INDIVIDUAL DIFFERENCES AND GENRE DIFFERENCES IN ADULTS' LANGUAGE

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Despite the interest of psychologists, speech-language-hearing scientists, linguistics, and educators in language development in children, language development during the adult years has received little attention (Cohen, 1981). While we now know a great deal about language development in preschool and school age children, we commonly assume that language development "crystalizes" sometime during adolescence and, apart from the consequences of hearing loss, brain trauma or dementia, remains uniform across the life-span (Obler, 1983, 1985). However, this assumption is not warranted in light of an emerging body of research which examines life-span changes to adults' language.

The assumption that language "crystalizes" and remains invariant across the life-span is based on two common findings: First, vocabulary skills, as measured by standardized tests such as the Wechsler Adult Intelligence Scales-Revised (Wechsler, 1958) reveal that the ability to define words such as "breakfast" and "terminate" shows little decline across the life-span and may, indeed, increase during adulthood (Kausler, 1982). Second, normative studies of aphasia test batteries such as the Boston Diagnostic Aphasia Examination (Borod, Goodglass, & Kaplan, 1980) and the Porch Index of Communicative Ability (Duffy, Keith, Shane, & Podraza, 1976) reveal only modest, although statistically significant, age-related decrements on a limited set of items.

Nonetheless, careful studies of adults' language and comprehension do reveal age-related decrements for text comprehension and recall (Cohen & Faulkner, 1984; Zelinski & Gilewiski, in press; Kemper, 1987) and for the repetition and production of complex syntactic constructions (Emery, 1985; Kemper, 1986a, 1986b, in press; Kynette & Kemper, 1986).

Kemper (in press) and Kemper and Rash (1987) suggested that such performance decrements are due to working memory limitations which affect adults' ability to retain and manipulate multiple syntactic elements simultaneously. Working memory (Baddeley,

1985) limitations may arise because of limitations on adults' capacity to analyze discontinuous morphemes, strategic differences in how they allocate attention to processing syntactic relations, or differences in the speed with which they can perform such elementary operations as establishing the antecedents of pronouns.

The present study was designed to replicate and extend the research of Kemper (in press) and Kynette and Kemper (1986) by examining the oral and written language of adults aged 60 and above. In particular, the study seeks to (1) determine sources of individual variation in adults' language by examining how education, memory ability, vocabulary, and health affect adults' language and (2) to investigate whether the syntactic complexity of adults' language varies from one prose genre to another. In this study, three prose genres were compared: oral question-answering involving adults' responses to questions about their employment history and current activities, an oral reflective statement requiring them to describe "the person they most admire," and a written reflective statement requiring them to write a short description of "the most significant event" in their life.

Oral and written language samples were compared because the observed changes to adults' syntax are reminiscent of reported differences between informal, spoken language and formal, written language (Beaman, 1984; Chafe, 1982). Speaking is faster and more transient and syntactically simpler than writing (Chafe, 1982). Elderly adults may be able to overcome working memory limitations that affect speaking when they write because writing affords them the opportunity to review and revise their sentences. Hence, the written syntax of elderly adults may be as complex as that of young adults.

Method

Subjects.   Thirty young adults (17 women) who were native speakers of English, 18 - 28 years (mean - 21.4), were recruited from introductory psychology classes.   Eighty-seven elderly adults, 60 to 92 years of age, were recruited from the local community through newspaper advertisements. Of these, seven were judged not to be native speakers of English because they spoke a language other than English before age five. Of those considered to be native speakers of English, data from two adults was incomplete so that the final sample consisted of 37 adults (24 women) 60 to 69 years (mean - 65.3),   26 (18 women) adults 70 to 79 years (mean - 73.9), and 15 (10 women) adults 80 - 92 years (mean - 83.9).   The young adults received course credit for their participation;   the elderly adults were paid for their participation.

