

Sustained Cognitive Competence Between Age 80 and 95: A Prospective Study

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Abstract

Objective: To examine the relation of age to sustained cognitive competence in late life among men who underwent a prospective, multidisciplinary assessment from age 19 to 95, with little attrition except death and dementia.

Method: A prospective 75-year study of 268 Harvard College sophomores was begun in 1939 with data points every 2-5 years and with multiple blinded raters. Measurements included assessment of childhood environment, objective mental and physical health over time, vascular risk factors and exercise. At age 80 the surviving 142 men, were assessed using the Telephone Interview for Cognitive Status (TICS). Cognitive status was reassessed at ages 85, 90 and 95.

Results: The observed incidence of dementia (14 per 1,000-person years) (age 76-85) was about half that expected. Between age 80 and 90 the mean TICS score the 40 still surviving, cognitively competent men had declined only 0.65 of a point. Between ages 80 and 95 the mean TICS score of the 11 surviving cognitively competent men had declined only 0.55 of a point over 15 years. In both groups almost, half of the men's TICS scores had not declined at all-or even increased.

Conclusions: Excluding those men developing dementia or MCI, age per se from 80 to 95 did not appear to play a very significant role in cognitive decline among unusually long-lived, highly educated men.

Keywords: Cognitive Decline; Dementia; Longitudinal; MCI; Prospective; Risk Factors; TICS

Introduction

Until the groundbreaking studies of Warner Schaie [1], it was commonly assumed that as we age-even in the absence of dementing neuropathology-we all began to encounter progressive cognitive decline. However, the findings of Schaie's Seattle Longitudinal Study revealed some intellectual abilities did not decline significantly until at least age 80, and our IQs at age 75 are roughly what they were at 20 [2]. Schaie noted statistically significant declines for Inductive Reasoning, Spatial Orientation, and Perceptual Speed by age 46 and for Verbal Memory by age 39. However, Schaie found that two remaining two factors, Numeric Facility and Verbal Ability, actually showed positive age differences until midlife, and less than .5 SDs negative differences thereafter. Indeed, persons in advanced old age, on average, tested at a higher level than Schaie's youngest adult age group.

The Study of Adult Development at Harvard Medical School [3,4] uses 75 years of prospectively collected longitudinal data to examine the effect of age per se on sustained cognitive competence from age 80 to 95. Due to high education (76% attended graduate school) and selection at 19 for physical and mental health, our sample is unusually long-lived. Thirty percent of the original 268 men survived until age 90-roughly 10 times the expected proportion for white men born in 1920 [5]. The present report is of the 142 College men (out of an original cohort of 268) who survived until age 80 without dementia. Using the TICS, they have been retested every five years until death or age 95.

Methods

Subjects

The Study of Adult Development (The Grant Study) originally consisted of 268 Caucasian sophomores at Harvard University (born circa 1920) drawn from the classes graduating in 1940-1944 [6]. Selection criteria included the absence of known physical

and mental illness (e.g. diabetes and depression) and a satisfactory scholastic record during freshman year. Although skewed towards high Socioeconomic Status (SES), 26% of the fathers and 65% of the mothers had not attended college. Fifty percent of the men were on scholarship and/or had to work during college. During college an interdisciplinary team of physiologists, internists, psychiatrists, psychologists and physical anthropologists assessed the men. The students' parents were interviewed, and extensive family, social and medical histories were obtained.

Since age 25, the men have been asked to complete questionnaires every two years and since age 45 complete records of their physical examinations have been obtained every five years until the present. The 142 men who survived to age 80 and who were without dementia are included in this study (Since 1992 this project has been reviewed and approved annually by the Brigham and Women's Hospital and, more recently, by Partner's IRB.)

Measures

Antecedent Measures: (More extensive detail is available in prior publications.)

