Verbal memory and verbal fluency as predictors of cardiovascular disease incidence in Polish cohort of the HAPIEE Study

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Background: Decline in cognitive functions is related to ageing. Previous results suggest that there is a relationship between verbal memory (VM) and verbal fluency (VF) and risk of cardiovascular death. Less is known on the relationship between cognitive functions and cardiovascular disease (CVD) incidence.

Purpose: To assess the relationship between verbal memory, verbal fluency and CVD incidence.

Methods: Studied group was a random sample of men and women aged 45-69 years at baseline, permanent residents of Krakow. Each participant was interviewed at home using a standard questionnaire, which included cognitive tests, information on CVD risk factors, education and health behaviours; blood samples were also collected. Assessment of verbal memory involved recalling of 10 words, assessment of verbal fluency included animal naming in 1 minute. Participants were classified into 4 categories of each component, according to quartile values of the distribution of the results. New CVD cases included: myocardial infarction, stroke, and coronary artery bypass graft. Clinical diagnosis of CVD was verified by review of medical records. Information on deaths and causes was obtained from the local registry, Central Statistical Office of Poland and by contacting relatives. Causes of deaths were classified according to ICD-10 (codes: I.01-I.99). Relationship between verbal memory, verbal fluency and CVD incidence was assessed using Cox proportional hazards model.

Tab 1. Descriptive characteristics of the study sample

	Men N=1530		Women N=1677	
Age (x, sd)	64.1	4.36	64.0	4.51
Education (n, %)				
primary or less than primary	180	11.8	305	18.2
vocational or secondary	866	56.6	963	57.4
university	484	31.6	409	24.4
Smoking (n, %)	1057	69.1	619	36.9
Physical activity [h per week] (Me, IR)	16	17.5	19	18.0
BMI [kg/m^2] (x, sd)	28.1	3.70	29.3	5.09
Hypertension (n, %)	1072	70.1	1107	66.0
Hypercholesterolaemia (n, %)	1152	75.3	1400	83.5
Diabetes (n, %)	269	17.6	261	15.6
Number of memorized words (Me, IR)	19	5	20	5
Number of recalled animals (Me, IR)	19	8	19	8
Follow-up time [years] (Me, IR)	11	0.9	11	0.9
New CVD cases (n, %)	228	14.9	160	9.5

Results: Median follow-up time was nearly 11 years. There were 3207 men and women free of CVD at baseline who completed assessment of verbal fluency and verbal memory. 388 new CVD cases were observed during follow-up time (228 in men, 160 in women). After adjustment for age, compared to women with the best VM, women with the worst VM had higher risk of developing CVD by 65% (HR=1.65; 95%CI=1.04-2.62). Similarly, women with the worst VF had almost 2 times higher risk of CVD incidence (HR=1.96; 95%CI=1.22-3.15) in comparison with women with the worst VF. The relationship between both components of cognitive functioning in women was explained by CVD risk factors such as hypertension, hypercholesterolemia, diabetes, BMI and smoking. Adjustment for CVD risk factors reduced previous estimates found in women (HR=1.47; 95%CI=0.85-2.54 for VM, and HR=1.64; 95%CI=0.94-2.82 for VF). Relationship between both measurements of cognitive functions and risk of developing CVD was not found in men.

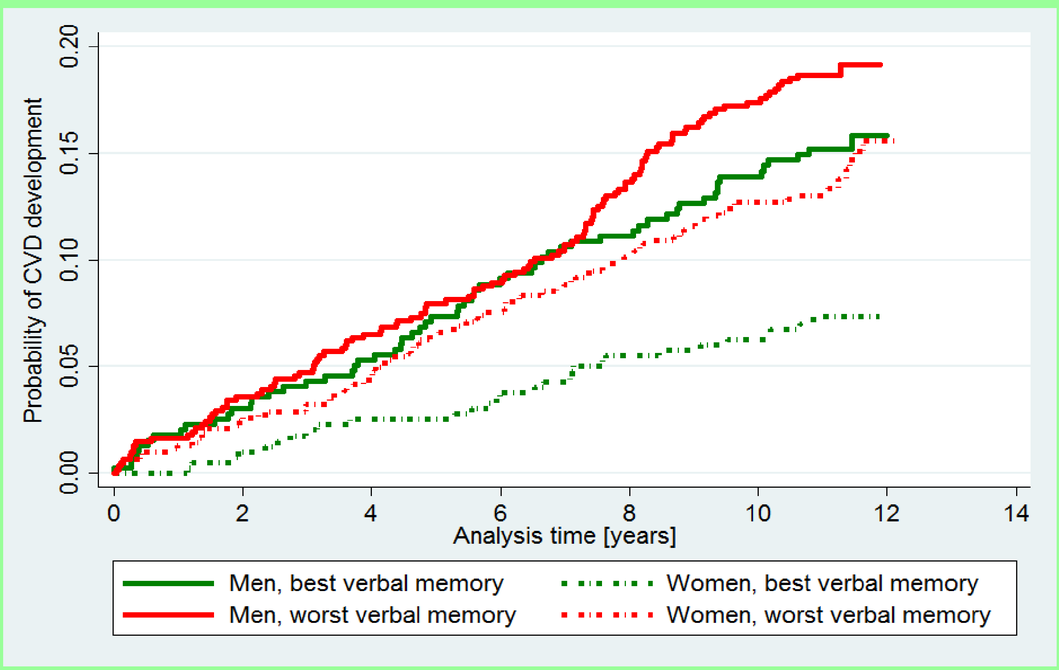

Fig.1. Kaplan-Meier estimates of failure function: CVD incidence by verbal memory

