • (T3): sitting up from laying down • (T4): balance in the sitting position with the feet off the ground for at least 30 seconds • 0 points: unable to do without assistance, unable to hold for 30 seconds • 12 points: able to do so using non-muscular help or in an abnormal style; uses arms to steady self when sitting • 25 points: able to complete task normally[1]
Level of client participation required (is proxy participation available?)	• Client must attempt to perform all 4 activities.
Limitations	• Trunk Control Test is not useful in the planning of treatment, and it gives no information regarding quality of performance. • Does not take into account spasticity, sensory loss, or apraxia. • Was not a valid test measure in elderly patients following and acute illness and bed rest. • Has a large ceiling effect. • Only has been proven valid and reliable in an acute post stroke

	patient population.

Recommendations
Practice Setting (check all that apply):

__X__ Acute
__X__ Inpatient Rehab
__X__ Home Health
__X__ Skilled Nursing
____ Outpatient

Comments:

-

Level of Disability (check all that apply):

_____ EDSS 0.0 – 3.5
_____ EDSS 4.0 – 5.5
_____ EDSS 6.0 – 7.5
__X__ EDSS 8.0 – 9.5

Comments:

-

Should this tool be required for entry-level curricula?

_____ Yes __X__ No

Comments:

-

Is this tool appropriate for research purposes?

_____ Yes __X__ No

Comments:

-

Attachments:

- Score Sheets: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Instructions: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Reference list AND INSTRUCTIONS: _____ Uploaded on website

http://www.ncbi.nlm.nih.gov/pmc/articles/PMC488133/pdf/jnnpsyc00517-0036.pdf

Second Reviewer Comments: • Agree with ratings and recommendations.
Overall Taskforce Agreement with Recommendations: •

Practice Setting	**4**	**3**	**2**	**1**	**Comments**
Acute			X		• Not tested in MS, poor psychometrics in stroke
Inpatient Rehab			X		• As above
Home Health			X		• As above
Skilled Nursing			X		• As above
Outpatient				X	• As above
Overall Comments: •					

Level of Disability	**4**	**3**	**2**	**1**	**Comments**
EDSS 0.0 – 3.5				X	•
EDSS 4.0 – 5.5				X	•
EDSS 6.0 – 7.5				X	•
EDSS 8.0 – 9.5			X		• Not tested in MS, poor psychometrics
Overall Comments: •					

Entry-Level Criteria	**Students should learn to administer tool**	**Students should be exposed to tool (e.g. to read literature)**	**Do not recommend**	**Comments**
Should this tool be required for entry level curricula?			X	• The Trunk Control Test may be useful patients post-stroke with significant impairment; do not recommend at this time for education related to MS

Research Use	YES	NO	Comments
Is this tool appropriate for research purposes?		X	• Lack of psychometric data in MS, so do not recommend for use in research at this point in time. • Recommend investigating psychometric properties in MS.

References:

1) Collin C, Wade D. Assessing motor impairment after stroke: a pilot reliability study. *J Neurol Neurosurg Psychiatry*. 1990 Jul;53(7):576-9.

2) Franchignoni FP, Tesio L, et al. Trunk control test as an early predictor of stroke rehabilitation outcome. *Stroke A Journal of Cerebral Circulation*. 1997 April;28(7):1382-1385.

3) Farriols C, Lorena B, Muniesa J, et al. Functional decline after prolonged bed rest following acute illness in elderly patients: Is trunk control test (TCT) a predictor of recovering ambulation? *Archives of Gerontology and Geriatrics*. 2009 Feb;49:409-412.

4) Duarte E, Marco E, et al. Trunk Control Test as a Functional Predictor In Stroke Patients. *J Rehabil Med*. 2002; 34:267-272.

5) Franceschini M, Carda S, Agosti M. et al. Walking after stroke: What does treadmill training with body weight support add to overground gait training in patients early after stroke?: A single-blind randomized control trial. *Stroke* 2009, 40:3079-3085

6) Franchignoni, Franco. Psychometric and practical attributes of the trunk control test in stroke patients. *J Rehabil Med*. 2003; 35: 150-151.

