Does Leisure-Time Physical Activity Variety Lead to Better Cognitive Function Despite NOT Meeting PA Guidelines?

John F. Adamek[1] & Steven J. Petruzzello[1] FACSM

[1]Department of Kinesiology & Community Health, University of Illinois at Urbana-Champaign, Urbana, IL

ABSTRACT

PURPOSE: Examine whether engaging in a variety of leisure-time physical activities (LTPA), despite not meeting physical activity (PA) guidelines, leads to better cognitive function in older adults. **METHODS:** Data were retrieved from the 1999-2002 National Health and Nutrition Examination Survey (NHANES). Older adults (N = 2,773, M age= 71.4 yrs, 50.6% ♀, 60.9% non-Hispanic White) reported their moderate- and vigorous-intensity LTPA during the past 30 days, including the specific type (e.g., hiking, tennis, or running), frequency (e.g., d·wk^{-1}), and average duration. Moderate-to-vigorous physical activity (MVPA) was calculated by multiplying the metabolic equivalent values of the activities (MET) by the frequency and duration (MVPA-min·wk^{-1} = MET level x frequency x duration). A dichotomous variable was created categorizing those who met PA guidelines (n = 831) based on federal guidelines (≥600 MVPA-min·wk^{-1}). LTPA-variety was calculated as the total number of activities participated in at least once a month. Cognitive function was assessed via the Digit Symbol Substitution Task (DSST). Age, sex, education, race, and whether the reported PA was similar over the previous 10-years were used as covariates in all analyses. Total minutes spent in MVPA was controlled for in all analyses as it was possible to engage in some PA and not meet PA guidelines. **RESULTS:** A multivariable linear regression model revealed a significant effect of LTPA-Variety on DSST (β = 7.14, 95% CI: 4.78-9.50, P < 0.01); MVPA-min·wk^{-1} was not a significant predictor (P = 0.41). Univariate analysis of covariance (ANCOVA) of those not meeting PA guidelines (n = 1942) revealed a significant effect ($F_{1,29}$ = 7.99, r^2 =0.41, P <0.01) for LTPA-Variety on DSST. In those not meeting PA guidelines, engaging in 2 or more different types of LTPA, compared to less, resulted in significantly greater cognitive functioning (M = 45.60 vs M = 40.09, P < 0.01) when accounting for MVPA-min·wk^{-1}. **CONCLUSION:** These results suggest that, for older adults, engaging in a greater variety of leisure-time physical activities can promote greater cognitive function regardless of the amount of time spent in moderate-to-vigorous activities. This has future implications for examining the primary metric of focus for physical activity engagement in this population.

INTRODUCTION

- Meeting physical activity guidelines (PAG) is shown to improve cognitive function in older adults; however, a volume-based metric can lead to age-related challenges in this population
- Variety may be an alternatively safer and effective metric
- Research examining variety as a metric of leisure-time physical activity engagement (LTPA) on cognitive performance is lacking

PURPOSE

- The purpose of this study was to examine whether engaging in a variety of LTPA is associated with better cognitive function in older adults regardless of the amount of time spent in LTPA

Exercise PsychoPhysiology Lab
University of Illinois, Urbana-Champaign

RESULTS

- Participants: older adults (N = 2,773, M age= 71.4yrs, 50.6% ♀, 60.9% non-Hispanic White)
- A medium effect on cognitive function (d = 0.48) and large effect on LTPA-Variety (d = 2.10) was found in favor of those meeting physical activity guidelines

