
Symposium 2: Lexical Retrieval and Aging: Implications for Aphasia

119. Lexical Retrieval and Aging: Implications for Aphasia

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Word finding difficulties characterize the language production of virtually every person with aphasia. They are also common language problems reported in healthy aging. For older individuals who experience aphasia, it is important to determine whether 1) their word finding difficulties differ from those found in typical aging and 2) the processes that facilitate word production in older age can facilitate word production in aphasia.

The four primary presentations in this proposed symposium explore stimulus variables and neurolinguistic processing associated with naming difficulties in older adults.

Rogalski and colleagues examine aspects of stimulus presentation that affect successful picture naming. The authors varied physical features of the mid-range Boston Naming Test items, adding color or priming with a slide depicting the context for the item. They compared the performance of younger and older participants and showed that while context facilitated naming in younger adults, it delayed it in older adults.

Additional stimulus variables are examined in Kave's presentation. She assessed the relations between two types of word characteristics -- word frequency and word concreteness -- and successful naming in a group of 136 participants ranging in age from 20 to 85. Kave finds a negative correlation between age and word frequency, that is, older participant produced less frequent words than younger ones. By contrast, there was a positive correlation between concreteness and production, with older adults successfully naming more concrete than abstract words.

The third presentation focuses on the contribution of timing variables to word production. Neumann and her colleagues report ERP correlates of younger and older individuals during a Go/Nogo task that requires implicit naming of picture stimuli. They found that their older participants were slower than the younger group in processing phonological information, particularly syllabic information of the target words. Their results support theories of word finding deficits that place the origin of naming failure at the phonological stage of word retrieval.

In the fourth presentation, Crosson and colleagues examine right frontal activity during word production. They found increased right frontal activity for old vs. young adults during picture naming and category member generation. Decreased right frontal activity in young persons contributed to differences. During category member generation, massive intercorrelations between activated areas for the oldest subjects suggested cortical de-differentiation. Right frontal activity during lexical retrieval in old persons suggests caution in interpreting such activity in aphasia studies, and cortical de-differentiation has implications for aphasia rehabilitation.

Presented by: **Obler, Loraine**

120. Effects of Surface Detail and Environmental Context on Lexical Access in Visual Confrontation Naming in Aging

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Lexical retrieval problems are common in aging. It remains unclear whether lexical problems are language-based or due to more global attentional and perceptual processes. One common belief is that changes in frontal lobe function compromise speed of processing during healthy aging (Salthouse, 1996), which can be exacerbated by cognitive tasks that are more processing intensive. From the standpoint of communication, it is critical to understand and compensate for the effects of perceptual and attentional load on the efficiency of lexical access. Recent work has demonstrated that younger adults, for example, show benefits of added color and surface texture on speed and accuracy of confrontation naming relative to black-and-white line drawings (Rossion & Portois, 2004). However, it is unclear whether the same benefits extend to lexical retrieval in healthy older adults. One possibility is that adding perceptual and contextual detail to sparse line drawings will enhance visual object recognition and improve confrontation naming accuracy. An alternative possibility is that the addition of detail will tax limited processing resources and produce interference. Here we evaluated these potential outcomes.

Method

We analyzed speeded response latencies and naming accuracies of 23 older adults (mean age=68) and 23 younger adults (mean age=21) for the high and mid-frequency items of the 60-item Boston Naming Test (Kaplan et al., 1983). All participants scored greater than 25 of 30 on the Montreal Cognitive Assessment (Nasreddine et al., 2005). Participants named target stimuli as quickly and accurately as possible under three different conditions: 1) BLACK+WHITE: unmodified BNT black-and-white line drawings; 2) COLORIZED: colorized-texturized BNT pictures; 3) COLOR+CONTEXT: colorized-texturized BNT pictures preceded 1000ms by an image of background context (e.g., “kitchen” preceded “asparagus”). We recorded response latencies (RTs) via microphone relay and scored accuracy offline.

Results

We eliminated RTs for incorrect responses, outliers ($z > \pm 2$), and low frequency BNT items due to low accuracy (< 50%). We found a significant interaction between age group and perceptual condition [$F(2,88)=3.96, p=.02$]. Older adults showed a mild interference effect when targets were preceded by environmental context on the magnitude of 970.06 ms relative to BNT unmodified line drawings (951.32 ms) and colorized drawings (943.97 ms). In contrast, younger adults showed the opposite trend (i.e., priming) and were faster to name target items preceded by context (kitchen primed asparagus) ($p < .01$).

