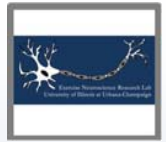


Physical Activity and Cognitive Processing Speed in Multiple Sclerosis



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Introduction

There is increasing recognition of the possible association between physical activity and cognitive processing speed (CPS) in neurological diseases, including multiple sclerosis (MS). To date, the evidence in MS is based on a limited number of cross-sectional studies with small samples. There further are unresolved methodological issues such as the lack of control for confounders, focus on fitness rather than physical activity, and variation and uncertainty in modes of cognitive assessment (i.e., written or oral administration).

Purpose

This prospective study examined the association of physical activity with both oral and written cognitive performance in 82 persons with MS (Table 1) and controlled for possible confounders of age, sex, education and disability.

Measures

Cognitive Processing Speed: Symbol Digit Modalities Test (SDMT) oral administration, SDMT written administration, and Paced Auditory Serial Addition Test (PASAT). The primary outcome for the SDMT was the total number of correctly provided numbers in a 90-second period. The primary outcome for the PASAT was the number of correct responses out of a possible 60.

Physical Activity: ActiGraph model GT3x accelerometer (Health One Technologies, Fort Walton Beach, FL) measured as average steps/day.

Procedure

Participants initially wore an accelerometer during the waking hours over 7 days for measuring physical activity as steps/day and completed a demographics questionnaire and the self-reported EDSS (SR-EDSS) during a single baseline testing session. Six-months later, participants completed two versions of the Symbol Digit Modalities Test (SDMT) and the Paced Auditory Serial Addition Test (PASAT) in a single follow-up testing session.

Data Analysis

The data were analyzed in PASW 18.0 (SPSS Inc., Chicago, IL). We examined the associations between physical activity and performance on the oral SDMT, written SDMT, and PASAT using non-parametric bivariate correlations (r_s). We then conducted non-parametric partial correlation analyses (pr_s) controlling for age, sex, education, and disability status—if these variables were jointly associated with physical activity and measures of cognitive performance.

Table 1: Demographic characteristics of 82 persons with MS

Variable	MS (n=82)
Age	49.0 (9.1)
Sex (n, % female)	62/82 (76%)
Education (n, % of sample)	
High School	82 (100%)
Some College	33 (40%)
College Graduate	49 (60%)
MS Type (n, % RRMS)	65/82 (79%)
MS Duration (years)	11.8 (8.2)
SR-EDSS (median, IQR)	3.5 (IQR=2.0-5.5)

Note: All data presented as mean (SD) unless otherwise noted; All participants reported at least a high school education; RRMS=Relapsing-remitting multiple sclerosis; SR-EDSS=Self-reported Expanded Disability Status Scale

Results

78 persons provided sufficient physical activity data and underwent cognitive testing and were subsequently included in the data analyses. Physical activity and cognitive characteristics of the sample are reported in Table 2.

Steps/day was significantly, moderately, and similarly associated with oral ($r_s=.45$, $p<.01$) and written ($r_s=.51$, $p<.01$) SDMT performance but weakly associated with scores on the PASAT ($r_s=.23$, $p=.02$). The scatter plots for these associations are presented in Figure 1.

Age and disability status were identified as covariates based on joint associations with physical activity and CPS. After controlling for age and disability status, steps/day was still significantly associated with both oral ($pr_s=.25$, $p=.02$) and written ($pr_s=.29$, $p=.01$) SDMT performance, but not PASAT performance ($pr_s=.12$, $p=.34$).

Table 2: Physical Activity and Cognitive Characteristics of 78 persons with MS

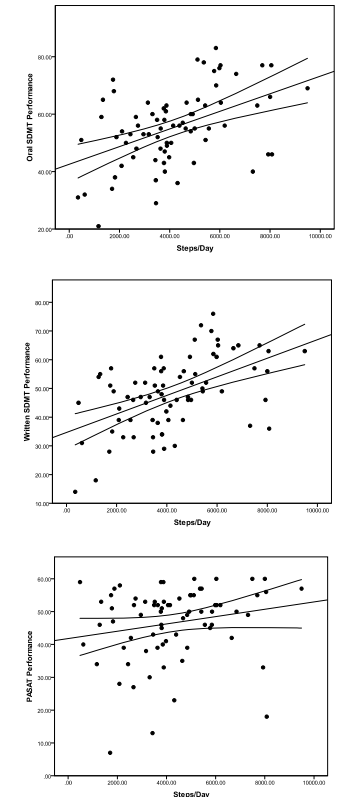
Variable	MS (n=82)
Steps/day	4,190 (1,980)
Oral SDMT Performance	55.5 (12.9)
Written SDMT Performance	48.3 (12.3)
PASAT Performance	46.8 (11.2)

Note: All data presented as mean (SD); SDMT=Symbol Digit Modalities Test; PASAT=Paced Auditory Serial Addition Test

Conclusions

The results of this prospective study support future examinations of physical activity behavior change and its influence on cognitive processing speed using either oral or written administrations of the SDMT in persons with MS.

Figure 1: Scatter plots of oral SDMT, written SDMT, and PASAT performance and steps/day in 78 persons with MS along with lines of best fit and 95% confidence intervals



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