

THE EFFECTS OF AGING ON THE COMPREHENSION
OF INFERENTIAL INFORMATION

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OF INFERENTIAL INFORMATION

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PREFACE

This investigation is concerned with the effects of aging on the comprehension of inferential information in 30 normal adults.

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CHAPTER I
INTRODUCTION

With a zero growth population in the United States, the elderly segment of our population is growing faster than any other age group. In 1983, there were approximately 27 million (10%) persons aged 65 years or older in the United States (U.S. Bureau of Census, 1983).

These persons constituted 20% of the nation's speech-language impaired. It was projected that by the year 2050, older persons would account for 39% of the speech-language impaired and 59% of the hearing impaired requiring services of speech-language pathologists (Fein, 1983, 1984).

As our population is composed of more elderly, research should focus on better ways to meet their needs (Boone, 1985). It is important, in view of the growing population of elderly, to be able to specify the language changes attributable to the normal aging process.

Although in recent years there has been an increase in research on aging individuals, there have been relatively few studies of age-related changes in normal adults. Reportedly, there is a decline in functioning beginning at approximately age 30, and it continues throughout life (Clark, 1977). This decline is reflected

in changes in the muscular, cardiovascular, skeletal, neurological, and respiratory systems of the body (Kaldor & DiBattista, 1978; Shock, 1962). Because speech production depends on the integrity of these systems, it is understandable that changes due to aging occur in speech (Segre, 1971). Much of the research in speech production of the elderly has been in the area of physiological and anatomic changes that occur with aging. Studies focusing on perceptual aspects of speech (Hartman & Danhauer, 1976; Ptacek, Sanders, Maloney, & Jackson, 1966; Ryan & Burk, 1974) have found that changes in pitch, rate, and intensity occur with the normal aging process. Physical characteristics such as fundamental frequency, phonation range, resonance, and shimmer and jitter also change with aging as described by Honjo and Isshiki (1979), Ramig and Ringel (1983), and Sweeting and Baken (1982).

Memory and Verbal Learning

There have been several studies in the area of verbal learning and memory in elderly adults. Eysenck (1975) investigated age-related effects on semantic memory which was defined as "a mental thesaurus, organized knowledge a person possesses about words and other verbal symbols," and found that younger and older subjects responded equally quickly on instant recall tasks which involved subjects supplying a word belonging to a specific category and starting with a specified letter (example: name a fruit beginning with the letter "a"). However, the older subjects were significantly slower on a recognition task which involved being

given a category followed by a word and having to decide as quickly as possible whether the word did or did not belong to the category (example: fruit-ghost). The study involved oral responses, which was an advantage over previous studies where writing speed, cautiousness of the elderly (Slater & Scarr, 1964), and the two separate processes of retrieval and decision (Kintsch, 1970) were not addressed.

Craik (1977), Schonfield and Robertson (1966), and Drachman and Leavitt (1972) investigated memory function in the aged while testing the two hypothesized memory processes, storage and retrieval. Craik (1977) found a slight, statistically insignificant deficit in the performance of the aged. He concluded that poor memory function was attributed to retrieval rather than a storage deficit. Schonfield and Robertson (1966) also supported the retrieval-deficit hypothesis where the decline in recall was greater than in recognition. However, Drachman and Leavitt (1972) found direct evidence of storage-deficit where the decline was greater in recognition than in recall. Parkinson, Lindholm, and Urell (1980) concluded in a dichotic memory study that there was a common storage mechanism that declined with age. Salthouse (1982) concluded, on the basis of the relationship between word meanings and ideas (priming of lexical ideas), that a deficit in older adults' performance could be attributed to a general slowing of responses rather than language-specific deficits. In other studies, it was found that normal elderly adults performed significantly worse than

younger adults on measures of naming competence (Goodglass, 1980), speed of encoding and decoding (Salthouse & Somberg, 1982), and semantic processing (Cohen, 1979; Eysenck, 1974). Also, normal elderly had greater difficulty with semantic processing of prose material as opposed to word lists (Craik & Masani, 1976; Gilbert & Levee, 1971).

The research on memory has led to conflicting results. Many of the studies have not taken into account that memory has many facets that may decline at different rates. Generally, research has focused on measuring memory with a single test or procedure. This single measure has served as a basis for determining whether or not there is a loss of memory with aging. In a few studies, several tests have been utilized, but then scores have been reduced to one memory score. This may have obscured variations in differing aspects of memory. However, the majority of studies have supported the conclusion that memory function of most individuals declines with advancing age. The earliest age the studies have described the beginning of decline has been 50 years of age. The amount of loss was influenced by the type of material used, the kind of memory involved, and the time allowed for recall.

Syntax

Nebes and Andrews-Kulis (1976) reported there was no decline in speed or grammaticality of production when elderly subjects were asked to create sentences with word pairs. However, in Cohen's (1979) study, the elderly provided fewer modifiers and fewer summary

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propositions than the younger subjects. Emery (1983), in a study using standardized tests, reported the elderly performed worse in the areas of prepositions of time sequence (before spring or after fall), possessive construction of reversible form (i.e., what is the relationship of your mother's sister to you?), passive subject-object discrimination (The dog was killed by the wolf. Which animal is dead?), communication of abstract and/or logical relations (A lady came from the factory to the school where Nina was a student to talk.), and communication of narrative events which are concrete and/or alogical (John and Mary ran to the hospital really fast.). Although the body of research is relatively small in the area of syntactic abilities of the normal aging, it seems that individual variability and differences in definitions of syntactic abilities have contributed to conflicting conclusions and interpretations. These few studies have indicated that there appears to be a general decline in syntactic abilities with the aging process.

Word Association/Recall

Riegel (1968) assessed changes in word association that were related to aging. His study revealed that a longer response time was evident in word association tasks and that the older subjects produced a wider range of responses to certain words than younger subjects. Bierren, Riegel and Robbin (1962) and Malepeai and Hutchinson (1977) reported that elderly subjects performed worse on continuous word associations and also were slower in speed of

picture naming than younger adults. Bierren et al. (1962) found that speech rate was not a factor and concluded that the difficulty resulted from central processing problems.

Reading and Writing

With aging, reading and writing speed has been reported to decrease, with writing more affected than reading. It has also been reported that normal elderly subjects scored lower on subtests of writing skills than younger adults (Bollinger, 1974). Meyer and Rice (1981) studied the differences in the amount and type of information recalled from prose in aging adults. Their findings revealed no significant differences in the amount of information recalled, but the younger group recalled more propositions (main ideas) than the middle or older groups. There did appear to be an age-related deficit in text recall in middle aged adults. However, there was no relationship between age and the use of organizational skills. It was also noted that middle aged adults with higher levels of vocabulary recalled more information than those with low level vocabularies (Glynn, Okun, Muth, & Britton, 1983).

Hearing and Auditory Comprehension

There is also a general decline in hearing acuity as aging occurs that may make communication more difficult (Corso, 1971; Minifie, Hixon, & Williams, 1973; Myerson, 1976; Schow, Christensen, Hutchinsen, & Nerbonne, 1978). Reduced discrimination for speech as well as elevated auditory thresholds occur with aging (Corso, 1971). Pestalozza and Shore (1955) found that discrimination for speech was

9-20% better in younger subjects with speech discrimination losses than in a group of older patients with speech discrimination losses. Corso (1971) attributed reduction in speech perception, in part, to the increase in time necessary to process information in the higher auditory centers. Bergman (1971) found very little decrease with age in discriminating ordinary speech. However, when speech was distorted or competing noise was introduced, discrimination decreased as a function of age. Schmitt and McCroskey (1981) found that elderly listeners' auditory comprehension was better when the alteration of speech rate was within plus or minus 50% of normal rate.

Inference

Much of the research in the area of comprehension of language with the elderly has typically utilized simple verbal materials such as letters, digits, or words. The relevance of these findings is not clear for complex verbal material (Till and Walsh, 1980).