Discussion

Older adults showed mild interference effects when naming pictures primed by their environmental context, whereas younger adults showed facilitation. These results suggest that the addition of contextual detail may impede rather than facilitate naming in older adults. This finding is consistent with hypotheses about lengthier processing times, declining inhibitory control, and deleterious effects of competing stimuli on efficiency of naming in older adults.

Presented by: **Rogalski, Yvonne**

121. Frequency and Concreteness Effects in Spontaneous Noun Production

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Background and hypotheses: Difficulties in word retrieval are common in normal aging. While the negative effects of aging on single-word production have been replicated across tasks, languages, and populations, findings regarding connected speech are less consistent. Based on results from structured tests, it is predicted that older adults will resort to retrieving frequent and/or concrete nouns in connected speech. However, the increase in vocabulary associated with age can lead to retrieval of more infrequent and/or more abstract words. The research presented here examines whether age-associated retrieval difficulties are affected by the frequency and concreteness of nouns.

Procedures: Participants (n = 136, age range 20-85) completed a picture-naming test, a semantic fluency task, and a picture description task. Each noun in the picture descriptions was analyzed for its lexical frequency and concreteness. Frequency was analyzed through published word counts, subjective ratings by 40 young and 40 old adults, expert rating through a 4-point scale, and cumulative occurrence across all descriptions (see Kavé, Samuel-Enoch, & Adiv, 2009). Concreteness was rated on a 4-point scale, with concrete nouns referring to objects that could be seen/touched (e.g., stool), and abstract nouns referring to concepts that denote no specific time/place and may evoke numerous scenarios (e.g., disaster).

Results: Results show a decrease in total scores on structured single-word production tests with the increase in age. All frequency analyses converged in showing an association between the age of the participant and the selection of more infrequent words. There was a significant albeit not perfect correlation between ratings of frequency and concreteness for the 240 nouns selected on all picture descriptions, so that more frequent words were also rated as more concrete. However, the association between age and the concreteness of nouns selected for production was in the opposite direction to the effect of frequency, so that the older the participant retrieving the nouns, the more concrete those nouns were.

Conclusions: Instead of selecting the most frequent nouns and thus avoiding age-associated retrieval difficulties, older speakers produced more infrequent nouns. Yet, when concreteness was examined, older adults resorted to the less abstract words. It is suggested that the large vocabulary of older adults helps them retrieve infrequent nouns. In addition, the bilateral activation observed during word retrieval in old age (Wierenga et al., 2008) might account for the seeming paradox between the frequency and concreteness effects reported here. Thus, right hemisphere involvement might lead to the activation of a broader semantic field, including distant and unusual meanings (Jung-Beeman, 2005), yet these meanings might still be quite concrete. Implications for word retrieval in aphasia will be discussed.

References:

Jung-Beeman, M. (2005). Bilateral brain processes for comprehending natural language. *Trends in Cognitive Sciences*, 9, 512-518.

Kavé, G., Samuel-Enoch, K., & Adiv, S. (2009). The association between age and the frequency of nouns selected for production. *Psychology and Aging*, 24, 17-27.

Wierenga, C. E., et al. (2008). Age-related changes in word retrieval: Role of bilateral frontal and subcortical networks. *Neurobiology of Aging*, 29, 436-451.

Presented by: **Kavé, Gitit**

122. Early Phonological Problems for Lexical Retrieval in the Elderly

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Introduction

The psycholinguistic literature is in general agreement that lexical access for speech production involves retrieval of three different types of information, namely, conceptual-semantic, syntactic, and phonological information, in at least two distinct processing stages (Dell and O'Seaghdha, 1992; Levelt, 2001). The function of the first stage is to select an abstract representation of the target lexical item containing only semantic and syntactic information, and

the function of the second stage is to phonologically encode the chosen lexical item in preparation for articulation. Research on language production in older adults with unimpaired cognitive abilities suggests that naming problems associated with advanced age generally arise in, or just before, the second stage of phonological processing (see Burke et al., 1991, Transmission Deficit Hypothesis (TDH)). However, as this processing stage involves various substages, e.g. segment retrieval, syllable encoding, etc. (Levelt, 2001), which occur at very fast rates, the specific nature of the problem has not yet been identified.

