performing some duty or task. It is possible for several operational levels to be present in one group, says Reid, so long as everyone is aware of them.

Cartwright and Zander identify two aspects of the goal formation process toward which group tasks are aimed. One is the presence of individual goals which are brought to the group. The other is the conversion of goals held by members into a group goal.[13] Each person brings to the group his own motives; sometimes they are person-centered and sometimes group-centered. He also brings a preconceived notion of what the group's history has been, i.e., past goals. And finally, he brings his perspective of the relations between the group and its social surroundings.

The literature contains little about how goals held by members can be converted into group goals. Cartwright and Zander hold that most groups fail to meet "fairness" criterion in forming goals. Such criterion assumes that all members have equal weight in the decision-making process. Four factors seem to be key elements in whether or not a group member accepts the group goal:

(A) the member's assessment of the consequences of his acceptance.

(B) the member's perception of the goal and his potential involvement with it.

---

[13]Cartwright and Zander, op. cit., p. 403.

(C) the members' attraction for one another.

(D) mutual participation in goal-setting.[14]

Work and Emotionality: Two Sides of the Coin

Olmstead (1959),[15] Blake and Mouton,[16] and Reddin[17] have adopted Cartwright and Zander's classification of group task function - goal achievement and group maintenance. The literature indicates that goal-directed behavior as well as attention to the psycho-social needs of the group are task functions and therefore influence leadership behaviors. The problem for groups, administrators, managers, and educators is that some groups have an imbalance between the two functions, favoring either the goal achievement or the maintenance activities.[18]

Goal achievement includes behaviors such as initiating action, keeping the members' attention on the goal, clarifying the issues, and developing plans. Group maintenance has to do with interpersonal relations, mediating disputes, and stimulating self-direction.

---

[14] Ibid., p. 411.

[15] Michael Olmstead, The Small Group (New York: Random House, Inc., 1959), p. 135.

[16] Blake and Mouton, op. cit.

[17] Reddin, op. cit.

[18] Cartwright and Zander, op. cit., p. 308.

As an outgrowth of their work at the Harvard Business School, Zaleznik and Moment (1964) have proposed three criteria for diagnosing the interpersonal setting of group work:

(a) The psychological interdependence among members required by the task,

(B) The personal involvement of the individuals with the task,

(c) The personal risks facing group members by virtue of their working together.[19]

English psychiatrist Bion (1959) has formulated a comprehensive modality for analyzing the interpersonal aspect of group life. He views the group from three possible culture-levels: dependency, pairing, and fight-flight. The dependency group looks for direction and support from outside or from a symbol of authority. The pairing group works as if the strength could come from within. The fight-flight group engages in attacking and withdrawing from the object of its concern.[20]

Group effectiveness, according to Shaw and Blum (1964), should increase by increasing the members awareness of others in the group. This is especially true for

---

[19]Abraham Zaleznik and David Moment, The Dynamics of Interpersonal Behavior (New York: John Wiley and Sons, Inc., 1964), p. 137.

[20]Bion, op. cit., p. 78ff.

difficult tasks which require the best efforts of the members.[21] When group members are unaware of the feelings of others, it is likely that some unacceptable decisions will be made.

The importance of work and emotionality as two sides of the same coin is stressed in the research of Portal-Foster (1966) who studied instructional-learning groups. He found the productivity of instructional groups to be largely the interaction between and among individuals in the group. He conjectured that the productivity of adult instructional groups could be enlarged if the groups were comprised on the basis of emotional profiles of prospective participants.[22] Borman emphasized that task-oriented groups also have a social dimension. He and others cite the Bales model which accounts for both the social-emotional responses and the task dimension.[23]

TYPES OF TASK GROUPS

Zaleznik and Moment (1964) appear to be the only researchers to have proposed types of work groups. Their

---

[21]Marvin E. Shaw and J. Michael Blum, "Effects of the Group's Knowledge of Member Satisfaction Upon Group Performance," Psychonomic Science 1:15-16 (January, 1964).

[22]Charles Williams George Portal-Foster, "A Study of Work and Emotionality in a Small Adult Instructional Group," (unpublished Doctor's thesis, University of Wisconsin, 1966), p. 140.

[23]Ernest G. Borman, Discussion and Group Methods (New York: Harper and Row, 1969), p. 138.

conceptualization is useful to this paper in that it helps to differentiate between problem-solving groups and learning groups. Their first category or group setting is one which provides opportunity for individuals to perform tasks within the group. An example is the factory where workers are each doing separate tasks. There is little, if any, psychological interdependence; risk is low due to the relative absnece of emotional involvement by the workers. The group seeks to protect itself from outsiders such as the time-and-study engineer who may be seen as an intruder.

A second category is the group setting where information is exchanged. This group assumes each person has some information which others need by pooling information. Ordinarily this group does not engage in problem-solving or the production of new ideas. Changing work-shifts at a hospital where the staff passes along information to in-coming workers is an example of the information-sharing group. There is little psychological interdependence and risk is low. However, the workers may become bored and aggressive.

A third category is the problem-solving group. A high level of tension and psychological interdependence exists among the group members. As the group defines the problem and gathers data, it moves towards a concensus or decision. Ineffective problem-solving, according to

Zaleznik and Moment, is due to lack of commitment to the group and to a low degree of psychological interdependence.[24] As members attempt to influence one another, and as the possibility for a change in attitudes and feelings becomes more apparent, the level of risk rises. The writers take the position that in a problem-solving group the problems toward which the primary work is addressed lie outside the group.[25]

The fourth group classification is the learning group. In this category the researchers include small discussion groups, laboratory human relations groups, therapy groups, and some organization policy and planning groups. In learning groups it is assumed that change in cognition, attitudes and feelings is a possible outcome. Bradford explains that problems in learning groups arise when some are committed and others are not. Because individuals vary in degrees of anxiety about difficulties and consequences of learning, these can contribute to a general climate of resistence.[26] When the group has accepted the task of learning, it takes responsibility for the learning of each member, offering emotional support as needed.

---

[24] Zaleznik and Moment, op. cit., p. 138ff.

[25] Ibid., p. 144.

[26] Leland Bradford, "Developing Potentialities Through Class Groups," Perspectives on the Group Process, ed. Clarence G. Kemp (Boston: Houghton Mifflin Co., 1964), p. 68.

The policy and planning group in a learning setting is different from the problem-solving group according to Zaleznik and Moment. It deals in long-range objectives and abstract formulations while problem-solving is more related to the immediate time and problems. High ambiguity of task and process characterize the planning and policy group whereas in the problem-solving setting the task is relatively clear. There is potential for learning in a planning group, but there is also the potential for failure as well.

The similarities between problem-solving groups and learning groups are pointed out by Zaleznick and Moment. In each there is a prominent task--decision and/or individual learning is expected. Both depend upon the sharing of information. In each group the individual members stand as resources to one another with particular skills and knowledge. And finally, integration--the need for consensus--must take place.

The teaching-learning process, according to Bradford (1958), is a human transaction involving the teacher, learner, and learning group in a set of dynamic interrelationships.[27] The goal of this process is change

---

[27]Leland Bradford, "The Teaching-Learning Transaction," The Planning of Change. ed. Warren Bennis, et al. (New York: Holt, Rinehart and Winston, 1961), p. 493.

and growth in the individual and his behavior. Education is seen as being much broader than mere cognition; it includes feelings and attitudes. Necessary to this projected outcome is the ability of the learner to work effectively with others in the group situation. The teacher's role is that of guiding the process of learning and change. He must be skilled in human relations and the technologies of diagnosis and analysis of the whole learning environment. The group provides the climate, the culture, in which learning may occur or not. In addition Bradford argues for sound pedagogical methods of presenting knowledge and for developing ways of evaluating learning experiences.[28]

LEADER MANAGEMENT OF TASK VARIABLES

The problem of managing excess emotional energy concerns Zaleznik and Moment. It is one of channeling surplus emotions into a variety of activities as well as into the resolution of personal problems.[29] However, understanding the group emotional process does not mean one can control or change it. It does mean that a sophisticated member of the group can help the group move effectively toward problem-solving. The appointed leader

---

[28]Ibid., p. 502.

[29]Zaleznik and Moment, op. cit., p. 153.

may or may not do this. The management of group affect means that the members must take account of norms which inhibit group work or enhance it. Sometimes members have negative feelings about expressing feelings in public. Also, those who facilitate the expression of negative feelings must have the ability to deal with their impact and emotional meaning.

Again the importance of leadership to the group task is underlined by Hemphill who states:

> "A leader's most important function in the dynamics of group behavior may well be that of maintaining group membership as a satisfying experience for the members of the group and facilitating their acting as a unity rather than as separate individuals."[30]

What the leader does, he says, is largely dependent upon the characteristics of the situation in which he functions.

The teacher's task in the learning situation, according to Koff (1967) is to make sense out of the group situation.[31] His role is that of a diagnostician and consultant for a social system in which he is also a participant. He must know when to intervene, as well as when not to intervene.

---

[30]Hemphill, op. cit., p. 100.

[31]Robert H. Koff, "Dynamics of Task and Process: the Classroom as Social Organism," (unpublished research memorandum no. 15, Stanford University, November, 1967).

There are problems with group management. They arise from the group's difficulty in knowing precisely where it is in relation to a goal, and what steps are to be taken to reach it.[32] This difficulty comes about because group goals are sometimes decided by a sub-part of the group rather than by consensus.

Reeves (1970) sees difficulties ahead for those who attempt to change already established group goals. Such changes are often attempted by one member of the group rather than by consensus. Changes in goals often imply changes in behavior which in turn can create fear within the group. There can be no change in goals or task without the whole group accepting such changes.[33]

SUMMARY

The relational aspects of the small group phenomenon are brought out in the literature cited in this chapter. Clearly leadership behaviors cannot be separated from the primary focus around which the group is formed. This focus is the group task.

We distinguished between goals as the more global direction-set of the group and the task as being whatever

---

[32]Cartwright and Zander, op. cit., p. 402.

[33]Elton T. Reeves, The Dynamics of Group Behavior (American Management Association. 1970), p. 167.

activity is necessary to move toward the broader goals. At any particular point in the history of the group, work can be cnetered on goal achievement or group maintenance, leadership for such work being assumed either by the designated leader or coming from the group itself.

Zalenik and Moment have classified groups into four types, clearly distinguishing between administrative groups and learning groups. The nature of the task is the critical element differentiating the administrative group from the learning group.

Reid further reinforced this notion by saying that groups enter into contract for what they want to do and how they will do it. Problems arise when group members perceive the contract differently or attempt to change the contract without group acceptance.

The problem still remains: "How to change any part of the group contract, whether it be the initial focus of the group, or goals, or even the unwritten operationa philosophy of the group?" The literature says the group will do what it agrees to do; it is not clear about what is necessary to change any part of the task or even the goal.

This problem of changing the contract to include intentional learning experiences or even to change the operational philosophy of the group - is applicable to the

church board. Assuming that some changes are desirable, how can the minister as an educator and administrator intervene to facilitate change?

CHAPTER IV

CONCLUSIONS AND DISCUSSION

Literature concerning leadership and the group task was thought to have implications for the performance of learning tasks by the church board. Two hypotheses were advanced:

(1) Administrative groups are differentiated from learning groups primarily by:
   (A) styles of leadership and
   (B) group tasks and goals.

(2) Administrative groups in the church can become more effective at learning tasks by:
   (A) an educationally oriented and flexible leadership style of minister behavior
   (B) a commitment to study as well as to problem-solving and administration.

How do the elements of leadership and task-oriented behaviors affect an administrative group? A learning group? Is there a difference between an administrative group and a learning group? Can an administratively-oriented, problem-solving group become a learning group? What effect does the minister's behavior as he presides

over the church board have upon its working modality? How can board members work more effectively at their tasks? Can they change the group task?

Hypothesis 1

"Administrative groups are differentiated from learning groups by:

(A) styles of leadership

(B) group tasks and goals"

Conclusion: Administrative groups are differentiated from learning groups. However, the literature does not support the conjecture that such differentiation hinges upon the style of leadership which the designated leader brings to the group. More to the point, the evidence points to the group's perception of the task as being pivotal in determining the nature of the group.

Differences between administrative or problem-solving groups and learning groups have been clearly drawn by Zaleznik and Moment who categorized groups into four classifications: (a) the individual in the group setting, (b) the information exchange group, (c) the problem-solving group, and (d) the learning group. The differences, they hold, are more related to task differences than in approaches to leadership. The task in a learning group is more within the group while that of a problem-solving group are more outside the

group. Bradford supports Zaleznik and Moment in that the learning group is more oriented to behavioral changes in the members than groups organized for other purposes.

(A) With respect to styles of leadership: Leader behavior is not a valid criteria for differentiating administrative groups from learning groups. Leader behavior can be autocratic, democratic, or laisse-faire whether expressed in a classroom, a shop steward's meeting, or in church board meeting. Actually the literature of business management and educational administration desribes the leadership role as that of "teacher" and "educator."

Old stereotypes of the business manager conceptualizing his role as the "big boss" who moves and manipulates people to achieve company goals does not hold as accepted administrative practice. Management theorists and consultants such as Florey, McGregor, Reddin, Blake and Moulton use the terms "teacher" and "educator" to describe behaviors such as helping, guiding, supporting and advising. The behaviors they describe correspond to Boyd's classifications of teacher behavior in which he identifies four instrumental roles of the teacher:[1]

---

[1]Robert D. Boyd, "The Teacher Role Model," (mimeographed paper, University of Wisconsin, no date).

(1) Content-Resource Person

With more information in hand than his students he can help them see wider perspectives of the issues. More important, he knows the sources of information and can direct students to them.

(2) Guide

The teacher in this role helps the learner to see relationships in his experiences and learnings. He acts to analyze why students are hving learning difficulties and is skilled in the use of these techniques.

(3) Programmer

The teacher arranges opportunities and facilities for the teaching-learning transaction. This is referred to by others as the facilitator role.

