

# Risk factors for age-associated cognitive decline

## Citation for published version (APA):

Houx, P. J., Vreeling, F. W., & Jolles, J. (1990). Risk factors for age-associated cognitive decline. In *From Gene to Man* (pp. 190-193). Stichting Gerontologie en Geriatrie.

## Document status and date:

Published: 01/01/1990

## Document Version:

Publisher's PDF, also known as Version of record

## Please check the document version of this publication:

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## RISK FACTORS FOR AGE-ASSOCIATED COGNITIVE DECLINE

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### SUMMARY

Normal volunteers aged 20 to 80 underwent extensive neuropsychological examination and meticulous health screening. Of 256 subjects, 110 had been exposed to some risk factor for cognitive or brain dysfunction during their lives. There was an age-associated decrease of performance on several tests of cognitive performance. This age effect however, was much more pronounced in the risk-exposed group. These findings are thought to imply that health screening is crucial to aging research and that mild risk factors are indeed associated with reductions of cognitive performance, even in the normal population.

### INTRODUCTION

Several studies show a consistent decline of neuropsychological functions with age (Jolles, 1986). The present study investigates the possibility that risk factors for brain dysfunction might interact with aging in its effect on cognitive performance. Volunteers regarding themselves as healthy were recruited from the normal population. However, a substantial number of subjects had sustained one or more risk factors for brain dysfunction (see Table I). All subjects underwent the same procedure of health screening, neurological examination, and a number of cognitive tests. For these tests, normative data are now available.

### PROCEDURE

The subjects were divided in 7 age groups (range: 20-80 yr, interval 10), with a maximum deviation of 3 years within each group. According to selection criteria discussed below, subjects were assigned to either the healthy age groups or to corresponding risk groups. Within all groups,

Table I. CRITERIA USED TO EVALUATE FACTORS POTENTIALLY ASSOCIATED WITH DYSFUNCTIONS. EXCLUSION CRITERIA FOR THE HEALTHY GROUP (adapted from Houx et al. 1989)

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1. Present or past treatment by a neurologist concerning the brain;
  2. Present or past treatment for diseases with brain repercussions;
  3. More than 3 concussions, or 1 with a Post Traumatic Amnesia (PTA) of more than 1 hour;
  4. More than 3 times general anaesthesia, or 1 lasting more than 1 hour;
  5. Use of medication that affects driving ability or consciousness;
  6. Alcohol abuse (>35 glasses/week for men, >21 for women);
  7. Other neurotoxic factors (such as chronic solvent exposure);
  8. Present (or less than 5 years past) treatment by a psychiatrist;
  9. Perinatal complications or developmental problems.
- 

subjects were matched for sex and level of education. Table I shows the list of criteria used to exclude subjects from the healthy group. The results were analyzed by means of ANOVA (independent factors age\*risk).

## TESTS

Several complex cognitive tasks were administered. Two of these are discussed here:

1. A free recall verbal memory test with visual item presentation. Fifteen words were presented on a computer screen. Following the last word, the subjects were asked to reproduce every item they could recall, without paying attention to the order in which they had been shown. This procedure was repeated during 5 trials. Twenty minutes after the last trial, delayed recall was tested, followed by recognition of the 15 items between an equal amount of new words.
2. A motor choice reaction task. A keypad was used with a red home key (18 x 18 mm.) and 5 similar white target keys grouped around it in a 180° angle, at a distance of 5 cm. Stimulus administration and response registration was done by computer. The home key had to be pressed until one of the target keys was illuminated. There were 3 instructions with increasing task complexity: 1. "press the upper key as soon as it lights up"; 2. press one of the 3 upper keys as soon as it lights up" (alternative actions); 3. "press the key on the right side of the key that lights up" (stimulus-response incompatibility). Motor initiation typically takes extra time in complex task

requirements.

RESULTS

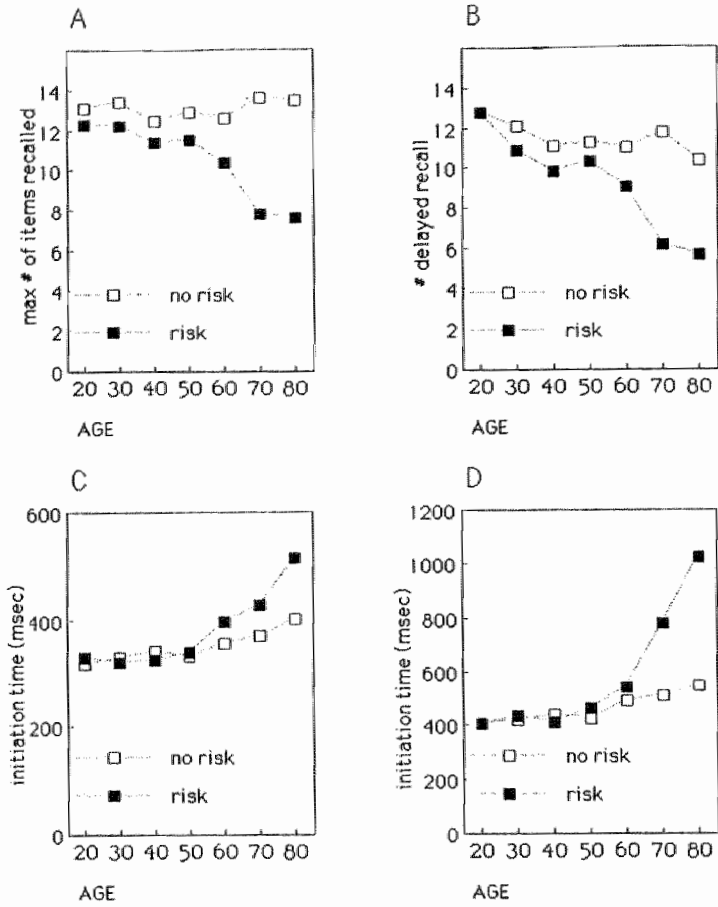


Fig. 1 Various cognitive functions plotted against mean age in years (X-axis) for no-risk and risk groups.

A: mean performance on a free-recall verbal memory test and (B) delayed recall after 20 minutes. Highest possible score = 15 items. C: reaction time = cognitively simple and (D) complex situations.

The subjects in the risk group performed significantly worse on the free recall test than those in the healthy group (Fig. 1A, 1B). Two parameters were analyzed: the maximum score and the delayed recall. Age as well as risk had main effects on both the max. score and the delayed recall. Moreover, the F-values for interactions (age\*risk) were significant, indicating a higher age effect in the risk groups ( $p < .001$  for all effects). The same was true for the speed of motor initiation. The results of condition 2 (alternative actions) and 3 (incompatibility) were analyzed separately (Fig. 1C, 1D). Age and risk affected the motor initiation time in both conditions. Again, the age\*risk effect was significant.

## DISCUSSION

Both verbal memory and speed of cognitive motor initiation have been found to deteriorate with aging. However these effects were greatly enhanced when risk factors were present. Memory performance does not even seem to decline if subjects have been able to avoid brain hazards during their lives. Motor initiation in cognitively complex situations takes twice as long in risk-affected elderly subjects as in truly healthy persons. This could have serious implications for situations such as driving.

Like the study of Houx et al. (1989) this investigation shows that the often-reported age effects on cognitive functioning may well find their origin in other factors than aging per se. This, in turn has methodological implications for all cognitive and aging research, as biological risk factor should apparently be accounted for.

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