The point has been made that almost every message carries a large number of implications (Clark, 1977). Very few studies have described age decrements in high-level language abilities involving extracting meaning from discourse by use of inferential information (Belmore, 1981).

Inference, in this study, has been defined as a process that goes beyond explicitly stated information. This process involves making judgments based on world knowledge as well as the content and context of statements (Crothers, 1978). In reviewing the

literature, there have been a few directly related studies in the area of inferential information and the elderly.

Cohen (1979) studied four groups' ability to draw correct inferences (Experiment I), to relate new information to prior knowledge stored in memory (Experiment II), and to preserve the most important points in the recall of a longer story (Experiment III). The subjects included 20 old (65-79 years) highly educated people (OHE), 20 old (70-95 years) low educational level people (OLE), 20 young (20-29 years) highly educated people (YHE), and 20 young (18-29 years) low educational level people (YLE). In the first experiment, the subjects listened to 16 short messages (60-75 words) with eight being classified as simple (60 words) and eight as complex (75 words) at two different rates (120 and 200 wpm). Each subject listened to four messages in each of the following conditions: slow simple, slow complex, fast simple, and fast complex. After each message, the subjects answered two questions. One question required reproduction of the presented facts and the other required an inference to be drawn from the presented facts. Responses were oral, and subjects were given as long as they wished to respond. In the OHE versus YHE comparison, no deficit was found for the verbatim questions, but the groups did differ for inferential question errors (OHE = 22.3%; YHE = 11.4%). The OHE group's error scores were significantly worse on inferential questions at the fast rate than at the slow rate, but the YHE group did not show any rate effect. There was no rate effect on verbatim questions for either old or

young groups. Complexity was not significant. The effect of order of questions was not significant for either group. With the absence of age effect on verbatim questions and no effect of message complexity, it was suggested that the OHE group's inference deficit was not due to memory loss. However, the OHE group did show a larger deficit at the fast rate, which indicated that the deficit was related to a reduction in the speed of processing. Analysis of the OLE and YLE groups yielded a significant effect of question type. The factors of rate and complexity were not significant. The effect of order of questions was not significant except in the OLE group where error rates on verbatim questions presented late in the session were significantly greater than on verbatim questions presented early. Inferential questions were unaffected by order in this group. The OLE and YLE groups were affected by other factors (health, education, intelligence), but there was a significant correlation between age and inferential question errors in the OLE group, which suggested that age was related to the deterioration of inferential comprehension. However, with the wide range of ages in each group, it would be difficult to conclude at what specific age such changes occurred.

Experiment II involved the same subjects. They were asked to judge whether the 16 messages were true or contained an error. If they did contain an error, they were to state why. Incorrect answers were divided into three categories: misses, false alarms, and false hits. Both older groups made more errors than did the

younger groups. The type of mistaken explanations included interpretive errors (prior knowledge was incorrect), factual errors (facts were represented incorrectly), and value judgments (judged wrong on moral grounds rather than on content). OHE and YHE groups did not differ in the number of factual mistakes. In the OHE group, interpretive errors were more frequent, but did not reach statistical significance. In the OLE group, both factual and interpretive errors were more frequent than in the YLE group. The OLE group had 31 errors based on value judgments as compared to two errors for the OHE group, no errors for the YHE group, and one error for the YLE group. Cohen speculated that egocentricity of aging may have been a factor as well as a low level of education and a mentally undemanding lifestyle. A possible explanation overlooked by Cohen was that the OLE group was recruited from a geriatric day care center and some were in poor health and receiving medication. Consequently, they were not typical of the group they purported to represent. Cohen (1979) offered several explanations for failure to detect errors in the messages. The new information may not have registered or may have been forgotten; prior knowledge may have been incorrect or inaccessible; or matching new information to prior knowledge may not have been carried out.

In Experiment III, subjects were asked to listen to a story (300 words) and retell it as fully as possible. Immediately following the story, they were asked to reproduce the story and when finished, they were encouraged to recall more information. The

story was analyzed into 48 propositions, and the transcripts were scored for the total number of propositions correctly reproduced. Modifiers were also identified as comparatives and quantifiers (more, a few), temporal modifiers (recently, soon), locatives (there, up north), and logical connectives (because, therefore, in order to). Reproductions were also scored for the number of summary propositions recalled. Both old groups performed worse than the young groups. The OHE group performed worse than the matched YHE group on all three measures and the OHE group also performed worse than the less educated YLE group on all three measures. It appeared that when memory was heavily overloaded, as in this task, age-related deficits were more apparent than in tasks where the memory load was less severe.

This study indicated several components of the comprehension process that were most likely to be affected by age. First, the results of the three experiments suggested that comprehension of spoken language was affected by age. In Experiment I, a clear deficit was evident for inference questions which required integration of information in the messages. In Experiment II, the errors suggested difficulty in retrieving relevant prior knowledge for matching against current information. Cohen stated that older subjects were more likely to access irrelevant prior knowledge as demonstrated by the high number of errors in value judgments where the subjects judged messages as wrong on moral grounds rather than on semantic ones. In story recall, older subjects had difficulty

extracting and preserving the main points. They also did not appear to compensate for lowered memory capacity by concentrating on the core structure of the story. However, Cohen seemed to generalize scores of the OLE group, who were significantly older, less independent, and less healthy to all older subjects. Second, the tasks required concurrent processing of surface meaning and processing of underlying meaning. It appeared that older subjects had more difficulty with this dual demand.

In a more recent study, Cohen (1981) attempted to determine the influence of impaired recall (constructing inferences at the time of input but forgetting the inferences constructed), reduced processing capacity (a slowing down of the rate of information processing), and impaired reasoning ability (deficient logical reasoning ability) in inferential reasoning in old age. The purpose of Experiment I was to compare older (65-79) and younger (19-29) subjects' performance on logical reasoning problems with written and spoken language. Forty logic problems (mean length 35 words) were constructed. Twenty were presented orally and 20 were presented in writing. Half of the oral and written problems were followed by a conclusion to be evaluated as being true, false, or perhaps, the other half were followed by a question to be answered by circling yes or no. The problems were presented in simple everyday language and five different types of inference were represented. The older group found it more difficult than the younger group to make the correct inference when the input was spoken than when it was written. Cohen

concluded that because the written condition allowed more study time and the input was self-paced, the older subjects performed better. Also, there was not as much emphasis on memory for the written condition. For the younger group, there was no significant difference between written and spoken language. Cohen attributed the differences between the older group and the younger group to the rate of input. However, the older group also made more errors when the problems were presented in writing than the younger group. Therefore, it was concluded that inferential reasoning was affected by aging. In Experiment II, the ability to construct inferences based on factual knowledge was tested. The same subjects participated as in Experiment I. Six stories were constructed. Three were implicit (mean length 55 words) and three were explicit (mean length 56 words). The subjects silently read through each story as fast as possible. After all six stories had been read, 24 questions were asked and answered orally. Four open-ended WH questions were presented for each story. The older group scored lower when answering questions related to implied information (41.6% errors) than explicit information (19.4% errors). For the younger group, there was no significant difference. In this study, Cohen (1981) concluded there was a general deficit in inference-making affecting a variety of different kinds of inferential reasoning. There was an age-related deterioration in making inferences based on logical relationships (Experiment I) and based on factual knowledge

(Experiment II). The difficulty the older subjects had was magnified when the input was spoken.