Interview. Each subject was interviewed individually. The interviews lasted 30 to 50 minutes and consisted of three parts: First, an oral questionnaire was used to elicit information about the adults' background, education, and current health and activities. This questionnaire concluded by asking the adults to orally describe the person they most admired. Second, the Vocabulary and Digits Forward and Digits Backward tests from the Wechsler Adult Intelligence Test--Revised (Wechsler, 1958) were administered. Third, each adult was asked to write down a short essay to describe the most significant event in their lives. Each interview was tape recorded so that language samples from the oral questionnaire could be transcribed and coded.

The questionnaire elicited the adults' place and date of birth, the number of years of formal education completed, their employment history, and current activities and interests. In addition, the adults' were asked for self-report assessments of their overall health, vision, hearing and mobility using a three-point scale of - 1 — worse than, 0 — same as, or +1 — better than other adults their age. The standard scoring conventions were used for the WAIS scales. For the Digits Forward and Digits Backwards tests, one point was given for each list of a specified length which was repeated correctly for a maximum score of 14 on each test. For the Vocabulary test, two points were given for each complete definition and one point for each partial definition for a maximum score of 70.

Language samples. Two oral language samples were obtained from the interview. The first was a sample based on the adults' answers to the questions about their employment history and current activities. A maximum of fifty utterances was transcribed for later analysis. The second oral language sample was the adults' response to the question "What person, living or dead, famous or not, do you admire the most and why?" The adults' complete response was transcribed. A written language sample was obtained from the adults' written response to the question "Please write a short passage about the most significant event you've experienced. It could be about the best thing that ever happened to you or it could be about the worst thing that ever happened."

Transcription and coding. The language samples were transcribed and coded by first segmenting each into utterances and then coding each utterance. In general, conventional sentence boundaries marked one utterance from another. Utterances were not restricted to sentences, however; sentence fragments corresponding to incomplete sentences, rephrasings or revisions of the previous utterance, or additions to the previous utterance following a pause, and both lexical and non-lexical fillers did occur. Since sentences or other utterances might involve "word-finding" problems (Burke, Worthley, & Martin, 1987), utterances in which

the same basic thought or idea was completed following a pause
(which might be filled with a non-lexical "uh" or similar filler)
were considered as one utterance. Continuations or rephrasings
that added new information to a previous complete sentence
following a pause were considered as separate utterances.

Lexical fillers such as "well," "yeah," or "let's see"
were transcribed as separate utterances if they occurred at the
beginnings or ends of another utterance. Lexical fillers that
occurred within another utterance were transcribed as part of the
utterance.

Unintelligible or partially unintelligible utterances were
excluded from the sample. Non-lexical fillers that occurred
within utterances or that were used between utterances such as
"uh," "uh-uh," "um," or "duh," were also excluded from the sample.
Utterances that repeated or echoed remarks by the experimenter or
repeated or echoed the adults' previous remarks were also
excluded.

Each utterance was coded in terms of the type of clauses it
contained coded and also as a complete sentence or as a sentence
fragment. Clauses were identified as either main clauses,
sentence-initial or left-branching subordinate or embedded
clauses, or sentence-final or right-branching subordinate or
embedded clauses. Main clauses have both a subject and a
predicate, are inflected for tense, and can be linked together in
a series with conjunctions. Subordinate clauses are sentence-
initial or sentence-final in relation to the predicate of the main
clause and are marked with a conjunction like "since," "because,"
or "although." Subordinate clauses also have a subject and
predicate and are inflected for tense. Embedded clauses occur
sentence-initial or sentence-final in relation to the predicate of
the main clause. Common forms include that-clauses, wh-clauses,
relative clauses, infinitive complements, and gerunds. Embedded
clauses are uninflected for tense and commonly introduced by a
grammatical marker such as the "to" which marks infinitives, or
the relative pronoun which marks relative clauses. Some
subordinate and embedded clauses, particularly those occurring in
sentence fragments, could not be classified as sentence-initial or
sentence-final.

Two types of fragments were distinguished from complete
sentences. The first type were fragments were missing their
subject, usually the speaker or the subject of the immediately
previous sentence. All other sentence fragments were categorized
together. Either type of fragment could have involved one or more
subordinate or embedded clauses; if possible, such subordinate or
embedded clauses were coded as sentence-initial or sentence-final
with regards to the main predicate of the sentence fragment.
Examples are given in Table 1.

