

GEORGIA INSTITUTE OF TECHNOLOGY
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SPONSORED PROJECT INITIATION

*NO action
add*

Date: FEBRUARY 4, 1977

Project Title: INTERACTION BETWEEN HUMAN AGING & MEMORY

Project No: G-42-A01 (CONTINUATION OF G-42-624)

Project Director: DR. ANDERSON D. SMITH

Sponsor: DHEW/PHS/NIH NATIONAL INSTITUTE ON AGING

Agreement Period: From 9/1/76 Until 8/31/77
(END CURRENT PROJECT PERIOD)

Type Agreement: GRANT NO. 2 R01 AG00445-05

Amount:
\$22,533 PHS
6,464 GIT (G-42-316)
\$28,997 TOTAL

Reports Required:
ANNUAL PROGRESS REPORT W/CONTINUATION APPLICATION
TERMINAL PROGRESS REPORT UPON GRANT EXPIRATION
Sponsor Contact Person (s):

Technical Matters

Contractual Matters

(thru OCA)

LEROY E. DUNCAN JR., M.D.
ACTING PROGRAM DIRECTOR
NATIONAL INSTITUTE ON AGING
DHEW/PHS/NIH
BETHESDA, MD. 20014

Defense Priority Rating: N/A

Assigned to: PSYCHOLOGY (School/Laboratory)

COPIES TO:

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- Project Code (GTRI)
- Other _____

GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION
SPONSORED PROJECT TERMINATION

Post of
9/27/77
D.H.

Date: 9/27/77

Project Title: *Interaction Between Human Aging and Memory*

Project No: *G-42-A01*

Project Director: *Dr. Anderson D. Smith*

Sponsor: *DHEW/PHS/NIH National Institute on Aging*

Effective Termination Date: 8/31/77 (end 05 year)

Clearance of Accounting Charges: by 8/31/77

Grant/Contract Closeout Actions Remaining:

- Final Invoice and Closing Documents
- Final Fiscal Report
- Final Report of Inventions
- Govt. Property Inventory & Related Certificate
- Classified Material Certificate
- Other Annual Report of Expenditures due by 11/30/77.

NOTE: FOLLOW-ON PROJECT IS G-42-A02 (06 YEAR)

Assigned to: Psychology (School/Laboratory)

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APPLICANT: REPEAT GRANT NUMBER SHOWN ON PAGE 1 →		GRANT NUMBER	
SECTION IV—SUMMARY PROGRESS REPORT		AG00445 - 06	
PRINCIPAL INVESTIGATOR OR PROGRAM DIRECTOR (Last, First, Initial)		PERIOD COVERED BY THIS REPORT	
Smith, Anderson D.		FROM	THROUGH
NAME OF ORGANIZATION		9/01/76	5/31/77
Georgia Institute of Technology			
TITLE (Repeat title shown in Item 1 on first page)			
INTERACTION BETWEEN HUMAN AGING AND MEMORY			

1. List publications: (a) published and not previously reported; (b) in press. Provide five reprints if not previously submitted.
2. List all additions and deletions in professional personnel and any changes in effort.
3. Progress Report. (See Instructions)

1. (a) Publications published and not previously reported:

Aging and the total presentation time hypothesis. Developmental Psychology, 1976, 12, 87-88.

Imagery in the aged. Experimental Aging Research, 1977, 3 17-32. (with S. E. Mason)

(b) Publications in press:

Adult age differences in cued recall. Developmental Psychology, 1977, in press.

2. No changes.

3. Progress report:

A. Objective. The objective of this research has been and continues to be the examination and subsequent interpretation of the interactions between human aging and memory. Recent developments in theory and methodology in the experimental psychology of memory are being applied in the present experiments to help clarify the nature of forgetting in the aged. The present project examines the encoding (input) and retrieval (output) processes for both episodic and semantic memory as a function of adult age.

Specific goals of the experiments completed in the first year of the current project (budget period) dealt with the encoding and retrieval processes of episodic memory. Specifically, experiments examined:

- (1) the differential use of organization as a function of age (Both the amount and the type of organization used by different age groups were studied);
- (2) the differential of use of visual imagery as a function of age (Instructions to image, imagery value of the to-be-remembered items, and the use of imagery-based mnemonic devices were manipulated); and
- (3) the differential effectiveness of different encoding orienting tasks on recall and recognition performance of subjects differing in age.

Current ongoing experiments (to be completed in the second year of the current project) are investigating storage and retrieval in semantic memory. In one study, category norms are being collected as a function of age, sex, and educational level. Differences in the normative data should provide insight into the structure of semantic memory. Using a different methodology in a second experiment, retrieval from semantic

memory is examined by measuring the reaction time necessary to answer questions concerning the structure of semantic memory, e.g., Is a robin a bird?

B. Summary report. In the three experiments to be reported, subjects were either Georgia Tech alumni (Experiment 2) or were selected from civic and church clubs in the Atlanta area (Experiments 1 & 3). All subjects had similar educational and socio-economic backgrounds and previous research has demonstrated the comparability of these samples in terms of WAIS digit span and vocabulary.