A study by Belmore (1981) was designed to further investigate age effects in processing explicit and implicit meaning. Belmore (1981) predicted that a decrease in accuracy and/or speed for older persons would be magnified on inferential items. The subjects were divided into two groups (N=16 per group) with mean ages of 66.5 and 18.3. They read 32 short passages (three simple sentences) with a paraphrase or inference following each passage. Half of the passages had a true paraphrase and a true inference, and the other half had a false paraphrase and a false inference. The subjects had to indicate if the paraphrase or inference was correct or not by pressing the correct button. The passages were presented by slides with presentation self-paced. At the end of the testing, the experimenter again asked the subjects to perform the same verification task without referring to the passages. The delay interval was approximately 20 minutes. The reading time of the passages was longer for the older group, but the difference between groups was not significant. Mean percentage of correct responses on paraphrase and inference items was calculated for both age groups. There was no significant difference in accuracy with immediate testing, but delayed testing produced a significant age effect. Older subjects responded less accurately. The data on latency of response indicated that paraphrase items were answered more rapidly than inferences in both immediate and delayed testing. Older

subjects required longer to verify the test sentences than did the younger group. However, when comparing speed and accuracy of performance on paraphrase and inference verification tasks, no age factor was evident. Belmore (1981) concluded that the data from this study did not show evidence of a deficit for implicit information. Although the older adults were generally slower and less accurate than the younger group, they were more accurate when answering questions regarding implicit information than explicit. However, the older group performed at a lower level than the younger group on both explicit and implicit items. Belmore (1981) speculated that an impairment in processing implicit information may be apparent with a speeded or less naturalistic task or with a less educationally advantaged group of elderly. However, implicit information processing was not considered deficient in this study.

LeDeux, Blum, and Hirst (1983) examined the performances of four groups of subjects on language comprehension tasks. The first group was diagnosed with Alzheimer's Dementia, the second group was composed of cardiac patients, and the third and fourth groups were normal old and young persons with a mean age of 72 and 29 years respectively. The subjects had to indicate one of two subjects referred to when sentences were presented with varied ambiguity (Weak - John stood watching while Henry fell down some stairs. He laughed with a vengeance.; Strong - John stood watching while Henry fell down some stairs. He ran for a doctor.; Ambiguous - John stood watching while Henry fell down some stairs. He thought of the

future.), with varied syntactic constraints when the syntactic structures were presented in different positions (John stood watching. He ran for a doctor after Henry fell down some stairs.), and lexical constraints in which the subject had to indicate the appropriate referent when presented a sentence with "he" or "she" pronouns (John stood watching while Henry fell down some stairs. He ran for a doctor.). The normal elderly and the young adults were similar in performance. The demented patients were impaired on tasks involving both grammatical and contextual constraints, and the cardiac patients were only impaired on the contextual task. The researchers concluded that since the normal elderly and the young adults were similar in performance that deficits in the demented and cardiac patients appeared to be related to the disease states and not to the normal aging process. It should be noted that this study may have been limited in that only one variation of each constraint was examined.

In addition to the studies of inference in the normal elderly population, research is voluminous in the area of inferential information in texts with children as subjects. These studies have focused on improving inferential comprehension of good and poor readers (Hansen & Pearson, 1983), inferential reading abilities of mildly mentally retarded and nonretarded students (Bos & Tierney, 1984), the role of inference in oral and written discourse (Hildyard & Olson, 1978), and recall of explicit and inferential information from expository (instructional) and narrative (entertaining) texts

(Bridge & Tierney, 1981). Other topics of interest in inference have included causal relations (Chen & Tuddenham, 1979; Halford & Kelly, 1984; Sedlak & Kurtz, 1981), rules of inference (Johnson-Laird, 1980; Leahey, 1980; Smith, 1984), and cognitive styles (Pitts & Thompson, 1984).

Many researchers have utilized college age adults as subjects. Just and Clark (1973) examined the point in time when implications and presuppositions were drawn from messages. Corbett and Doshier (1978), Just and Carpenter (1978), Singer (1979), and Singer and Ferriera (1983), concluded that inferences were drawn during retrieval rather than during encoding. In contrast to the studies just mentioned, Clark (1977), Crothers (1978), and Kintsch and vanDijk (1978) provided evidence that inferences were computed and stored when messages were encoded. Differences in results of these studies may have been due to the types of verbal materials used, the length of materials, and the types of questions utilized to obtain the results.

Spiro and Esposito (1981) and Wagner and Esposito (1981) looked at inferences in text with late adolescent students. In the Spiro and Esposito (1981) study, experiments were designed to test the superficial processing of presented inferences (SPPI) hypothesis. With this hypothesis, it was assumed that predictable information was taken for granted, processed superficially and was not encoded in long term memory. The results of the study supported the

hypothesis that pragmatic inferences presented in text were superficially processed and not stored in long term memory.

Wagoner and Rohwer (1981) compared preadolescents and late adolescents in the acquisition of premise and inference information. In the experiment, the researchers attempted to raise the inference performance of preadolescents to equal the performance of the late adolescents while assessing the premise performance of the two groups. It was reported that added contextual information did facilitate the performance of the younger group but not the late adolescents on inferential information. The performances on premise information remained the same for both groups. The experimenters concluded that since the addition of contextual information raised the inference performance of the preadolescents, the facilitation was evidence of age differences in the elaboration of inferences from text.

Ackerman (1985) examined the ability of first grade children, third grade children, and college adults to make excuse inferences and to modify those inferences appropriately upon receiving later information. Results indicated that younger children understand excuses. However, the younger children were limited in modifying inferences after receiving information later that proved the inference to be wrong. The children were inflexible in their interpretation and insensitive to succeeding information. The complexity of material seemed to affect the results in that the first graders performed worse than the third graders and adults.

The younger children were less able to relate succeeding information to the inference.

In summary, there have been relatively few studies of changes in language comprehension in the elderly population. It appears that the research in this area does point to a deterioration of complex processing in the elderly population. With the body of research on inferential information with children and college age adults and the lack of research on higher levels stages of language comprehension in normal elderly adults, the present study is an important step in attempting to lessen the gap in the research body on inferential information. Past research in language comprehension of the normal elderly has focused on word lists, paired associates, and nonsense syllables and words. A few studies have employed short vignettes, but none have used conversational discourse. In daily activities, adults normally comprehend discourse rather than nonsense materials or word lists of unrelated items.

The present study tests the hypothesis that there are age-related changes that occur in the comprehension of inferential information during informal conversation.

Specifically, the following research questions were asked:

1. Is there a difference in the ability to draw inferences in 30, 50, and 70 year old normal female adults?
2. Is there a difference within and between each of the three age groups in comprehending inferential and verbatim information?

3. What is the difference in the amount of time it takes to answer inferential questions and verbatim questions within and between the three groups?

CHAPTER II

METHODS

Subjects

The method of cross sectional comparison was used with 30 adult females. The first group of 10 females ranged in age from 30-35 years, the second group ranged in age from 50-55 years, and the third group ranged in age from 70-75 years. All subjects were recruited from the state of Oklahoma by letters and telephone calls to the clerical staff of some departments at Oklahoma State University, senior citizen groups, and personal acquaintances of the experimenter or other participants. The following selection criteria were employed: (1) high school graduate + two years of education; (2) air conduction thresholds no greater than 25 dB at the frequencies of 500, 1000, and 2000 Hz (speech range) in the better ear; (3) good health as determined by lack of cardiovascular illnesses, neurological problems, or any other chronic illnesses; (4) living in a home environment and functioning independently; (5) receptive vocabulary at the 16 year age level (equivalent to 10th grade) or above as measured by the Peabody Picture Vocabulary Test - Revised Form L (Dunn & Dunn, 1981); and (6) short term memory at the 50th percentile level or above for normal adults as determined by the Repetition of Digits Subtest of the Neurosensory

Center Comprehensive Examination for Aphasia (Spreen & Benton, 1969).

Materials

Seven conversations (Appendix A) were prerecorded on a Marantz PMD 340 cassette tape recorder at a normal rate of speech (150-170 words per minute). The examiner verbally provided a setting before each conversation. The conversations recounted everyday situations in informal conversation and ranged in length from 158-217 words. Two to three different speakers assumed separate parts in reading the conversations to be recorded. The materials were adapted from Crystal and Davy (1975). The language samples from which these conversations were extracted were part of the Survey of English Usage at the University College London. These materials were chosen because they were spontaneously produced utterances with no scripts or cues, and they represented language used naturally between two to three people of similar status and interest.