(4) Institutional Representative

Responsibility for upholding the policies of the institution is part of the teacher's task, although Boyd holds this should not pre-empt any of the functions and relationships identified under the other three roles.

The literature does not differentiate between one style of leadership for the business setting and another

for the classroom. Behaviors effective in the classroom are also applicable in other environments such as the business organization.

(B) With respect to group tasks and goals: Group goals and tasks are valid criteria for differentiating learning groups from administrative groups. Zaleznick and Moment have said both are work groups whether the emphasis is on "people work" or "task work." At some time or other each probably will do both kinds of work, the emphasis given to these tasks depending upon the purpose and goals of the group.

A significant difference seems to be the extent to which an administrative group engages in tasks external to its own life. Most of the energy of the administrative group is centered on completing tasks external to the group itself. There are reports to hear, problems to consider, and decisions to make. Feelings may break out, but these may be considered extraneous to the main purpose of the group.

Zaleznik, Moment, and Bradford theorize that learning groups are groups whose primary goal is to learn. This of course, means behavioral changes -- changes in attitudes, feelings, values, and cognition of the group members. While there may be some learnings, i.e., behavioral changes in problem-solving groups, this is

coincidental to the stated focus of the group. As Shaw and Blum have observed, a group may reach a decision in which people are unhappy with the group decision because they did not or were not allowed to express their feelings. In a problem-solving group the task is mainly external to the group, while in a learning setting it is internal, what Boyd and Bradford call the "teaching-learning transaction," involving the leader, the learner, and the group setting which we conclude is the task.

Hypothesis 2

"Administrative groups in the church can become more effective in learning tasks by:

(A) an educationally-oriented and flexible leadership style by the minister

(B) a commitment to study as well as to problem-solving and administration.

Conclusion: The inference from the literature is that administrative groups can become more effective at learning tasks or even accept learning as an intentioned task. Therefore, we conclude this is possible for the church board.

(A) With respect to leader's style of leadership: The literature is rather clear that the leader will not make the group accept what it has not agreed to accept as

its task or goal. On the other hand, an educationally-oriented and flexible leadership style by the minister can effect how the group or board goes about its accepted task, whether it be a decision-making task-group or a learning task-group.

It can be argued from this that if a leader-designate -- the minister-moderator of the church board -- is open, democratic, and flexible in his relationship to the board, it is more likely that the group will be more open to accepting learning tasks.

A leader in the field of educational administration, Jack Gibb, coined the term "catalyst-participative" to describe those behaviors involved in developing the group climate whereby the members are helped to grow, be free and exercise leadership functions required by the group.

Although a democratic, 9,9 management style may not lead a group to do what it does not wish to do, the catalyst-participative approach suggested by Jack Gibb may help the group exercise mutual leadership. Herein may lie the clue to assisting an administrative problem-solving group to accept learning goals. If the group setting provides satisfying experiences with a minimum of fear and distrust, it may be more ready to follow the leading of persons within it to change the task from problem-solving to learning tasks. Koff agrees it is the

leader's responsibility to act as diagnostician and consultant to the group to bring about these behaviors. Reeves warned against those one or two persons who would move a group toward their own personal goals without taking cognizance of where the other members are. The designated leader should know when this is happening and help the group to refrain from premature and inappropriate actions.

The Getzels and Guba social systems model is useful in providing the minister with a theoretical framework for analyzing the contextual environment in which he, as well as the board, must exercise leadership.

Leadership behaviors whether by the group or by a designated leader do not occur in a vacuum. The role expectations of the institution as well as the need dispositions of the people who make up the institution call for appropriate leadership behaviors. Getzels and Guba propose a middle ground, what they call a "transactional style," cutting a middle path between the expectations of the institution and the people who comprise the institution.

While most of the literature favors the democratic teacher-centered approach to the autocratic, rigidly controlling approach, Cecil Gibb opts for a flexibility in leadership style accepted by the group and appropriate to the situation.

Can a church board become more effective at learning tasks if the minister-moderator exercises an educationally-oriented and flexible leadership style? The literature indicates that leader behavior is positively correlated with group performance. The minister's behavior may not change the agenda of the church board from considering the church budget to taking up a study of human sexuality, but such behavior will influence the operational effectiveness of the church board. As a designated and recognized leader -- constitutionally appointed to moderate the church board -- is the minister a competent diagnostician to assess the environment? In the role of teacher can he help the group set goals and work toward them? How skillfully can he diagnose the internal problems of the group and, interpreting these to the group, help it to move forward toward its goals? Can he help the group maintain balance between task achievement and group maintenance functions? Is he flexible enough to allow leadership from the group to manifest itself?

These are transactional questions. They imply that the minister-moderator not only influences the working modality of the Session, but is influenced by the situation in which he works. In other words, the situation makes its mark on the man as he does on the

situation. McCarty and Ramsey identify what they call "the leadership dilemma." Is it circumstances which determine success or is it administrative acumen? The leader knows what is possible and not possible. He has the skill to diagnose the total environment and act accordingly.

Skills in the observation and diagnosis of small group behavior, flexibility of leadership behavior, and facility in timing are skills which the minister-moderator must bring to the parish church board. The terminology of Jack Gibb seems to best summarize the minister's functional role as the designated leader of the Session. He is the "catalyst-participative leader" whose efforts are directed toward building the church board into an effective team and all members are helped to assume leadership functions as they emerge in the group. The minister's educational role is to encourage the board members to accept responsibility for developing a work climate which is as tuned into the emotionality of the members as it is to getting on with the tasks of administration. The monumental work of Bion in classifying the work cultures of the small group cannot be ignored with respect to group emotionality.

(B) With Respect to Commitment to Study: The major conclusion of this paper is that an administrative

group who perceives its work to be decision-making may not engage readily in other tasks unless it, as a group, accepts such tasks and makes a commitment to them. Certainly the minister can lead a board to a consideration of learning tasks and try to get the group to accept them, but if the learning task is not accepted, there is little he can do without violating his own integrity as an educator and that of the group.

Self-directing adults should have the freedom to do what they think is appropriate,[2] although such decisions may not always correspond to the minister's expectation or even those of the United Presbyterian Church. To deny this freedom of self-direction is to put aside the purpose of education which is to help a person grow and be free.

IMPLICATIONS OF THE STUDY

Questions such as the following are yet unanswered:

(A) How do Session members in fact perceive their primary tasks?

(B) What do they name as secondary tasks?

(C) What are the role expectations for the minister-moderator at Session meetings?

---

[2]Malcolm Knowles, The Modern Practice of Adult Education (New York: Association Press, 1970), pp. 1-50.

(D) What are the minister's perceptions of his role as moderator?

(E) Does the minister work with the Session from any conscious theoretical framework?

(F) What are the objectives of Church Officer Development programs? What are the goals of those who engage in church officer development?

(G) What programs are being offered by seminaries to prepare the minister to work with parish boards?

(H) What continuing education programs are and should be available to the practicing minister?

(I) Can church boards be classified as to the relationship between type of board and the minister's style of leadership? (See reference to McCarty and Ramsey's research on school boards, p.29ff).

The church board, like the school board and other management or administrative groups, is a valid area for research. However, little has been done to study the inner processes of the church board except in rather isolated instances. As Edgar Mills of the Ministry Studies Board has said, the problem is not that research is not

being done, but the problem is discovering who is doing it. The need for further study of the church board seems apparent particularly in these days of structural change in the institutional church. If educational programs are to be designed to assist the minister and church officers, then they should be designed on the basis of research evidence. Is it enough to offer programs in church polity and theology for board members without first helping them to learn the processes and characteristics of their own group? We argue from the literature evidence that the minister, if he has been trained in the skills of group observation and analysis, can be the primary teacher in guiding the church board in a systematic experience of learning how to work together, engage conflict, and be more open and accepting of each other. This writer feels that while a Session might not accept the task of "studying" the proposal for the restructuring of national boards and agencies of the denomination, it may be more inclined to accept a learning task in which the members have a personal investment. Such learning must be problem-oriented and innovative, utilizing some of the simulation devices and teaching-learning tools already developed.

However, we conclude the church in both its preparatory education and its continuing professional

education must do more to enhance the minister's skills as an educator-administrator whose task it is to mediate between the needs of the institution and the needs of the individual.

BIBLIOGRAPHY

BOOKS

Adams, Arthur (ed.). Administration In the Church: Theory and Practice. Philadelphia: General Assembly, UPUSA, 1970.

Bass, Bernard M. Leadership, Psychology, and Organizational Behavior. New York: Harpers, 1960.

Bennis, Warren G., Kenneth D. Benne, and Robert Chin (eds.). The Planning of Change: Readings in the Applied Behavioral Sciences. New York: Holt, Rinehart and Winston, 1961.

Bion, Wilfred R. Experiences in Groups. New York: Basic, 1959.

Blake, Robert R., and J. Mouton. The Managerial Grid. Houston: Gulf Publishing Co., 1965.

Borman, Ernest G. Discussion and Group Methods. New York: Harper and Row, 1969.

Cartwright, Dorwin and Alvin Zander (eds.). Group Dynamics: Research and Theory. New York: Harper & Row, 1968.

Collins, Barry E., and Harold Guetzkow. A Social Psychology of Group Processes For Decision-Making. New York: John Wiley, 1964.

Dubin, R., G. C. Homans, and D. C. Miller (eds.). Leadership and Productivity. San Francisco: Chandler Publishing Co., 1965.

Flory, Charles D. (ed.). Managers For Tomorrow. New York: Mentor, 1965.

Goodman, Grace Ann. Rocking the Ark. New York: Board of National Missions, 1968.

Haiman, Franklyn S. Group Leadership and Democractic Action. Boston: Houghton Mifflin, 1951.

Hinton, Bernard, and H. Joseph Reitz (eds.). Groups and Organizations. Belmont: Wadsworth Co., 1971.

Houle, Cyril O. The Effective Board. New York: The Association Press, 1960.

Kemp, Clarence (ed.). Perspectives on the Group Process. Boston: Houghton Mifflin Co., 1964.

Knowles, Malcolm and Hulda Knowles. Introduction to Group Dynamics. New York: Association Press, 1959.

Knowles, Malcolm S. The Modern Practice of Adult Education: Andragogy Versus Pedagogy. New York: Association Press, 1971.

Let's Look at Leadership. Philadelphia: Board of Christian Education, UPUSA, 1962.

Likert, R. New Patterns of Management. New York: McGraw-Hill, 1961.

Lindzey, Gardner and Elliot Aronson (eds.). Vol. 4 of The Handbook of Social Psychology. Reading, Mass.: Addison-Wesley Publishing Co., 1969.

McCarty, Donald J., and Charles E. Ramsey. The School Managers. Westport, Conn.: Greenwood, 1970.

McGregor, Douglas. The Human Side of Enterprise. New York: McGraw-Hill, 1960.

National Society of the Study of Education. Behavioral Science and Educational Administration. Sixty-third Yearbook, Part II. Chicago: University of Chicago Press, 1964.

Olmsted, Michael S. The Small Group. New York: Random House, Inc., 1959.

Pigors, P. Leadership or Domination. Boston: Houghton Mifflin, 1935.

Powell, Robert Richard Managing Church Business Through Group Procedures. Englewood Cliffs: Prentice-Hall, 1964.

Reddin, W. J. Managerial Effectiveness. New York: McGraw-Hill, 1970.

Reeves, Elton T. The Dynamics of Group Behavior. American Management Association, 1970.

Reid, Clyde. Groups Alive - Church Alive: The Effective Use of Small Groups in the Local Church. New York: Harper and Row, 1969.

Reilly III, Joseph A. The Effects of Different Leadership Styles on Group Performance. U. S. Dept. of Health, Education and Welfare, Industrial Relations Center, Iowa State University, Ames, Iowa, 1968.

Sherif, Muzafer and M. O. Wilson. Group Relations at the Crossroads. New York: Harper, 1953.

Tead, Ordway. The Art of Administration. New York: McGraw-Hill, 1951.

The Book of Order, 1970-71. "The Constitution of the United Presbyterian Church in the United States of America". Philadelphia: Office of General Assembly.

Thelen, Herbert A. Dynamics of Groups at Work. Chicago: The University of Chicago Press, 1968.

White, Ralph K., and Ronald Lippitt, Autocracy and Democracy. New York: Harper and Brothers, 1960.

Zaleznik, Abraham and David Moment, The Dynamics of Interpersonal Behavior. New York: John Wiley and Sons, Inc., 1964.

JOURNALS

Ashbrook, James B., "Ministerial Leadership in Church Organization," Ministry Studies, 1:1-33, May,1967.

Bovard, E. W. Jr., "Clinical Insights as a Function of Group Process," Journal of Abnormal Social Psychology, 47:534-539, 1952.

Carter, L., W. Haythorn, Beatrice Shriver, and J. Lanzetta, "The Behavior of Leaders and other Group Members," Journal Abnormal Social Psychology, 46:589-595, October, 1951.

Getzels, J. W., and E. G. Guba, "Social Behavior and the Administrative Process," School Review, Vol. LXV, No. 4, 423-41, Winter, 1957.

Gibb, Jack R., "Expanding Role of the Administrator," The Bulletin of the National Association of Secondary School Principals, Vol. 50, No. 319, 46-60, May 1967.

Hadden, Jeffrey K., "Role Conflict and the Crisis in the Churches," Ministry Studies, Vol. 2, 16ff, Dec. 1968.

Hemphill, John K., "Situational Factors In Leadership," Columbus: Bureau of Educational Research for The Ohio State University, 1949.

Redl, Fritz, "Group Emotion and Leadership," Psychiatry 5, 573-596, November, 1942.

Scherer, Ross P., "Sources of Role Conflict: Summary of Discussion," Ministry Studies, Vol. 2, 41ff, Dec. 1968.

Shaw, Marvin E. and J. Michael Blum, "Effects of the Group's Knowledge of Member Satisfaction Upon Group Performance," Psychonomic Science, 1:15-16, January, 1964.

