

Relationship of Cardiovascular Disease to Change in Cognitive Ability

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CVD and Cognitive Ability

- CVD is related to lower cognitive performance
 - Hypertension/heart disease & MMSE (Starr et al., 1993)
 - Carotid artery thickening & MMSE (Johnston et al., 2004)
 - Congestive heart failure & neuropsychological tests (Trojano et al., 2003)
- Longitudinal research has also shown a relationship of CVD to change in cognitive performance
 - Hypertension & decline in psychomotor speed (Carmelli et al., 1998), digit symbol tests (Knopman et al., 2001), and MMSE (Comijs et al., 2004)
 - Hypertension/heart disease & neuropsychological tests (Elias et al., 1996)
 - CVD & perceptual speed and fluency (Verhaeghen et al., 2003)
- Primarily older samples

Current Study

- Existing cognitive database from the Seattle Longitudinal Study
- Richer medical data recently available
- Wide age range – 36 to 77 years at T1
- Cognitive ability measured with factor scores
 - Multiple indicators of each domain

Seattle Longitudinal Study

- Began in 1956
- Testing cycles in 7-year waves: 1963, 1970, 1977, 1984, 1991, 1998
- Participants drawn from the membership of an HMO
- 1984: cognitive battery expanded to have multiple indicators of 6 domains (factors) of cognitive ability (Schaie, Dutta, & Willis, 1991)

Cognitive Ability Factors

- Verbal Memory
 - PMA Word Fluency
 - Immediate Recall
 - Delayed Recall
- Numeric Ability
 - PMA Number
 - Addition
 - Subtraction and Multiplication
 - Number Comparison
- Inductive Reasoning
 - PMA Reasoning
 - ADEPT Letter Series
 - Word Series
 - Number Series
- Spatial Orientation
 - PMA Space
 - Object Rotation
 - Alphanumeric Rotation
 - Cube Comparison

Cognitive Ability Factors

- Perceptual Speed
 - Identical Pictures
 - Finding A's
 - Number Comparison
 - PMA Word Fluency
 - PMA Verbal Meaning
- Verbal Ability
 - PMA Verbal Meaning
 - ETS Vocabulary
 - Advanced Vocabulary
 - PMA Word Fluency

Medical Record Info

- 1956-1991: medical records for selected SLS participants were abstracted by hand & diagnoses tabulated
- 1992: HMO members' medical records were computerized
- 2001: computerized medical records were obtained for participants in the 1998 SLS wave who were enrolled in the HMO
 - Physician and hospital visits
 - Diagnoses coded in ICD-9 format

CVD status groups

- Based on ICD-9 diagnosis codes in the medical records
 - 410-438: heart and cerebrovascular disease
 - Myocardial infarction
 - Pulmonary heart disease
 - Congestive heart failure
 - Intracerebral hemorrhage
 - 401-405 only: hypertension only
 - No diagnoses in 401-438: no CVD

Analysis Sample

- Participated in both the 1991 and 1998 SLS waves
- Between 36-77 years old in 1991
- HMO medical record data available
- 891 participants
 - 54% were 60 years or older
 - 56% females
 - 96% Caucasian
 - Average education = 15.4 years (range=7-20)

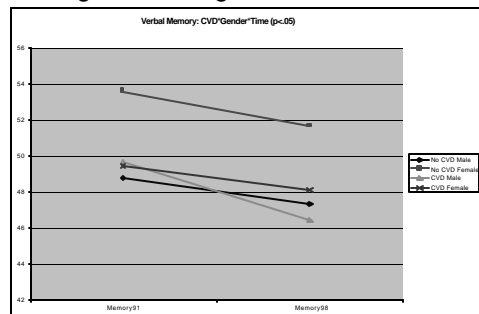
Descriptives: By CVD group

	No CVD	Hypertension only	CVD
% males	39%	43%	53%
% =60 yrs	40%	56%	76%
Avg. Educ.	15.8	15.0	14.9
N	484	124	283