Table 1.   Example transcript indicating main (MAIN), subordinate
(SUB), infinitive phrases (INF), relative clauses (REL), that-
clauses (THAT),wh-clauses (WH) and gerunds (GER). Each
subordinate or embedded clauses is marked as left-branching (L) or
right-branching (R).   Fillers (FILL), and sentence fragments
without subjects (w/o SUBJ), and other types of sentence fragments
(FRAG) are also indicated.

As a young person I worked [MAIN] in Salina in the state grain
        inspection office for summer jobs.
And did [MAIN] that some in college too [w/oSUBJ]
And I worked [MAIN] one summer in KansasCity.
Actually it was required [MAIN] for my degree.
It was [MAIN] a seminar and we worked [MAIN] in [FRAG] (pause)
Not a seminar, but a practical experience [FRAG] (pause)
And I worked [MAIN] in city hall in the personnel office in city
        hall and actually they let [MAIN] me come [INF-R] in and sit
        [INF-R] at a desk.
Then [FILL] (pause)
Then I was married [MAIN] and [FRAG] (pause)
Had [MAIN] children [w/oSUBJ] (pause)
And [FILL] (pause)
When they were grown [SUB-L] I started [MAIN] working [GER-R] in
        the school system here.
First as a volunteer [FRAG]
And when I realized [SUB-L] they were paying [THAT-L] someone for
        essentially what I was doing [WH-L] why [FILL] I applied
        [MAIN] and got a job as an aide.
This was [MAIN] with specialized children.
Yeah [FRAG]
It was [MAIN] very interesting actually and I enjoyed [MAIN] it a
        lot.
I am [MAIN] now divorced and after I was divorced [SUB-R] I
        started [MAIN] working [GER-R].
I worked [MAIN] in two different banks here in Lawrence and now
        work in an attorney's office.
No [FRAG]
I thought [MAIN] being [GER-R] very naive that when I got [SUB-R]
        back into the world as a person aspiring [GER-R] to have
        [INF-R] a job that probably I would be able [THAT-R] to, but
        I was [MAIN] not realistic.
And now know [MAIN] that when you've been [SUB-R] away from the
        scene that even your schooling [GER-R] for as long as I have
        [OTHER-R] that [FRAG]

Analysis. Each language sample was analyzed using the *Systematic Analysis of Language Transcripts* (*SALT*) computerized system developed by Chapman and Miller (1984). Two measures of sentence length were computed: the mean number of words per utterance (MLU) and the mean number of clauses (main, subordinate, and embedded) per utterance (MCU). Second, four measures of clause structure were computed: the percent of sentence-initial or left-branching subordinate or embedded clauses (LEFT), the percent of sentence-final or right-branching embedded or subordinate clauses (RIGHT), the percent of other subordinate or embedded clauses which could not be classified as to position (OTHER), and finally, the percent of main clauses (MAIN). Third, four measures of fluency were computed: relative to the total number of utterances, the percentage which were sentence fragments missing subjects (w/o SUBJECT), the percentage which were all other types of sentence fragments (FRAGMENT), the percentage which contained lexical fillers (FILLER), and the percentage which were complete sentences (COMPLETE).

Results

The data analysis involved three stages: first the four groups of adults were compared on the basis of the background and WAIS data collected as part of the interview. Second, the language samples were compared so as to examine possible genre and age group differences. Third, the interview data was correlated with the language sample data to examine individual differences in speaking and writing.

Interview data. The interview data was first used to compare the four groups of adults. In this analysis, there were four age group, young adults 18 - 28 years, adults 60 - 69 years, 70 to 79 years, and 80+ years; age group was a between-subjects factor and years of education completed, health, vision, hearing, and mobility ratings, and scores on the WAIS Digits Forward and Digits Backward and Vocabulary tests were treated as multiple dependent variables. In this analysis, there was a significant multivariate effect $F(3, 104) = 3.23$, $p < .05$, indicating that the groups did differ and significant univariate F's for years of education and overall health. The three groups of elderly adults (mean = 14.2 years) had completed more years of formal education than the college students (mean = 13.0 years), $F(3,104) = 6.08$, $p < .01$. The college students reported that their health was the same as that of others their age (mean = .13 where 0 = "same as others your age") whereas the elderly adults reported that their overall health was somewhat better (mean = .52) than others their age, $F(3,104) = 6.26$, $p < .01$. The three groups of elderly adults did not differ on these measures.