Shaw, Marvin E., "Acceptance of Authority, Group Structure, and the Effectiveness of Small Groups," Journal of Personality, 27, 196-210, 1959.

UNPUBLISHED WORKS

Bernthal, Wilmar F, "Organizational Leadership: Some Conceptual Models," Paper presented at the Mountain-Plains Institute for New Presidents of Community Colleges, Scottsdale, Arizona, May 5, 1969.

Brereton, Philip R., "Management Grids," University of Wisconsin, Management Training Institute, no date. (Mimeographed.)

Boyd, Robert, Syllabus for Teaching the Adult Learner. (Mimeographed paper, University of Wisconsin, no date.)

Chung, Ki-Suck, "Teacher-Centered Management Style of Public School Principles and Job Satisfaction of Teachers," 24 page paper presented at American Educational Research Association Annual Meeting, Minneapolis, Minn., March 2-6, 1970.

Coleman, David, "A Study of the Leader Behavior of Selected Directors of University Conference Operations." Unpublished Doctor's dissertation, University of Wisconsin, 1969.

Koff, Robert H. "Dynamics of Task and Process: The Classroom as Social Organism." Unpublished Research Memorandum No. 15, Stanford University, Nov. 1967.

Mills, Edgar, Telephone interview. August 24, 1971.

Portal-Foster, Charles William George. "A Study of Work and Emotionality in a Small Adult Instructional Group." Unpublished Doctor's dissertation, University of Wisconsin, 1966.

Stanavage, John A. "Man About School or How Can the Principal Be or Become an Instructional Leader." Paper presented at the National Association of Secondary School Principals meeting, Atlantic City, N. J., 1968.

Wiggins, Thomas W. "Leader Behavior Characteristics and Organizational Climate." Paper based on unpublished doctor's dissertation and presented at the Annual Meeting of the American Educational Research Association, Los Angeles, Feb. 5-8, 1969.

DOCUMENT RESUME

ED 059 471 08 AC 012 343

AUTHOR Monge, Rolf H.; Gardner, Eric F.
TITLE A Program of Research in Adult Differences in Cognitive Performance and Learning: Backgrounds for Adult Education and Vocational Retraining. Final Report.
INSTITUTION Syracuse Univ., N.Y. Dept. of Psychology.
SPONS AGENCY Office of Education (DHEW), Washington, D.C. Bureau of Research.
BUREAU NO BR-6-1963
PUB DATE Jan 72
GRANT OEG-1-7-061963-0149
NOTE 256p.

EDRS PRICE MF-$0.65 HC-$9.87
DESCRIPTORS *Adult Learning; *Age Differences; *Cognitive Ability; Data Analysis; Educational Background; *Educational Research; *Learning Characteristics; Learning Motivation; Older Adults; Personality; Test Construction; Test Results; Vocational Rehabilitation; Word Lists; Young Adults

ABSTRACT

A five-year program of research in adult learning is reported upon. One purpose of this program was to determine age differences in cognitive abilities, with special reference to items selected as suitable for adults of different ages, to survey the educational backgrounds and skills that older and younger adults bring to learning situations, and to study age differences in personality characteristics of a type likely to influence the individual's learning. A second main purpose of the research was to investigate experimentally the interaction of the variables mentioned above with the age of the learner in determining learning and performance. The general plans and results for these two aspects of the program of research are described in Parts I and II of the report. Part I, Adult Age Differences in Cognitive Abilities, Educational Background, and Learning Orientation, discusses adult age differences in cognitive functioning, in educational background, and in learning orientation. Part II, Experimental Studies, discusses effects of performance; and age, stress, and cognitive performance. Four appendixes present Tests Developed & Means and Standard Deviations for Each Age Decade, Sex and Education on Test scores, educational and occupational level; Responses by Age Decade on test items; and Paired Associate Word Lists. (DB)

FINAL REPORT
Project No. 6-1963
Grant No. OEG 1-7-061963-0149

A PROGRAM OF RESEARCH IN ADULT DIFFERENCES IN COGNITIVE PERFORMANCE AND LEARNING: BACKGROUNDS FOR ADULT EDUCATION AND VOCATIONAL RETRAINING.

Rolf H. Monge and Eric F. Gardner
Department of Psychology
Syracuse University
Syracuse, New York 13210

January, 1972

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

Office of Education
Bureau of Research

Final Report

Project No. 6-1963
Grant No. OEG 1-7-061963-0149
A Program of Research in Adult Differences in Cognitive Performance and Learning: Backgrounds for Adult Education and Vocational Retraining.

Rolf H. Monge and Eric F. Gardner

Syracuse University

Syracuse, New York 13210

January, 1972

The research reported herein was performed pursuant to a grant from the Office of Education, U.S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

Office of Education
Bureau of Research

ACKNOWLEDGEMENT

We wish to acknowledge first our debt to the late Dr. Raymond G. Kuhlen, who was (with E.F.G.) an original Principal Investigator and co-author of the proposal that guided this project.

Secondly, we are very grateful to all of the citizens of greater Syracuse and Onondaga County, New York who participated as subjects in this research. We are particularly indebted to Monsignor Thomas J. Costello, Superintendent of Schools for the Roman Catholic Diocese of Syracuse, whose support in our recruiting of participants was invaluable, and to E. Marie Carter, who stimulated many organizations to work with us.

We are also most grateful to the Board, the Staff and especially the members of the Senior Centers of Dade County, Florida who worked so hard for us. We are particularly grateful to Mr. Marvin Schreiber, former Executive Director of Senior Centers, Mr. Glenn B. McKibbin, then the Executive Director, and the Board Presidents of Senior Centers during whose tenure we worked there, Senator Harry P. Cain and Dr. H. Franklin Williams.

And finally, to our staff (listed on next page), our special gratitude for their efforts and support through good times and bad.

R.H.M.
E.F.G.

Staff of the Adult Development Study

(1966 - 1972)

Administrative Assistants

Mary C. Fisher
Susan W. Taylor
Deborah J. Truex

Secretaries

Agnes R. Chamberlain
Carol A. Halligan
Helene S. Torrisi

Research Associates

Harriett D. Blank
David F. Hultsch
Milton F. Nehrke
Mark D. Reckase

Graduate Research Assistants

Georgette Bellucci
Harmon Cohen
J. Kent Davis
Nancy Jane Godfrey
Edward W. Herbert
Mary Ann Lewis
Veronica O'Neill
Thomas R. Owen
Ilene C. Siegler
E. Webb Stacy, Jr.
Bruce Thompson
John E. Trowbridge
Susan L. Van Nostrand
Barrie Wellens

Research Assistants

Marilynn Arkerson
Marguerite De Yaeger
Lytt Gardner
Jonathan A. Haber
Patricia Hanbury
Susan T. Harris
Jonathan Headley
Penny M. Hoyt
Wilson Hunt, Jr.
Deborah A. Jason
Ethel Kuckhoff
Janet C. Markarian
Frances O'Neill
Sharon K. Owen
Kevin L. Roberts
M. Elizabeth Smith
Sybil J. Strough
Joseph Weir

Table of Contents

Introduction

The degree to which the productive abilities of adults of different ages can be utilized in various types of work situations and the degree to which adults can be efficiently retrained for new types of jobs will depend to no small degree upon our understanding of their intellectual resources and learning ability. The desires and apprehensions of learners as they relate to such training and to new learning in general also represent important variables to be considered. In view of the social importance of programs aimed at the retraining and the vocational rehabilitation of workers at all levels and ages and in view of the lack of scientific information relating to the role of personal variables in complex human learning at different adult ages, this five-year program of research in adult learning was undertaken.

While a substantial body of research on adult learning has been conducted since the early reports of Thorndike (1928) much of the research has served primarily to describe age differences in learning and performance as evidenced in laboratory types of tasks (Welford, 1958; Jerome, 1959; Botwinick, 1967). Little research has been done on the more meaningful types of verbal materials, nor has much research been directed toward an analysis of the types of variables, particularly personal variables, that might differentially influence learning and performance during young adulthood, middle age, and the older years. While there have been many studies of age differences in performance on "intelligence" tests, such data are relatively restricted in scope, especially with respect to the sampling of abilities with items appropriate to older adult groups. Little is known regarding the range of educational knowledge and skills (reading comprehension, arithmetic skills, general knowledge) that people of different ages bring to learning tasks. Nor is much known regarding adult age differences in motivation to achieve or in the degree to which adults experience apprehension and anxiety in situations requiring new learning.

One purpose of this program of research was to determine age differences in cognitive abilities with special reference to items selected as suitable for adults of different ages, to survey the educational backgrounds and skills that older and younger adults bring to learning situations, and to study age differences in personality characteristics of a type likely to influence the individual's learning. A second main purpose of the research was to investigate experimentally the interaction of the variables mentioned above with the age of the learner in determining learning and performance.

The general plans and results for these two aspects of the program of research are described in Parts I and II of this report.

I. Adult Age Differences in Cognitive Abilities, Educational Background, and Learning Orientation

The first of the two aspects of this research program involved a determination of adult age differences in a variety of abilities and personal characteristics of presumed importance in learning at different adult ages. The following description will relate to studies of adult age differences in 1) cognitive abilities, 2) educational background, and 3) learning orientation.

Adult Age Differences in Cognitive Functioning

It is obvious that the ability of adults of different ages to profit from educational and training or retraining programs will depend in part on the types and levels of abilities they bring to those tasks. Yet, except possibly for Wechsler's (1958) studies with an intelligence scale designed for use with adults and a study by Demming and Pressey (1957), there has been no systematic or extensive effort to explore adult age differences in cognitive abilities as such abilities are revealed on a wide range of types of individual items or on items appropriate for adults of different ages. Mainly, explorations of intellectual differences during the adult life span have been accomplished by means of tests that have been developed for and normed on young adult populations, such as college students or army selectees. And these studies have focused upon age differences in sub-test and total test scores, with little attention paid to age trends in individual items. The resulting data have serious limitations for an understanding of adult abilities. It is not improbable that tests designed for young adults will prove to be biased against older adults, and thus that the observed decrements in test performance noted with increasing adult age may simply reflect the structure of the test.

Hence, it is likely that some of the seemingly well-established generalizations regarding mental functioning (e.g., those relating to the stability of the functions

measured by vocabulary and information) reflect an over-simplification of the problem. In contrast to stability over age, it is reasonable to expect that rather important age trends would be found to occur, if a wider variety of items were sampled and varying levels of scoring criteria employed.

One major phase of this research project involved the development of new items and tests and the exploration of adult abilities by these means.

Procedures

Test items were generated on the basis of a priori considerations, taking into account the probability that adult age differences would be revealed on different sub-categories of items. One important dimension was the new versus the static aspects of the culture. Other dimensions related to the sampling of various interest domains, e.g., finance, sports, art, transportation, death and disease, and religion. New items were generated to sample these and other domains, including those conventionally employed in tests of ability, and items already in the files of one of the present investigators (EFG) were drawn upon.

The study of cognitive functioning will be presented in four parts. 1) Listing of tests developed, 2) Characteristics and development of these tests, 3) Differences over the age span 20-79 utilizing some of these tests, and 4) Differences over the age span 20-79 focusing on individual item responses.

Tests of Cognitive Abilities Developed

Since most published tests have been designed by educators and psychologists for students from kindergarten through college or by similar professionals employed by the military establishment for young men in their late teens and early twenties, obviously the kinds of situations, backgrounds, and settings used for the items were those familiar to and of interest to young people. In an effort to identify material suitable for tests and test items for adults at all ages, among the various approaches used was one similar to Flanagan's (1949) critical incident method.

Subjects were told that we were trying to obtain information about the types of problems requiring thought that adults face in their daily lives--at home, in their social activities and at work. They were asked to describe in as much detail as possible a problem they had faced recently and which required some thought on their part to solve. These incidents were used in some instances as background material for the construction of cognitive tasks for adults to be used in the experimental studies and in others for setting up tasks suitable for adults for use in the construction of instruments measuring types of cognitive tasks.

Twenty-eight tests have been developed specifically aimed at discerning differential age trends among adults. The most promising among these were refined and used to collect the basic data for this research. These twenty-eight tests plus material obtained by modifying available tests can be grouped into four categories.

1) Forms D-2 and E--Short vocabulary tests of 30 multiple-choice items each suitable for the entire adult age range and called "Word Familiarity Survey--General."

2) Twelve tests in multiple-choice form to test knowledge of specific areas. These are as follows:

   a) Form TR-2--Modes of transportation used at various times in the past 75 years.

   b) Form DD-2--Diseases and other medical matters specific to various adult ages and matters related to death and dying.

   c) Form SL-2--Slang current among different generations.

   d) Form FI-2--Financial matters including stocks and bonds, estate management, wills, and installment buying.

   e) Form RE--Religion

   f) Form NW--New Words, defined as words selected from the 1967 addenda to the 1966 Webster's Unabridged.

   g) Form MN--New Words, defined as words that appeared in the 1966 but not the 1913 edition of Webster's Unabridged.

   h) Form FA--Fashions

i) Form AR--Arts

j) Form PH--Pastimes and hobbies

k) Form SP--Sports

l) Form CA--Current Affairs

3) Fourteen tests designed to sample interests, experience domains, or the ability to follow directions which require the breaking of long established mental sets:

a) Geographical Location

(1) Form F-1--Identifying positions on a grid using letters of the alphabet to represent compass points.

(2) Form F-2--Identifying positions on a grid using numbers to represent compass points.

(3) Form F-3--Identifying positions on a grid using both letters and numbers to identify points within a grid.

b) Word Transformation

(1) Form R-3--Changing position of letters in words using three rules.

(2) Form R-6--Changing position of letters in words using six rules.

c) Arithmetic Sets

(1) Form Q-1--Performing operations using relative size.

