

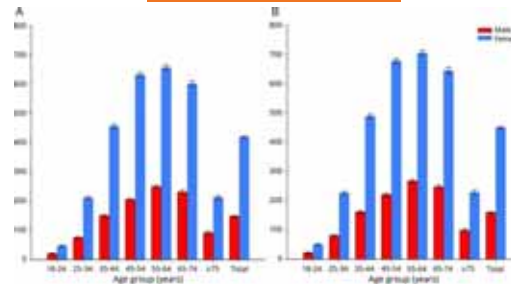
# PHYSICAL ACTIVITY, SEDTENTARY BEHAVIOR, AND SLEEP QUALITY IN ADULTS WITH MULTIPLE SCLEROSIS ACROSS THE LIFESPAN

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## MS IN THE UNITED STATES

- Nearly 1 million people living with MS
- “Greying” of the population of adults with MS
  - Peak prevalence at 55- to 64-years of age<sup>2</sup>



Wallin, Culpepper et al. 2019

## SLEEP IN MS

- **Fourfold increase in the prevalence of sleep problems in persons with MS<sup>1</sup>**
  - 60% of persons with MS report sleep abnormalities<sup>1</sup>
- **Reduced sleep quality may worsen other symptoms and consequences of MS**
  - Cognitive function, depression, perception of pain, fatigue, quality of life<sup>2</sup>
- **Sleep quality may impaired in older adults with MS<sup>3</sup>**

1. Sakkas, Giannaki et al. 2019; 2. Attarian 2019; 3. Carland, Surrency et al. 2017

## PHYSICAL ACTIVITY FOR MANAGING SLEEP

**Physical activity (PA) may directly or indirectly benefit sleep in MS**

- **Higher levels of PA are associated with better sleep quality in older women who were postmenopausal<sup>1</sup>**
- **Increases in PA improves many symptoms and consequences of MS**
  - Depression, anxiety, pain, fatigue<sup>2-3</sup>

1. Creasy et al 2019; 2. Moll 2014; 3. Moll and Sandroff 2015

## SEDENTARY BEHAVIOR

- **Sedentary behavior is very prevalent in MS<sup>1</sup>**
- **Higher levels of sedentary behavior associated with poorer sleep quality in young adults<sup>2</sup>**

**The rate and distribution of PA and sedentary behavior might be associated sleep quality in persons with MS across the lifespan**

1. Sasaki, Motl et al. 2018; 2. Kakinami et al 2016

## PRESENT STUDY

### Purpose

**Examined associations among physical activity, sedentary behavior, and sleep quality among adults with MS across the lifespan**

### Hypotheses

- ↓ Sleep quality in older adults
- ↓ PA in older adults
- ↑ PA associated with ↑ sleep quality
- ↓ Sedentary behavior associated with ↑ sleep quality

## PARTICIPANTS

- **Inclusion Criteria**
  - a) Between ages of 20-79
  - b) Ambulatory with or without assistance
  - c) Relapse free for at least 30 days
- **Assessed for Eligibility: 279**
- **Enrolled: 192**
- **Completed: 122**
  - Young Adults (ages 20-39)
  - Middle-aged Adults (ages 40-59)
  - Older Adults (ages 60-79)

## MEASURES

- **Physical Activity/Sedentary Behavior**
  - Participants wore an ActiGraph GT3X+ accelerometer during waking hours for a 7-day period (min/day)
    - Troiano (2007) algorithm for estimating wear time
    - Valid day = 10 hours (i.e., 600 min)
    - Cut-point for MVPA = 1,584 counts/minute and <sup>1</sup>
    - Cut-point for LPA vs sedentary behavior = 100 counts/minute <sup>1</sup>
- **Disability Status**
  - Patient Determined Disease Steps (PDDS)<sup>2</sup>
    - Ranging between 0 (normal) and 8 (bedridden)