There were also significant univariate effects for two of the WAIS scales. Table 2 summarizes these findings. The age

groups did not differ on Digits Forward, $F(3,104) = 2.41$, $p > .05$ but there was an age-related decline on Digits Backward, $F(3,104) = 5.68$, $p < .01$. On the Vocabulary test, the three groups of elderly adults scored significantly higher than did the young adults, $F(3,104) = 3.72$, $p < .05$.

Table 2. Performance on the three WAIS scales.

	Young	Age Group 60s	70s	80+
Digits Forward	9.2	9.5	9.8	8.0
Digits Backward	7.8	7.4	7.1	5.1
Vocabulary	54.4	62.3	62.6	61.5

Language samples. Separate MANOVA's were performed on the length (MLU and MCU), clause (OTHERs, RIGHTs, LEFTs, and MAINs), and fluency (FILLERs, fragments W/O SUBJECTs, other FRAGMENTs, and COMPLETE sentences) measures obtained from the three language samples. In these analyses, age group was a between-subjects factor while genre (oral question-answering, oral "admire" statement, and written "event" statement) was a within-subjects factor. Multivariate and univariate F's are reported in Table 3 and genre and age-group means are given in Tables 4 and 5.

Table 3. Multivariate and univariate *Fs*.

	Age Group df	F	Genre df	F	Genre X Age Group df	F
LENGTH	(3,104)	1.99	(1,104)	300.45**	(3,104)	4.21**
MLU	(3,104)	2.04	(2,103)	989.15**	(6,206)	2.41
MCU	(3,104)	3.63*	(2,103)	75.39**	(6,206)	2.53*
CLAUSE	(3,104)	.63	(1,104)	450.65**	(3,104)	.63
OTHER	(3,104)	.74	(2,103)	8.38**	(6,206)	1.65
RIGHT	(3,104)	.64	(2,103)	457.05**	(6,206)	1.25
LEFT	(3,104)	6.62**	(2,103)	40.54**	(6,206)	4.48**
MAIN	(3,104)	.63	(2,103)	1696.64**	(6,206)	1.20
FLUENCY	(3,104)	1.12	(1,104)	752.75**	(3,104)	1.37
FILLERS	(3,104)	.24	(2,103)	37.37**	(6,206)	.39
W/O SUBJS	(3,104)	1.58	(2,103)	32.15**	(6,206)	.94
FRAGMENTS	(3,104)	1.30	(2,103)	256.36**	(6,206)	2.64*
COMPLETE	(3,104)	.56	(2,103)	179.12**	(6,206)	2.42

*$p < .05$
**$p < .01$

Genre. There were consistent differences between the three language samples. The written samples contained more words per

utterance and more clauses per utterance than did either oral
language sample. More sentence-initial left-branching clauses and
more sentence-final right-branching clauses occurred in the
written samples than in the oral samples resulting in fewer main
clauses in the written than oral samples. The written samples
contained more complete sentences and fewer fillers and sentence
fragments.

Table 4. Comparison of the three language samples.

	Oral question-answering	Oral "admire"	Written "event"
LENGTH			
MLU	6.91	7.32	15.18
MCU	1.16	1.40	2.21
CLAUSES			
OTHER	4%	4%	2%
RIGHT	25	31	38
LEFT	4	6	8
MAIN	66	58	51
FLUENCY			
FILLER	4%	7%	<1%
W/O SUBJECTS	4	3	2
FRAGMENTS	33	33	4
COMPLETE	63	64	94

Age group. The only significant age group differences were
obtained for the mean number of clauses per utterance and the
percent of sentence-initial or left-branching clauses. For these
measures as well as the percentage of sentence fragments, there
were significant age group x genre interactions, as summarized in
Table 6.

