Insulin Sensitivity, Neuropsychological Performance, and Cognitive Diagnosis: The Vanderbilt Memory & Aging Project

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Background & Objective

- Insulin resistance is associated with cognitive impairment and risk for the development of Alzheimer's disease.
- We examined the relation of insulin sensitivity to neuropsychological performance in non-demented older adults, including a possible interaction with cognitive diagnosis or apolipoprotein e4 (APOE4) status.

Methods

- Participants were drawn from the Vanderbilt Memory & Aging Project, a case-control longitudinal study investigating vascular health and brain aging.
- Participants were diagnosed with normal cognition (NC) or mild cognitive impairment (MCI; Albert et al., 2011) via consensus conference following a comprehensive assessment.
- 137 NC and 137 MCI participants completed a separate neuropsychological protocol and fasting blood draw (see **Table 1**).
- Insulin resistance was calculated using quantitative insulin sensitivity check index (QUICKI; QUICKI=1/(log(insulin, mg/dL)+(glucose, mg/dL)). Lower QUICKI values indicate greater insulin resistance.

Analyses

- Linear regressions related QUICKI to neuropsychological performance, adjusting for age, sex, race, education, body mass index, systolic blood pressure, prevalent cardiovascular disease, cognitive diagnosis, and APOE4.
- Cognitive diagnosis was added as an interaction term, to investigate the interaction between QUICKI and cognitive diagnosis on neuropsychological performance.

Results

- There were no main effects between QUICKI and neuropsychological performances (all p-values>0.13).
- See Figures 1. and 2. for significant interactions between QUICKI and cognitive diagnosis on cognitive performance (CVLT Learning and CVLT Delayed Recall; all other p-values>0.05).

Table 1. Participant Characteristics

	NC n=137	MCI n=137
Age, years	73±7	72±8
Sex, % female	41	40
Race, % White	91	87
Education, years	**16±3**	**15±3****
Diabetes (no medication), %	2	9
Prevalent CVD, %	4	2
QUICKI	**0.36±0.04**	**0.34±0.04***
HbA1c, %	5.6±0.4	5.6±0.7
Insulin, mg/dL	**10±8**	**15±14***
Glucose, mg/dL	91±12	92±22
Systolic Blood Pressure, mm/Hg	141±18	143±18
BMI	26±5	27±4
APOE4+, %	**26**	**39***
Montreal Cognitive Assessment	**27±2**	**24±4****
CVLT-II Trials 1-5 Total Learning	**47±10**	**34±10****
CVLT-II Delayed Recall	**11±3**	**6±4****
CVLT-II Discrimination	**3.0±0.7**	**1.8±0.9****
BFLT Trials 1-5 Total Learning	**136±30**	**88±37****
BFLT Delayed Recall	**33±7**	**21±10****
BFLT Discrimination	**0.8±0.1**	**0.6±0.2****
BNT 30-Item	**28±2**	**26±4****
Animal Naming	**21±5**	**17±5****
WAIS-IV Digit-Symbol Coding	**59±11**	**48±12****
DKEFS Tower	**16±4**	**14±5****
DKEFS Color-Word Inhibition	**58±12**	**78±28****
Letter Fluency (FAS)	**44±11**	**34±11****
DKEFS Trail Making A	**35±11**	**49±23****
DKEFS Trail Making B	**81±27**	**128±51****
Hooper Visual Organization Test	**26±2**	**24±4****

Note: *p<0.05; **p<0.001; CVLT-II=California Verbal Learning Test-II; BFLT=Biber Figure Learning Test; BNT=Boston Naming Test; WAIS-IV=Wechsler Adult Intelligence Scale-IV; DKEFS=Delis-Kaplan Executive Function System