1. Sandroff, Motl et al. 2012; 2. Hohol, Orav et al. 1995, Hohol, Orav et al. 1999

## MEASURES

### Sleep Quality

- **Pittsburgh Sleep Quality Index (PSQI)<sup>1</sup>**
  - **7 Component Scores ranging between 0 (not during past month) and 3 (three or more times a week)**
    1. Subjective Sleep Quality
    2. Sleep Latency
    3. Sleep Duration
    4. Habitual Sleep Efficiency
    5. Frequency of Sleep Disturbance
    6. Frequency of Sleep Medication Use
    7. Daytime Dysfunction
  - **Scores are summed into Global Sleep Quality Score**
    - Range between 0 and 21 (higher = worse sleep quality)
  - **PSQI greater than 5 = “poor sleeper”<sup>1</sup>**

1. Buysse, Reynolds et al. 1989

## PROCEDURE

- **IRB approval and written informed consent**
- **Single session in a laboratory setting**
  - **Measures of sleep quality and disability status**
  - **Provided accelerometer and instructions**
    - Returned via USPS
- **Participants were compensated for completing all measures and returning the accelerometer**

## STATISTICAL ANALYSES

- **SPSS Statistics, Version 25**
- **Descriptive Statistics as mean and standard deviation (SD), unless otherwise noted (e.g., median and interquartile range [IQR] or number and percentage).**
- **One-way Analysis of Variance (ANOVA) or Chi-square analysis for differences among groups.**
- **Spearman rho correlation analysis ( $\rho$ ) for associations among PA, sedentary behavior, and sleep quality**
  - Correlation coefficients of 0.1, 0.3, and 0.5 were interpreted as small, moderate, and large, respectively<sup>1</sup>

1. Cohen 1988

## RESULTS: SAMPLE CHARACTERISTICS

	Young Adults (n = 37)	Middle-aged Adults (n = 45)	Older Adults (n = 40)	P
Age (years)	33.2 (4.9)	49.4 (5.9)	66.0 (4.2)	0.000 <sup>abc</sup>
Sex (n (%))	29 (78) F / 8 (22) M	32 (71) F / 13 (29) M	30 (75) F / 10 (25) M	0.752 <sup>+</sup>
MS Type (n (%))				0.882 <sup>+</sup>
Relapsing Remitting	32 (87)	38 (84)	34 (85)	
Secondary Progressive	2 (5)	2 (4)	3 (8)	
Primary Progressive	1 (3)	3 (7)	1 (3)	
Benign	0 (0.0)	1 (2)	1 (3)	
Disease Duration (yr)	6.0 (5.3)	11.6 (6.3)	21.7 (10.1)	0.000 <sup>abc</sup>
PDDS (median (IQR))	0.0 (2.5)	1.0 (3.0)	2.0 (4.0)	0.040 <sup>b</sup>

<sup>a</sup>Difference between young and middle; <sup>b</sup>Difference between young and older; <sup>c</sup>Difference between middle and older; <sup>+</sup> Chi Square Test. MS multiple sclerosis; PDDS Patient Determined Disease Status; IQR interquartile range.