Tab 2. Hazard ratio for CVD incidence by verbal memory categories

	HR^A (95%CI)	HR^B (95%CI)
Men		
Best verbal memory (1st quartile: 22+ words)	1.00	1.00
2nd quartile (19-21 words)	0.86 (0.59-1.26)	0.83 (0.55-1.25)
3rd quartile (17-18 words)	0.93 (0.62-1.39)	0.92 (0.59-1.44)
Worst verbal memory (4th quartile: <16 words)	1.02 (0.71-1.47)	0.90 (0.59-1.39)
Women		
Best verbal memory (1st quartile: 23+ words)	1.00	1.00
2nd quartile (20-22 words)	1.26 (0.77-2.05)	1.35 (0.79-2.31)
3rd quartile (18-19 words)	0.85 (0.48-1.51)	0.87 (0.46-1.62)
Worst verbal memory (4th quartile: <17 words)	**1.65 (1.04-2.62)**	1.47 (0.85-2.54)

A: adjusted for age
B: model A + education, hypertension, hypercholesterolemia, diabetes, BMI, smoking, physical activity

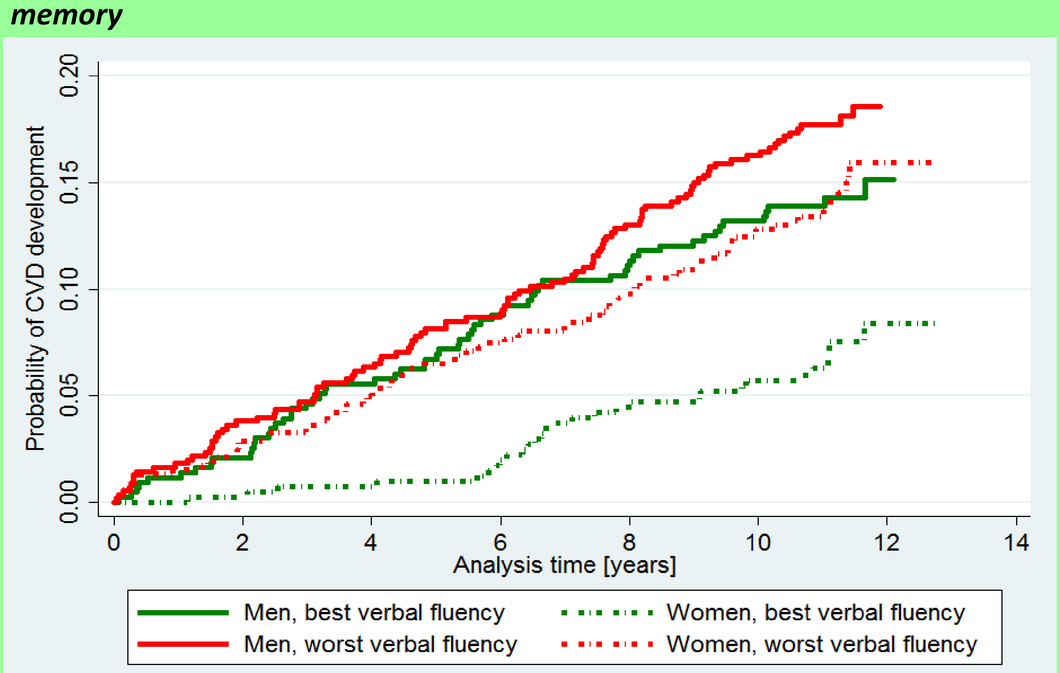

Fig.2. Kaplan-Meier estimates of failure function: CVD incidence by verbal fluency

Tab 3. Hazard ratio for CVD incidence by verbal fluency categories

	HR^A (95%CI)	HR^B (95%CI)
Men		
Best verbal fluency (1st quartile: 24+ animals)	1.00	1.00
2nd quartile (20-23 animals)	1.05 (0.71-1.56)	1.21 (0.79-1.87)
3rd quartile (16-19 animals)	1.23 (0.84-1.79)	1.22 (0.80-1.87)
Worst verbal fluency (4th quartile: <15 animals)	1.14 (0.78-1.67)	1.12 (0.71-1.75)
Women		
Best verbal fluency (1st quartile: 24+ animals)	1.00	1.00
2nd quartile (20-23 animals)	1.21 (0.71-2.05)	1.22 (0.69-2.15)
3rd quartile (16-19 animals)	1.33 (0.81-2.18)	1.30 (0.76-2.23)
Worst verbal fluency (4th quartile: <15 animals)	**1.96 (1.22-3.15)**	1.64 (0.94-2.82)

A: adjusted for age
B: model A + education, hypertension, hypercholesterolemia, diabetes, BMI, smoking, physical activity

Conclusions: The relation between poor VM, VF and increased risk of CVD was found in women but not in men. However, it was attenuated and not significant after adjustment for other CVD risk factors.

Conflict of interest: NONE