- Parental Social Class: This was estimated by the 5-point classification devised by Hollingshead and Redlich [7].
- Risk Factors for Vascular Disease at age 50: This was a composite variable including: heavy smoking, alcohol abuse, hypertension, type II diabetes, and BMI > 28 [4].
- Social Supports (Age 50-70): after reviewing 11 biennial questionnaires and all interview data, an independent rater assigned social support ratings. The rating is based on 6 items; score: range 14 = best; 0 = worst. The 6 items were: warm marriage (doubled), Close Adult Sibling Relationships, Close to Kids, Use of Confidantes, Regular Recreation with Friends, Other Contact with Friends. Reliability for the sum of these ratings (assessed by interclass correlations computed for 3 raters on 30 cases) was .92. (Men who died prior to age 60 were excluded due to inadequate data.) [8].
- Exercise (Age 45-60): Exercise between age 45 and 60 (reported on multiple questionnaires and interviews), were rated on a 1 to 3 scale defined as 1 ("heavy") = > 2000 kcal/wk., 2 = 500-2000 kcal/wk., 3 (little) = < 500 kcal/week (using the tables provided in the Harvard Sports Code) [4].

Outcome Measures

Cognitive Status was determined using the Telephone Interview for Cognitive Status (TICS) [9]. The TICS includes a broad range of cognitive domains, including orientation, registration, short-term recall, concentration, serial subtraction, and language. The maximum score was 41. This interview was administered by telephone to all surviving men without dementia within an average of 7 months of their birthday at age 80, age 85, age 90 and age 95. (5 men born in 1923 were tested at age 94.)

Based on previously validated data [10] and from this paper, a TICS score of 41 to 34 reflected intact cognition; a score of 33-31 indicated Mild Cognitive Impairment (MCI) [11,12] usually culminating in crippling dementia within 5 years; a TICS score below 31 reflected dementia. The TICS has been shown to have good test-retest reliability and is highly correlated ($r = 0.94$) with the Mini-Mental State Examination (MMSE) [9,13,14]. In addition to the TICS, interview data from relatives, results from the physical exams conducted every five years, and death certificates were used to confirm the diagnosis of dementia.

Statistical Methods

Variables were examined in their continuous and dichotomized forms. Because many of our continuous variables were not normally distributed, Spearman's rho (two tailed) was used as the statistical test of correlation in univariate analyses. Although Spearman correlations are unorthodox for binary variables our p values did not differ significantly from chi-square (Fisher's Exact Test) and Wilcoxon Tests.

Results

Of the original 268 men, 126 men were not tested at age 80. (106 men died before age 81, one man was lost; 4 refused testing, and 15 were not tested due to preexisting dementia -confirmed by family or physician.) These excluded men, had significantly ($p < .01$) less exercise, social supports and long-lived ancestors and more vascular risk factors.

Table 1 illustrates the outcome at age 95 of the surviving 142 men who comprise the Study sample. At 95 only 11 (8%) of the men were still alive and with a TICS greater than 33. Eighty-one (57%) additional men had died by 95 without documented MCI or dementia. Of the 27 men with MCI at 80 all but 3 were dead or demented by age 95. By age 95, 40 (28%) men had been identified as demented by TICS, by family report, and by medical exam. The lifespan of the men who developed dementia was only 5 +/- 2 years.

STUDY MEMBERS AT AGE 80	N	%
TICS at 95 > 33	11	8%
TICS at 95 = 31-33 (MCI)	10	7%
Dementia by age 95	40	28%
Died without dementia or MCI	81	57%
Total	142	100%

Table 1: Cognitive Outcome Category at Age 95.

More intriguing, (if confirmed by larger samples) was the fact that of the 40 still surviving, cognitively competent men the mean TICS score had declined only 0.65 of a point between age 80 and 90, and between 80 and 95 the mean TICS score of the 11 still cognitively competent men declined only 0.55 of a point over 15 years. In both groups almost, half of the men's TICS scores had not declined at all-or even increased.

Discussion

Despite its small numbers and biased selection, our prospectively studied long-lived sample makes a singular contribution to the study of sustained cognitive competence. Undoubtedly, our sample was protected by the fact that due to their high education they had fewer than average vascular risk factors. Thus, in our highly educated cohort, the dementia rate-14 per 1,000 person-years (age 76-85) was about half of the EURODEM multi-study rate at age 76-85 [10].

Perhaps the most startling finding of this prospective study was that in the absence of neuropathology, which is age dependent, advancing age per se may be less important than many believe as a cause of late life cognitive decline in individuals without MCI or dementia. In other words, without disease the human brain may not be preprogrammed to decline rapidly even in its ninth decade.

However, two alternative explanations cannot be ruled out. First, people who survive into their middle nineties may constitute a cohort of hardy survivors with high cognitive reserve, and using the same instrument, the TICS, every five years may conceivably have led to familiarity.

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