## RESULTS: SLEEP, PA, AND SEDENTARY BEHAVIOR

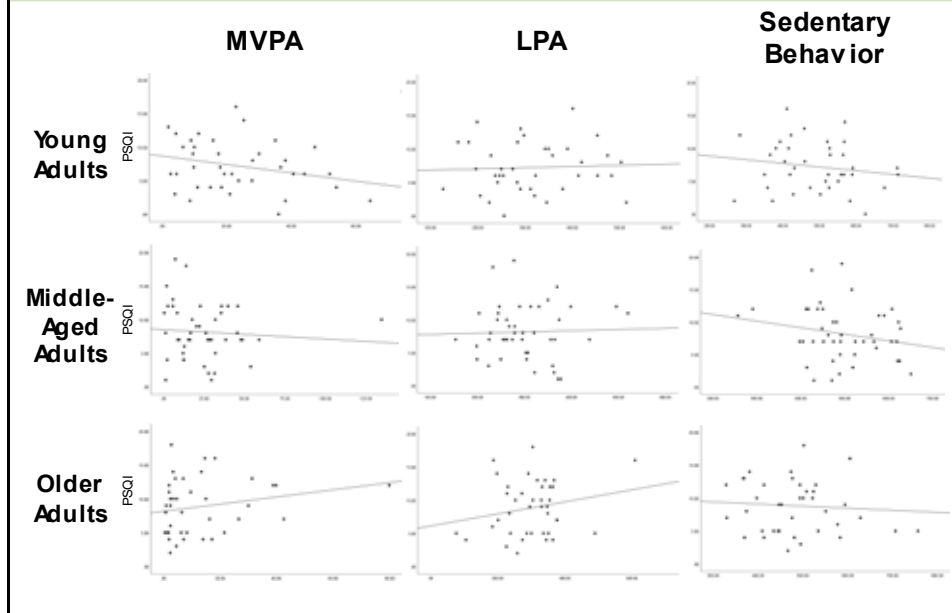
	Young Adults (n = 37)	Middle-aged Adults (n = 45)	Older Adults (n = 40)	P
Average Wear Time (min/day)	824.7 (102.9)	822.9 (84.2)	798.3 (107.3)	0.407
MVPA (min/day)	22.9 (16.1)	25.0 (22.8)	12.8 (16.0)	0.008 <sup>bc</sup>
LPA (min/day)	316.1 (101.7)	301.0 (75.7)	299.2 (93.5)	0.668
Sedentary Behavior (min/day)	485.7 (108.0)	496.8 (86.6)	486.4 (96.0)	0.838
PSQI Global Score	7.4 (3.6)	8.1 (4.1)	8.8 (4.1)	0.288
Poor Sleepers (n (%))	28 (76%)	36 (80%)	34 (85%)	0.588 <sup>a</sup>

<sup>a</sup> Difference between young and middle; <sup>b</sup> Difference between young and older; <sup>c</sup> Difference between middle and older; <sup>\*</sup> Chi Square Test. MS multiple sclerosis; PSQI Pittsburgh Sleep Quality Index; LPA light physical activity; MVPA moderate-to-vigorous physical activity.

## RESULTS: CORRELATION ANALYSIS

		Global PSQI
Young Adults (n = 37)	MVPA	-0.194
	LPA	0.029
	Sedentary Behavior	-0.075
Middle-aged Adults (n = 45)	MVPA	-0.134
	LPA	0.030
	Sedentary Behavior	-0.204
Older Adults (n = 40)	MVPA	0.241
	LPA	0.114
	Sedentary Behavior	-0.025

## RESULTS: CORRELATION ANALYSES



## DISCUSSION

**This is the first study to examine the relationship among physical activity, sedentary behavior, and sleep quality across the lifespan in adults with MS**

- **No significant differences among age groups for global sleep quality**
- **No evidence for associations among sleep, PA, or sedentary behavior in any age group**



## DISCUSSION

- Older adults spent less time in MVPA compared with young and middle-aged adults
- MVPA may influence other symptoms and consequences of MS in this age group

## DISCUSSION

Research Paper

**Randomized controlled trial of a behavioral intervention targeting symptoms and physical activity in multiple sclerosis**

LA Pilutti, D Dlugonski, BM Sandroff, R Klaren and RW Motl

MULTIPLE  
SCLEROSIS  
JOURNAL | MSJ

Multiple Sclerosis Journal  
2019; 23(11): 1944-1950  
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DOI: 10.1177/1352459519850491  
msj.sagepub.com  
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- Significantly increased physical activity following a 6-month behavioral intervention
- Significant improvements in MS-related symptoms (i.e., fatigue, depression, anxiety)
- Nonsignificant improvements in sleep quality ( $p = 0.06$ )

Improvements in MS-related symptoms with PA may indirectly benefit sleep quality

## LIMITATIONS

- **Cross-sectional design**
- **Did not include non-MS control group**
- **Single measure of sleep: self-report in nature**
  - **Our sample included a high percentage of poor sleepers**
- **Primarily RRMS (72%)**

## CONCLUSIONS

- **There were no apparent relationships among PA, sedentary behavior, or sleep quality in our sample of adults with MS across the lifespan**
- **Future research should further evaluate the relationships among PA, sedentary behavior and sleep using different, multifaceted approaches that may improve sleep quality among adults with MS**

**THANK YOU**