The mean number of clauses per utterance were similar for
young and elderly adults for the oral question-answering sample
but there were age-related declines in MCU for the other two
samples. For the oral "admire" statements, the age-related
decline occurs between the young adults and the adults in their
60s. For the written "event" statements, the age-related decline
spans the entire age range.

Table 5. Comparison of the four age groups.

	Young	60s	70s	80s
LENGTH				
MLU	9.80	10.15	10.02	8.60
MCU	1.39	1.27	1.29	1.23
CLAUSES				
OTHER	5%	5%	3%	2%
RIGHT	30	29	30	27
LEFT	9	5	4	3
MAIN	56	62	64	68
FLUENCY				
FILLER	5%	3%	3%	4%
W/O SUBJECTS	2	3	4	3
FRAGMENTS	25	24	21	23
COMPLETE	74	72	75	75

The incidence of sentence-initial, left-branching clauses shows an age-related decline for all three language samples. For oral question-answering and the oral "admire" statements, the decline shows up between the young adults and the 60-year-olds. For the written "event" statements, the decline spans the entire age range.

Table 6. Significant age group x genre interactions.

	Age Group			
	Young	60s	70s	80+
MCU				
Oral question-answering	1.2	1.2	1.2	1.2
Oral "admire"	1.6	1.3	1.4	1.3
Written "event"	2.6	2.1	2.1	1.8
LEFT-BRANCHING CLAUSES				
Oral question-answering	6%	4%	3%	3%
Oral "admire"	10	4	4	3
Written "event"	13	9	5	3
SENTENCE FRAGMENTS				
Oral question-answering	40%	32%	29%	28%
Oral "admire"	33	36	28	31
Written "event"	3	4	5	9

Young adults produced more sentence fragments than did the elderly adults during oral question-answering but the incidence of sentence fragments is similar for young and elderly adults for the oral "admire" statements and written "event" statements.

Correlations. The final analysis correlated the adults'
education, health, vision, hearing, and mobility ratings, Digits
Forward, Digits Backward, and Vocabulary scores with the measures
obtained from the language samples. An initial series of analyses
computed separate correlations for the three language samples; a
similar pattern emerged from the three samples so that the final
analysis, reported in Table 7, computed the correlations using
average measures collapsing across the language samples. First-
order correlations were computed as well as correlations
statistically controlling for the effects of age. There were no
significant the self-reported ratings of health, vision, hearing,
or mobility so these variables are not included in Table 7.

Table 7. Correlations between the language sample measures and
the adults' age, years of education completed, and scores on the
Vocabulary, Digits Forward, and Digits Backwards tests.

	First-order correlations				AGE partialled out			
AGE	EDUCA-TION	VOCA-BULARY	FOR-WARD	BACK-WARD	EDUCA-TION	VOCA-BULARY	FOR-WARD	BACK-WARD
LENGTH								
MLU								
-.03	+.26**	+.30**	+.15	+.16	+.27*	+.33**	+.15	+.15
MCU								
-.63**	.00	+.18*	+.47**	+.35**	-.02	+.23*	+.27**	+.22*
CLAUSES								
OTHER								
-.20*	-.04	-.07	+.05	+.12	-.04	-.02	.02	+.05
RIGHT-BRANCHING								
-.07	+.21*	+.18*	+.11	+.04	+.23*	+.21*	+.21*	+.11
LEFT-BRANCHING								
-.55**	-.09	-.04	+.49**	+.41**	-.02	+.16	+.46**	+.49**
MAIN								
+.39**	-.11	-.10	-.15	-.18*	-.21*	-.24**	-.25**	-.16
FLUENCY								
FILLERS								
-.14	-.08	-.09	-.15	-.00	-.05	-.05	-.15	-.04
FRAGMENTS without SUBJECTS								
+.20*	-.05	-.22*	-.20*	-.10	-.09	-.29**	-.20*	-.04
SENTENCE FRAGMENTS								
-.16	-.02	-.16	-.20*	-.12	-.00	-.13	-.21*	-.17*
COMPLETE SENTENCES								
+.03	-.01	+.20*	+.22*	+.20*	-.02	+.21*	+.23*	+.22*

*p < .05
**p < .01

MLU is positively correlated with years of education and score on the WAIS Vocabulary test whereas MCU is negatively correlated with the adults' age but positively correlated with both WAIS Digits Forward and Digits Backwards. Removing the linear effects of age does not affect these correlations. These findings suggest better educated adults produce longer utterances, as measured in words, but that adults with greater memory capacity produce longer utterances, as measured in clauses.