Instrument name: Trunk Impairment Scale (TIS)

Reviewer: Kirsten Potter, PT, DPT, MS, NCS | **Date of review:** 9/11

ICF domain (check all that apply):

__x___ Body function/structure __x___ Activity _____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance
_____ Ataxia
_____ Cardiovascular/pulmonary status
_____ Coordination (non-equilibrium)
_____ Dizziness/vestibular
_____ Fatigue
_____ Flexibility
_____ Muscle performance
_____ Muscle tone / spasticity
_____ Pain
_____ Posture
_____ Sensory integration
_____ Somatosensation
__x__ Balance/falls
_____ Bed mobility
_____ Gait
_____ Reach and grasp
_____ Self care
_____ Transfers
_____ Wheelchair skills
_____ Health and wellness
_____ Home management
_____ Leisure
_____ Quality of life
_____ Role function
_____ Shopping
_____ Social function
_____ Work

Other: motor impairment of the trunk

Type of measure:

__x___ Performance-based _____ Self-report

Instrument description:

- The Trunk Impairment Scale (TIS) was developed to measure motor impairment of the trunk after stroke.[1] It has since been used for patients with Parkinson's disease, brain injury, and MS
- Version 2.0 of the TIS[2] has been developed based on a Rasch analysis in patients post-stroke; the static sitting balance subscale was dropped from the scale due to a ceiling effect and poor fit within the Rasch model
- This review will focus primarily on the literature of the original TIS[1] in patients with MS

Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • Inter-rater: • In 30 patients with MS (mean EDSS = 7.5; range 5.5 – 8.5), K values (and % agreement) for static sitting balance ranged .88 - 1.0 (97 – 100%) ; dynamic sitting balance 0.55 – 1.0 (80 – 100%), and coordination 0.46 – 0.78 (70 – 97%)[3] • ICC for total TIS = 0.97, static sitting balance subscale = 0.98, dynamic sitting subscale = 0.87, and coordination subscale =

	0.82[3] Test-retest: • In 30 patients with MS (mean EDSS = 7.5; range 5.5 – 8.5), K values (and % agreement) for static sitting balance ranged .87 - 1.0 (83 – 100%) ; dynamic sitting balance 0.49 – .91 (80 – 97%), and coordination 0.63 – 0.82 (73 – 87%)[3] • ICC for total TIS = 0.95, static sitting balance subscale = 0.97, dynamic sitting subscale = 0.85, and coordination subscale = 0.87[3]
Validity (concurrent, criterion-related, predictive)	Concurrent validity: • In 30 patients with MS (mean EDSS = 7.5; range 5.5 – 8.5), total TIS correlates with Functional Independence Measure (rho = 0.81) and EDSS (rho = -.85)[3] Predictive validity: • Not reported in MS • In stroke, total TIS and static sitting balance subscales were strong predictors of Barthel Index score at 6 months post-stroke[4] Discriminative validity: • Not reported in MS • TIS total and subscale scores are able to discriminate between healthy individuals and those with stroke[5] • TIS total, and static sitting and coordination subscales are able to discriminate between healthy individuals and those with Parkinson's disease[6] Sensitivity/Specificity/Predictive Values/Likelihood Ratios: •
Ceiling/floor effects	Ceiling effects: • No ceiling effect found in 30 individuals with MS (mean EDSS = 7.5; range 5.5 – 8.5)[3] Floor effects: •
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • MCID: • Other responsiveness values:

