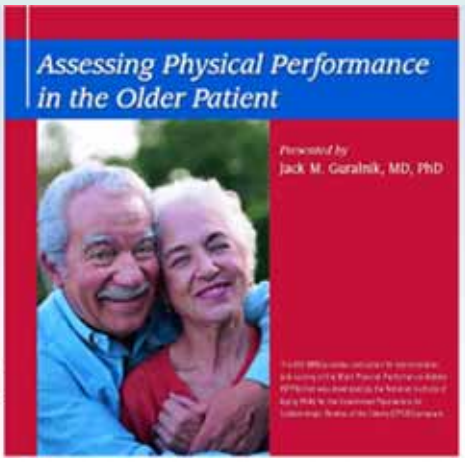
Greying of MS

- **Prevalence:** 32% between 55-64 years; 14% over 65 years; peak prevalence is 55-59 years.
- **Interaction:** Intersection of aging and chronic, progressive disease.
- **Consequences:** Self-reported loss of physical functioning and limitations with ADLs.

Short Physical Performance Battery (SPPB)

- Objective measure of lower extremity physical functioning in older adults.
- Three components: Balance, gait speed, and lower extremity strength.
- Predictive of nursing home admission, mobility impairment, disability, and mortality.
- Best measure performance-based measure of physical function in older adults.



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SPPB in MS: Recent Validation

- **Purpose:** Construct validity of SPPB scores in older adults with MS.
- **Sample:** 44 older adults with MS.
- **Method:** SPPB plus walking speed and endurance (lower extremity) and grip and bicep strength (upper extremity).
- **Results:** Strong correlations between SPPB and lower extremity function (r_p>.80), and weak correlations with upper extremity function (r_p<.30).
- **Meaning:** SPPB scores represent a measure of lower extremity function in older adult with MS.

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Motl et al., BMC Geriatrics, 2015, 15, 157

Present Study

- **Purpose:** We examined physical function using the SPPB in a community-dwelling sample of older adults with MS compared with controls who were matched on age and sex.

- **Hypotheses:** (1) older adults with MS would have worse overall physical function on the SPPB than older adults without MS and (2) older adults with MS would have worse performance on the balance, gait speed, and lower extremity strength components on the SPPB

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Sample

- **MS inclusion criteria:** (a) definite diagnosis of MS confirmed in writing by neurologist; (b) relapse free in the last 30 days; (c) ambulatory with or without assistance (i.e., walk independently or walk with a cane/rollator) based on EDSS scores of 6.5 or less; and (h) mTICS score above 21 (i.e., no major cognitive impairment).
- **Non-MS inclusion criteria:** (a) matched a subject with MS on age and sex and (b) mTICS score above 21.
- **Screening:** Screened 34 persons with MS and 23 persons without MS
- **Enrollment:** 20 older adults with MS and 20 older adults without MS.

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SPPB

- **Standing balance: Maintain upright posture while standing with feet in side-by-side, semi-tandem, and tandem positions for up to 10 sec per position.**
- **Gait speed: Time taken by a participant to walk a 4-meter course at a normal pace.**
- **Lower extremity strength: Chair stand test in which participants were instructed to sit in and fully rise from a chair 5 times as quickly as possible, without using arms for support.**
- **Scoring: (a) Categorical score ranging from 0 (inability to complete a test) through 4 (highest level of performance) using standardized scoring, and (b) summary ranging between 0 and 12 by summing the component categorical scores.**

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Procedure

- **IRB approval and written ICD**
- **Single session in a laboratory setting**
- **Neurological exam for EDSS**
- **Height and weight**
- **SPPB**
- **Demographic survey for age, sex, and education**

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Analysis

- **SPSS Statistics, Version 22**
- **Descriptive statistics as mean (SD).**
- **Independent samples *t*-tests for comparing SPPB overall and component scores between groups.**
  - **Cohen's *d* as an effect size estimate.**
- **Distribution of scores using frequency analyses, and compared the frequency of cases with an SPPB score of 10 or below using chi-square statistic.**
- **Pearson (r_p) and Spearman rho rank-order (r_s) correlations (a) between SPPB scores and component scores for the overall and separate samples, and (b) between EDSS and SPPB scores for the older MS sample.**

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Results: Sample Characteristics

Characteristic	Sample with MS (n=20)	Sample without MS (n=20)	*t*-value or χ^2 statistic	*p*-value
Age (yr)	61.2 (5.8)	61.1 (6.9)	0.05	0.96
Sex (#, % female)	15, 75%	15, 75%	0.00	1.00
Height (m)	1.61 (0.17)	1.68 (0.09)	1.59	0.12
Weight (kg)	76.2 (19.2)	71.2 (11.87)	0.99	0.33
Education (yr higher education)	5.8 (8.3)	5.2 (3.2)	0.29	0.78
EDDS (mdn, IQR)	4.5 (3.0)			

Note. Values are mean (standard deviation), unless otherwise noted.