The use of sentence-final, right-branching clauses is positively correlated with years of education and with vocabulary while main clauses are negatively correlated with education and vocabulary suggesting that better educated adults use more right-branching clauses and fewer main clauses. The use of right-branching clauses is also positively correlated with Digits Forward while main clauses are negatively correlated with Digits Forward, even when age is controlled for, suggesting that adults with greater memory capacity use more of right-branching clauses and fewer main clauses.

The use of sentence-initial, left-branching clauses and other types of clauses are negatively correlated with age suggesting that the elderly adults used few of these constructions. The use of left-branching clauses is positively correlated with both Digits Forward and Digits Backward, even when age is controlled for, suggesting that adults with greater memory capacity used more of these clauses.

While the use of complete sentences is positively correlated with vocabulary, Digits Forward, and Digits Backwards, fragments without subjects and other types of fragments are negatively correlated with these measures, even when age is partialled out. This suggests that sentence fragments are due to both vocabulary limitations and memory load during sentence production.

Conclusions

This study has revealed two different patterns of individual variation in adults' language. On one hand, the oral and written language of better educated adults differs from those with less education: they know more words, as measured by the WAIS vocabulary test, and produce sentences containing more words, as measured by MLU, and more right-branching clauses. On the other hand, regardless of educational level, elderly adults with greater memory capacity, as measured by the WAIS Digits Forward and Digits Backwards tests, produce more complex sentences containing more clauses, measured by MCU, particularly left-branching clauses, than do younger adults with less memory capacity. These results are consistent with those Kemper (1986b) obtained using a more restricted age range and other statistical procedures.

These patterns of individual differences in adults' language are stable across at least three prose genres. Although oral-question answering, oral statements, and written statements differ in their syntactic complexity, similar effects of education and memory capacity were obtained for all three genres when the language measures were correlated with individual difference measures obtained from the interviews. Further, significant age-related declines in the use of left-branching clauses were obtained for all three genres and for MCU in two of the three genres.

A comparison of these three genres did reveal that they impose different processing demands on adults which interact with the adults' memory capacity. Written statements appear to impose many demands on adults that exceed those of oral statements; hence, 70- and 80-year olds, with less memory capacity to spare, are unable to meet these demands and the complexity of their written statements declines even as compared to the 60-year-olds'. Consequently, age-related declines in both MCU and left-branching clauses were obtained for the written statements.

Perhaps because oral statements do not require adults' to review and revise their sentences, oral statements appear to impose fewer processing demands that compete with adults' memory capacity. Elderly adults are able to partially offset these processing limitations by producing right-branching and main clauses, thus preserving MCU at the expense of left-branching clauses. Consequently, MCUs for 60-, 70-, and 80-year-olds were similar although left-branching clauses declined across this range.

Oral question-answering appears to be less demanding than oral statements and even 60-year-olds can marshall sufficient processing resources to meet the demands of oral question-answering. Hence, no age-related decrement in MCU was obtained for oral question-answering although there was some loss of left-branching clauses. Again, these findings suggest that the 60-year-olds substituted right-branching clauses and main clauses for left-branching ones in order to preserve the syntactic complexity of their oral answers.

The results of this study challenge the notion that language crystalizes during adolescence and remains generally invariate across the adult years. Rather, it appears that language development is a life-long process of change. Most significant among these changes in adults' language are the accommodations made to memory limitations which increase with age. Elderly adults appear to respond to their loss of memory capacity, not by producing more sentence fragments or relying on lexical fillers, but by restricting the syntactic complexity of their sentences.

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