Four questions (Appendix A) regarding each conversation were presented by live voice immediately after each conversation. Each question was answered orally and recorded on a Realistic CTR-48 cassette recorder to be scored at a later time. Two of the four questions required processing of inferential information, and two of the four questions required an answer verbatim from the paragraph. A total of 14 verbatim and 14 inferential questions were presented.

Prior to testing, two independent observers, trained in recognizing inferential and verbatim information, read all seven

conversations and the 28 questions. The observers scored the questions as requiring inferential processing or as being verbatim from the paragraph. Revisions were made until 100% agreement was reached.

The materials were tested on four pilot subjects prior to the study. Appropriate revisions were made in materials and instructions.

Procedure

Subjects were tested individually either in a therapy room of the Speech-Language-Hearing Clinic at Oklahoma State University or in their homes. The noise level in the room was no greater than 40 dB signal to noise ratio as measured by a Realistic Sound Level Meter #42-3019.

Hearing was screened (ANSI, 1969) at the beginning of the session with a Beltone 12D portable audiometer. Other screening measures obtained were receptive vocabulary as measured by the Peabody Picture Vocabulary Test - Revised Form L and short-term memory as measured by the Repetition of Digits Forward Subtest of the Neurosensory Center Comprehensive Examination for Aphasia. A short interview was also conducted to determine education, residence, health, and independent living status.

Subjects were instructed as follows: "You will be hearing seven conversations that are recorded. Each conversation will be played twice, and then I will ask you four questions after each conversation. Some of the answers will not be directly stated.

However, answer all questions to the best of your ability with no more than a one sentence answer. I can repeat each question one time but cannot offer any further explanation."

The subjects were instructed to guess if they did not know the answer. No feedback was given for any answer. There was no time restriction in answering the questions, however, a stopwatch was used to measure latency of response to questions. The conversations were presented in varied order as randomly chosen by the examiner.

The sessions were timed using a stopwatch and typically lasted 45 minutes to one hour.

Scoring

Each response was scored as correct or incorrect. Then a further decision regarding the quality of each response was made with each response being classified into one of six categories:

1. Correct complete general - Question: "What time do they eat Christmas dinner now?" Answer: "They eat dinner sometime around early afternoon."
2. Correct complete specific - Question: "What time do they eat Christmas dinner now?" Answer: "They eat dinner at noon."
3. Correct incomplete - Question: "What time do they eat Christmas dinner now?" Answer: "They eat dinner the same time on Christmas as they do any other time."
4. Incorrect misinformation - Question: "What time do they eat Christmas dinner now?" Answer: "They eat dinner at 3:00."

5. Incorrect related - Question: "What time do they eat Christmas dinner now?" Answer: "They enjoyed eating lunch early more than later."

6. Rejection, no attempt - Question: "What time do they eat Christmas dinner now?" Answer: "I have no idea."

Variations in length of response were also noted and scored as follows:

1. Phrase - A word or group of words that is not a sentence and has no formal indicator of subordination such as subordinating conjunctions. Example: more time.

2. Clause - A group of words, containing a subject or verb (or an understood subject), which depends on some other words for its meaning. Example: so she'd have more time to prepare it.

3. Sentence - A group of words, containing a subject or verb, which is a complete thought or idea. Example: She wanted to have more time to prepare dinner.

4. Sentence + - A sentence plus a phrase, clause, or another sentence. Example: She wanted time to cook dinner. She always had to rush before.

Reliability

The quality and length of the subjects' responses were initially scored by the examiner. An independent scorer used the original transcription to check 12 (4 of each age group) of the 30 individuals tested. On length of responses, total percentage

agreement was 88%; on quality of response, 72% agreement was reached; and correct/incorrect scoring revealed 100% agreement.

Treatment of Data

Statistical analyses included analysis of variance (ANOVA) (StatPlanII, 1984) for the subjects' latency of response within and between age groups by question type, and for the correctness of responses within and between age groups by question type. Means and standard deviations were calculated for correct/incorrect responses, scores on the NCCEA Memory Test, scores on the PPVT-R, educational level, and age for each group. Responses were tallied according to quality and length categories and presented in tabular form for age groups and question types.

Pearson product moment coefficients of correlation were computed for the NCCEA Memory Test scores and correct responses to experimental questions, PPVT-R scores and correct responses, and educational level and correct responses.

CHAPTER III

RESULTS

Screening Measures

Table 1 presents the screening measures for individual subjects. Means and standard deviations are presented for each age group for age, PPVT-R scores (language age equivalents), NCCEA Memory test scores, and educational level. The group means reflect similar abilities for the age groups. Also illustrated are hearing screening results and health problems. Two of the subjects participating in the study deviated from the screening criteria. A 50 year old subject had hypertension, and a 70 year old subject failed the hearing screening in both ears at 25 dB but passed at 30 dB. The 70 year old also had hypertension. Pearson product moment coefficients of correlation indicated that there were no significant relationships between PPVT-R scores and number of correct responses ($r = +.016$), NCCEA Memory scores and number of correct responses ($r = -.146$), and educational level and number of correct responses ($r = +.123$).

Latency of Response

Table 2 provides a summary of latency of response for the age groups and question types. Latency of response represents the time which elapsed between completion of the question and initiation of

Table 1

Summary of Screening Measures

| Subject | Age | Screening Measures | | | | | |
|---------|-------|--------------------|---|-------|-------|----------------|--------------------|
| | | Hearing | | PPVT | NCCEA | Educ. Level | Health Problems |
| | | R | L | | | | |
| 1 | 32 | P | P | 24-2 | 9 | 12 | None |
| 2 | 30 | P | P | 33-8 | 7 | 12 | None |
| 3 | 32 | P | P | 33-8 | 9 | 12 | None |
| 6 | 32 | P | P | 33-8 | 11 | 12 | None |
| 8 | 30 | P | P | 17-7 | 10 | 12 | None |
| 9 | 30 | P | P | 33-8 | 11 | 12 | None |
| 10 | 33 | P | P | 33-8 | 13 | 14 | None |
| 11 | 35 | P | P | 24-2 | 8 | 12 | None |
| 14 | 30 | P | P | 33-8 | 8 | 14 | None |
| 17 | 30 | P | P | 25-3 | 8 | 12 | None |
| Mean | 31.40 | | | 29.42 | 9.30 | 12.40 | |
| SD | 1.71 | | | 5.99 | 1.94 | .84 | |
| 4 | 55 | P | P | 25-3 | 8 | 12 | None |
| 5 | 52 | P | P | 30-7 | 8 | 12 | None |
| 7 | 53 | P | P | 33-8 | 10 | 10 | None |
| 13 | 55 | P | P | 16-4 | 7 | 12 | Hypertension |
| 16 | 55 | P | P | 33-8 | 8 | 12 | None |
| 18 | 50 | P | P | 33-8 | 7 | 12 | None |
| 19 | 51 | P | P | 26-4 | 8 | 11 | None |

Table 1. Continued

| Subject | Screening Measures | | | | | | |
|---------|--------------------|---------|---|-------|-------|----------------|--------------------|
| | Age | Hearing | | PPVT | NCCEA | Educ. Level | Health Problems |
| | | R | L | | | | |
| 21 | 53 | P | P | 33-8 | 9 | 13 | None |
| 23 | 53 | P | P | 33-8 | 11 | 14 | None |
| 28 | 55 | P | F | 33-8 | 8 | 12 | None |
| Mean | 53.00 | | | 30.16 | 8.40 | 12.00 | |
| SD | 1.94 | | | 5.83 | 1.26 | 1.05 | |
| 12 | 74 | F | F | 20-5 | 8 | 12 | Hypertension |
| 15 | 74 | P | P | 33-8 | 13 | 14 | None |
| 20 | 71 | F | P | 24-2 | 7 | 12 | None |
| 22 | 70 | P | P | 33-8 | 10 | 10 | None |
| 24 | 71 | P | P | 27-6 | 10 | 13 | None |
| 25 | 75 | P | P | 30-7 | 10 | 12 | None |
| 26 | 75 | P | P | 33-8 | 10 | 12 | None |
| 27 | 73 | P | P | 33-8 | 8 | 14 | None |
| 29 | 73 | P | P | 30-7 | 9 | 12 | None |
| 30 | 75 | P | P | 33-8 | 10 | 12 | None |
| Mean | 73.70 | | | 30.27 | 9.50 | 12.20 | |
| SD | 1.94 | | | 4.73 | 1.65 | 1.19 | |

