Chronotropic response and cognitive function in a cohort at risk for Alzheimer's disease

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BACKGROUND

- Alzheimer's disease (AD) shares pathology with cardiovascular disease.[1]
- Chronotropic response (CR) and heart rate (HR) recovery are two measures of cardiovascular function.[2-4]
- These measures are commonly used as predictors of severe adverse outcomes, such as mortality,[3-5] but have not yet been studied with respect to more intermediate outcomes, such as cognition.

OBJECTIVES

In a healthy, late-middle-aged cohort of individuals with risk factors for AD:

- Examine the (i) univariate and (ii) differential influences of CR and HR recovery on cognitive function.

METHODS

Participants:
- 90 late-middle-aged adults
- Enriched for AD risk
- Enrolled in the Wisconsin Registry for Alzheimer's Prevention (WRAP)

Graded Treadmill Exercise Test:
- Modified Balke protocol

Chronotropic Response
- ((peak HR – resting HR)/[(220 – age) – resting HR]) x 100

HR Recovery
- (peak HR – HR 60 seconds after test termination)

Neuropsychological Assessment:
- Included tests for four cognitive domains:
  - **Immediate Memory**: Rey Auditory Verbal Learning Test (RAVLT) learning trials 1 and 2
  - **Verbal Learning & Memory**: RAVLT learning trials 3-5 and Delayed Recall
  - **Working Memory**: Digit Span and Letter-Numbering Sequencing subtests of Wechsler Adult Intelligence Scale, 3rd edition
  - **Speed & Flexibility**: Stroop Color-Word Test Interference Trial and Trail-Making Test A & B

Statistical Analyses:
- Univariate associations
  - Linear regressions
  - Adjusted for age, sex, and education
- Differential association
  - Linear regression
  - Terms included in the statistical model were CR, HR recovery, age, sex, and education

RESULTS

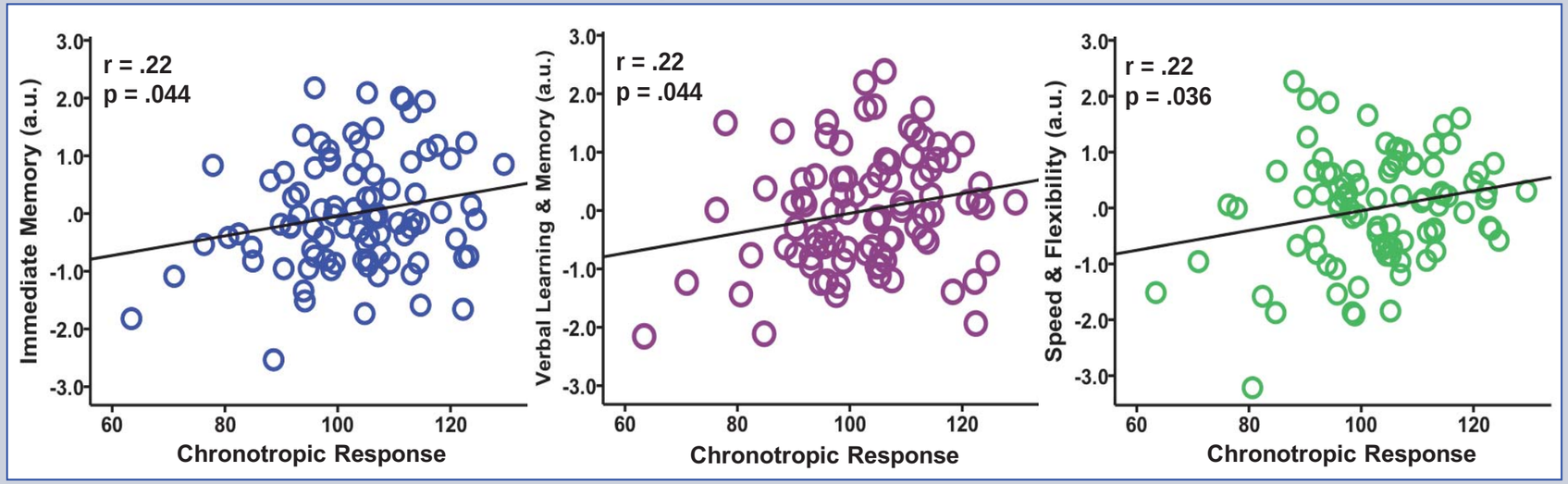
Table 1. Background characteristics

Characteristic	Value
Age, years	63.52 (5.86)
Female, %	65.6
Education, years	16.52 (2.32)
APOE4 positive, %	42.2
Family history positive, %	68.9
CR	102.84 (12.50)
HR recovery, bpm	21.13 (6.74)

Table 2. Univariate influence of CR and HR recovery on cognition

Cognitive domain	CR		HR Recovery	
	β (SE)	p	β (SE)	p
Immediate Memory	**.02 (.01)**	**.044**	-.01 (.02)	.882
Verbal Learning & Memory	**.02 (.01)**	**.044**	-.01 (.01)	.789
Working Memory	.01 (.01)	.855	-.02 (.02)	.322
Speed & Flexibility	**.01 (.01)**	**.036**	.02 (.01)	.161

Figure 1. Univariate association between CR and cognitive performance



CONCLUSIONS

- CR is positively associated with cognition, specifically in the domains of Immediate Memory, Verbal Learning & Memory, and Speed & Flexibility. This association remains even after controlling for HR recovery.
- HR recovery is not associated with cognition in this cohort.
- Cardiovascular health plays an important role in cognitive function, particularly in populations at risk for AD. Monitoring vascular health early may be a viable pathway to preventing or slowing cognitive decline due to AD.

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