

CAC Submission – January 2010

Word retrieval in aging: An exploration of task effects

Difficulty retrieving words is a defining feature of aphasia, but is also a feature of healthy aging. Since the incidence of aphasia increases with age, our ability to reliably assess, and to understand the mechanisms of, word retrieval deficits in individuals with aphasia relies on an understanding of the processes of normal word retrieval and how they may decline with age. In the current study, word retrieval was assessed using several tasks in healthy adults between the ages of 30 and 90. The relationship of naming performance to age, education, and word knowledge was examined.

The most consistently reported decrement in language production that occurs with age is an increase in word-finding difficulties, evident most consistently and unambiguously in picture naming or naming-to-definition tasks (e.g. Au, Joung, Nicholas, Obler, Kaas, & Albert, 1995; Burke, MacKay, Worthey, & Wade, 1991; Connor, Spiro, Obler, & Albert, 2004). This is particularly intriguing in light of the fact that passive vocabulary (i.e. word knowledge) does not typically decline—and may in fact increase (Park, 2000; Verhaeghen, 2003)—with age, indicating that word retrieval problems arise from an access deficit, rather than a breakdown in word knowledge. The conditions under which access to words becomes difficult seem to depend on a number of factors, including the task in which words need to be retrieved. For example, age-related word retrieval deficits may not be apparent in connected speech tasks, because these afford the opportunity to substitute a different word, or to circumlocute around a target (Mortensen, Meyer & Humphreys, 2006). The ability to retrieve multiple words in a category (verbal fluency) has also been shown to change with age, but with semantic categories more than letter categories (Kavé, 2005; Mathuranath et al., 2003). In the current study, word retrieval was assessed using picture naming and verbal fluency. Connected speech sample have also been collected, and analysis of these is underway.

Participants. All participants were native English speakers between the ages of 30 and 90, with no history of language or learning disability, neurological or psychiatric disorders, and all scored at least 27/30 on the MMSE (Folstein, Folstein, & McHugh, 1975). These were divided into three groups: younger adults (30-50 years of age), young-old adults (50-70 years of age), and older-old adults (70-90 years of age). The sample recruited so far consists of 16 younger adults (mean age 38; range 31-49), 24 young-old adults (mean age 62; range 50-69), and 21 older-old adults (mean age 78; range 70-89).

Stimuli & Analyses. Word retrieval was assessed in three tasks: in the Naming task, participants were asked to name 400 line drawings; in the Semantic Fluency tasks, participants named as many animals as they could in one minute; in the Letter Fluency task, they named as many words as they could in one minute beginning with F, then A, then S. Totals for these three letters were averaged to yield a single Letter Fluency measure. The Vocabulary subtest from the WAIS-IV (Wechsler, 2008), which requires participants to generate definitions to given words, was also administered as a measure of passive word knowledge. This task has also been interpreted as reflective of crystallized intelligence, which is hypothesized to remain stable with age (e.g. Baltes, 1987). Mean accuracy and latency of naming, and the number of words

produced in the verbal fluency tasks were compared across groups, then correlated with age and education level, measured in years, and with Vocabulary scores.

Group Comparisons. Group means for naming accuracy and naming latency are shown in Figures 1 and 2, respectively. Using *t*-tests ($p < 0.05$), the performance of the three groups was compared. The only performance difference between the young and the young-old groups was in Vocabulary; young-old adults (aged 50 to 70) had higher vocabulary scores than those aged 30 to 50. Notably, they also had significantly higher levels of education. The young-old and the old-old participants did not differ in education level, but the young-old group named pictures more accurately, and showed a trend towards faster naming ($p = 0.062$). They also produced more items in the Letter Fluency task, and marginally more in the Semantic Fluency task ($p = 0.061$), than the older-old group. Young participants were faster at naming than older-old participants, but only marginally more accurate ($p = 0.058$), and they also produced significantly more items in both Semantic and Letter Fluency tasks.

Correlational Analyses. Unless otherwise specified, all correlations are reported at significance values of $p < 0.05$ (directional). Across all participants, Naming latency (but not accuracy), and both verbal fluency measures were significantly correlated with age. Only the Vocabulary measure was significantly correlated with education level. Naming latency was significantly correlated with Semantic Fluency. Neither naming measure was significantly correlated with Vocabulary, but Letter Fluency was, suggesting that it may rely on more crystallized aspects of lexical knowledge.

Within the younger group, none of the measures were correlated with age, although naming accuracy showed a marginal negative correlation ($p = 0.053$) suggesting that, even in early adulthood, age may begin to exert a negative effect on word retrieval accuracy. Education exerted stronger effects in this group, however, showing positive correlations with the measures of Vocabulary and Semantic Fluency, and a negative correlation with Naming latency. The accuracy and latency of Naming, and Semantic Fluency, were all correlated with Vocabulary scores.