Form Q-2--Performing tasks using the four simple arithmetic operations.

d) Information about Common Tasks

e) Coding

f) Ability to Follow Directions Using Recipes

g) Peg-Board Coding

h) Card Games

i) Understanding and Using Time Tables

j) Understanding and Using Road Maps

The contents of these tests include such activities as decoding, arithmetic operations, following rules in the transformation of words, ordering of steps in cooking and logic problems. Many, among which are those involving geographical location and arithmetic, require the subject to break a long established set by reversing or changing the meaning of conventional words and operations.

4) Revision or Adaptation of Available Tests

a) The syllogisms test devised by Lefford (1946) has been updated.

b) Items involving evidence evaluation and spatial reasoning which were constructed for Analysis of Learning Potential Test (Harcourt, Brace, Jovanovich) a differential aptitude test, coauthored by one of the principal investigators (EFG) were revised, put on slides and used to collect data in one of the experiments described later in this report.

c) Concept Mastery Test--Analogy items from L. M. Terman's Concept Mastery Test (Psychological Corporation) were selected on the basis of previous work done by one of the principal investigators (RHM), were put on 2" x 2" slides, and used to collect pilot data for one of the experiments described later in this report.

d) Vocabulary Test--GT, Form 1, I.E.R. Intelligence Scale, CAVD (Institute of Psychological Research, Teachers College, Columbia University, 1962) was used without modification as an "anchor test" in the early stages of the development of some of the above-mentioned instruments.

Characteristics of Tests

Forms D-2 and E--Word Familiarity Survey--General

Beginning with a large pool of items three successive revisions were made using various item analyses, including biserial correlation coefficients on both age and total score (N = 805), resulting in two short, comparable forms with very desirable characteristics designed for adults at all ages. The reliability coefficient was increased to approximately .90 (S = 6.2). This final test, consisting of two comparable

forms of 30 items each, was used as a control measure in connection with learning studies. Item analysis with 1588 subjects of both sexes ranging in age from the late teens to the 90's yielded a mean score of 17.2, standard error of measurement of 0.17, and Kuder-Richardson Formula 20 reliability of 0.90. K-R 20 reliabilities for various subgroups by sex and age varied from .87 to .92. This test was used to collect basic data on a large sample of adults over the age range 20-79.

Form TR-2--Transportation

The original test was composed of 40 items dealing with both old and new modes of transportation. The guiding concept behind the test was that certain old terms were more likely to be known by the older members of the population since those types of transportation are no longer used, while the new transportation terms would be known to both the younger people and the older people. This assumption may not be valid in view of the wide availability of television and the fact that motion pictures from earlier eras are common on television. The old items may yield a measure of long term recall since little reinforcement has been given to the use of these words for many years. Knowledge of the new transportation terms may yield some kind of measure of openness to the environment.

The original form was administered to a sample of teachers taking summer courses at Syracuse University. This first pilot group consisted of N = 162 and obtained a mean of 26.6 with a standard deviation of 4.9, a K-R 20 reliability coefficient of .77. Since this first sample obviously had a high educational level, a second sample of 93 paid adult volunteers from church and social organizations in the Syracuse area with education ranging from grammar school to high school graduation were administered the test. This group had a mean of 28.2, standard deviation = 5.0 and K-R 20 reliability coefficient = .80. Item analysis was also performed, which gave among other things information about the relationship of the items to age. On the basis of these data the initial form was revised to a shorter, 23-item test labeled form TR-2. The new form was tried out on a fresh sample of paid adult volunteer subjects with varying educational backgrounds. An item analysis was performed to determine the success of the revision. The data are as follows: N = 120, mean - 15.28, standard deviation = 3.47, K-R 20 reliability coefficient = .71.

The test was then used to collect data from a large sample over the age range from 20 to 79.

Form DD-2--Death and Disease

The original test consisted of 40 items based on the concept that older subjects with their greater years of experience, concern and interest would be more knowledgeable about items involving death and disease than very young people. The initial pilot data were obtained from 164 teachers in service who were taking courses at a Syracuse University summer session. Although this group was far from representative of the adult population for which this test was designed, it had a fairly high proportion of part-time students who were older than the normal graduate student population and who did not attend college during the regular school year. The test data are as follows: N = 164, mean = 32.3, standard deviation = 4.7, K=R 20 reliability coefficient = .78. The test was obviously too easy for this group of subjects since the lowest score was 19. Also, many of the items had poor item statistics. Before a revision was undertaken additional data from a more representative population was required, so the test was administered to 94 adult subjects who were paid volunteers from church and social organizations in the Syracuse area with educational backgrounds ranging from grammar school to high school graduation. N = 94, mean = 31.9, standard deviation = 5.5, K-R 20 reliability coefficient = .84. An analysis was also done by age with item analyses being performed on two groups, those below 30 years old and those 30 and above. On the basis of these data the initial form was revised by deleting poor items, changing distractors, and adding new items. The result was a 20-item test labeled form DD-2. Form DD-2 was administered to 110 adults. These were paid volunteers with educational backgrounds from grammar school to high school graduation. The statistics are as follows: N = 110, mean = 16.66, standard deviation = 2.87, K-R 20 reliability coefficient = .73. This test was used to collect data from a large sample over the age range 20 to 79.

Form SL-2--Slang

The initial slang test consisted of 40 multiple-choice items based on words selected from dictionaries of slang (Partridge, 1950; Weingarton, 1954; Wentworth, 1960), with a

number of words chosen to represent dates of initial appearance in each decade from 1900 to the present. This test is of particular interest because of the degree of objectivity that it was possible to achieve in constructing items which sampled the contents of slang dictionaries by decade of appearance. Pilot data were obtained initially from a sample of 156 subjects most of whom were teachers in service studying part-time at Syracuse University. Mean score = 26.4, S = 4.25 and K-R 20 = .67. Since this group had a very high education level it was administered to an additional 150 paid volunteers who had educational backgrounds varying from some attendance at high school to high school graduation. The mean education level was 11.5 years of schooling. A detailed item analysis was performed using both total score and age as criterion measures. As a result of this analysis a new 25-item form (SL=2) was constructed. This test was administered to an additional group of 115 paid adult volunteers with educational background ranging from grammar school to high school. The test appeared appropriate for this adult population and was used to collect basic data on a large sample of adults over the age range 70 through 79.

Form FI-2--Finance

This test, which initially consisted of 40 items, was administered in a pilot study to 164 subjects most of whom were teachers in service taking summer school courses at Syracuse University. The mean score was 31 with a standard deviation of 5.2 and a K-R 20 reliability of .80. Since the test appeared rather easy for this group, which had a very high educational level, it was administered to 141 paid volunteers from the Syracuse area with educational backgrounds which varied from some high school study to high school graduation. The mean education was 11.5 years of schooling. For this group the mean score = 33, standard deviation = 4.5, and K-R 20 reliability coefficient = .79. An analysis was also made by age. As a result of this analysis a number of the easiest items were deleted and a number of items revised. A new 20-item test called form FI-2 was developed. This revised form was administered to 100 paid adult volunteers with educational backgrounds ranging from grammar school to high school graduation. The summary data are as follows: N = 107, mean = 16.1, standard deviation = 3.2, K-R 20 = .78. The test appeared relatively easy for this adult population; however, the reliability remained close to .80 despite the fact that

the test was reduced by 50 per cent in number of items. This test was used to collect basic data on a large sample of adults over the age range from 20 through 79.

Form RE--Religion

This test, consisting of 40 items, was administered to a group of 345 subjects. These consisted of some teachers in service taking summer session school courses at Syracuse University and some paid volunteers. The subjects were divided into two groups, those 30 years old and under and those 31 and over. The groups were of comparable size with N = 128 for the first group and N = 117 for the second. The means were 25.9 and 26.2, while the standard deviations were 5.8 and 6.2, respectively. The K-R 20 reliability coefficients were .81 and .84, respectively. Since this test was constructed with the expectation of obtaining age differences, an item analysis was performed to determine whether or not certain items were related to age. The items were classified into two groups according to whether or not the difficulty of the item increased with age or decreased with age. The two sets of items were studied to see whether there were any obvious factors related to age. None was found. Upon further analysis it appeared that the items were highly intellectual in nature, many asking questions about Islam, Shintoism and other aspects of religion that were liekly to be highly correlated with educational level rather than age. Since this test did not show as much promise as some of the others it was decided not to continue with additional revisions.

Form NW--New Words

One category in which it seemed reasonable to expect adult age differences was the extent to which adults of various ages would be familiar with new words appearing in the dictionary. Our first effort was to take a 20 per cent sample of the thousand words that were published in 1967 as addenda to the 1966 edition of Webster's Third New International Dictionary. A test of 56 items was constructed, administered to 156 subjects, and comparisons were made between the performance of subjects below 30 years old and those above. Mean performance of the two age groups was comparable although the older subjects did slightly better. This test did not seem to be as promising as some of the others and so it was dropped

from the battery. It did however have K-R 20 reliability coefficients of .76 and .78 and mean scores of 34.5 and 36.3 for the two age groups.

Form MN--New Words

As a result of the data obtained on Form NW, as just described, we decided to discontinue work on that particular test and to use another approach to obtain an instrument based on new words entering the vocabulary. This new approach involved selecting words that were not included in the 1913 Webster's New International Dictionary but which did appear in the 1966 edition. There are so many such words that we used a random sampling procedure in order to select a sample of words that appeared in the 1966 edition but did not appear in the 1913 edition. The sampling procedure resulted in the identification of approximately 3,000 words, from which 200 were selected at random for pretesting purposes. Pretesting was necessary since many of these words were either scientific, very esoteric, or of low frequency usage. They were presented to a group of 100 subjects who were asked to rate the words according to familiarity. On the basis of these responses 48 items were selected which were not specific to any one field. Pilot data have been collected for 29 middle-aged subjects (30-50) and 52 college nursing students. A comparison of the scores for these two groups is as follows: The 30 adults obtained a mean = 23.3 and standard deviation = 5.1 items correct, while the 55 student nurses got a mean = 22.3 and standard deviation of 5.4 items.

This test is obviously very difficult and a detailed examination of the items indicated that this test, although possibly of interest for testing highly educated adults, would not be suitable for the average person.

Form FA--Fashions

A 40-item test on fashions was constructed and pilot data from 100 subjects were obtained. As a result of analyzing these data and an editorial review of the items it was considered that this test was not likely to be as effective as some of the others and therefore was dropped.

Form AR--Arts

A 40-item test on the arts was developed and data were obtained from 110 subjects. After comparing these data and the content of the items with the Arts and Humanities Test of the high school Stanford Achievement Test Battery, it was concluded that the Stanford test was sufficiently superior to make it undesirable to spend the necessary time to develop this test to equivalent excellence.

Form PH--Pastimes and Hobbies

A 40-item test on pastimes and hobbies was constructed, administered to 90 subjects, and the data analyzed. This test also did not seem to show as much promise as some of the others and was not refined.

Form SP--Sports

A 40-item test on sports was also developed and was administered to 115 subjects. Upon analysis of the content it seemed obvious that these items would be likely to be less useful in showing differences over the age span than those in some of the other tests. It was not developed further.

Form CA--Current Affairs

A test of current affairs consisting of 40 items was devised, edited, and administered to a sample of 120 subjects. Although the test functioned reasonably well it was obvious that many of the items would become outdated shortly and would be relatively useless for a study extending over as long a period of time as this one. It also would have low utility in the future. Hence it was not revised.

Tests on Interests, Experience and Following Directions

The following fourteen tests designed to sample interests, experience domains or the ability to follow directions which require the breaking of long-established mental sets were refined and pilot data obtained. Our pilot data showed very little difference in performance

between groups of middle-aged adults and groups of college nursing students. Some of these tests show considerable promise for additional research. Our subject pool and resources did not permit these tests to be administered to our large cross-sectional sample of age groups.

Geographical Location (Forms F-1, F-2, and F-3)

Three 20-item tests were developed involving geographical location. Each required the subject to follow detailed instructions to identify elements related to those locations. The purpose was to determine the extent to which it was possible to break a set which had been established over one's lifetime. The same geographical layout was used for each of the three forms. However, the geographical directions did not correspond to those on a conventional map. The differences between these tests involved differing instructions which required subjects to break their accustomed mental set in identifying specified locations.

The differences in the three sets of directions are as follows: In Form F-1 the compass points were identified by the letters N, S, E and W, but these letters did not correspond with the first letters of the points of the compass. Instructions were to identify positions within a grid relative to the letters used on the grid to identify the different points of the compass. The directions for Form F-2 required the subject to associate the four compass points with numbers rather than with letters of the alphabet. Form F-3 utilizes the same grid but the directions in this case involve the use of both a letter and a number to identify points within the grid.

To be more specific, in Form F-1 the answer NORTH is identified with the letter "W". In Form F-2 the answer NORTH is identified with the number 3. In Form F-3 the answer NORTH is identified with the letter (S) and the number (1). This task requires a break in set between tests as well as a break in set within tests. The break in set within tests is related to past history and the traditional means of identifying a point on a map as previously learned either in geography or map reading.

For each of these tests pilot data has been collected from a group of 33 middle-aged adults (35-50 years old)

and a second group consisted of 54 college-aged nurses. The means and standard deviations for the middle-aged adults were: Form F-1--Mean = 17.9, SD = 5.8, Form F-2--Mean = 19.5, SD = 1.1, and Form F-3--Mean = 19.3, SD = 1.2. The corresponding data for the college nursing students were: Form F-1--Mean = 18.2, SD = 5.0, Form F-2--Mean = 18.8, SD = 3.2, and Form F-3--Mean = 19.3, SD = 3.3.

Since the time allowed for testing has been shown in other studies to be an important variable in results obtained from adults, no time limits were set for either group. The results were rather disappointing since the tests apparently were too easy to show much variability.

