



Exercise Improves Executive Function in Older US Veterans with amnestic Mild Cognitive Impairment: What is the Role of HbA1c?

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INTRODUCTION

- Moderate-to-high intensity aerobic exercise may be related to improved executive functioning (EF) in adults with and without mild cognitive impairment (MCI).¹
- While evidence supports the importance of moderate-to-high intensity exercise, research comparing the effects of different exercise interventions on EF are limited.
- EF is critical for functional independence in MCI and possibly delaying transition to Alzheimer's disease.
- Poorer EF is associated with and exacerbated by higher HbA1c levels.²
- Exercise may significantly improve HbA1c levels and glucose control.³
- No current investigations explore HbA1c-change as a mechanism driving improved cognition following exercise in amnestic MCI (aMCI).

AIMS

To determine whether HbA1c-change differentially impacts improvements in executive function in water-based and land-based exercise interventions.

PARTICIPANTS

- 42 US Veterans (mean age = 71.1 ± 8.04 years) with aMCI.
- Predominantly White (76%), male (93%), retired (69%), well-educated (49% received a Bachelor's degree) sample.

PROCEDURES

Moderate-to-high intensity exercise

- 3 x 60-minute supervised exercise training sessions per week for 6 months:
 - Combined aerobic and resistance exercise (LAND)
 - Water-based activity (WATER)

Fasted Biological Collection: Blood

- Two samples collected: pre- and post-intervention

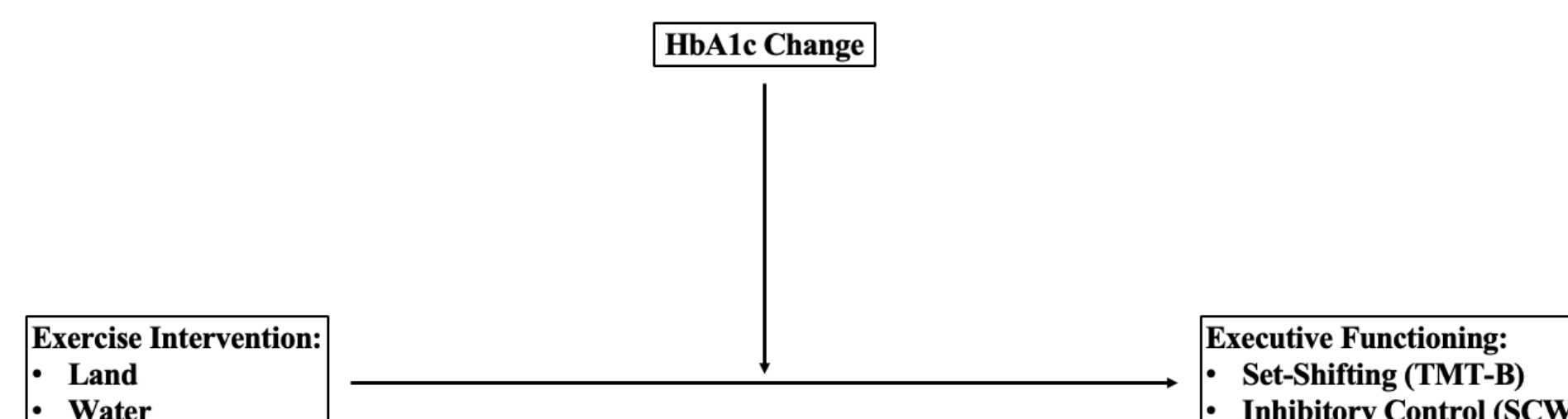
Measures of Executive Function

- Trail Making Test: Trial B (TMT-B)
- Stroop Color Word Test: Color-Word Trial (SCW)

MIXED EFFECTS MODERATION MODEL

Statistical Analyses - Linear Mixed Effects Models:

- Group*Time
- HbA1c-change*Group*Time



RESULTS

Executive Function: Set-Shifting (TMT-B):

- HbA1c-change moderated set-shifting improvements in the land-based group only
- HbA1c-change significantly improved the model fit, ($\chi^2(3) = 17.68, p < .001$)

Executive Function: Inhibitory Control (SCW):

- HbA1c-change moderated inhibitory control improvements in the land-based group only
- HbA1c-change significantly improved the model fit, ($\chi^2(3) = 8.97, p = .030$)

Table 1. Summary of Fixed Effects for Executive Function

Group	Cognitive Test	Fixed Effect	Estimate	SE	df	p-value
Land	TMT-B	Group*Time	-2.57	1.41	44	.076
		HbA1c-change*Group*Time	-12.26	3.85	40	.003**
	SCW	Group*Time	0.07	0.17	44	.677
		HbA1c-change*Group*Time	-0.95	0.44	41	.037*
Water	TMT-B	Group*Time	-1.57	1.62	46	.336
		HbA1c-change*Group*Time	-20.27	11.01	51	.072
	SCW	Group*Time	0.43	0.19	45	.026*
		HbA1c-change*Group*Time	-0.70	1.29	48	.587

DISCUSSION

- Water-based aerobic exercise improves inhibitory control only, independent of changes in HbA1c.
- As muscle mass drives glucose clearance, lower impact water-based exercise may involve less muscle engagement, resulting in smaller changes in HbA1c.
- Results suggest that improvements in executive functioning following land-based exercise depend on the magnitude of glycemic improvement; greater reductions in HbA1c were associated with statistically significant improvement in inhibitory control and set-shifting ability.
- Results are consistent with previous research that suggests moderate-to-high intensity exercise improves glycemic control in older adults and that better glycemic regulation is associated with better executive functioning.

CLINICAL IMPLICATIONS

Combined aerobic and resistance exercise drives exercise-induced changes in HbA1c that result in improvements in EF, while water-based exercise alone is associated with improved EF. Participation in these exercise modalities may be promising interventions for aMCI.

LIMITATIONS & FUTURE DIRECTIONS

- Future research should look at other at-risk groups and in larger samples that are fully powered to model possible non-linear relationships.
- The retrospective nature of this study precludes a direct comparison between the two types of exercise, so future research might randomize persons to either combined aerobic and resistance, water-based, and/or a usual care/control condition.
- Future research might track EF changes in aMCI patients to assess if progress is sustained or transient.

REFERENCES & SUPPLEMENTAL MATERIAL