Table 2

Summary of Latency of Responses in Seconds by Age and Question Type

| Age and Question Type | Measure | |
|--------------------------|---------|------|
| | Mean | SD |
| 30-Inference | 3.20 | 4.65 |
| Verbatim | 2.44 | 2.95 |
| 50-Inference | 3.26 | 3.46 |
| Verbatim | 1.86 | 2.01 |
| 70-Inference | 4.03 | 4.77 |
| Verbatim | 2.94 | 3.55 |

the answer. The latency of response was shorter for all age groups on the verbatim questions with the 50 year old group performing better than the 30 or 70 year old groups. The 70 year old group took longer to respond than the 30 and 50 year old groups on both question types. Table 3 presents the F ratios and significance levels for the subjects' latency of response within and between age groups by question type. The latency of response within the groups for inferential and verbatim questions was significant for the 50, $F(1,278) = 17.157$, $p < .01$ and 70 year old groups, $F(1,278) = 4.719$, $p < .05$, but was not significant for the 30 year olds. When comparing latency of response across groups, there was a significant difference between the 50 and 70 year old groups, $F(1,278) = 5.267$, $p < .01$ on verbatim questions. All other comparisons were not significant.

Correctness of Response

Table 4 provides a summary of correct and incorrect responses by age group and question type. The 50 year old group displayed more correct responses on the inference and verbatim questions than did the 30 or 70 year old groups. Relatively few differences were noted in correctness of response between the two question types for any age group. The 70 year old group had more correct responses on inference questions than on verbatim questions, whereas the 30 and 50 year olds performed better on the verbatim questions. As presented in Table 5, ANOVA results showed a significant difference in correctness of responses between the 30 and 50 year old groups,

Table 3

Summary of ANOVA for Latency of Response

| Age Groups & Question Types | ANOVA Results | |
|--------------------------------|---------------|-----|
| | F | p |
| 30I vs 30V | 3.206 | - |
| 50I vs 50V | 17.157 | .01 |
| 70I vs 70V | 4.719 | .05 |
| 30I vs 50I | .007 | - |
| 50I vs 70I | 2.340 | - |
| 30I vs 70I | 2.040 | - |
| 30V vs 50V | 3.086 | - |
| 50V vs 70V | 9.637 | .01 |
| 30V vs 70V | 1.950 | - |

Table 4

Summary of Correct and Incorrect Responses by Age Group and
Question Type

| Age and Question Type | Measure | Responses | |
|--------------------------|---------|-----------|-----------|
| | | Correct | Incorrect |
| 30 Inference | Mean | 11.50 | 2.50 |
| | SD | 1.43 | 1.43 |
| Verbatim | Mean | 12.10 | 1.90 |
| | SD | 1.37 | 1.37 |
| 50 Inference | Mean | 12.90 | 1.10 |
| | SD | .74 | .74 |
| Verbatim | Mean | 13.00 | 1.00 |
| | SD | .82 | .82 |
| 70 Inference | Mean | 11.60 | 2.40 |
| | SD | 1.58 | 1.58 |
| Verbatim | Mean | 11.40 | 2.60 |
| | SD | 2.01 | 2.01 |

Table 5

Summary of ANOVA for Correctness of Response

| Age Groups & Question Types | ANOVA Results | |
|--------------------------------|---------------|-----|
| | F | p |
| 30I vs 30V | .915 | - |
| 50I vs 50V | .083 | - |
| 70I vs 70V | .061 | - |
| 30I vs 50I | 7.538 | .05 |
| 50I vs 70I | 5.571 | .05 |
| 30I vs 70I | .022 | - |
| 30V vs 50V | 3.183 | - |
| 50V vs 70V | 5.434 | .05 |
| 30V vs 70V | .827 | - |

$F(1,18) = 7.538$, $p < .05$ on inference questions, between 50 and 70 year old groups, $F(1,18) = 5.571$, $p < .05$ on inference questions, and between 50 and 70 year old groups, $F(1,18) = 5.434$, $p < .05$ on verbatim questions. No significant differences were found in any other comparisons.

Quality of Response

Table 6 summarizes the number of responses in each qualitative category. There were more specific responses to verbatim than inferential questions. The 70 year old group displayed more incomplete responses, particularly on inferential questions. The 50 year old group produced more specific responses than the other age groups and no rejections were noted. Rejections were relatively low for the other two groups with slightly more for inferential questions. Incorrect responses were most frequently in the misinformation category with fewer incorrect responses in the related category. The 30 and 70 year old groups performed similarly on incorrect responses with the 50 year old group producing fewer errors.

Item Analysis

In Table 7, the number of correct responses are presented for each test item. Of the inferential questions, number 6 ("How does the place Jill lives compare with the place Pam described?") appeared to present the most difficulty (73.3% error rate) and of the verbatim questions, number 8 ("What did Carol talk about?") appeared to be the most difficult question (53.3% error rate). The

Table 6

Quality of Responses by Age Group and Question Type

| Age and Question | | Correct | | | | Incorrect | | | |
|------------------------|-----|---------|----|-------|----|-----------|---|-------|--|
| Types | CCG | CCS | CI | Total | IM | IR | R | Total | |
| 30-I | 54 | 55 | 9 | 118 | 11 | 7 | 5 | 23 | |
| 30-V | 26 | 78 | 13 | 117 | 18 | 1 | 3 | 22 | |
| 50-I | 53 | 72 | 8 | 133 | 7 | 0 | 0 | 7 | |
| 50-V | 14 | 98 | 15 | 127 | 10 | 3 | 0 | 13 | |
| 70-I | 53 | 41 | 24 | 118 | 13 | 7 | 6 | 26 | |
| 70-V | 33 | 66 | 12 | 111 | 18 | 3 | 4 | 25 | |

Note: Numbers in table represent tallies.

Key: CCG = Correct complete general

CCS = Correct complete specific

CI = Correct incomplete

IM = Incorrect misinformation

IR = Incorrect related

R = Rejection, no attempt

I = Inference

V = Verbatim

Table 7

Number of Types of Quality of Responses by Question (Item Analysis)

| Question | Correct | | | | Incorrect | | | |
|------------------|---------|-------|------|-------|-----------|------|-----|-------|
| | CCG | CCS | CI | Total | IM | IR | R | Total |
| Inference | | | | | | | | |
| 1 | 8 | 9 | 9 | 26 | 2 | 2 | 0 | 4 |
| 2 | 15 | 9 | 2 | 26 | 2 | 1 | 1 | 4 |
| 6 | 4 | 4 | 0 | 8 | 15 | 5 | 2 | 22 |
| 7 | 11 | 8 | 6 | 25 | 2 | 3 | 0 | 5 |
| 10 | 16 | 10 | 1 | 27 | 0 | 2 | 1 | 3 |
| 11 | 8 | 22 | 0 | 30 | 0 | 0 | 0 | 0 |
| 13 | 3 | 25 | 0 | 28 | 2 | 0 | 0 | 2 |
| 15 | 7 | 18 | 1 | 26 | 4 | 0 | 0 | 4 |
| 18 | 26 | 1 | 0 | 27 | 0 | 1 | 2 | 3 |
| 19 | 9 | 4 | 14 | 27 | 2 | 0 | 1 | 3 |
| 22 | 20 | 5 | 2 | 27 | 2 | 1 | 0 | 3 |
| 23 | 5 | 23 | 0 | 28 | 1 | 1 | 0 | 2 |
| 26 | 15 | 12 | 2 | 29 | 0 | 1 | 0 | 1 |
| 27 | 21 | 1 | 3 | 25 | 2 | 2 | 1 | 5 |
| Mean | 12.00 | 10.78 | 2.85 | | 2.42 | 1.35 | .57 | |
| SD | 6.99 | 8.14 | 4.13 | | 3.79 | 1.39 | .75 | |
| Verbatim | | | | | | | | |
| 3 | 11 | 7 | 10 | 28 | 1 | 1 | 0 | 2 |
| 4 | 9 | 20 | 0 | 29 | 1 | 0 | 0 | 1 |

