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Efficacy of a behavioral intervention for reducing sedentary behavior in persons with multiple sclerosis: A pilot examination

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Physical Activity Behavioral Interventions in MS

- Benefits of PA in persons with MS¹
- Exceedingly low levels of PA in MS²
- Involve teaching persons the skills, resources, and strategies for successful behavior change
- Three RCTS of behavioral interventions based on social cognitive theory³ and delivered through the internet have increased PA and yielded symptomatic and functional benefits in persons with MS⁴⁻⁶



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¹Motl & Pilutti, 2014; ²Klaren et al., 2013; ³Bandura, 2004; ⁴Motl et al., 2011; ⁵Pilutti et al., 2014; ⁶Sandroff et al., 2014

Table 2. Physical activity and mediator variables pretrial and post-trial for intervention and control conditions

Variable	Intervention (n = 23)		Control (n = 25)	
	Pretrial	Post-trial	Pretrial	Post-trial
Physical activity	13.8 (15.2)	24.7 (18.8) ^a	11.7 (16.3)	12.4 (14.2)
Self-efficacy	77.4 (29.8)	61.8 (39.6)	74.7 (24.0)	52.5 (34.1)
Physical outcome expectations	20.8 (2.2)	20.7 (1.3)	20.4 (1.3)	20.8 (1.8)
Social outcome expectations	11.6 (2.2)	12.0 (2.1)	11.6 (1.9)	12.2 (2.1)
Self-evaluative outcome expectations	18.3 (1.7)	18.5 (1.6)	18.6 (1.4)	18.1 (1.7)
Functional limitations	59.3 (11.2)	60.0 (12.0)	57.1 (11.0)	57.6 (12.2)
Goal setting	15.4 (8.6)	23.8 (10.9) ^b	21.0 (10.7)	19.6 (10.8)

Note. Physical activity = Godin Leisure-Time Exercise Questionnaire; Self-efficacy = Exercise Self-efficacy Scale; Physical outcome expectations = Multidimensional Outcome Expectations for Exercise Scale, Physical subscale; Social outcome expectations = Multidimensional Outcome Expectations for Exercise Scale, Social subscale; Self-evaluative outcome expectations = Multidimensional Outcome Expectations for Exercise Scale, Self-evaluative subscale; Functional limitations = Late-Life Function and Disability Inventory; Goal setting = Exercise Goal setting Scale.

^aSignificantly different compared with pretrial value at $p = 0.01$.
^bSignificantly different compared with pretrial value at $p = 0.001$.



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*Modi et al., 2011

Table 2. Post-trial data from intervention and control conditions and tests for condition effect controlling for pre-trial outcome scores. Values are estimated marginal means (SE).

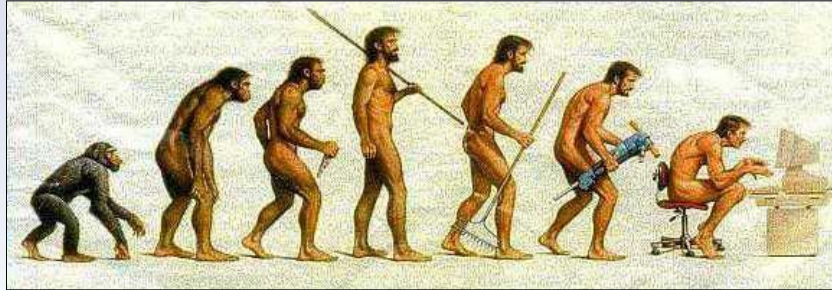
Outcome	Intervention (n=37)	Control (n=39)	η_p^2	d
Physical activity				
GLTEQ	27.2 (3.0)	13.0 (3.0)	.13*	.77
MVPA, minutes	19.5 (2.3)	13.8 (2.2)	.05	.43
Symptoms				
FSS	4.6 (0.2)	5.4 (0.2)	.15*	.82
MFIS Total	35.7 (1.8)	40.5 (1.8)	.05	.43
MFIS Physical	16.0 (0.9)	19.3 (0.8)	.09*	.63
MFIS Cognitive	16.7 (1.0)	18.0 (0.9)	.01	.22
MFIS Psychosocial	3.0 (0.2)	3.3 (0.2)	.01	.24
HADS Depression	5.0 (0.4)	6.6 (0.4)	.10*	.64
HADS Anxiety	4.1 (0.4)	5.6 (0.4)	.10*	.64
SF-MPQ	8.1 (0.7)	9.8 (0.6)	.04	.42
PSQI	6.4 (0.4)	7.4 (0.4)	.05	.45
Health-related quality of life				
MSIS-29 Physical	29.1 (1.5)	33.2 (1.5)	.05	.45
MSIS-29 Psychological	27.6 (2.4)	33.1 (2.3)	.04	.38

FSS: Fatigue Severity Scale; GLTEQ: Godin Leisure-Time Exercise Questionnaire; HADS: Hospital Anxiety and Depression Scale; MFIS: Modified Fatigue Impact Scale; MSIS-29: 29-item Multiple Sclerosis Impact Scale; MVPA: moderate-to-vigorous physical activity; PSQI: Pittsburgh Sleep Quality Index; SF-MPQ: Short-form McGill Pain Questionnaire. *Notes statistically significant difference between intervention and control groups post-trial ($p < .05$).



