

ABSTRACT

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The focus of the presented studies was to provide population estimates of change and variability in cognitive performance in old age. Data was drawn from the Gerontological and Geriatric Population Studies in Gothenburg, Sweden (H70). In **study I** retest effects were evaluated on level of performance in five cognitive abilities. In 1971, the total population of 70-years-olds, living in the city of Gothenburg was identified. One-third of them were invited to participate in the study with repeated measurements at ages 70, 75, 79, 81, 85, 88, 90, 92, 95, 97, 99, and 100. In 1985, the remaining survivors of the two-thirds, not invited at baseline, were invited, with measurements at ages 85, 88, 90, 92, 95, 97, 99 and 100. This design allows evaluation of retest effects at age 85. Comparisons revealed a trend toward retest effects on two tests. The study demonstrates how a design-based approach can provide valuable insights into continuous learning processes embedded in population average aging trajectories not confounded with cohort and mortality-related selective attrition. In **study II** the hypothesis of terminal decline was tested in perceptual speed. Terminal decline refers to acceleration in cognitive decline preceding death. Several growth models were fit to the data (N = 764) that varied in the specification of time. Time to death accounted better for the data as compared with chronological age and there was a substantial acceleration in decline preceding death. Age of death was a significant moderator of between-person differences on age-related change but not on death-related change. The results indicate, 1) support for the terminal decline hypotheses, 2) mortality selection over time, and 3) that terminal decline occurs across ages. In **study III** onset and rate of terminal decline on cognitive abilities were identified. A death-related change-point modeling procedure, including an automated piecewise linear approach, were fit to the data (N = 288 non-demented). A profile likelihood method was used to draw inferences of the change points. The results indicate onset of terminal decline 6.6 years before death for verbal ability, 7.8 years for spatial ability, and 14.8 years for perceptual speed. Substantial acceleration in cognitive decline is present many years prior to death among non-demented individuals. Time of onset and rate of terminal decline however varies across cognitive abilities. In **study IV** onset and rate of acceleration in cognitive decline preceding diagnosis of dementia was identified. A pre-clinical-dementia change-point modeling procedure was fit to the data (N = 113 cases and 272 non-cases). The results indicate onset of pre-clinical decline 5.8 years before diagnosis for verbal ability, 9.0 years for spatial ability, and 11.5 years for perceptual speed. Cognitive decline preceding diagnosis of dementia can be discerned from normal aging many years prior to clinical diagnosis. Overall, the findings suggest integration of terminal decline, pre-clinical dementia, and subsequent population composition changes in analyses of change and variability in cognitive performance in old age.

Keywords: Aging, cognition, longitudinal, retest effects, terminal decline, pre-clinical dementia