Word Transformation

As another effort to determine cognitive flexibility in viewing a particular situation tests Form R-3 and Form R-6 were developed. These are tests which require the letters in a word to be moved to form additional words according to certain rules. The difference between the two is that while both tests require the subject to follow directions Form R-3 has three rules that are available for use whereas there are six rules for Form R-6. For each of these tests we collected pilot data for 33 middle-aged (35-50 years old) subjects and from 52 college nursing students. Unlimited time was permitted for these tests also. The middle-aged adults obtained the following results: Form R-3--Mean = 19.4, SD = 1.4, and Form R-6--Mean = 15.7, SD = 8.2. The data for the nurses showed: Form R-3--Mean = 19.4, SD = 1.5, and Form R-6--Mean = 15.6, and SD = 4.1.

Here again the mean performances of the two groups were very similar.

Arithmetic Sets

Two tests Form Q-1 and Form Q-2 were designed to require the subject to break an accustomed set using quantitative operations. Form Q-1 involved interchanging the use of the words "more," "less," "equal" and then describing a quantitative relationship using the transposed meanings. Form Q-2 involved using the words "add," "subtract," "multiply," "divide" but where these words were given the meaning of an operation which was different from that taught

and used during the person's lifetime. For example, the process of addition specifies directions which require that the student subtract. In like manner in test Form Q-1 if the answer is "less than 50" the directions specify that the subject should answer "more." Pilot data for this test involves 32 adults between the ages of 35 and 50 and 52 college nursing students. For the middle-aged adults the data showed: Form Q-1--Mean = 9.3, SD = .75, and Form Q-2--Mean = 19.3, SD = 1.3. For the nurses the data showed: Form Q-1--Mean = 19.3, SD = 1.7, and Form Q-2--Mean = 19.3, SD = 1.5.

Here again there is little difference in performance for these two different age groups and without a time limit the test is too easy.

Information About Common Tasks
Set Up In A Matching Form

The purpose of this test was to determine whether there are changes over age when people are asked questions about specific situations that they commonly experience. For example, "Clean surface thoroughly before applying surface coat" in Column A would be associated most logically with "house painting" in column B. There are 10 situations and 15 foils. We have data from a pilot study using 36 middle-aged subjects between the ages of 35 and 50 and 52 college nursing students. The mean and standard deviation for the middle-aged adults are 9.5 and .75 respectively. The corresponding statistics for the college nursing students are 9.1 and .8 respectively. This test when untimed was too easy for adult subjects.

Coding

This test contains three different codes where code letters are substituted for the usual letters in a printed passage. These three codes are of differing degrees of complexity. The purpose of this test is to determine whether or not there are age differences and changes in flexibility in using codes of the kind specified in the test. Subjects were 11 middle-aged subjects and 52 college nursing students. The mean and standard deviation for the adults were: Mean = 18.8, SD = 1.4 while the corresponding statistics

for the nurses were: Mean = 18.9, SD = 1.3. Again there is essentially no difference between the groups on this untimed test.

Using Recipes As A Test For
Ability To Follow Directions

This test is less one of following directions than it is ability to order steps in logical sequence using recipes as the vehicle. The recipes varied from three steps to five. We have collected data from 14 middle-aged subjects (35 to 50 years old) and 52 college nursing students. The mean and standard deviation for the middle-aged adults were 24.7 and 6.7 respectively. The corresponding statistics for the nurses were 24.5 and 7.0 respectively. The untimed means of both groups are similar. This test would be of interest if tried out on a male sample.

Peg-Board Coding

This test was an attempt to determine the subject's ability to follow directions by inserting various sized pegs in a peg board containing various sized holes. Data were obtained from 11 middle-aged subjects (35-50) and 52 college women nurses. These subjects were used to conduct a pilot study to determine whether or not such a test would be useful for our purposes. The middle-aged adults obtained a mean = 58.0 with a SD = 2.0. The nurses had a mean = 55.8 with a SD = 2.1.

Card Games

A test which was based upon assigning various numbers of points to hands dealt from a regular deck of playing cards was devised. A series of rules was set up involving high cards, short suits, lengths of cards, combination of cards, etc. Upon editorial review and tryout with a number of subjects it became obvious that those subjects who were bridge players would do well in such a test and those who were not would do relatively poorly. Hence this test was abandoned.

Understanding and Using Timetables

A 10-item test which involved answering a series of questions requiring the understanding and use of a railroad timetable was developed. This type of item is useful and is fairly common in achievement tests in the social studies field. It was decided that such items could be obtained if needed from published tests and therefore it was not desirable to spend the time in developing such items.

Understanding and Using Road Maps

A short seven-item test was developed using a road map. Although this kind of item has merit its deficiencies were considered to be somewhat comparable to the timetable items and therefore the idea was not developed.

Differences in Cognitive Functioning Ages 20-79

Introduction

Since one of the major objectives of this research was to investigate two of the seemingly well-established generalizations regarding change in mental functioning with age--namely, attaining maximum performance at an early age and maintaining relative stability or minimum decline thereafter, on functions measured by vocabulary and information--the optimum procedure obviously would require testing the largest sample with the maximum number of tests and providing in-depth analysis of test scores and items. However, since the subject pool and funds available were limited, we were forced to decide how far certain instruments should be developed and how much data should be collected with each rather than to obtain as much data as we would have liked utilizing all of them.

Data were collected by age decade from a large sample of subjects from the 20's through the 70's using the following five instruments: D-2 (Word Familiarity Survey--General), TR-2 (Transportation, DD-2 (Death and Disease), SL-2 (Slang) and FI-2 (Finance). It was anticipated that the scores on these instruments would show differential age trends, sex trends, and education trends. It was further anticipated

that a more detailed analysis by individual item response would give further insights into changes in cognitive performance over age. This latter analysis will be presented in the next section.

One of the major difficulties in obtaining meaningful data to study changes over age involves the dilemma in which the experimenter finds himself in that neither longitudinal nor cross-sectional studies alone can provide conclusive interpretation of observed age changes. This issue has been discussed in great detail by several investigators (Kuhlen, 1963; Damon, 1965; Schaie, 1965). One of the major factors in interpreting data related to age has been the fact that not only are there different cultural and environmental situations over one's life span but also the amount of education acquired by people of different ages varies systematically and drastically. Since education is such an important factor in dealing with data from the kinds of instruments we have used we have presented both raw scores obtained on the tests and raw scores adjusted for education by covariance.

The first fifteen tables in appendix B show the data from which Figures 1-A through 5 were constructed. It also gives information about the characteristics of the sample used for each of the measures for each decade.

Sample

The present investigators were well aware of the problems of obtaining the cooperation of an appropriate sample of adults of different ages. It was desirable to have a reasonably representative sample of the general population, or some defined segments of the population, and to have a sample that was comparable across age with respect to variables related to performance on the criterion. This is exceedingly difficult to accomplish in cross-sectional studies of the type here proposed. Yet a cross-sectional approach in the present instance is not only the only feasible approach to sampling, but is, in studies of this type, the design of choice. In problems relating to adult education (whether involving general education or more specific types of retraining) the focus must be upon differences between existing age groups, since it is with these differences that the adult educator must cope.

Since it was necessary to administer these items to subjects in groups of reasonable size and under relatively formal group-testing procedures in general, intact groups were studied. Intact groups of adults in social, church, PTA, local organizations and industrial establishments were obtained. These settings select from a wide sample of ages, and probably with minimal bias with respect to various age groups.

No attempt was made to obtain a sample that was representative geographically. It was considered that the results would be more meaningful if the sample were restricted to Central New York where groups could be selected whose characteristics were well known. The one exception was due to our need for a large sample of the adult population over 60 years of age. For this purpose several testing sessions were held at the Dade County, Florida Senior Centers. The responses of these groups were comparable to those of similar subjects of the same age obtained from Central New York.

In order to make comparisons across age decades more meaningful detailed information was obtained from a brief biographical survey on age, sex, amount of education, occupational level (for married women the occupation of the husband was used) and general intellectual ability as measured by a short vocabulary test. Educational level was rated from 1 to 9 on the following scale: 1 = 5th grade or less; 2 = 6th to 8th grade; 3 = 9th to 11th grade; 4 = high school equivalency certificate; 5 = high school diploma; 6 = post-high school training other than college, 7 = 1-3 years of college; 8 = college graduate, and 9 = post-baccalaureate study. Occupational level ratings were adapted from U.S. Bureau of the Census (1960) classifications. Briefly, these levels may be characterized as follows: 0 = long-term unemployed, 1 = laborers, 2 = service workers, except private household, 3 = private household workers, 4 = operatives and kindred workers (e.g., apprentices), 5 = craftsmen, foremen, and kindred workers, 6 = sales workers, 7 = clerical and kindred workers, 8 = managers, officials, proprietors, and farmers and farm managers, and 9 = professional, technical, and kindred workers. The subjects were recruited by offering to pay the treasury of the organization (such as church groups, social clubs, PTA, etc.) a per capita fee for obtaining at least 80 per cent of their membership as participants. These groups were selected to give us the age, sex, and education levels needed for the decade to decade comparison.

Samples drawn from the same population employed in this phase of the study were also employed in the phases described later relating to age differences in educational background, learning orientation, and the experiments described in the second part of this report. In a great many cases, the same individuals participated in several phases of this project.

Results

Form D-2 (Word Familiarity Survey)

The mean scores on Form D-2 are presented by age decade separately for males and females so that differences by sex over the age span 20-79 could be observed. As can be seen in Figure 1A, for both males and females there is an initial increase in score with a maximum mean score occurring in the decade 50-60 ("55" in the graph). Thereafter the mean scores for both sexes decline.

Since this is a cross-sectional sample in which the subjects are representative of their age group and are not equated with respect to education, an analysis was performed in which the means of each age-sex group were adjusted by covariance to remove the effects of differing amounts of education. The results given in Figure 1A show that even after the effect of education has been removed there exists a similar pattern with the maximum score being obtained by the female group aged 50-59 and the male group aged 60-69 (plotted at 55 and 65, respectively, in the graph).

The results of a third analysis are presented in Figure 1B where the data are grouped by age decade and education only. The high education group contained those subjects, male or female, who had graduated from high school and who had had at least some formal post-high school education. The low education group consisted of those subjects who had obtained a high school education or less. Figure 1B shows the same general pattern when the subjects are dichotomized by education as was presented in Figure 1A. The age groups increase in score with a maximum score obtained by the 50-59 year old groups (both high education and low education). The scores decrease for the next two age groups 65 (60-69) and 75 (70-79) although the scores of the two groups in the 70s are not as low as the 20-29 year old groups.

Figure 1 Performance on Form D-2 (Word Familiarity Survey - General) as a function of age, sex, and education.