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*Pilutti et al., 2014



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Sedentary Behavior

- Defined as sitting or lying that does not increase energy expenditure during the waking hours⁷
- Sitting time (ST)
 - Adults on average engage in ~8 hours of ST/day⁸
 - Associated with morbidity and mortality in the general population, independent of PA^{9,10}
 - Reduced through a behavioral intervention based on SCT in older obese women¹¹



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⁷Sed Behav Res Net, 2011; ⁸Matthews et al., 2008; ⁹Bauman et al., 2011; ¹⁰Patel et al., 2010; ¹¹Adams et al., 2013

Sedentary Behavior

- Persons with MS engage in high amounts of sedentary behavior¹²
- Associated with mobility disability, fatigue, walking performance, and cognitive processing speed in MS¹³
- Importance of examining effects of behavioral interventions on sedentary behavior in MS



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¹²Cavanaugh et al., 2011; ¹³Hubbard & Motl, 2014

Purpose & Hypothesis

- The current study involved a secondary analysis of previously published data to examine the effect of a behavioral intervention based on SCT for reducing ST in persons with MS
 - We expected that persons with MS in the intervention condition would demonstrate a reduction in ST compared with the waitlist control



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Participant Inclusion Criteria

- Physician diagnosed MS and approval for participation
- Ability to walk with or without an assistive device
- Age between 18-64 years
- Physical inactivity defined as <60 minutes/week
- Relapse free for past 30 days
- Low risk of contraindications based on Physical Activity Readiness Questionnaire (PAR-Q)¹⁴



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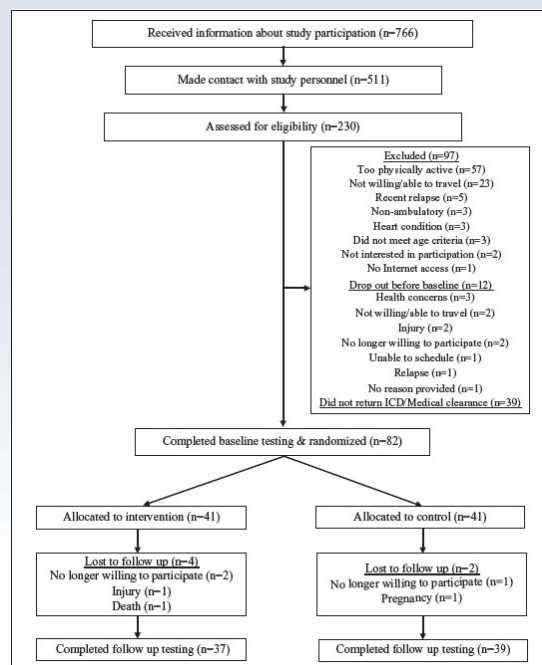
¹⁴Thomas et al., 1992

Participants

- Final sample included 70 participants who were randomly assigned into intervention (n=33) or wait-list control (n=37) conditions and provided baseline ST data



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Primary Measure

- ST
 - Question seven of the abbreviated International Physical Activity Questionnaire (IPAQ)¹⁵
 - “During the last 7 days, how much time did you spend sitting on a weekday?”



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¹⁵Craig et al., 2003

Procedure

- All participants provided informed consent approved by University IRB
- Participants provided demographic/clinical information and completed a battery of tests during a one-hour session in the laboratory at baseline (pre-intervention) and six-months (post-intervention)
- Participants were grouped based on disability and PA data and then randomly assigned into intervention or wait-list control conditions



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Procedure

- **Intervention:**
 - Over a six-month period, participants visited a study website, wore a pedometer, completed a log book along with Goal Tracker software, and participated in one-on-one video coaching sessions
- **Wait-list control:**
 - Participants completed the study measures before and after the six-month period and received the intervention once the study reached completion



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Intervention Components

- **Study website**
 - Content based on SCT focused on teaching behavioral strategies for changing PA and ST
 - Outcome expectations, goal setting and self-monitoring, self-efficacy, facilitators and barriers for PA and ST
 - Guided participants to online materials and videos of examples and ideas for reducing ST and increasing PA
- **Video coaching sessions**
 - Semi-scripted and based on principles of supportive accountability
 - Review of goal-setting and progress towards goal attainment
 - Stressed the importance of identifying opportunities for reducing ST and moving more and co-developed approaches for reducing relevant examples of ST



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Data Analysis

- Data were analyzed in IBM SPSS v21.0
- Examined baseline differences between groups in demographic/clinical characteristics using independent samples t -tests and χ^2 statistics
- Intent-to-treat and completers analyses
- Examined group differences in ST using ANCOVA on post-intervention scores controlling for pre-intervention values
- Provide the parameter estimate, standard error (SE), and associated t -value along with p -value per analysis



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Participant Characteristics

Variable	Intervention (n=33)	Control (n=37)
Age (years)	49.4 (9.2)	50.3 (9.1)
Sex (% female)	73%	82%
Race (% Caucasian)	100%	95%
Employment (% employed)	64%	59%
MS Type (% RRMS)	82%	84%
Disease Duration (years)	11.1 (7.1)	13.2 (9.4)
PDDS score (median, IQR)	2.0 (3.0)	3.0 (3.0)
Daily ST (minutes)*	550 (233)	412 (193)

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

* Represents statistical significance.