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Results: SPPB Comparison b/w Samples

SPPB Score	Sample with MS (n=20)	Sample without MS (n=20)	*t*-value	*p*-value	Cohen's *d*
Total (0-12)	9.5 (2.2)	11.1 (1.2)	2.90	.006	0.96
Balance (0-4)	3.4 (0.7)	4.0 (0.2)	3.43	.001	1.22
Gait speed (0-4)	3.7 (0.6)	4.0 (0.0)	2.67	.011	1.19
Lower extremity strength (0-4)	2.4 (1.2)	3.1 (1.1)	1.96	.06	0.62

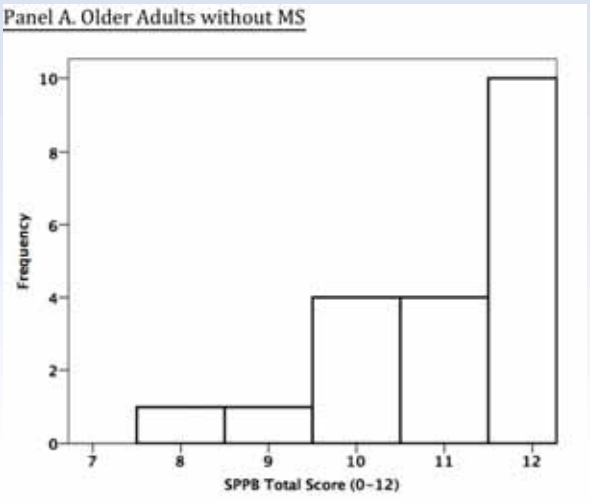
Note. Values are mean (standard deviation).

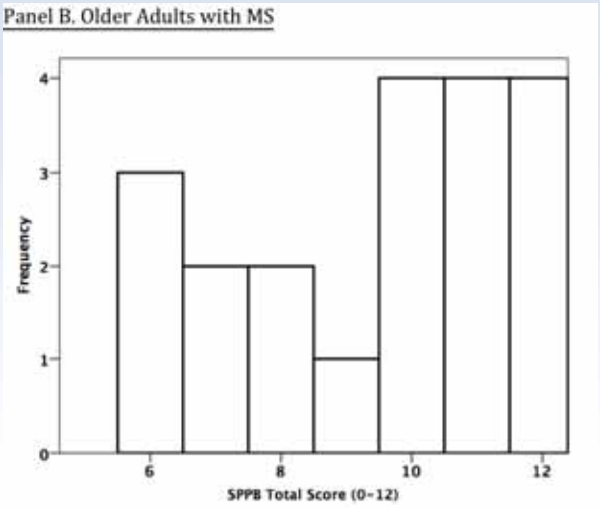
Results: SPPB Component Frequencies

SPPB Component	Possible Scores	Sample with MS (n=20)	Sample without MS (n=20)
Balance	0	0	0
	1	0	0
	2	2	0
	3	8	1
	4	10	19
Gait Speed	0	0	0
	1	0	0
	2	1	0
	3	5	0
	4	14	20
Lower Extremity Strength	0	1	0
	1	4	2
	2	5	4
	3	6	4
	4	4	10

Note. Values are frequency of cases per score value on the components of the SPPB.

Results: Overall SPPB Scores per Sample





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Disability Risk

- **Only 2 older adults without MS had SPPB scores below 10 (i.e., 10%), whereas 8 older adults with MS had SPPB scores below 10 (i.e., 40%)**

- **Significant, 4-fold difference in future risk for disability (χ^2=4.80, *df*=1, *N*=40, *p*=.028)**

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Results: Components Correlate with Overall Score

Component	Overall sample	Sample with MS	Sample without MS
Balance	.853/.762	.872/.875	.603/.407
Gait speed	.746/.630	.793/.784	--/--
Lower extremity strength	.925/.972	.930/.950	.986/1.00

Note. Values are Pearson/Spearman correlation coefficients. There is no correlation reported for gait speed in the sample without MS, as there was no variation in gait scores in this sample.

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Results: EDSS and SPPB

- **EDDS scores strongly correlate with overall SPPB scores (r_p=–.721, r_s=–.717)**
- **Strong correlations between EDSS scores and the component scores:**
  - **Balance (r_p=–.734, r_s=–.781)**
  - **Gait speed (r_p=–.586, r_s=–.628)**
  - **Lower extremity strength (r_p=–.603, r_s=–.623)**

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Discussion

- **1st direct comparison of objectively measured physical function between older adults with MS and matched controls.**

- **Primary results :**
  - **Older adults with MS had worse physical function overall and on the SPPB components of balance and gait speed, with a moderate, nearly significant difference in lower extremity strength.**
  - **40% of older adults with MS had an overall SPPB score of less than 10, and this portended a 4-fold increase in future disability compared with older adults without MS.**
  - **Older adults with worse MS disability based on EDSS scores further had worse physical function overall and based on the components of balance, gait speed, and lower extremity strength.**

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Discussion

Aging and multiple sclerosis

Shaik Ahmed Sanai, Vasu Saini, Ralph HB Benedict, Robert Zivadinov, Barbara E Teter, Murali Ramanathan and Bianca Weinstock-Guttman

Physical Activity and Healthy Aging with Multiple Sclerosis—Literature Review and Research Directions

Robert W Motl,[1] Emerson Sebastião,[2] Rachel E Klaren,[3] Edward McAuley,[1] Elizabeth AL Stine-Morrow,[4] and Brent Roberts,[5]

Effects of a DVD-delivered exercise intervention on physical function in older adults with multiple sclerosis: A pilot randomized controlled trial

Edward McAuley, Thomas R Wójcicki, Yvonne Charlotte Learmonth, Sarah A Roberts, Elizabeth Anne Hubbard, Dominique Kinnett-Hopkins, Jason Fanning and Robert W Motl

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Primary Limitations

- Sample size was relatively small
- Sample did not present with cognitive dysfunction, based on mTICS scores as a general screener
- We collected cross-sectional data without broad consideration of outcomes other that neurological disability based on EDSS

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Conclusions: We Should Intervene!

- Our results present a picture of deteriorated physical function in older adults with MS that portends considerable risk for future disability.
- This lower level of physical functioning is associated with lower extremity weakness as well as reduced balance and gait speed.
- We should consider developing interventions that target the consequences of aging with MS

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Acknowledgements

- **Participants!**
- **Undergraduate students, graduate students, post-doctoral fellows, & colleagues.**

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Thank you and questions

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