	• <u>Normative Data:</u> • In 40 healthy individuals (20 females and 20 males; mean age = 65 with range from 36 - 86), median TIS score = 23 (inter-quartile range {IQR} 22 – 23) and a range of 17 – 23; score of 20 was in the 10th percentile; dynamic sitting balance and coordination subscales showed more variability as compared to static sitting balance subscale[5] • 45% of a healthy population aged 36 – 86 (mean age 65) did not reach maximal score = 23 on the TIS, indicating that a maximal TIS score is not a prerequisite for normal function[5] • In 26 healthy individuals (16 males and 10 females; mean age = 65 ± 12 years), median total TIS = 22 (IQR 21 – 23), median static sitting subscale = 7 (IQR 7 – 7), median dynamic sitting subscale = 10 (IQR 9 – 10), median coordination subscale = 6 (IQR 5 – 6)[6] • Younger individuals, women, and people who are more active tend to perform better on the TIS[5]
Instrument use	• The TIS was developed for patients with stroke, but has been studied in individuals with MS, Parkinson's disease, and brain injury; it is particularly appropriate for individuals with greater impairment and activity limitation
Equipment required	• Pen/pencil • Bed or treatment table • Stopwatch may be useful for timed items
Time to complete	• 10 minutes[3]
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• The TIS items are scored on an ordinal scale (variable range of possible scores across TIS items); total TIS values range from 0 – 23 (higher scores indicating better performance); TIS subscales range from 0 – 7 for static sitting, 0 – 10 for dynamic sitting, and 0 – 6 for coordination
Level of client participation required (is proxy participation available?)	• The TIS requires active client participation, but is appropriate for lower functioning individuals, as all items are performed in sitting
Limitations	• Larger differences have been found in the range of total TIS scores (i.e., less agreement in ratings for inter-rater and test-retest reliability) for patients with moderate trunk impairment, as compared to those with mild or severe impairment (in patients with mean EDSS = 7.5; range 5.5 – 8.5) [3]

Recommendations
Practice Setting (check all that apply):
__x___ Acute
__x___ Inpatient Rehab
__x___ Home Health
__x___ Skilled Nursing
_____ Outpatient

Comments:
- The TIS is feasible in any clinical setting, but may have the least relevance to patients receiving care in out-patient settings, as they tend to be higher functioning

Level of Disability (check all that apply):
_____ EDSS 0.0 – 3.5
__x___ EDSS 4.0 – 5.5
__x___ EDSS 6.0 – 7.5
__x___ EDSS 8.0 – 9.5

Comments:
- The TIS can be used for patients at all EDSS levels, but is least relevant for higher functioning patients (those with EDSS levels < 4.0)

Should this tool be required for entry-level curricula?
__x___ Yes _____ No
Comments:
- The TIS is a reliable and valid measure of trunk impairment for patients with a variety of neurological conditions, including MS
- It's focus on trunk impairment is particularly unique and appropriate for lower functioning individuals

Is this tool appropriate for research purposes?
__x___ Yes _____ No
Comments:
-

Attachments:
- Score Sheets: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Instructions: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Reference list: _____ Uploaded on website

Second Reviewer Comments:
- Agree with primary review

Overall Taskforce Agreement with Recommendations:

•

Practice Setting	**4**	**3**	**2**	**1**	**Comments**
Acute		X			•
Inpatient Rehab		X			•
Home Health		X			•
Skilled Nursing		X			•
Outpatient				X	• TIS may have less applicability in an out-patient setting due to its focus on sitting balance, so may not be useful for higher functioning patients
Overall Comments: • Data exists to supporting the reliability and validity of the TIS in patients with MS and the measure is feasible in any clinical setting; rating of 3 reflects incomplete psychometric data (e.g., responsiveness) in MS					

Level of Disability	**4**	**3**	**2**	**1**	**Comments**
EDSS 0.0 – 3.5				X	• TIS may have less applicability due to its focus on sitting balance, so may not be useful for higher functioning patients
EDSS 4.0 – 5.5		X			•
EDSS 6.0 – 7.5		X			•
EDSS 8.0 – 9.5		X			•
Overall Comments: • Data exists to supporting the reliability and validity of the TIS in patients with MS and the measure is appropriate for many patients with MS; rating of 3 reflects incomplete psychometric data (e.g., responsiveness) in MS					

Entry-Level Criteria	**Students should learn to administer tool**	**Students should be exposed to tool (e.g. to read literature)**	**Do not recommend**	**Comments**
Should this tool be required for entry level	X			•

curricula?				
Research Use	**YES**	**NO**	**Comments**	
Is this tool appropriate for research purposes?	X		• Recommend studies examining the responsiveness of the TIS.	

