Grammatical Agreement Processes in Young and Older Adults

Robert Thornton, Kristen Skovbroten, & Deborah M. Burke
Pomona College

Background

The central question we are asking is **how does language processing change across the lifespan**? This question is central to cognitive aging research, but much of this work has either focused on lexical processing (e.g., MacKay, Abrams, & Pedroza, 1999) or how working memory deficits affect processing (e.g., Kemper & Sumner, 2001).

We examine the extent to which on-line grammatical processes themselves might change with age. Grammatical agreement is a good domain to study aging effects on language because it concerns a dependency among words in a sentence rather than being a simple property of lexical representation.

Subject-verb agreement is a well studied topic in psycholinguistics. E.g., Bock & Miller (1991) gave participants a sentence preamble (e.g., "the key to the cabinets") and asked them to produce a complete sentence. When the local noun mismatched in number with the subject (e.g., "cabinets" is plural whereas "key" is singular), participants produced more agreement errors.

Theories of aging make different predictions for this task. The **inhibition deficit hypothesis** proposes that aging weakens inhibitory processes, so that older adults are less able to suppress irrelevant information than younger adults (e.g., May, Zacks, Hasher, & Multhaup, 1999). Age-related inhibition deficits in this task would predict that older adults are less able to inhibit the mismatching number of the local noun and should thus produce a disproportionate increase of agreement errors in the number mismatch conditions relative to young adults.

The **transmission deficit hypothesis** proposes that age-related changes stem from weakened connections among memory representations (e.g., MacKay et al., 1999). This model predicts greater age declines in production than comprehension because top-down connections involved in production are more vulnerable to transmission deficits than bottom up processes involved in comprehension. Age-related transmission deficits in this task would predict more errors in production for older than young adults, but no disproportionate increase in the agreement mismatch conditions.

Specific Aims

1. Examine how online subject-verb agreement processes change with aging using an elicited production task (e.g., Bock & Miller, 1991)

2. Test predictions for age differences in production errors based on the inhibition deficit and transmission deficit models

Method

- Participants: 32 young and 32 older adults
- Bock & Miller (1991)'s items and elicited production task. Additionally, participants had to use form of the verb "to be" to increase the number of tensed verbs.
- Three main factors:
  1. head noun number (singular vs. plural)
  2. local noun number (singular vs. plural)
  3. age (young vs. older adult)

Sample Item

Singular-Singular:	The key to the cabinet
Singular-Plural:	The key to the cabinets
Plural-Singular:	The keys to the cabinet
Plural-Plural:	The keys to the cabinets

Scoring

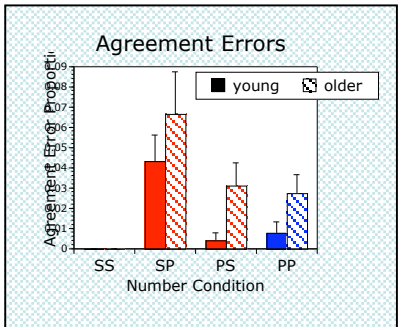
Correct: (a) the preamble was repeated correctly, (b) the response contained the correctly inflected form of the verb, and (c) the response was a full sentence uttered in its entirety

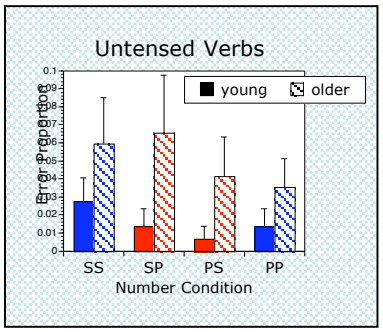
Agreement Errors: Same as correct, but incorrect number marking on the verb

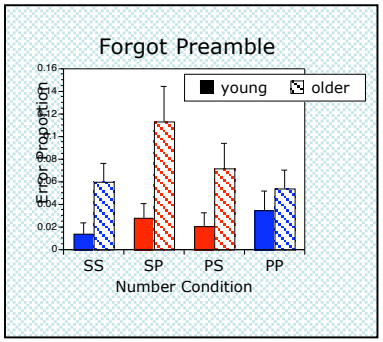
Forgot Preamble: Part or all of the preamble not repeated correctly

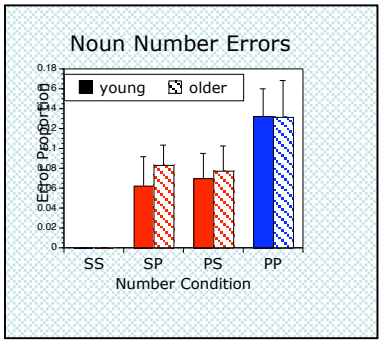
Number Errors: Preamble repeated correctly, except for the number marking on at least one of the nouns

Tense Errors: Response didn't include a form of the verb "to be" (e.g., is, was, are, were)









Results

Agreement errors:

Age	$F(1, 62) = 4.492$, $p < .05$
Local	$F(1, 62) = 17.460$, $p < .001$
HeadxLoc	$F(1, 62) = 12.928$, $p < .001$

no age interactions, all ps > .3

Tense errors:

Age	$F(1, 62) = 4.437$, $p < .05$

Forgot preamble:

Age	$F(1, 62) = 14.262$, $p < .001$
Local	$F(1, 62) = 5.556$, $p < .05$

Number errors:

Head	$F(1, 62) = 35.285$, $p < .001$
Local	$F(1, 62) = 27.111$, $p < .001$

No age effects, all ps > .12

Summary: Older adults made significantly more errors of three different types: (a) agreement errors, (b) forgot preamble, and (c) tense errors. They did not produce significantly more number errors.

For none of these error types did age interact with either of the syntactic variables.

Conclusions

Older adults produced an overall higher rate of agreement errors than young adults did.

However, age did not interact with either of the syntactic variables, for any error type, suggesting that older adults are processing agreement in the same way the young adults are.

No evidence for inhibition deficits.

In sum, the data indicate that producing agreement is a more difficult task for older adults, but that they are processing agreement in qualitatively the same way as younger adults. This pattern suggests weakened memory connections, but intact grammatical processing.