Table 7. Continued

| Question | Correct | | | | Incorrect | | | |
|----------|---------|-------|------|-------|-----------|-----|------|-------|
| | CCG | CCS | CI | Total | IM | IR | R | Total |
| 5 | 2 | 9 | 15 | 26 | 4 | 0 | 0 | 4 |
| 8 | 0 | 13 | 1 | 14 | 11 | 0 | 5 | 16 |
| 9 | 16 | 10 | 0 | 26 | 2 | 0 | 2 | 4 |
| 12 | 0 | 25 | 3 | 28 | 1 | 1 | 0 | 2 |
| 14 | 5 | 21 | 0 | 26 | 3 | 0 | 1 | 4 |
| 16 | 2 | 17 | 11 | 30 | 0 | 0 | 0 | 0 |
| 17 | 4 | 19 | 1 | 24 | 4 | 1 | 1 | 6 |
| 20 | 3 | 25 | 0 | 28 | 2 | 0 | 0 | 2 |
| 21 | 3 | 22 | 0 | 25 | 5 | 0 | 0 | 5 |
| 24 | 13 | 14 | 0 | 27 | 3 | 0 | 0 | 3 |
| 25 | 0 | 29 | 0 | 29 | 1 | 0 | 0 | 1 |
| 28 | 2 | 23 | 0 | 25 | 4 | 0 | 1 | 5 |
| Mean | 5.00 | 18.14 | 2.92 | | 3.00 | .21 | .71 | |
| SD | 5.17 | 6.68 | 5.09 | | 2.74 | .42 | 1.38 | |

Key: CCG = Correct complete general

CCS = Correct complete specific

CI = Correct incomplete

IM = Incorrect misinformation

IR = Incorrect related

R = Rejection, no attempt

range of error rates on the remainder of the questions was 0% to 20%. It should also be noted that question number 8 yielded the highest number of rejections.

Length of Response

Although the subjects were instructed to respond with no more than a one sentence answer during the experiment, Table 8 illustrates the length of responses according to age group and question type. Responses appear to be more lengthy on the inferential questions than verbatim. Also, the 70 year old group presented a greater number of longer responses than the 30 or 50 year old groups.

Cued Responses

Data were collected on the questions which required the examiner to cue the subject to respond. For example, for each response of "I don't know" or "I have no idea," the examiner asked the subject to take a guess. Table 9 presents the number of cued responses by question type and age. The 50 year old group required less cueing than the 30 and 70 year old groups. No difference was noted in the number of cues given for inferential and verbatim questions.

Table 8

Number of Different Lengths of Response by Age Group andQuestion Type

| Age Group & Question Type | Length of Response Categories | | | |
|------------------------------|-------------------------------|----|-----|----|
| | P | C | S | S+ |
| 30-Inference | 24 | 18 | 96 | 3 |
| 30-Verbatim | 96 | 17 | 24 | 2 |
| 50-Inference | 21 | 21 | 95 | 3 |
| 50-Verbatim | 120 | 5 | 13 | 2 |
| 70-Inference | 12 | 20 | 106 | 5 |
| 70-Verbatim | 100 | 6 | 25 | 6 |

Key: P = Phrase

C = Clause

S = Complete sentence

S+ = Complete sentence plus a phrase, clause, or another
sentence

Table 9

Number of Cued Responses by Age Group and Question Type

| Age | Question Type | |
|-------|---------------|----------|
| Group | Inference | Verbatim |
| 30 | 5 | 5 |
| 50 | 1 | 0 |
| 70 | 5 | 6 |

CHAPTER IV

DISCUSSION

The purpose of the present study was to test the hypothesis that there are age-related changes that occur in the comprehension of inferential information during informal conversation. More specifically, the study focused on differences in the ability to draw inferences between three age groups (30-35, 50-55, 70-75), differences in comprehending inferential and verbatim information, and latency of response in answering inferential and verbatim questions. These hypotheses were tested by presenting recorded conversations to the subjects and then asking verbatim and inferential questions following each one. Latency of response was measured for each question.

The results of this study did indicate a significant difference between the 30 and 50 year old groups and between the 50 and 70 year old groups on inference questions regarding correctness of response. The 50 year old group performed better than the 30 and 70 year old groups. The 30 and 70 year old groups performed similarly. Also, a significant difference was noted between the 50 and 70 year old groups on verbatim questions. The analysis of latency of response revealed a significant difference within the 50 and 70 year old groups between inference and verbatim questions. The 70 year old

group took longer to respond to inference questions than on verbatim questions, as did the 50 year old group. Also noted was a significant difference in response time between the 50 and 70 year old groups on verbatim questions. The 50 year old group responded more quickly. A note should be made that standard deviations indicate that latency was highly variable. Perhaps the variability in response times would have been less if the subjects had been informed in the instructions that latency of response would be measured. Further research could focus on stabilization of this measure.

Assessment of quality indicated more specific answers on verbatim questions, because the responses were taken directly from the recorded conversations. For example, in answer to the question "Where did they have breakfast?", specific answers such as "in the kitchen" were generated. More general answers were generated by the inference questions. For example, "Why did the children get up so early?" was answered in a variety of ways such as "to do the chores," "to go outside and help the farmer," or "to enjoy early morning activities at the farm." Analysis of length of response categories yielded a difference in inference and verbatim questions. The length of response on verbatim questions was shorter than on inference questions, because the subjects frequently used a word or phrase directly from the conversations (Verbatim: "How much did the director of a company spend a year on football?" "A thousand dollars." Inference: "Why does Bill not like football?" "Oh, it

costs a lot of money, the conditions probably aren't too comfortable, and it is boring.") The 70 year old group displayed longer responses than the 30 and 50 year old groups. The 70 year old subjects related many of their responses to personal experiences which lengthened the answers. For example, "What did the parents forget on the first night?" "Well, if they were anything like I was when my children were little, they forgot the money and the tooth and then they had to make up an excuse like I had to do many times." The results of the study indicated that changes in comprehension of inferential information did not occur with aging.

In an effort to understand the differences in the groups, attitudinal differences were recalled from the administration of the test. The 30 year old group appeared to be interested in assisting the examiner and seemed unconcerned with their individual performances. The 50 year old group appeared more eager to determine their quality of performance on each question and seemed to attempt to answer quicker and in shorter utterances. This is revealed in Table 8 where the 50 year old group responded with more phrases and fewer sentences than the 30 and 70 year old groups. Also noted, the 50 year olds required less cueing, and fewer rejections were scored. The 70 year old group appeared to be more concerned with their performance on the screening measures. They seemed to relate the topics of conversation in the test to personal experiences more than the other groups. Whether or not this phenomena is one of age or individual differences is not known.

The screening procedures in this study were designed to ensure that the subjects be as equal as possible on important dimensions. Low correlations with educational level, memory, and PPVT-R scores would indicate these did not play a role in performance. However, one variable not considered was the socio-economic status of the participants. It should also be mentioned that some of the subjects were from rural areas of Oklahoma and some were not. Also not included in the screening measures was consideration of the occupations of the subjects. As a point of interest, notes were made on the subjects' current or former occupations. In the 30 year old group, all but two of the subjects were working outside of the home. In the 50 and 70 year old groups, four of each group worked in the home only. Four of the 70 year olds were still employed. All but two of the 70 year old group appeared to be socially active at this time. There did not appear to be significant employment differences between groups except that several of the 70 year olds previously had jobs which involved supervisory responsibilities.