References:

1. Verheyden G, Nieuwboer A, Mertin J, Preger R, Kiekens C, De Weerdt W. The Trunk Impairment Scale: a new tool to measure motor impairment of the trunk after stroke. *Clin Rehabil.*2004;18(3):326-334.
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3. Verheyden G, Nuyens G, Nieuwboer A, et al. Reliability and validity of trunk assessment for people with multiple sclerosis. *Phys Ther.*2006;86(1):66-76.
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6. Verheyden G, Willems AM, Ooms L, et al. Validity of the trunk impairment scale as a measure of trunk performance in people with Parkinson's disease. *Arch Phys Med Rehabil.*2007;88(10):1304-1308.

Instrument name: Visual Analog Scale- Fatigue (VAS-F)

Reviewer: Kathleen Brandfass, MS, PT | **Date of review:** 8/12/11

ICF domain (check all that apply):

___X__ Body function/structure _____ Activity _____ Participation

Constructs measured: (check all that apply):

_____ Aerobic capacity/endurance
_____ Ataxia
_____ Cardiovascular/pulmonary status
_____ Coordination (non-equilibrium)
_____ Dizziness/vestibular
_X____ Fatigue
_____ Flexibility
_____ Muscle performance
_____ Muscle tone / spasticity
_____ Pain
_____ Posture
_____ Sensory integration
_____ Somatosensation
_____ Balance/falls
_____ Bed mobility
_____ Gait
_____ Reach and grasp
_____ Self care
_____ Transfers
_____ Wheelchair skills
_____ Health and wellness
_____ Home management
_____ Leisure
_____ Quality of life
_____ Role function
_____ Shopping
_____ Social function
_____ Work

Other:

Type of measure:

_____ Performance-based ___X__ Self-report

Instrument description:

- The VAS serves as a single item self-report of fatigue; this report will focus primarily on its use in MS, but data pertinent to other patient populations will be provided when MS-related data is lacking
- Various versions of VAS – fatigue have been reported, including:

1) 0-10 scale: 0 = fatigue no problem to 10 = fatigue major problem[1, 2]
2) 100 mm line: left end of the scale = not tired at all to right end = extremely tired[3-5]
3) 50 mm line: left= fatigue worsened as much as possible to right = fatigue completely relieved[6]
4) 0-10 scale: 0 = greatest fatigue to 10 = less fatigue[7]
5) 0-100 mm line; three separate VAS-F scales; each is rating according to left = no influence at all to right = a lot of influence:[8]

VAS-1: Impact on Daily Life- How much influence does fatigue have on your daily life (the everyday life at home and work) and on your relationships?

VAS-2: Impact on Self Care Activities- How much influence does fatigue have on daily activities, like grooming and dressing, etc?

VAS-3: Impact on Household and Occupation- How much influence does fatigue have on household or occupational activities?

6) 18 individual 0-100 mm lines. 13 –fatigue subscales, 5- energy subscales. Left no difficulty to right extremely affected[9]	
Reliability (test-retest, intra-rater, inter-rater)	Intra-rater: • Inter-rater: • Test-retest: • In 62 persons with MS and 24 ICC values for VAS – 1 = 0.69, VAS-2 = 0.68, and VAS-3 = 0.69[8]
Validity (concurrent, criterion-related, predictive)	Concurrent validity: • In MS (median EDSS = 3.5; range from 0 – 8.5): VAS-F compared to Fatigue Severity Scale rho = 0.38 and Modified Fatigue Impact Scale rho = 0.47 ($p < 0.00001$); VAS – F did not correlate significantly to MS-Specific Fatigue Severity Scale[3] • In MS (median EDSS = 6.5; range from 3 – 8.5): VAS -1, VAS – 2, and VAS – 3 correlated significantly to Fatigue Severity Scale, Modified Fatigue Impact Scale (MFIS; including physical, cognitive, and psychosocial subscales; only exception: VAS – 2 did not correlate significantly to MFIS cognitive subscale), Guy's Neurological Disability Scale's fatigue subscale; however, Kendall's tau-b correlation coefficients were weak (ranging from 0.28 – 0.48 for VAS – 1, 0.19 – 0.20 for VAS – 2, and 0.23 to 0.37 for VAS – 3)[8] • VAS -1, VAS – 2, and VAS – 3 did not correlate significantly to EDSS, Functional Independence Measure, Zung depression scale, or Rao's cognitive battery[8] • In 68 patients with MS (EDSS range from 0 – 7.5), VAS-F correlates to Fatigue Impact Scale for Daily Use rho = -0.57, Global Perception of Fatigue Scale rho = -0.65, and Multidimensional Fatigue Inventory dimensions (rho values ranging from -0.38 for reduced motivation to -0.57 for physical fatigue)[10] • In 25 patients with MS VAS correlates significantly to Fatigue Severity Scale 0.47, $p < 0.05$ (statistical method to determine correlation not stated)[11] • In MS: fatigue as measured by a 10-cm VAS did not correlate significantly to EDSS level or the Center for Epidemiological Studies – Depression scale[12] • In 28 patients with MS (mean EDSS = 5.1; range 2.0 – 8.0), perceived fatigue, measured by 10-cm VAS, did not correlate significantly to muscular fatigue (fall in titanic force produced), EDSS, Ashworth Scale, or ability to perform rapid foot