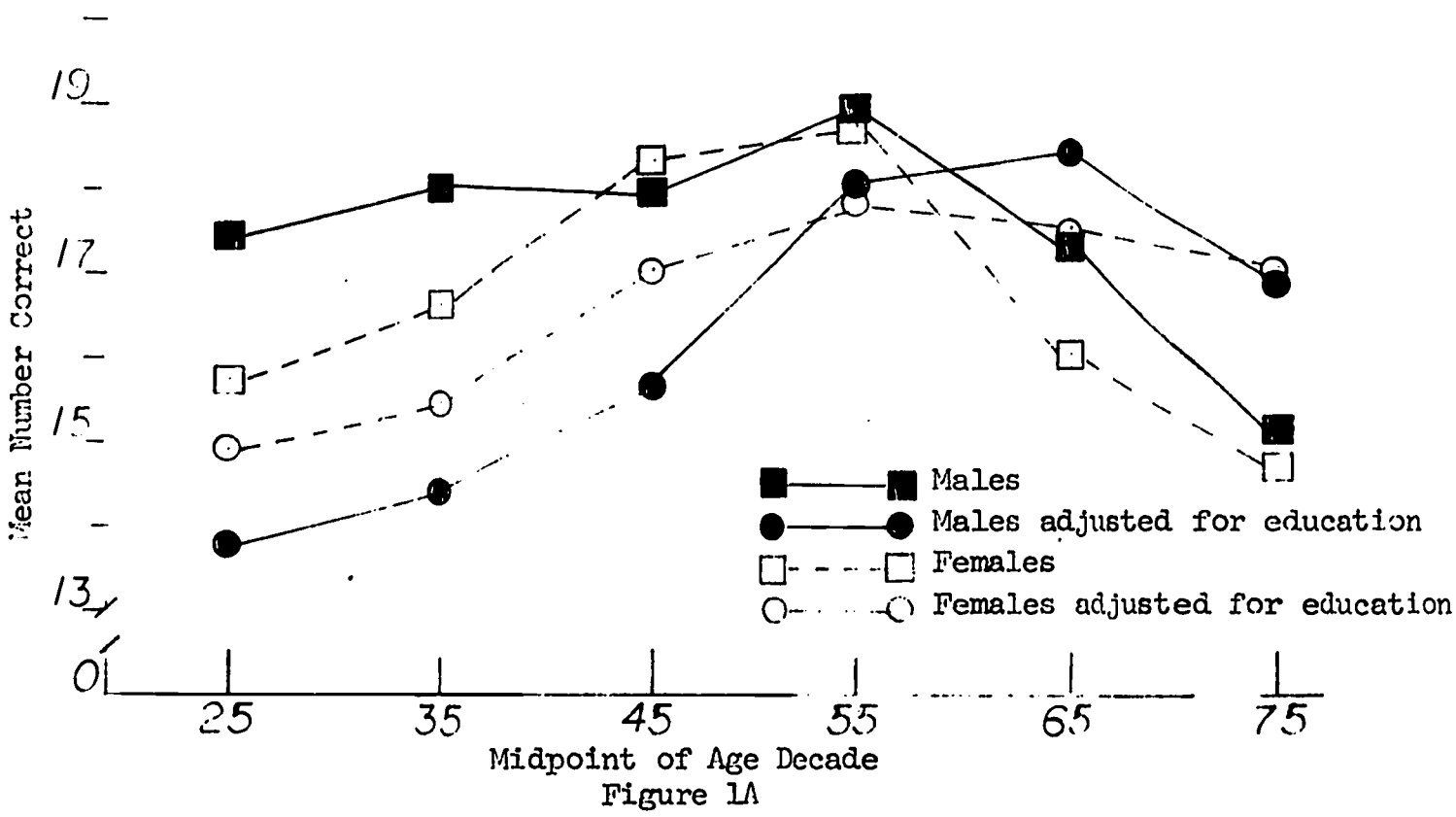


Figure 1A

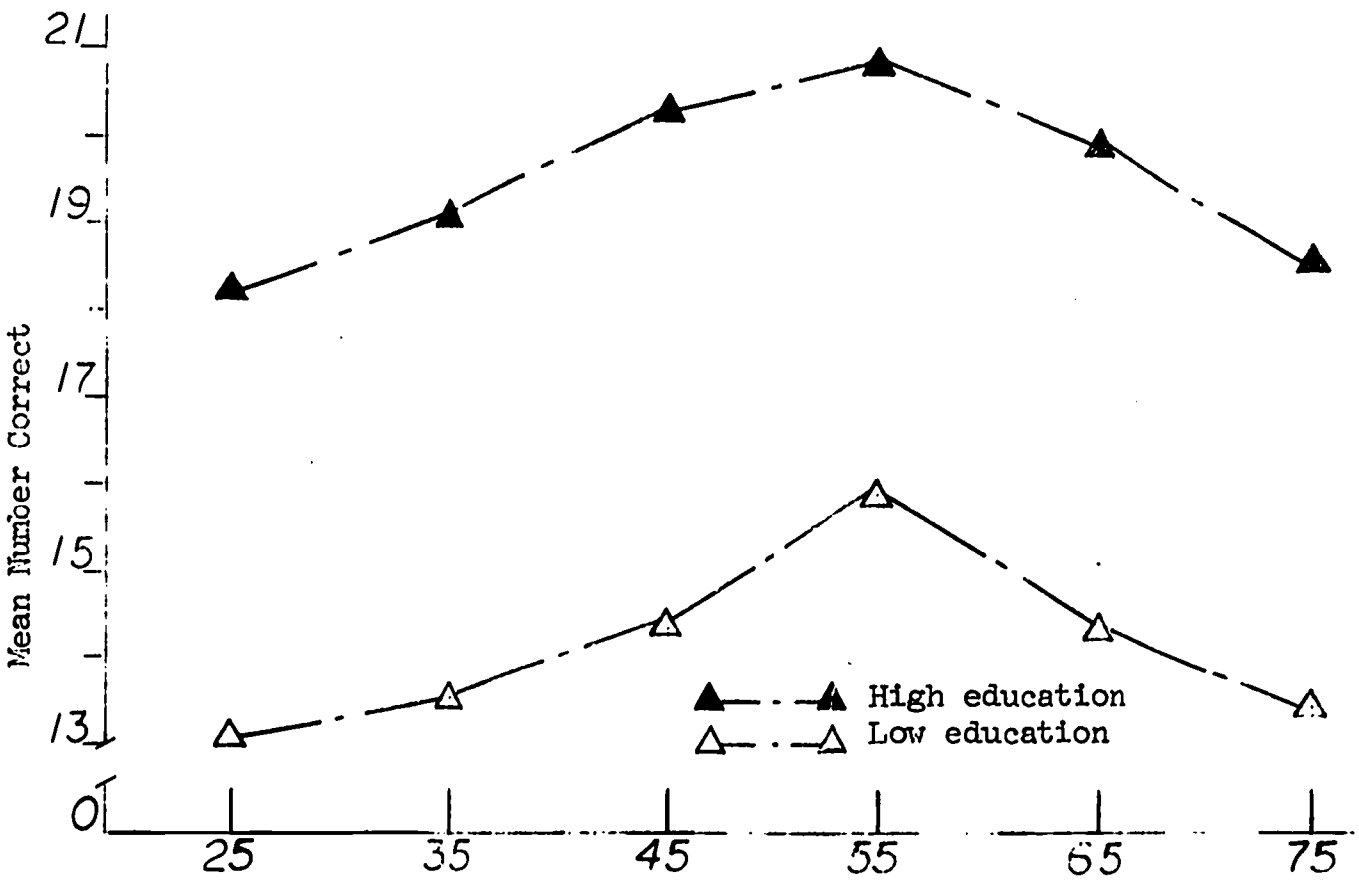


Figure 1B

Form TR-2

The mean scores on the test measuring knowledge about modes of transportation showed that for males there was an immediate increase for the 30-39 year old males over the 20-29 year old males. The successive male age groups remained at about the same level until 60-69 when the scores of the 70-79 year olds declined. The female groups had increasingly large mean scores to the 50s after which the mean scores declined. See Figure 2A.

When the mean scores of the various age groups were adjusted by covariance for differences in education the adjusted mean scores of both males and females were a maximum in the 50s. See Figure 2A.

A comparison of differences by age decade of the data dichotomized into high and low education groups showed the maximum mean score for higher education group was that of the 40-49 year old group while for the lower education group the 50-59 year olds had the largest mean score. See Figure 2B.

Also of interest is the fact that the male age groups scored consistently higher than the female group over the entire age range (20-79).

Form DD-2

The mean scores for successive age groups on the test measuring knowledge about issues related to death and disease showed that for males the trend was not consistent but did attain a maximum value for the 50-69 year old group, after which the mean score declined for the 70-79 year olds. The female groups obtained successively larger mean scores up through the 50-59 year old group, after which the mean scores of the older groups declined. See Figure 3A.

When the mean scores of the various age groups were adjusted by covariance for differences in education, an interesting but not unreasonable result occurred. The pattern of scores for the female groups was very similar to that of their unadjusted mean scores with the maximum mean score again being obtained by the 50-59 year old group. The males by contrast, with the exception of a reversal between the 30-39

Figure 2 Performance on Form TR-2 (Transportation) as a function of age, sex, and education.

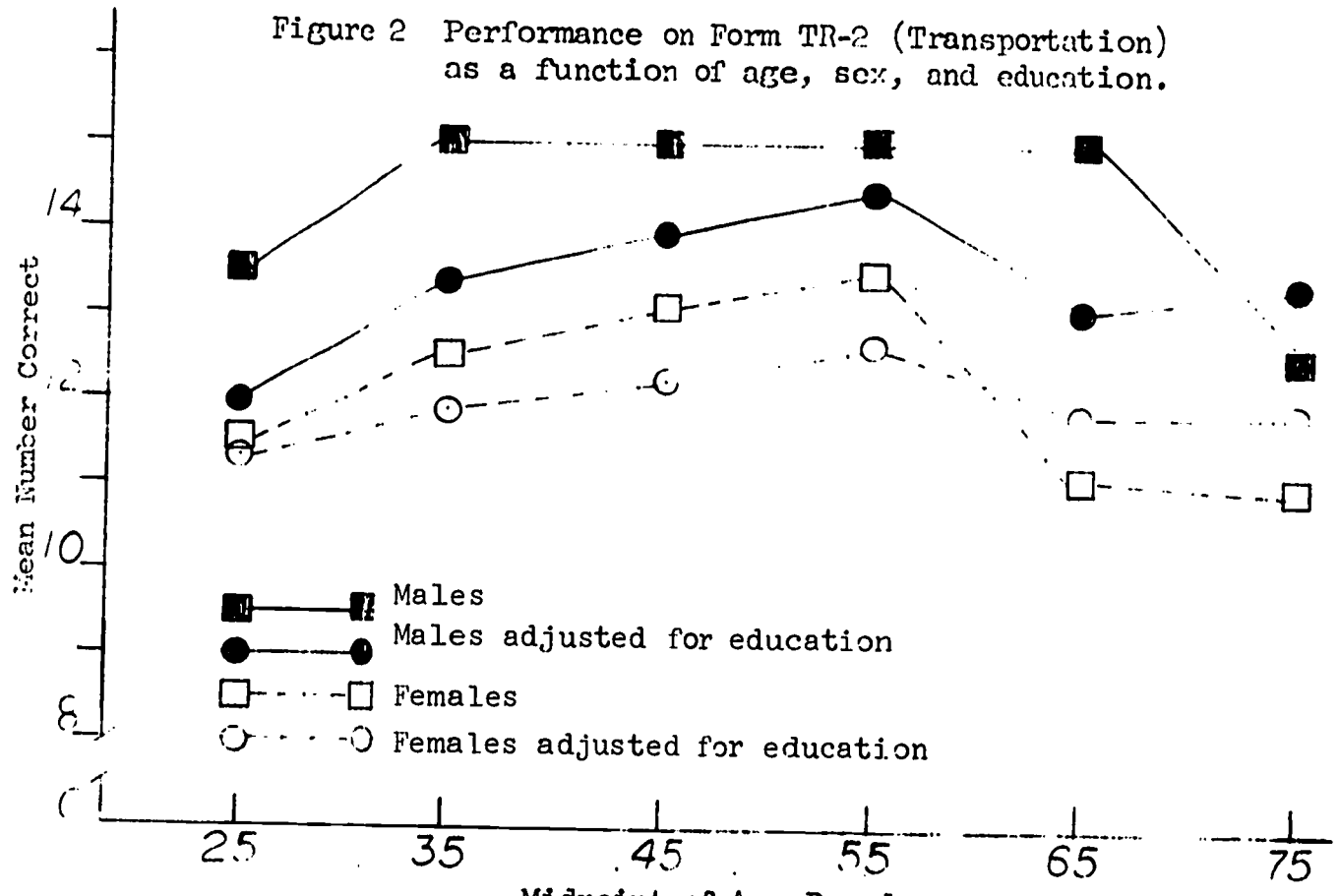


Figure 2A

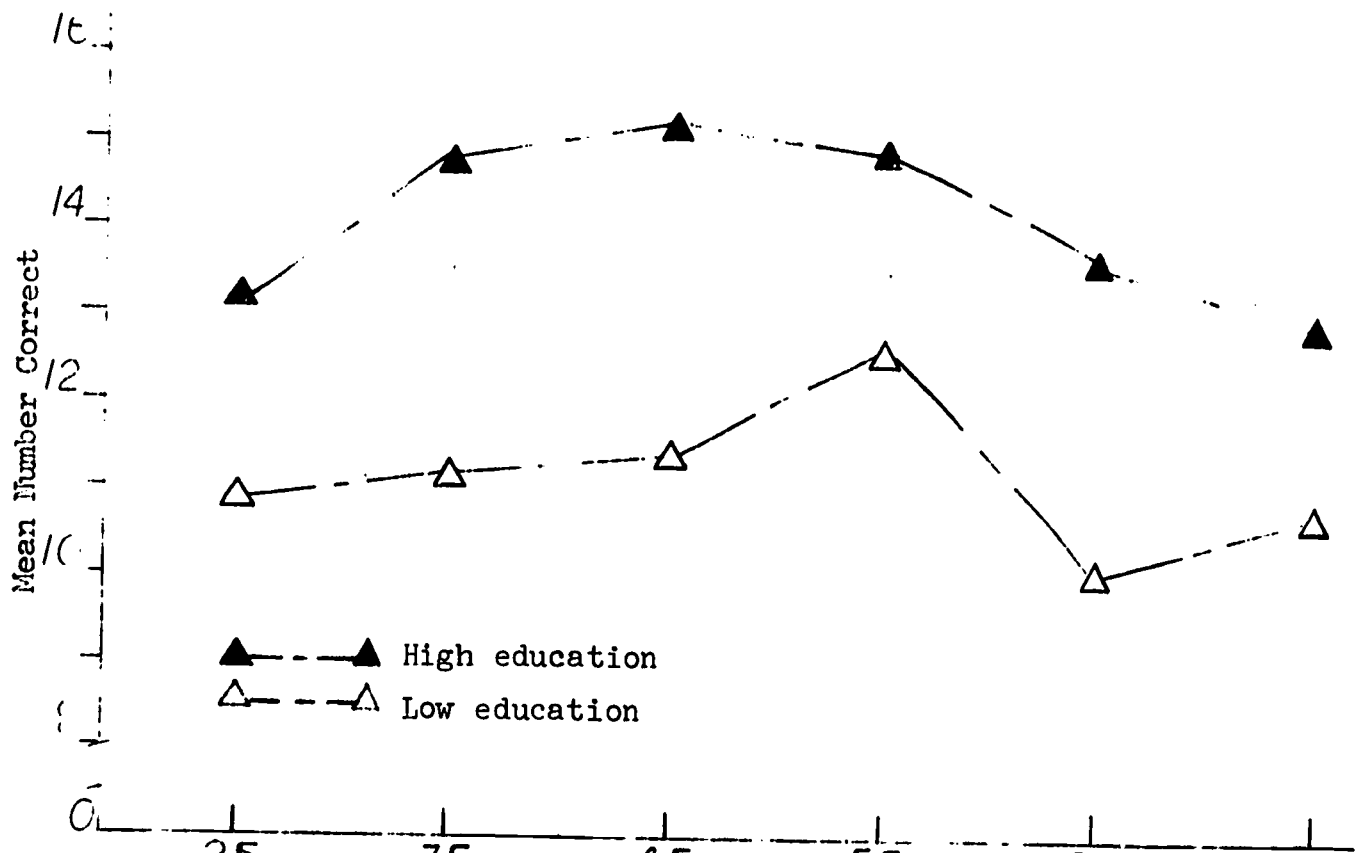


Figure 2B

year old group and the 40-49 year old group, had increasing adjusted mean scores throughout the entire age range with the maximum score obtained by the 70-79 year old group. See Figure 3A.

A comparison of difference by age decade of the data dichotomized into high and low education groups showed the maximum mean score for both education groups was obtained by the 50-59 year olds. See Figure 3B.

In contrast with the results obtained on knowledge about modes of transportation, the female mean scores were consistently higher than the male mean scores until the 60-69 year old groups were reached, at which time the mean scores of the corresponding sex group were very similar. See Figure 3A.