Characteristics	Total Sample N (%) or $M \pm SD$	Not Meeting PA Guidelines N (%) or $M \pm SD$	Meeting PA Guidelines N (%) or $M \pm SD$	t	P-value	Cohen d
N	2773	1942 (70.0)	831 (28.5)			
Age in years	71.4 ± 7.9	71.7 ± 8.1	70.5 ± 7.3	3.75	<.001	0.16
Female	1404 (50.6)	1070 (55.1)	334 (40.2)	7.26	<.001	-
Race						
Non-Hispanic White	1688 (60.9)	1115 (57.4)	573 (69.0)	-5.74	<.001	-
Mexican American	523 (18.9)	396 (20.4)	127 (15.3)	3.16	<.001	-
Non-Hispanic Black	396 (14.3)	304 (15.7)	92 (11.1)	3.17	<.001	-
Other Hispanic	107 (3.9)	85 (4.4)	22 (2.6)	2.17	.015	-
Other	59 (2.1)	42 (2.2)	17 (2.0)	0.20	.423	-
Education						
Less than HS	1083 (39.1)	875 (45.1)	208 (25.0)	10.05	<.001	-
HS Diploma/GED	685 (24.7)	487 (25.1)	198 (23.8)	0.67	.250	-
Some College	553 (19.9)	341 (17.6)	212 (25.5)	-4.85	<.001	-
College Degree	449 (16.2)	238 (12.3)	211 (25.4)	-8.74	<.001	-
PA Similar 10years						
Same or more	1004 (36.2)	615 (31.7)	389 (46.8)	7.70	<.001	-
Less	1768 (63.8)	1327 (68.3)	441 (53.1)			
MVPA min·wk^{-1}	803.2 ± 1926.6	74.7 ± 153.7	2505.7 ± 2863.2	-37.3	<.001	1.55
LTPA Variety per week	0.21 ± 0.29	0.08 ± 0.15	0.52 ± 0.31	-50.72	<.001	2.10
DSST	41.46 ± 18.49	38.87 ± 18.18	47.51 ± 17.78	-11.54	<.001	0.48

- Multivariable linear regression model revealed a significant effect of LTPA-Variety on DSST (β = 7.14, 95% CI: 4.78-9.49, P < 0.01); MVPA-min·wk^{-1} was not a significant predictor (P = 0.41).