	movements[13] • In 345 patients with secondary progressive MS (mean EDSS = 4.8 ± 1.4), fatigue (measured on a VAS) was associated with reduced quality of life (Nottingham Health Profile – Part I) scores, worse energy, worsening of pain, unfavorable emotional response, social isolation and worse sleep scores[14] <u>Predictive validity:</u> • <u>Discriminative validity:</u> • In MS (median EDSS = 3.5; range from 0 – 8.5): VAS-F able to discriminate between patients with and without fatigue ($p < 0.0001$), but is less able to discriminate when compared to Fatigue Severity Scale and Modified Fatigue Impact scale[3] • In MS (median EDSS = 6.5; range from 3 – 8.5): VAS -1, VAS – 2, and VAS – 3 are able to discriminate between healthy individuals and those with MS; however, VAS – 1 had the best discriminatory ability of the 3 VAS versions and was best able to discriminate among individuals with and without fatigue when comparing healthy to persons with MS, patients with low versus high impact of fatigue (based on Modified Fatigue Impact Scale), and individuals with low versus high fatigue (based on Fatigue Severity Scale) at $p < 0.0001$[8] • 10-cm VAS was found to be able to discriminate between individuals with MS with fatigue and healthy individuals (fatigue severity scores for the two groups = 5.7 and 3.03, respectively; $p < 0.001$)[12] <u>Sensitivity/Specificity/Predictive Values/Likelihood Ratios:</u> • VAS- 1 with 59 mm as cut off value; able to discriminate between patients with MS with versus without fatigue at 76% sensitivity/ 72% specificity; when using the critical value of the Modified Fatigue Impact Scale to discriminate between persons with high impact of fatigue on daily life, VAS – 1 was the best at 81% sensitivity and 77 % specificity[8]
Ceiling/floor effects	<u>Ceiling effects:</u> • Not reported in MS • In rheumatoid arthritis: Khanna et al[1] reported that a ceiling effect may exist, but Wolfe[2] found no ceiling effect in this population <u>Floor effects:</u> • Not reported in MS • In rheumatoid arthritis: Khanna et al[1] reported that a floor effect

	may exist, but Wolfe[2] found no floor effect in this population
Sensitivity to change (responsiveness, MCID, MDC) / normative data	MDC: • Not reported in MS • In rheumatoid arthritis, a change (improvement or worsening) of 3.47 points on a 0 – 10 point VAS scale indicates a real change MCID: • Not reported in MS • In rheumatoid arthritis: clinically relevant improvement is between -0.82 to -1.12 and meaningful worsening is between 1.13 to 1.26 on 0-10 scale[1] Other responsiveness values: • Normative Data: •
Instrument use	• The VAS has been used in multiple patient populations, including MS
Equipment required	• Scale • Pen/pencil
Time to complete	• 5-15 minutes dependent on individual scale use
How is the instrument scored? (e.g., total score, are there subscales, etc…)	• Dependent on scale used, but in general the patient marks a line along the VAS to indicate fatigue level
Level of client participation required (is proxy participation available?)	• Self Report
Limitations	Motor, visual, or cognitive impairment could potentially limit accuracy of score.