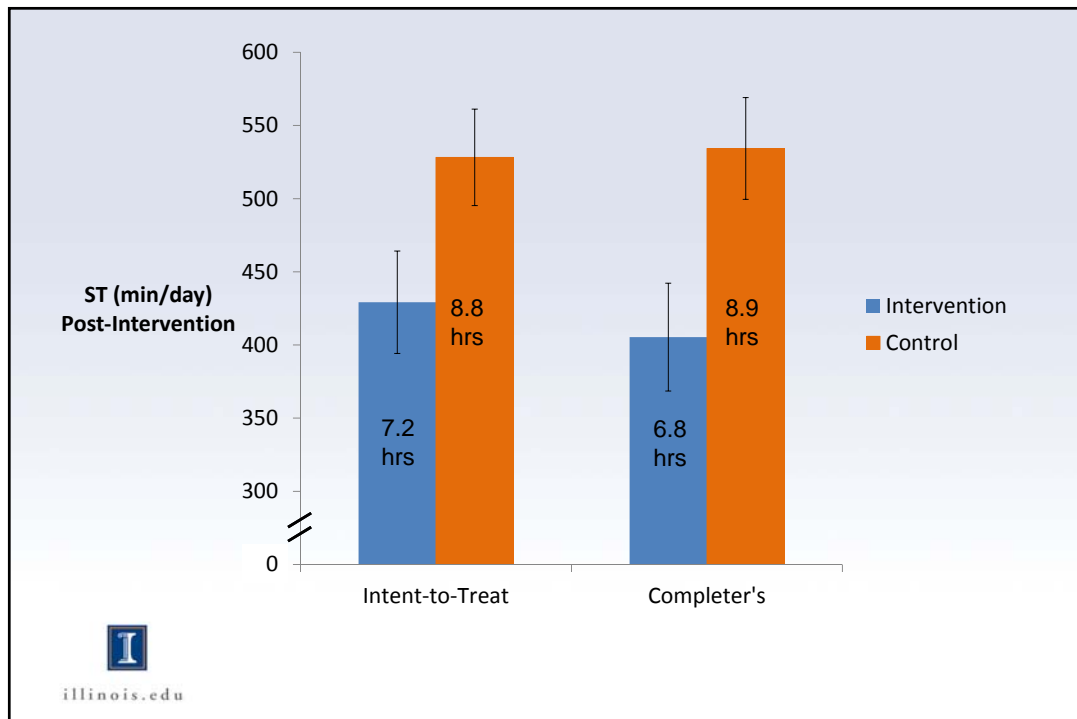
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Group Differences

- **Intent-to-treat analysis:**
 - Significant difference between groups ($F(1,67)=4.03, p<0.05, \eta^2=0.06$)
 - Parameter estimate of 98.9 min ($SE=49.3, t=2.01, p<0.05$)
 - Adjusted mean scores for intervention and control groups were 429.2 (201.2) and 528.2 (200.7) minutes of ST ($d=0.49$)
- **Completer's analysis:**
 - Significant difference between groups ($F(1,54)=5.15, p<0.05, \eta^2=0.09$)
 - Parameter estimate of 128.9 min ($SE=56.8, t=2.27, p<0.05$)
 - Adjusted mean scores for intervention and control groups were 405.4 (211.6) and 534.3 (211.4) minutes of ST ($d=0.61$)



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Primary Findings

- Daily ST was reduced in the intervention group compared to the control group
 - The amount of reduction was 1.65 hours based on the intent-to-treat analysis; the difference was even larger in the completer's analysis and exceeded 2 hours
- To our knowledge, we provide the first data of the efficacy of a behavioral intervention for reducing ST in persons with MS.



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Why is this important?

- Sedentary behavior is common in persons with MS¹⁰⁻¹² and has been associated with mobility disability, fatigue, walking performance, and cognitive processing speed in MS¹³
- These preliminary data support future investigations aimed at reducing ST and other sedentary behaviors in MS



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What to do we need to do next?

- More information about sedentary behavior in persons with MS
 - Identify what types of sedentary behavior are most common in persons with MS and who is more likely to engage in sedentary behavior
- Determine if reductions in sedentary behavior affect other outcomes in persons with MS



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Strengths and Limitations

- Strengths
 - Large sample size for a pilot study
 - Validated ST measure in healthy adults^{17,18}
- Limitations
 - Secondary analysis of existing data
 - No objective assessment of sedentary behavior

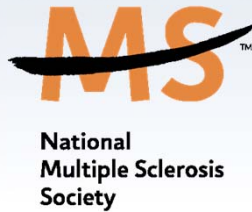


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¹⁷Craig et al., 2003; ¹⁸Rosenberg et al., 2008

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THANK YOU!

Questions?



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