In these experiments, the use of various encoding strategies by subjects in different age groups was studied. In the first experiment, organization of words in the recall protocols of subjects was examined. In Experiment 2, the use of imagery during encoding was examined. And in Experiment 3, encoding was manipulated by using different encoding instructions or orienting tasks which require the subject to attend to different characteristics of the stimulus and thus encode the word differently.

Thirty-nine subjects in Experiment 1 were presented a list of 36 words for five acquisition trials. One third of the words were conceptually related (Battig & Montague, 1969); one third of the words were associatively related (Deese, 1969); and the remainder were structurally related in terms of acoustic or formal similarity. In addition to clustering along these three dimensions, overall measures of subjective organization (ITR) and measures looking at commonality of organizational relationships between subjects (Commonality measure) were computed. The results are presented in Table 1 and Figure 1. The age groups differed on all organizational measures unless the measures were adjusted for differences in the level of recall between the groups (ratio scores, i.e., organizational measure divided by the maximum possible score given a particular level of recall). In addition, as seen in Figure 1, the oldest group was especially poor at associative clustering. In summary, the results of Experiment 1 showed organizational deficits for the older groups, but deficits that were correlated with overall recall deficits.

Seventy-two Georgia Tech alumni (24 in each of three age groups) participated in the second experiment. Half of the subjects were taught the use of a concrete mnemonic device (one is a bun, two is a shoe, etc.) and the other half were taught to use an abstract device (one is fun, two is true, etc.). The subjects were then presented four 10-item lists for free recall. The lists were counterbalanced and represented each of the four combinations of presentation rate (5 sec. and self-paced) and imagery value of the to-be-remembered words (concrete and abstract). The results of the experiment are presented in Table 2. Type of mnemonic device (concrete or abstract) did not have a significant effect in the present study while the other main effects, age, presentation rate, and imagery value of the items, were all significant. Age interacted only with item concreteness and this interaction is depicted in Figure 2. A smaller difference between concrete and abstract words was found with the oldest group.

An additional group of 24 subjects (12 young and 12 old) were given the lists without any mnemonic aid, but instead, with standard learning instructions. Comparisons with the mnemonic subjects in the experiment showed that the older subjects did not use the mnemonic devices to improve recall, i.e., no facilitative mnemonic effect was found with the old subjects (aged 60-80). Consistent with the literature, however, mnemonic effects were found with the younger subjects. This finding suggests that the older subjects were not influenced by the experimenter-provided encoding strategies.

The use of encoding strategy can also be manipulated by having the subjects perform orienting tasks while the list items are being presented. In Experiment 3, subjects answered the following questions during the list presentation. (Half could be answered "yes" and half "no")

Is the word printed in all capital letters? (CASE)
 Does the word rhyme with _____? (RHYME)
 Is the word a _____? (CATEGORY)

The subjects were first presented a 60-item list. One fourth of the subjects were assigned to each of the three orienting tasks. A fourth group of subjects were given standard learning instructions. The results of this experiment are presented in Table 3. The interactions of interest are the ones relating age to the different encoding tasks. In recall, the largest age effects are found with both the semantic orienting task and with standard instructions. This finding suggests a possible "processing deficit" in the older group, a deficit that is seen with tasks that require semantic processing. It further suggests that younger people optimally encode for recall after standard instructions. In recognition, however, a significant age effect was seen only with the semantic orienting task. No differences were found between age groups with the standard instructions replicating earlier recognition studies. The younger group improves with the semantic task indicating that optimal processing is not achieved with standard instructions. Instead, younger subjects probably organize (relate the items together) after standard instructions and this encoding strategy is not optimal for recognition performance. Older subjects, on the other hand, do not organize as well, and thus are not detrimentally affected by the standard instructions as much as younger subjects.

The results of all three reported experiments demonstrate deficits in the older group in processing or encoding at input. Organization, imagery, and elaboration (semantic processing) were examined, and the results demonstrate an inability of the older subjects to optimally encode during input.

C. Significance. Before understanding the memory deficit found in older subjects, we must first specify the nature of the deficit. The ongoing research is investigating the possibility that the memory deficit is in part a "processing deficit" and the possibility that retrieval or trace utilization is faulty in older persons. The present research is showing under what conditions differential forgetting is due to encoding problems at input and under what conditions it is due to retrieval problems at output.

D. Objectives for the current year. One uncompleted experiment is attempting to differentiate trace storage and trace utilization by manipulating list length. This experiment will be completed in the Summer of 1977. In addition, experiments will be conducted or completed in the coming year that are designed to investigate storage and retrieval in semantic memory. The specific objectives of these experiments are:

- (1) to assess differences in the response structures to category names and develop category norms for different adult age groups; and
- (2) to use reaction time as an indicant of retrieval time in a semantic memory probe experiment. Three hypotheses that account for the greater amount of time taken by older persons to make semantic decisions (i.e., category size, decision, and retrieval hypotheses) will be tested.

The undersigned agrees to accept responsibility for the scientific and technical conduct of the project and for provision of required progress reports if a grant is awarded as a result of this application.

6/10/77

Date



Anderson D. Smith,
Principal Investigator