Recommendations
Practice Setting (check all that apply):
__x___ Acute
__x___ Inpatient Rehab
__x___ Home Health
__x___ Skilled Nursing
__x___ Outpatient

Comments:
- Utilization of VAS-F scale is not limited to a particular practice setting. Would be appropriate to evaluate level of fatigue in any setting

Level of Disability (check all that apply):
__x___ EDSS 0.0 – 3.5
__x___ EDSS 4.0 – 5.5
__x___ EDSS 6.0 – 7.5
__x___ EDSS 8.0 – 9.5

Comments:
-

Should this tool be required for entry-level curricula?
___X__ Yes _____ No
Comments:
- There is value in being exposed to a rapid screening tool for MS related fatigue. Each curricula should decide the most appropriate version to include.

Is this tool appropriate for research purposes?
__X___ Yes _____ No
Comments:
- Demonstrates good reliability and validity in comparison to alternate MS fatigue scales. Would be appropriate for clinical trials.

Attachments:
- Score Sheets: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Instructions: _____ Uploaded on website _____ Available but copyrighted _____ Unavailable
- Reference list: _____ Uploaded on website

Second Reviewer Comments:
- Agree with ratings and recommendations. The VAS – F is a valid measure of fatigue for the MS population, has moderate reliability, and high clinical utility. While it may not provide the PT with an in-depth understanding of the impact of the fatigue on the patient, it could be useful as a screening test to determine if further examination of fatigue is warranted.

Overall Taskforce Agreement with Recommendations:
-

Practice Setting	4	3	2	1	Comments
Acute		X			•
Inpatient Rehab		X			•
Home Health		X			•
Skilled Nursing		X			•

Visual Analog Scale- Fatigue

Outpatient		X			•
Overall Comments: • Fatigue is a significant MS related symptom. The VAS-F scale is appropriate as a screening tool. • Rating of 3 reflects moderate reliability and lack of responsiveness data specific to the MS patient population.					
Level of Disability	**4**	**3**	**2**	**1**	**Comments**
EDSS 0.0 – 3.5		X			•
EDSS 4.0 – 5.5		X			•
EDSS 6.0 – 7.5		X			•
EDSS 8.0 – 9.5		X			•
Overall Comments: • MS related fatigue can be present at any EDSS level and the VAS-F is appropriate for individuals at any EDSS level. • Rating of 3 reflects moderate reliability and lack of responsiveness data specific to the MS patient population.					

Entry-Level Criteria	**Students should learn to administer tool**	**Students should be exposed to tool (e.g. to read literature)**	**Do not recommend**	**Comments**
Should this tool be required for entry level curricula?	X			• Curricula should determine which iteration to include.

Research Use	**YES**	**NO**	**Comments**
Is this tool appropriate for research purposes?	X		• Correlates with multiple MS fatigue scales; rapid screening tool appropriate for clinical trials.

References:

1. Khanna D, Pope JE, Khanna PP, et al. The minimally important difference for the fatigue visual analog scale in patients with rheumatoid arthritis followed in an academic clinical practice. *J Rheumatol.*2008;35(12):2339-2343.

2. Wolfe F, Wolfe F. Fatigue assessments in rheumatoid arthritis: comparative performance of visual analog scales and longer fatigue questionnaires in 7760 patients. *J Rheumatol.*2004;31(10):1896-1902.

3. Flachenecker P, Kumpfel T, Kallmann B, et al. Fatigue in multiple sclerosis: a comparison of different rating scales and correlation to clinical parameters. *Mult Scler.*2002;8(6):523-526.

4. Brunier G, Graydon J. A comparison of two methods of measuring fatigue in patients on chronic haemodialysis: visual analogue vs Likert scale. *Int J Nurs Stud.*1996;33(3):338-348.

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12. Krupp LB, Alvarez LA, LaRocca NG, Scheinberg LC. Fatigue in Multiple Sclerosis. *Mult Scler.*1988;45:435-437.

13. Sharma KR, Kent-Braun J, Mynhier MA, Weiner MW, Miller RG. Evidence of an abnormal intramuscular component of fatigue in multiple sclerosis. *Muscle Nerve.*1995;18(12):1403-1411.

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