The task offered ample opportunity for processing the material since each conversation was presented twice, and a context was provided. It is speculated that since the conversations were presented twice, possible memory differences between groups were diminished. It is believed that the memory load would be lessened with immediate repetition of the paragraphs. The subjects appeared to be more relaxed in listening the first time and then more tense and attuned to the content on the second presentation of the

conversations. If the results are to be generalized to normal informal conversation, one presentation may be more appropriate.

The materials were selected as being representative of normal conversation with revisions, omissions of words, and repetitions that occur in informal conversation. Reliability was good between the judges on identifying question types and scoring responses. Conversational discourse was used in this study rather than standardized test materials. The conversations and questions were tested with four pilot subjects and minor revisions were made regarding instructions and materials. The item analysis indicated that two of the test questions were particularly difficult. Those two questions may need to be revised if these materials are used for further research.

The results of this research are in general agreement with a study by Belmore (1981) where it was found that older subjects' ability to comprehend implicit information was not impaired. However, in Belmore's study, the older subjects performed better on the implicit than explicit information. In this study, the older subjects performed the same on verbatim and inferential information. Belmore also found that older subjects performed worse than younger subjects on accuracy and speed. The data generated by this study revealed that the older subjects performed worse than the 50 year olds but similar to the 30 year old group in accuracy of responses. Latency of response was somewhat longer for the 70 year old group. The younger and older subjects performed similarly on correctness of

response. However, in this study a middle group of 50 year olds were also tested. The 50 year old group performed better than the 30 or 70 year old groups.

Some general observations as to possible reasons for the 30 to 70 year old groups performing similarly are that eight of the 10, 30 year olds were tested in a clinical setting where apprehension may have affected their performance, whereas the 70 year olds were tested in their homes. Although the signal to noise level in all settings was monitored, visual stimuli and other differences in the physical setting were not held constant across subjects. It would be interesting to note if these variables would affect performance.

Other research studies have shown evidence of a deficit for inferential information (Cohen, 1979; Cohen, 1981). The data analyzed in this study did not yield that conclusion. Although latency of response data in this study showed slow responding to inferential information in the 70 year old group, correctness of response did not provide support for the hypothesis that the aging process impairs the comprehension of inferential information.

The discrepancies in the results of this study and previous research where age-related changes in inferential responding were substantiated are probably due in part to methodological differences. The older subjects used in Cohen's (1979) study were from a geriatric day care center, and some were on medication for illnesses. For this study, the subjects were independent and healthy, which is more typical of the population. Cohen (1981) also

did not control for age of both older groups. The range of ages was widespread. Cohen (1981) noted that memory may have been a factor in the results of the study. Naturalistic conversations were used in the present study, and no time constraints were imposed. The present study utilized context cues before each conversation and played each conversation twice to ensure that memory differences would be diminished. The structure of the materials utilized in this study made it easier for the subjects to infer information. Sensitivity to the structure of discourse may have been a factor in the performance of the 70 year olds. Context, timing, and prosody variables are often referred to as being redundant to the content of a message and offer more cues to enhance comprehension. Linguistic stress may have also provided selective attention cues which help listeners decode messages. Speakers stress the most critical elements in a sentence. These cues prime the auditory perceptual system for important information. After careful examination of the materials, it was noted that the questions may have referred more to the main ideas rather than detailed information. The subjects may have been sensitive to the salience of the information presented in the discourse and employed strategies to search for, identify and remember main ideas. If a particular word or sentence within the paragraph was not understood, there were enough cues in the context to infer the missing part.

These data suggest that communicating with older persons does not require a need to explicitly state information. The ability to

draw inferences seems to be as intact for older persons as for younger persons. In a clinical situation, these results would indicate that it is feasible to focus on comprehension of inferential and verbatim information in discourse with aphasics, because deficits in this area are a result of the neurological insult and not the normal aging process.

Language of the elderly is a worthwhile area of research in that it provides us with a lifespan characterization of normal language. A more specific rationale for studying language of the normal elderly population is the relevance to the clinical study of pathological language. It is of extreme importance to be able to specify the changes in language attributable to normal aging patterns and those related to pathological problems. For example, often in the early stages of dementia there is an unclear boundary between what may be attributed to normal aging and what may be attributed to the disease process. Careful documentation of language changes is of special importance in these cases.

Further research should focus on different age groups to ensure that deficits in comprehension of inferences do not appear at an older age. As this study indicated, no appreciable differences existed in the 30 and 70 year old groups. The effect of physical setting should also be investigated. Careful analysis of question types and whether or not they generate main ideas or detailed information is an important idea in salience of materials and responses. Variability in complexity of the test materials may

generate different responses from specific age groups. Although this study focused on female subjects, male subjects should also be studied to provide a more comprehensive view of the language changes in the normal elderly. The effect of memory might also be determined if the results of only one presentation of the conversations versus two presentations were compared. This type of information would allow more insight into the effects of aging on the comprehension of inferential information.

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APPENDIXES

APPENDIX A
PARAGRAPHS AND QUESTIONS

Two women, Jerry and Carol, are discussing Jerry's vacation on a farm.

I. Jerry: Oh yes and one pig died because it ate too much, ooh really, it was disgusting. They were terrible. They had a little fight in the morning when it was feeding time and one pig about middle size - it was dead and it was lying there. I'd never seen a dead pig before - absolutely stiff.

Carol: Did the children see it?

Jerry: Yes, they thought this was wonderful and asked why it was dead and the farmer apparently didn't want his wife to know because he had overfed them before and she'd been furious and, of course, he was trying to keep it from her, but all the kids were very curious about this dead pig - and was telling them not to tell his wife. So this pig - so they put it on this trash pile that smolders all the time - so they went to burn the pig - and all the kids hanging over the gate watching this pig. They were really curious - I mean - over that pig that died.

1. I - What did she think of her visit to the farm?
2. I - What had Jerry been talking about before you began listening?
3. V - Who saw the dead pig?
4. V - What caused the death of the pig?

This is a conversation between two women, Pam and Jill, discussing Jill's reaction to her move closer to the center of a city.

II. Pam: Oh, it was the most unfriendly unpleasant place you ever heard of.

Jill: Well, it sounds a bit like where we're living in a way, not like it entirely, but ... what I - what surprised me was when I came down to see you, I thought - well I thought my last sight of the country, you know, as I came back to Chicago and then I discovered how lovely Spring Vale is. It's a beautiful area. I can see trees from my window and walking to town is beautiful because there are some apartments and lots of lawns and trees and some lovely old houses on the other side of the road and in the fall, the leaves and everything - it really is pretty and its a very wide road, too. There are wide roads everywhere there. It's not like where we lived before. It was dirtier and smokier.

5. V - What types of homes are found in the area where Jill lives? Jill is the second person speaking.
6. I - How does the place Jill lives compare with the place Pam described?
7. I - What kind of area does Jill live in?
8. V - What did Carol talk about?

A conversation between two women, Anne and Nancy, about taking a vacation on a farm.

III. Anne: It was very nice and relaxing.

Nancy: So, how did you plan your day? You had your breakfast in the kitchen ...

Anne: We had our breakfast in the kitchen and then we sort of did what we liked and we got ready to go out. We usually went out soon after the children were up - at the crack of dawn - with the farmer, they went to the milk barn and helped him feed the pigs and all that and, you know, we didn't see the children. And, we went to the beach but by four o'clock we were ready to leave the beach, so we'd generally go for something cold to drink somewhere just in case supper was delayed, you know. Then, we'd get back and the children would go straight back out to the barns and - their own children had ponies and they'd come up and put them on the ponies' backs and - the milking - it was milking time and really, we were committed to getting back for milking time - for the children, and feeding time, and putting the geese to bed and all this.