Form SL-2

The mean scores for successive age groups on the test measuring knowledge about old and current slang words shows that the pattern for males and females is very similar. The maximum mean scores were obtained by both 40-49 year old groups. Thereafter, one can observe a consistent decline for successive age groups. Of interest is the fact that mean scores for the 70-79 year old males and females are similar to each other but considerably below the scores for the 20-29 year olds. See Figure 4A.

When the mean scores of the various female age groups were adjusted by covariance for differences in education, the same general pattern occurred as was found for the unadjusted means. The adjusted mean scores of the various male age groups showed a maximum value for the 60-69 year old group in contrast to the maximum unadjusted mean score belonging to the 40-49 male group. We have no explanation for this result. See Figure 4A.

A comparison of difference by age decade of the data dichotomized into high and low education groups showed the maximum mean score for both education groups was obtained by the 40-49 year olds for both education levels. See Figure 4B.

Figure 3 Performance on Form DD-2 (Death and Disease) as a function of age, sex, and education.

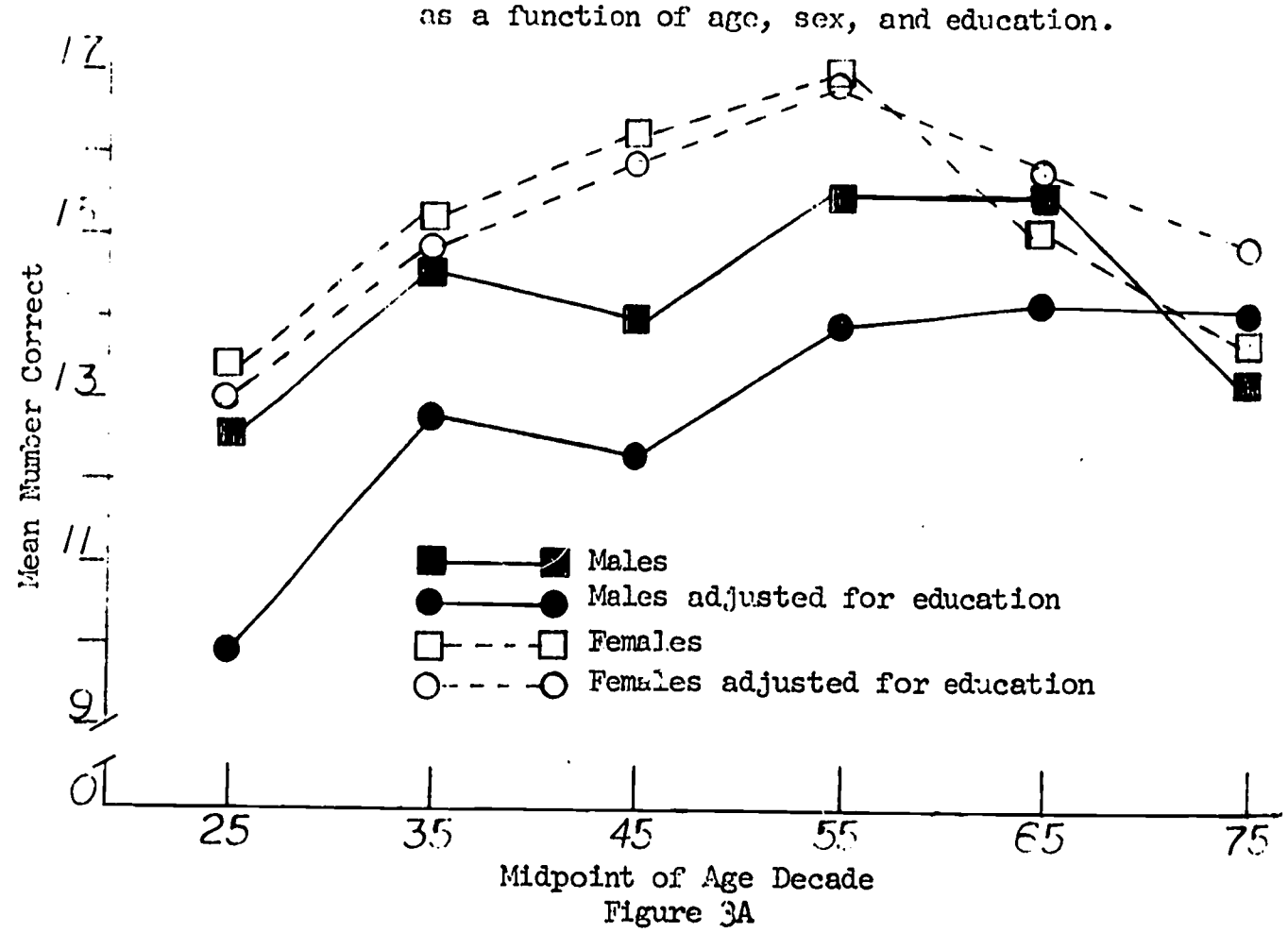


Figure 3A

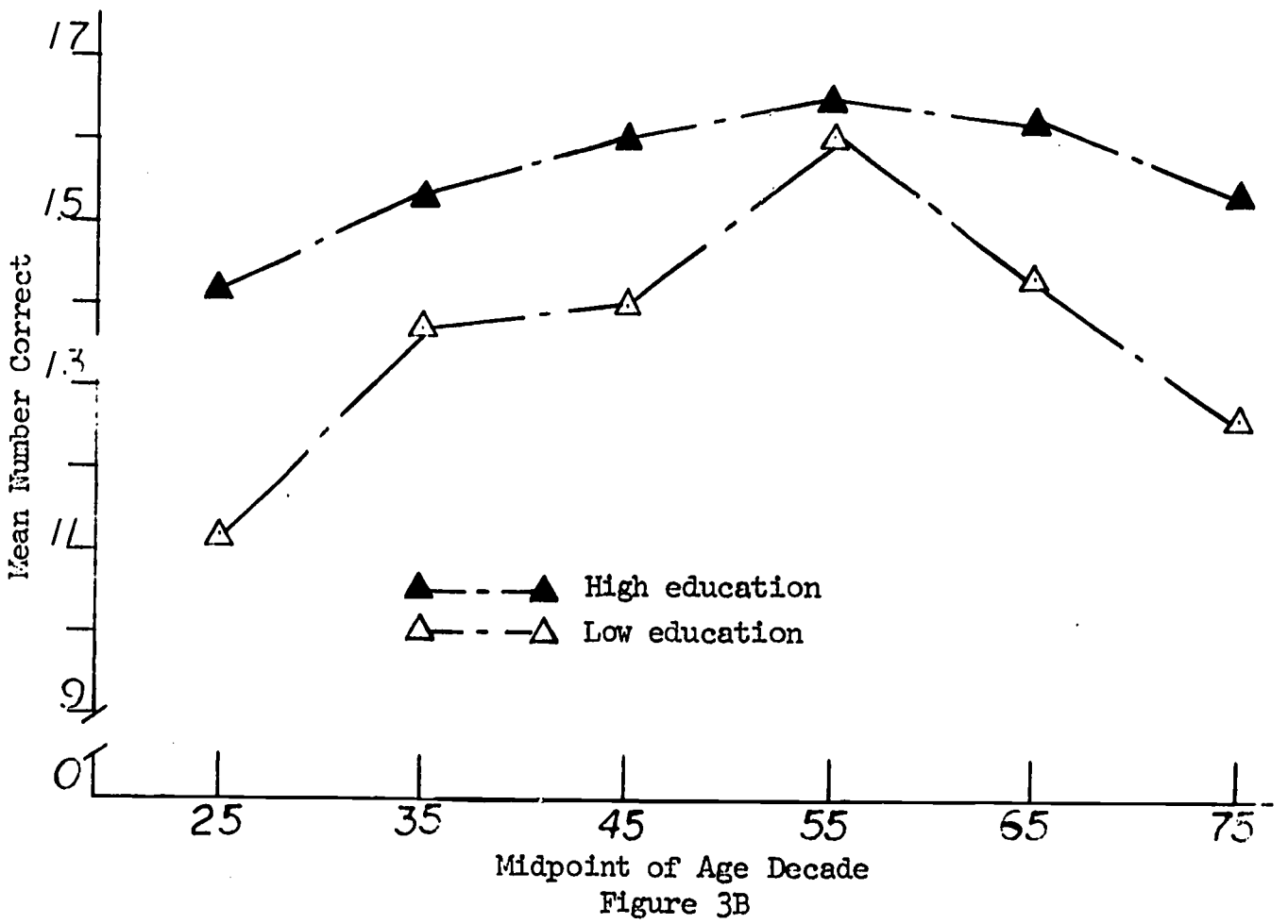


Figure 3B

Figure 4 Performance on Form SL-2 (Slang)
as a function of age, sex, and education.