The dynamic real-time measure of event related potentials (ERPs) permits investigating distinct processing stages in speech production (van Turennout et al., 1997; Schmitt et al., 2001). However, substages of phonological retrieval in older adults have not yet been examined. Thus, it is unknown whether older, as compared to younger, adults would have greater difficulty in accessing segmental or syllabic information. The results of this study provided this information. The motivation for this study arose from research investigating tip-of-the-tongue (TOT) states in non-clinical populations (Burke et al., 1991) and from the aphasia literature exploring lexical access problems in post-stroke populations (Dell, Schwartz and Martin, 1997; Wambaugh, Linebaugh, and Doyle, 2001).

Methods and Results

The study utilized the ERP component N200, reflecting response inhibition, in a GO/NOGO paradigm. Two experimental implicit naming tasks required participants to make a decision about the final phoneme of the picture name, e.g. GO if the picture name ends with a /n/ but NOGO if the picture name ends with a /r/, and the target-word syllabic length, e.g. if one syllable, GO, if two syllables, NOGO.

Results support the TDH of age effects at the phonological level, as N200 latencies on each of the phonological tasks were later (100 ms, $p = 0.005$) in the older, as compared to the younger, group. In particular, within the older group, as compared to the younger group, syllabic retrieval was significantly later (50 ms, $p = 0.020$) than segmental retrieval. These findings further suggest that the phonological breakdown is greater at the syllabic than at the segmental level.

Conclusion

Implications of the study are that aging affects lexical retrieval at very early phonological stages in an implicit naming task, even when older adults correctly name pictures. Since many people with aphasia today are older adults, these findings suggest that their anomic difficulties consequent to brain damage will be compounded by the normal changes associated with healthy aging. Remediation of their anomic difficulties, thus, may require work at early phonological stages (phonemic and syllabic) in addition to the more common semantic methods.

Presented by: **Neumann, Yael**

123. HAROLD and Lexical Retrieval: What is the Role of the Right Frontal Lobe?

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HAROLD (Hemispheric Asymmetry Reduction in OLD adults) is a phenomenon in which old adults show increased nondominant hemisphere activity relative to young adults, especially in frontal cortices. A common interpretation is that the nondominant hemisphere is a cognitive reserve for an older, less capable dominant hemisphere. A majority of the work on verbal functions shows increased right frontal activity during working memory for old vs. young adults. However, we recently did three studies imaging lexical retrieval activity with fMRI and a study of sequential finger movements relevant to HAROLD. Wierenga et al. (2008) showed increased right frontal activity for old vs. young adults during picture naming. Subsequently, Meinzer et al. (in press) showed increased right frontal activity for old vs. young adults in category member generation. Yet, the explanation for increased right frontal activity is not clear. One conundrum is that older right-handed adults with right frontal lesions do not normally demonstrate significant anomias. A study of learned, unilateral sequential finger movements (McGregor et al., unpublished data)

showed a normal, positive blood oxygenation level dependent (BOLD) response in contralateral motor cortex of young participants, but a negative BOLD response in ipsilateral motor cortex. Old subjects, by comparison, showed a positive BOLD response in ipsilateral motor cortex. This phenomenon may represent loss of interhemispheric inhibition in old adults. Given these findings, we asked whether similar phenomena could be seen during lexical retrieval. In re-assessing Wierenga's findings, old participants showed a normal positive BOLD response in right frontal regions (12+ second positive BOLD phase followed by negative BOLD phase of lesser amplitude). After a shortened positive BOLD phase (8+ seconds), young participants showed a negative BOLD phase of greater amplitude and duration than their positive BOLD phase. Can these findings represent a loss of interhemispheric inhibition similar to that from sequential finger movements? In a final study by Cohen et al. (unpublished data), old and young adults generated category members. Old adults were divided into young-old (mean age=66.4) and old-old (mean age=76.2) groups. Correlations between 16 activated areas across participants showed few intercorrelated areas for young-old participants, but old-old participants showed significant correlations between most of the activated regions. This finding suggested de-differentiation of function in the old-old adults, which could reflect a massive loss of intercortical inhibition. The presence of right frontal activity during lexical retrieval in normal old adults represents an interpretive challenge for right frontal activity in aphasia patients during lexical retrieval. Further, a breakdown in intercortical inhibition may have implications for aphasia treatment.

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Wierenga, C. E., Benjamin, M., Gopinath, K., Perlstein, W. M., Leonard, C. M., Rothi, L. J. G., Conway, T., Cato, M. A., Briggs, R. W., Crosson, B. (2008). Age-related changes in word retrieval: Role of bilateral frontal and subcortical networks. *Neurobiology of Aging*, 29, 436-451.

Presented by: **Crosson, Bruce**