For young-old adults, neither Naming accuracy nor Naming latency were significantly correlated with age or education. Only Letter Fluency was significantly (negatively) associated with age, and only Vocabulary was significantly (positively) associated with education. For the older-old adults, again neither Naming measure correlated with age or education. Letter Fluency was significantly associated with age, but this time positively. Although it did not reach significance, Semantic Fluency was also positively correlated with age in this group. When these two groups were collapsed to increase power, Naming accuracy was found to be significantly positively correlated with age, and Naming latency showed a trend towards a negative correlation with age ($p = 0.064$). Neither fluency measure was significantly correlated with age or education. Vocabulary was positively associated with years of education, but not age. Naming performance was not related to Vocabulary scores or verbal fluency measures.

Conclusions. Results are consistent with previous studies showing that word retrieval declines after age 70, particularly when using time-sensitive measures (naming latency, verbal fluency). In addition, word knowledge was found to increase with age, at least from the young to young-old age range. In middle age to early old age, word retrieval abilities appear to depend more on aspects of crystallized intelligence, which are related to education level. In later phases

of old age, other factors, such as processing speed, may come into play. Additional background tests are being analyzed to investigate this possibility. Interpretation of the results from the older groups was complicated by apparent positive effects of age within the oldest group, which may be specific to the subject sample tested. On-going recruitment will increase the power of the group comparisons, and enable us to judge whether this effect is reliable.

References

- Au, R., Joung, P., Nicholas, M., Obler, L.K., Kaas, R., & Albert, M.L. (1995). Naming ability across the adult lifespan. *Aging and Cognition*, 2(4), 300-311.
- Baltes, P. B. (1987). Theoretical propositions of life-span developmental psychology: On the dynamics between growth and decline. *Developmental Psychology*, 23(5), 611-626.
- Connor, L.T., Spiro, A., Obler, L.K., & Albert, M.L. (2004). Change in object naming ability during adulthood. *Journal of Gerontology: Psychological Sciences*, 59B(5), P203-P209.
- Folstein, M. F., Folstein, S. E., & McHugh, P. R. (1975). "Mini-mental state:" a practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Research*, 12, 189-198.
- Kavé, G. (2005). Phonemic fluency, semantic fluency, and difference scores: Normative data for adult Hebrew speakers, *Journal of Clinical and Experimental Neuropsychology*, 27, 690-699.
- Mathuranath, P.S., George, A., Cherian, P.J., Alexander, A., Sarma, S.G. & Sarma, P.S. (2003). Effects of age, education, and gender on verbal fluency. *Journal of Clinical and Experimental Neuropsychology*, 25, 1057-1064.
- Mortensen, L., Meyer, A.S., & Humphreys, G.W. (2006). Age-related effects on speech production: A review. *Language and Cognitive Processes*, 21(1, 2, & 3), 238-290.
- Park, D. C. (2000). The basic mechanisms accounting for age-related decline in cognitive function. In D. C. Park & N. Schwarz (Eds.), *Cognitive Aging: A Primer* (pp. 3-21). Philadelphia, PA: Psychology Press.
- Verhaeghen, P. (2003). Aging and vocabulary scores: A meta-analysis. *Psychology and Aging*, 18(2), 332-339.
- Wechsler, D. (2008). *Wechsler Adult Intelligence Scale*, 4th ed. (WAIS-IV). New York, NY: Pearson.

Figure 1. Accuracy of naming responses across groups.

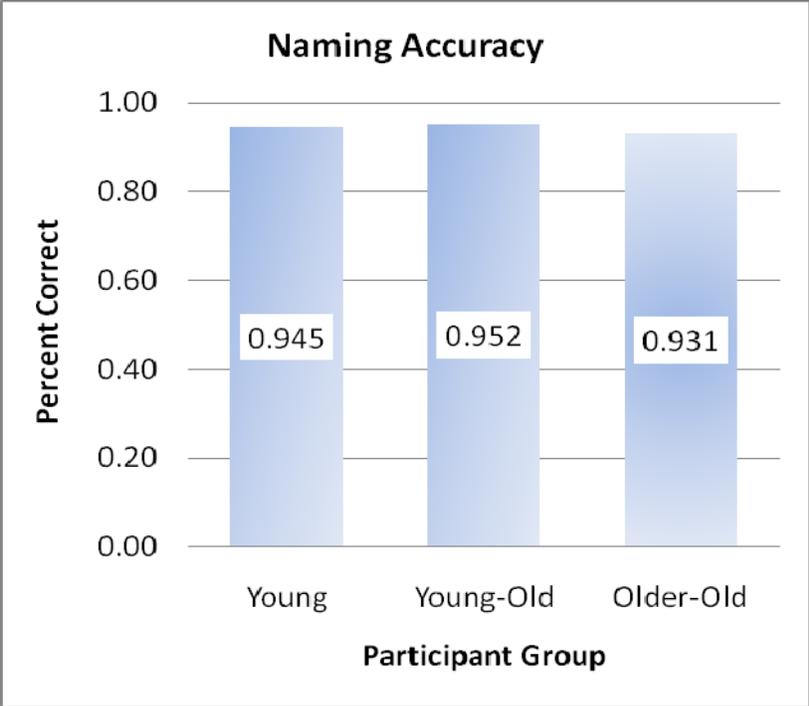


Figure 2. Latency of naming responses across groups.