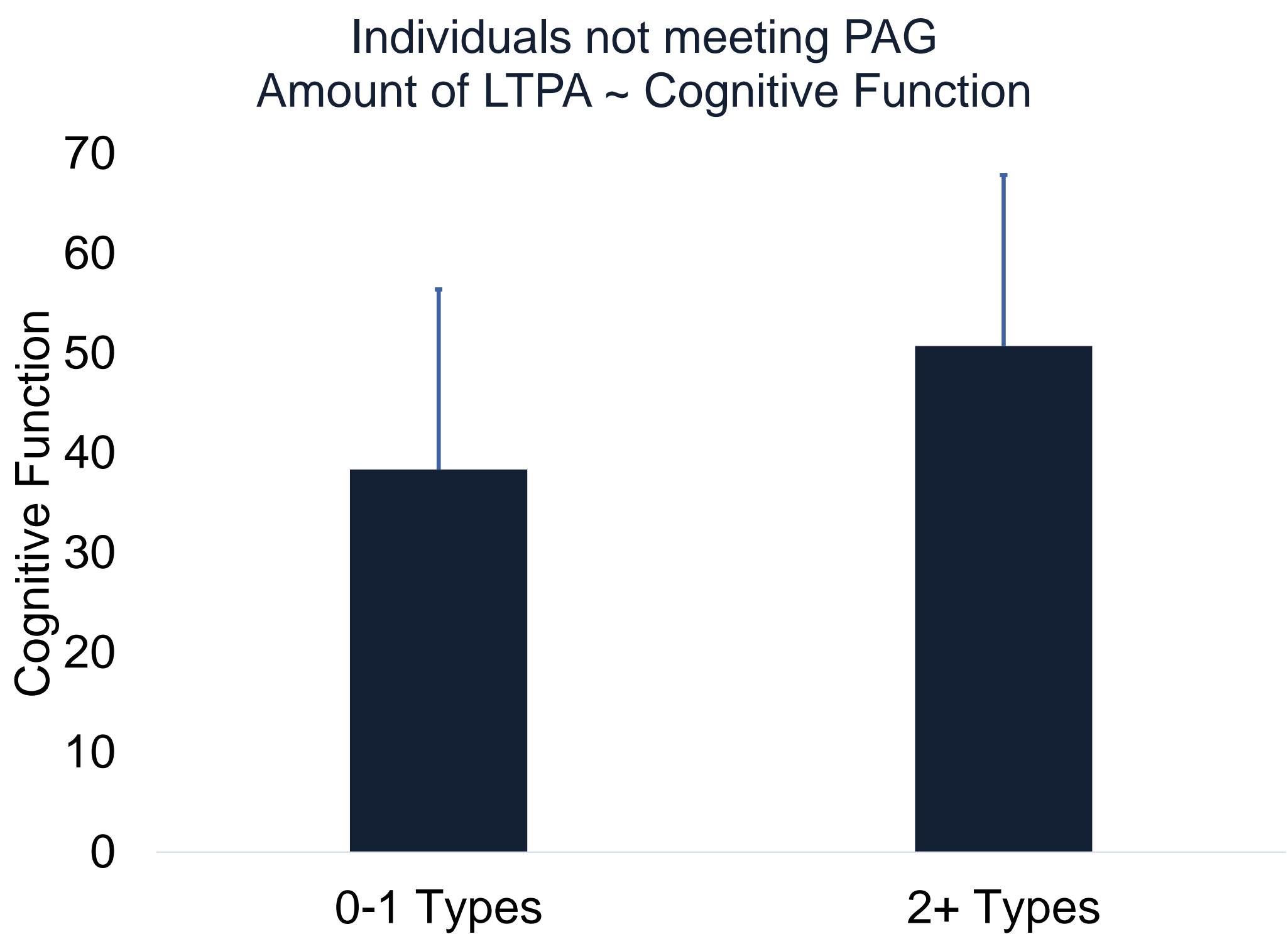| Dependent Variable	Predictor	β	95% CI	P
Cognitive Function (DSST)	Age	-0.86	-0.92, -0.79	<.001
	Males vs Females	-5.06	-6.37, -3.76	<.001
	Race			
	Mexican American vs white	-9.21	-11.70, -6.72	<.001
	Non-Hispanic black vs white	-11.16	-14.14, -8.19	<.001
	Other Hispanic vs white	-14.26	-16.06, -12.46	<.001
	Other vs white	-3.57	-8.89, 1.75	.180
	Education			
	No HS Diploma vs College degree	18.00	16.64, 19.36	<.001
	HS Diploma vs College degree	7.87	6.18, 9.57	<.001
	Some college vs College degree	4.91	3.21, 6.61	<.001
	PA Same or more vs PA less	-2.53	-3.93, -1.12	<.001
	LTPA Variety	7.14	4.78, 9.49	<.001
	MVPA min·wk^{-1}	0.00	0.00, 0.00	.414

METHOD

- Data were retrieved from the 1999-2002 National Health and Nutrition Examination Survey (NHANES)
- Moderate-to-vigorous physical activity (MVPA) was calculated by multiplying the MET of the activity by the frequency and duration

MEASURES

- Cognitive function was assessed via the Digit Symbol Substitution Task (DSST)
- LTPA-variety was calculated as the total number of LTPA engaged in per week
- Meeting PAG (n = 831) was based on federal guidelines (≥600 MVPA-min·wk^{-1})
- LTPA engagement was assessed via open-ended questions which included the type, frequency, intensity, and duration over the past 30 days

- Univariate analysis of covariance (ANCOVA) of those not meeting PA guidelines (n = 1942) revealed a significant effect ($F_{1,29}$ = 7.99, r^2 =0.41, P = 0.008) for LTPA-Variety on DSST
- Engaging in two or more different types of LTPA, compared to less, resulted in significantly greater cognitive functioning (M = 50.77 ± 17.15 vs M = 38.35 ± 18.05, P < .001, d = 0.69), when accounting for MVPA-min·wk^{-1}

Individuals not meeting PAG
Amount of LTPA ~ Cognitive Function
(bar chart: Cognitive Function by 0-1 Types vs 2+ Types)

CONCLUSIONS

- In conclusion, we found that for older adults, engaging in a greater variety of leisure-time physical activities was significantly associated with greater cognitive function regardless of the amount of time spent in moderate-to-vigorous activities
- This has future implications for examining the primary metric of focus for physical activity engagement in this population

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