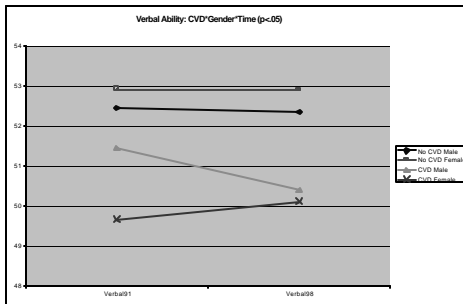
Research Question #1

- Is there differential cognitive change between 1991 and 1998 for individuals with CVD versus no CVD?
 - By gender
 - By age group
- 2 CVD status x 2 gender x 2 age group x 2 time repeated measures ANOVA

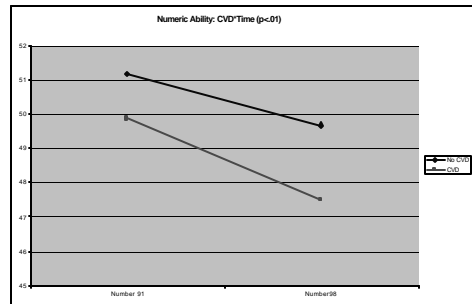
Cognitive Change: CVD vs. no CVD



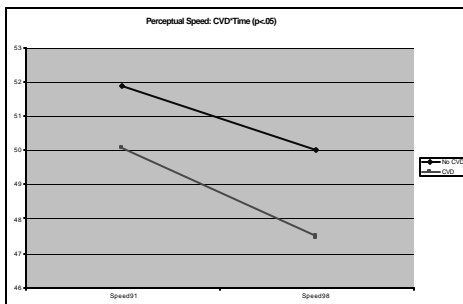
Cognitive Change: CVD vs. No CVD



Cognitive Change: CVD vs. No CVD



Cognitive Change: CVD vs. No CVD



Summary of Question #1

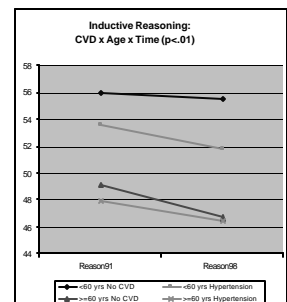
- Males with CVD showed greater decline than males without CVD for verbal memory and verbal ability
- Similar rates of decline in verbal memory and verbal ability were observed for females with CVD and females without CVD
- Decline for CVD group was greater than no CVD group on numeric ability and perceptual speed
- No difference between CVD groups over time on inductive reasoning or spatial orientation

Research Question #2

- Is there differential cognitive change between 1991 and 1998 for individuals with hypertension only versus no CVD?
 - By gender
 - By age group
- 2 CVD status x 2 gender x 2 age group x 2 time repeated measures ANOVA

Cognitive Change: Hypertension Only vs. No CVD

- Only inductive reasoning had significant change over time involving CVD status
 - Older participants showed similar decline, regardless of hypertension status
 - Younger hypertensive participants showed more decline than younger participants without hypertension



Research Question #3

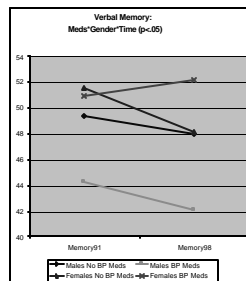
- Among hypertensives, is there differential cognitive change for those taking BP medications versus those not taking BP medications?
 - By gender
 - By age group
- 2 medication status x 2 gender x 2 age group x 2 time repeated measures ANOVA

Medication Status

- Determined with HMO-provided prescription records
- Medications
 - Diuretics
 - Antihypertensives (primarily ACE inhibitors)
 - 61% of hypertensive participants took one or both of these medication classes

Hypertensives: Meds vs. No Meds

- Only verbal memory had significant change over time involving BP meds
 - **Males:** Cognitive change did not differ as a function of meds
 - **Females:** Those not taking BP meds had a decline; those taking BP meds had an increase



Conclusions

- Differences in cognitive change demonstrated at the factor level for CVD groups
 - Greatest differences in cognitive change were for serious CVD versus no CVD
 - Hypertensives differed from no CVD on inductive reasoning only
 - Gender difference in cognitive change was in opposite directions for the comparison of CVD/No CVD and Hypertensives with & without Medications
- Age range was wide and included younger individuals

Future Directions

- Diagnosis onset
- Change over longer periods of time
 - Differences in medical record info
 - Much smaller sample
- More specific CVD groups and medications (e.g., statins)

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