9. V - Where did the children go?
10. I - Why did the children get up so early?
11. I - What was the weather like?
12. V - Where did they have breakfast?

This is one woman telling another about her daughter, Susie, and an incident concerning tooth fairies and Santa Claus.

IV. Susie said that there was no such things as fairies, elves, this that and the other. Well, the night she put her tooth under the pillow, we forgot to put the money there and take the tooth. So, she got up in the morning - "my tooth isn't gone and there's no money." Dave said well there you are, you see. You said you didn't

believe in fairies, so how can you expect the tooth fairy to come and see you. Dave said well try again tonight. The next morning she gets up all happy and Dave said well there you are - that just shows that if you believe well, if they hear you saying you don't believe - no money, she says. Then she says I know you're only saying that because you forgot to put it there. And now she thinks that - she says - she comes in and she'll grin all over. She'll say - just out of the blue - I do believe in Santa Claus you know and she'll grin from ear to ear and it's perfectly obvious that she doesn't. But, she's not going to say it just in case - just in case there's no toys on Christmas morning.

13. I - At first, how does Susie feel about the tooth fairy?
14. V - Who does Susie like to tease her parents about?
15. I - At the end of the story, how does Susie feel about the tooth fairy?
16. V - What did the parents forget on the first night?

A man is telling a favorite story of his concerning a car incident.

V. Oh, I remember there was a terrible horrifying story that a friend of mine told. He lived in a duplex and next door there was a man who'd just bought a new car and he was telling me that one morning he was looking out the window and this man was letting his wife drive the car, very unwisely, and he backed it out of the garage and closed the garage door. She came out of the house to go shopping - so she came out and got in the car and began backing out very gently then there was this unpleasant crunching sound and she realized she hadn't opened the gates that open up to the street, you see, and she'd just backed into these very gently and sort of touched the bumper and bent the gates slightly, and this really flustered her, so before she could do anything about this, she had to pull forward in order to open the gates. So she took the car out of reverse, put it into first gear and pulled forward very gently but unfortunately, she misjudged the distance to the garage doors, so that as she pulled forward, she ran into the garage doors and smashed in the front bumper of the car and tore up the garage doors.

17. V - Where did the man and his wife live?
18. I - Why did the friend who saw the accident think it was unwise to let the woman drive, even before the accident?
19. I - What did the woman's husband think of her driving?
20. V - Who backed the car out of the garage?

Jeannie and Sharon are discussing Christmas Dinner, and David, Jeannie's husband, joins in on part of the conversation.

VI. Jeannie: Did you read it in the Sunday Times?

Sharon: What?

Jeannie: About this new idea of having Christmas Day that you sort of get up in the morning and have breakfast. About 11:30 you have a brunch, you know, bacon and sausages. Then you put on your turkey. Then you put your stuff all on and you eat in the evening about 6:00 or something and you eat ...

David: ... right in the middle of the football game.

Jeannie: Well, that's it - well of course, I did think of that.

Sharon: But then, I mean, isn't it a relief to have an excuse for getting away from the television.

David: But, wait a minute. I'm just catching up on this conversation. How about the mid afternoon snack?

Jeannie: Yes, well you could have some Christmas cake for brunch, couldn't you?

David: Oh, I don't know about that.

Jeannie: You see, they eat breakfast and they're eating all morning and you slave away and you're rushing around to get this Christmas Dinner for around lunch time - well, that's what I said to Dave and he said "I never notice any rush."

21. V - What time do they eat Christmas dinner now?

22. I - What will Dave think of changing the time for Christmas dinner?

23. I - Why is the woman in favor of changing the time for Christmas dinner?

24. V - Where did Jeannie get this new idea?

This is a conversation between two men, Jack and Bill, on the topic of football.

VII. Jack: Well, what's wrong with football, I mean, I don't really see, I mean it, cause of the money? How much does it cost to get in?

Bill: I think it probably is the money for what you get, you know. I was reading in the paper this morning, a man, he's a director of a big company in Birmingham - who was the world's number one football fan. He used to spend about a thousand a year watching football. He goes all over the United States watching it, you see. This year he's watched 22 games which is about 50% his normal, that's just so far this year. He was saying that you could go have a nice meal in very plush surroundings, very warm, nice, pleasant - say it costs him about the same amount of money to go and sit in a breezy, windy stand on a wooden bench to watch a rather boring game of football with no personality and all defensive and everything. He says its just killing itself, you know.

25. V - How much did the director of a company spend a year on football?
26. I - Why does Bill, the second man speaking, not like football?
27. I - What does Jack, the first man speaking, think of football?
28. V - Where did Bill get his information about the director of the company?

APPENDIX B
SAMPLE DATA SHEET

Score Sheet

Identification Number: _____

Age: _____

Date: _____

Sex: _____

Hearing Screening:

| | | | | | | | |
|--------|------|------|------|------|------|------|--|
| | | 500 | | 1000 | | 2000 | |
| Right: | Pass | Fail | Pass | Fail | Pass | Fail | |
| Left: | Pass | Fail | Pass | Fail | Pass | Fail | |

PPVT:

Raw Score: _____

Age Equivalency: _____

NCCEA (Digit Subtest):

Raw Score: _____

%ile Rank: _____

Health Status:

Living Situation:

Educational Level:

Test Paragraphs

| Responses: | Verbatim/ Inferential | Response Time | Correct/ Incorrect |
|------------|--------------------------|------------------|-----------------------|
| I. | | | |
| 1. | _____ | _____ | _____ |
| | _____ | | |
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| 2. | _____ | _____ | _____ |
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| 3. | _____ | _____ | _____ |
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| 4. | _____ | _____ | _____ |
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| | _____ | | |
| II. | | | |
| 5. | _____ | _____ | _____ |
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| 6. | _____ | _____ | _____ |
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| | _____ | | |
| 7. | _____ | _____ | _____ |
| | _____ | | |
| | _____ | | |

| Responses: | Verbatim/ Inferential | Response Time | Correct/ Incorrect |
|------------------------------------|--------------------------|------------------|-----------------------|
| 8. _____ _____ _____ | _____ | _____ | _____ |
| III. 9. _____ _____ _____ | _____ | _____ | _____ |
| 10. _____ _____ _____ | _____ | _____ | _____ |
| 11. _____ _____ _____ | _____ | _____ | _____ |
| 12. _____ _____ _____ | _____ | _____ | _____ |
| IV. 13. _____ _____ _____ | _____ | _____ | _____ |
| 14. _____ _____ _____ | _____ | _____ | _____ |

| Responses: | Verbatim/ Inferential | Response Time | Correct/ Incorrect |
|------------------------------------|--------------------------|------------------|-----------------------|
| 15. _____ _____ _____ | _____ | _____ | _____ |
| 16. _____ _____ _____ | _____ | _____ | _____ |
| V. 17. _____ _____ _____ | _____ | _____ | _____ |
| 18. _____ _____ _____ | _____ | _____ | _____ |
| 19. _____ _____ _____ | _____ | _____ | _____ |
| 20. _____ _____ _____ | _____ | _____ | _____ |
| VI. 21. _____ _____ _____ | _____ | _____ | _____ |

| Responses: | Verbatim/ Inferential | Response Time | Correct/ Incorrect |
|------------------------------------|--------------------------|------------------|-----------------------|
| 22. _____ _____ _____ | _____ | _____ | _____ |
| 23. _____ _____ _____ | _____ | _____ | _____ |
| 24. _____ _____ _____ | _____ | _____ | _____ |
| VI. 25. _____ _____ _____ | _____ | _____ | _____ |
| 26. _____ _____ _____ | _____ | _____ | _____ |
| 27. _____ _____ _____ | _____ | _____ | _____ |
| 28. _____ _____ _____ | _____ | _____ | _____ |

VITA

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