Figure 1. QUICKI x CVLT Learning x Diagnosis

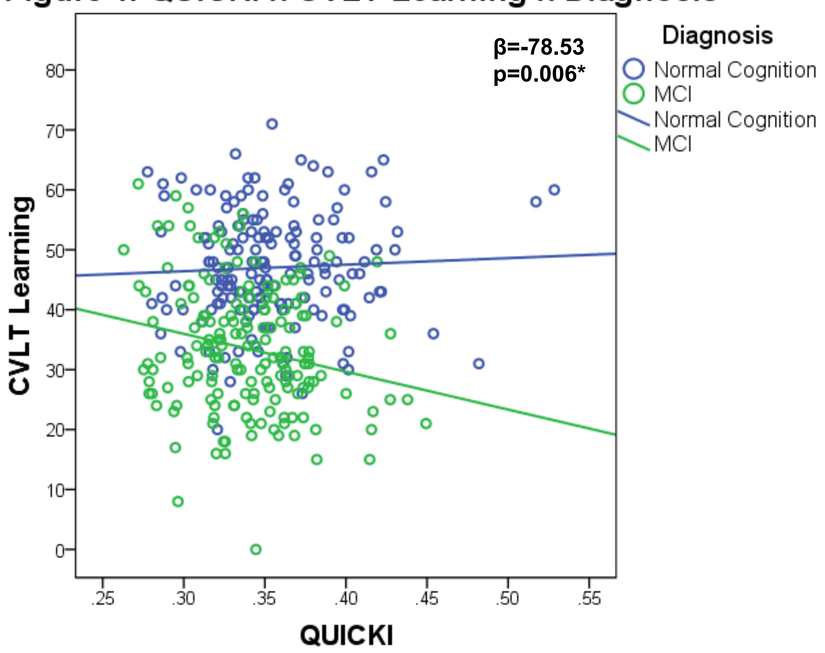
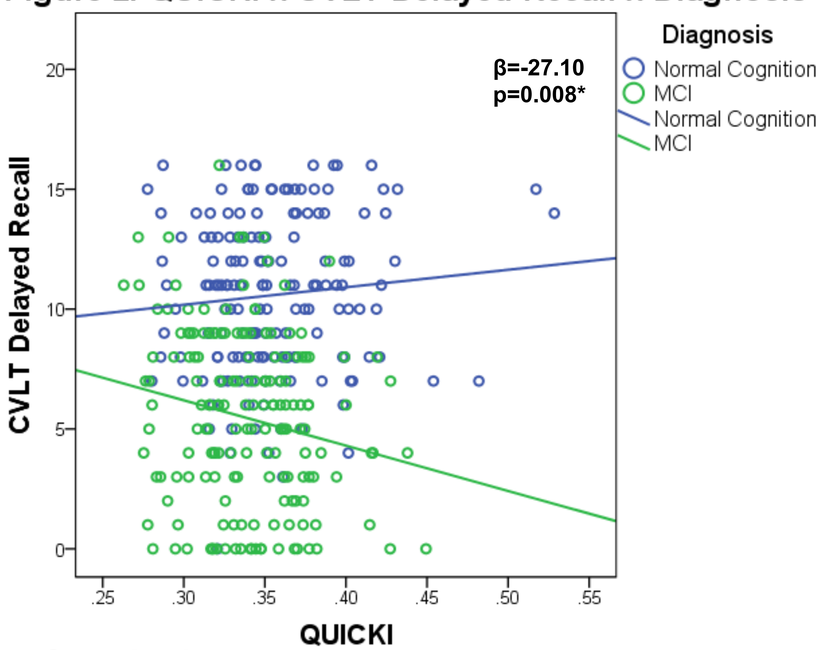


Figure 2. QUICKI x CVLT Delayed Recall x Diagnosis



Conclusions

- The effects of insulin resistance on memory performance vary depending on cognitive diagnosis.
- In our cohort, individuals with MCI and greater insulin resistance performed better on memory measures.
- Further investigation is necessary to understand how insulin resistance relates to memory in individuals with MCI.

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