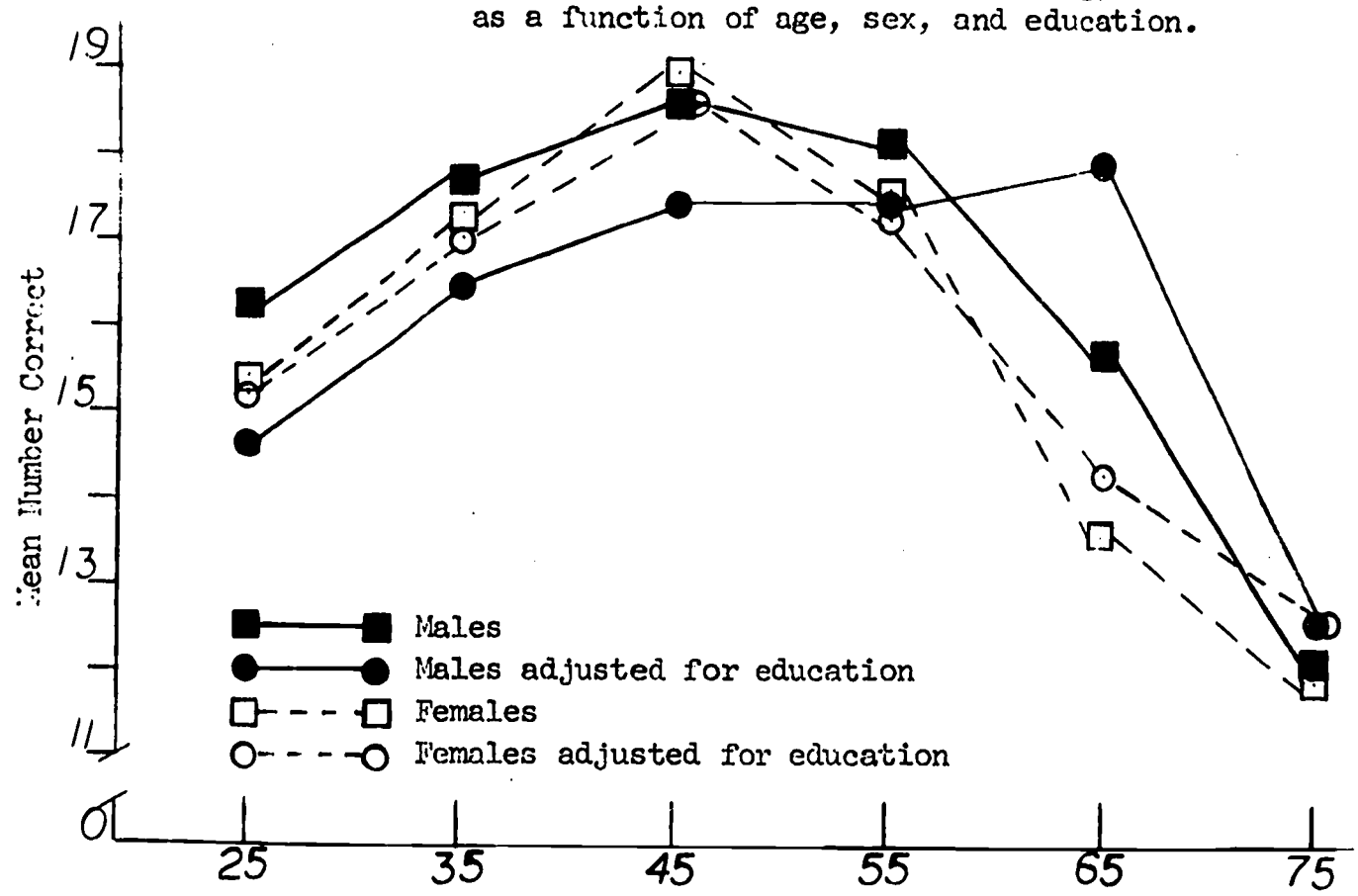


Figure 4A

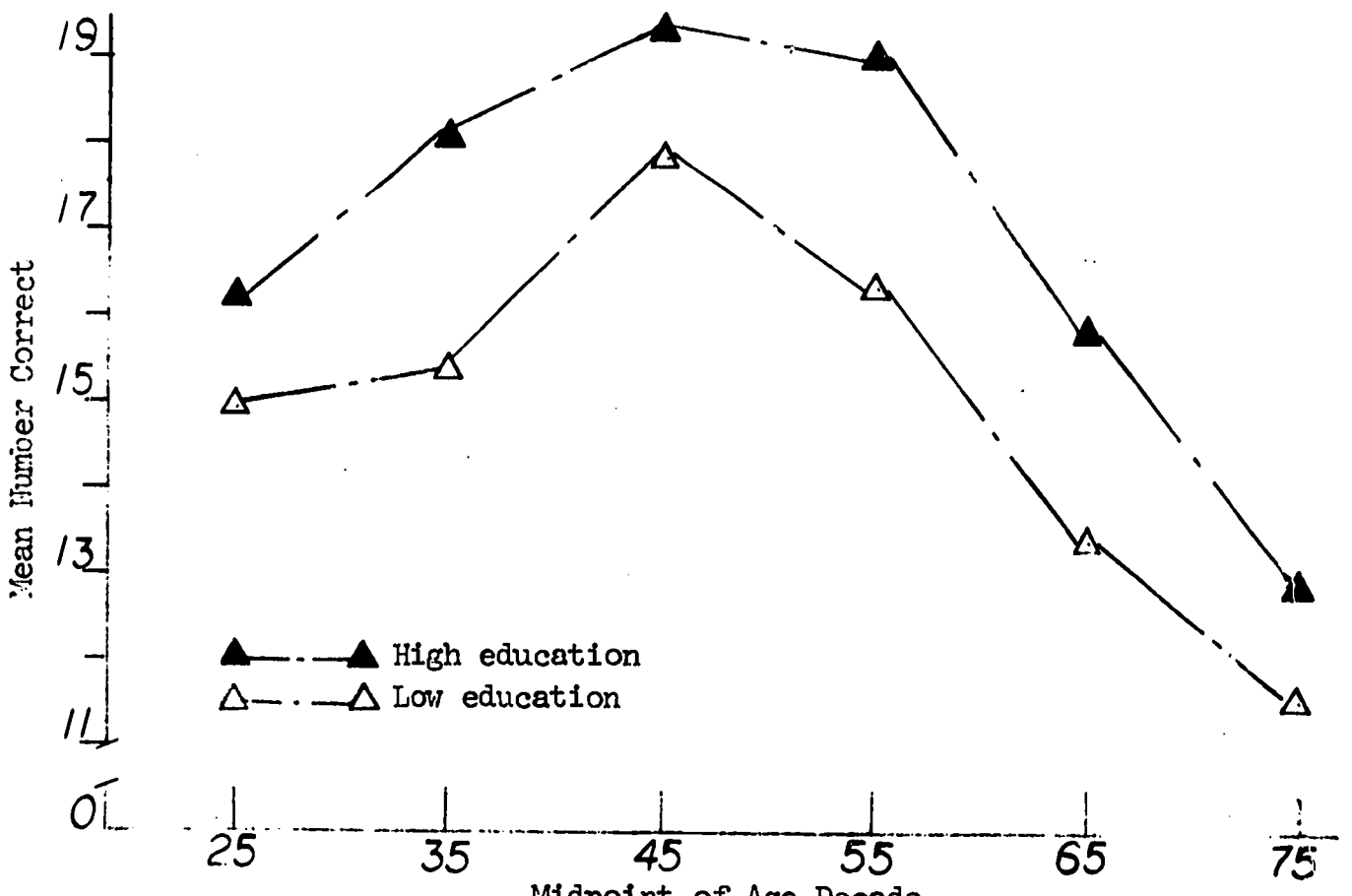


Figure 4B

Form FI-2

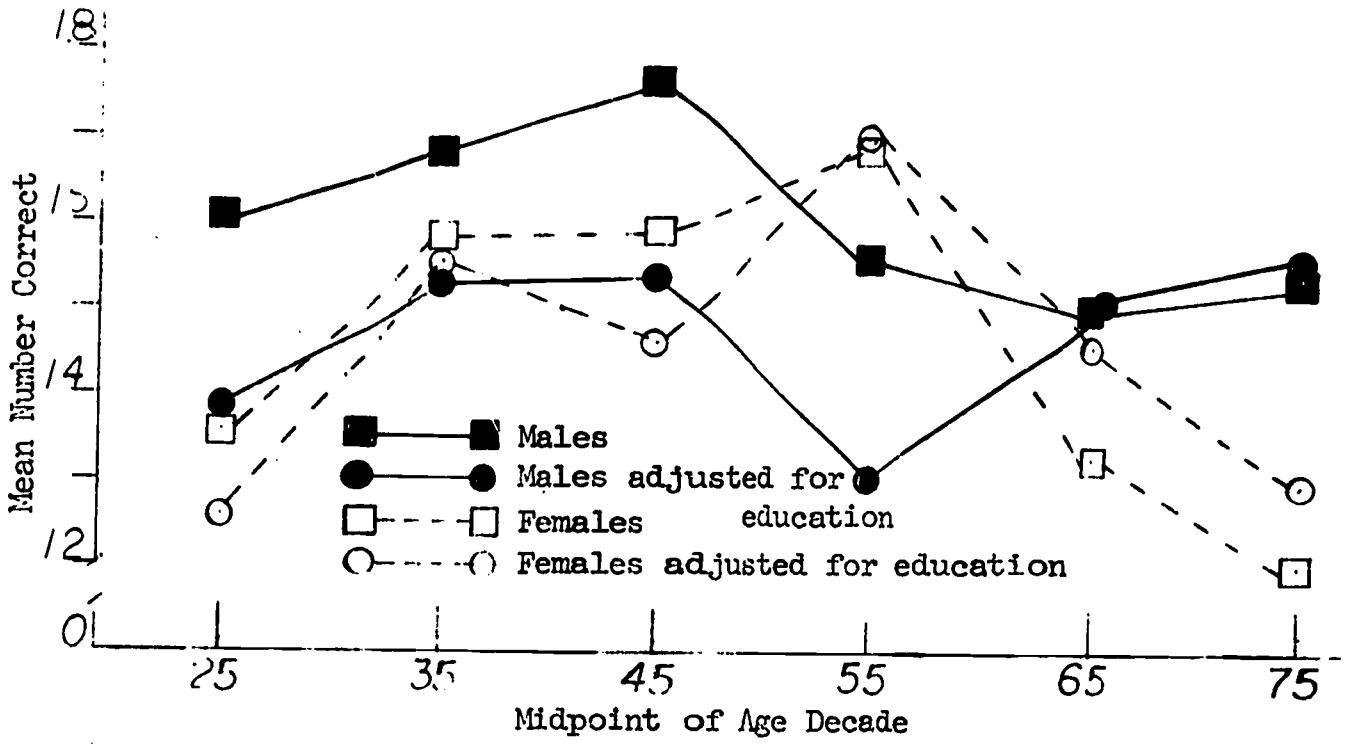
The mean scores for successive age groups on the test measuring knowledge about finance shows an unusual pattern for the male groups. The mean scores by decade increased successively as far as the 40-49 year old group. A sharp decrease occurred for the mean of the 50-59 year old group after which the mean scores for the following 60-69, 70-79 year old groups were relatively similar to each other and to that of the 50-59 year olds. In fact there was a very slight increase for the mean of the 70-79 year old group over that of the 60-69 year olds. (This difference could be chance.) In any event the mean score of the 70-79 year old group did not drop as was true for all the previous measures. See Figure 5. When the mean scores of these various male age groups were adjusted by covariance for differences in education, a similar overall pattern occurred but the largest adjusted mean score was obtained by the 70-79 year olds.

Both the unadjusted mean scores for female age groups and the mean scores adjusted for education show similar patterns. The maximum mean scores for females was obtained by the 50-59 year old group. The mean scores, both unadjusted and adjusted, decreased for the successive two older female age groups.

Summary

In general it can be seen that the data in the preceding sections do not support the hypotheses that cognitive functioning for all variables is at a maximum for groups of males and females in their 20's and 30's and that from that point on it remains relatively stable or declines for successive age groups. These data show that for most of our variables the largest mean scores were obtained by groups of much older subjects. They also show variability among these variables as to the age at which the maximum mean score occurs for both sexes. For the variables investigated, the youngest age group obtaining the maximum mean score among the other age groups was the male 30-39 year olds on TR-2 (Transportation). The oldest age group obtaining the maximum mean score among the other age groups on a particular variable was the 60-69 year old male group on DD-2 (Death and Disease).

Figure 5 Performance on Form FI-2 (Finance) as a function of age, sex, and education.



It seems reasonable to believe that change in cognitive functioning is related to such things as interest, or present and prior experience.

Some investigators (Bayley & Oden, 1955; Campbell, 1965) have implied that for highly educated people it is reasonable to expect the maximum scores on certain measures of cognitive function to begin declining at a later age than normally presented in psychology textbooks (around 25-30 years old). The emphasis is on the highly educated aspect of the adults. Our data lead one to believe that it is an oversimplification to assume that decline in cognitive functioning at an older age than commonly believed is restricted to the most highly educated groups.

In fact all four variables examined for this phenomenon showed that the mean scores of successive age groups for both high education and low education categories gave the same general pattern, with the same age groups obtaining maximum mean scores. Of course the trace for the lower education group was lower than that of the high education group as would be expected. See Figures 1B, 2B, 3B, and 4B.

Changes in Item Response for Cognitive Measures Over the Age Range 20-79

Introduction

In addition to examining differences in total score by decade over the age range 20-79 as reported in the previous section, a similar study was made of the responses of the subjects to each individual item for each of these rubrics. The proportion of subjects in each age decade group obtaining the correct answer to that item was obtained and the item was then characterized by the age decade which obtained the largest proportion of correct answers. It was anticipated that the items would vary substantially with respect to the ability of the different age groups to answer them correctly.

The detailed data for each item and item index for Form D-2, Form TR-2, Form DD-2, Form SL-2, and Form FI-2 are presented in the tables in Appendix C. These tables present the proportion of individuals in each of the age decades selecting the correct answer for the various items. The last

column represents the age group obtaining the largest number of individuals choosing the correct answer for the item. The item is then characterized by this modal age value. For example, if the age group with a midpoint of age 45 (40-49) has 70 per cent of this group obtaining the correct answer and this group is the one having the largest proportion of correct answers, the item is characterized as a 45 year old item. Occasionally an item was not unimodal but bimodal and in a few cases trimodal. In such a situation the item was given more than one index and such differences were taken into account in our analyses.

Form D-2--Word Familiarity Survey--General

For Form D-2 separate item indices were obtained for each item by sex and education level. As in the previous section the high education group contained those subjects who had graduated from high school and who had had at least some post-high school education. The low education group consisted of those subjects who had obtained a high school education or less.

For the high education male group, the item indices ranged from 25 year old items to 75 year old items with the mean = 54.3 and SD = 16.4 when the younger age index for bimodal items was used and mean = 57.7 and SD = 11.9 when the older age index for these items was chosen. See Table C-1a. When the younger index for each of these items was used there were 16 out of the 30 items which had indices of 65 or older. Seven had 35 year old indices or less.

For the low education male group, the item indices again ranged from 25 year old items to 75 with the mean = 52.3 and SD = 13.7 when the younger age index for bimodal items was used and mean = 53.0 and SD = 12.8 when the older age index for these items was chosen. See Table C-1b. When the younger index for each of these items was used there were eight out of the 30 items which had indices of 65 years or older. Six had indices of 35 years old or younger.

The high education female group had item indices ranging from 25 to 75 years old with the mean = 15.2 and SD = 14.7. See Table C-1c. All items were unimodal with respect to age decade responses so each received a single index.

There were eight items out of 30 which had indices of 65 years or older. Of these items six had indices of 75. Five had indices of 35 years old or less.

For the low education female group, the item indices again ranged from 25 year old items to 75 with the mean = 50.5 and SD = 12.5. All of these items were unimodal. There were five items out of 30 which had indices of 65 years or older. Six had indices of 35 years old or less. See Table C-1d.

These data support the point of view that per cent of correct responses to the individual items on our word familiarity survey are extremely heterogeneous with respect to age and that the older age groups are definitely superior in their ability to answer correctly a large number of specific items.

Form SL-2 (Slang)

In addition to analyzing the individual items of Form D-2 separately by both sex and education of respondents, we decided to analyze the items of the slang test using the same four groupings of subjects.

For the high education male group, the item indices on slang extended over the entire age range, i.e., 25 year old items to 70 year old items. The mean = 44.4 and SD = 14.7. Of the 24 items analyzed five had indices of 65 or over. Ten had indices of 35 or less. See Table C-2a.

For the low education male group the item indices ranged from 25 to 75 with a mean = 43.3 and SD = 14.9. See Table C-2b. All of these items were unimodal. Of the 24 items three had indices of 65 years old or greater while 13 had indices of 35 or less.

The high education female group had item indices ranging from 25 to 65 years old with the mean = 43.5 and SD = 13.8. See C-2c. Out of the 24 items studied, two had indices of 65 or older while eight had indices of 35 or less.

The low education female group had item indices ranging from 25 to 70 with the mean = 43.8 and SD = 14.6. Out of the 24 items studied five had indices of 65 or older while 11 had indices of 35 or less. See Table C-2d.

Form TR-2 (Transportation)

For Form TR-2 separate indices were obtained for each item by sex. The male item indices ranged from 25 year old items to 65 year old items with the mean = 14.4 and SD = 14.7 when the younger age index for the one bimodal item was used. The mean = 45.7 and SD = 14.2 when the older age index for this item was used. Of the 23 items analyzed four had indices of 65 or over. Ten had indices of 35 or less. See Table C-3a.

The female item indices ranged from 25 year old items to 75 year old items with mean = 43.7 and SD = 13.3. Of the 23 items analyzed one had an index over 65 years old. Nine had indices of 35 years old or less. See Table C-3b.

Form DD-2 (Death and Disease)

For Form DD-2 separate indices were obtained for each item for males and females separately. The male item indices ranged from 30 year old items to 65 year old items with the mean = 55.3 and SD = 9.8. Of the 20 items analyzed seven had indices of 65 or over. Two had indices of 35 or less. See Table C-4a.

The female item indices ranged from 35 year old items to 65 with a mean of 48.8 and SD = 8.8. Of the 20 items analyzed one had an index of 65 or over. Four had indices of 35 or less. See Table C-4b.

Form FI-2 (Finance)

For Form DD-2 separate indices were obtained for each item for males and females separately. The male item indices ranged from 25 year items to 75 year old items with the mean = 45.5 and SD = 14.7 when the younger age index was used for the three bimodal items. When the older indices were used for these three items the mean was 49.0 with SD = 13.7. Of the 20 items analyzed three had indices of 65 years old or greater. When using the distribution containing the younger indices for the three bimodal items eight items had indices of 35 or less. See Table C-5a.

The female item indices ranged from 35 year old items to one 60 year old item with the mean = 47.5 and SD = 8.4 when the younger age index was used for the two bimodal items. When the older indices were used for these two items the mean = 49.5 and SD = 7.6. Of the 20 items analyzed only one item had an index as large as 60. When using the distribution containing the younger indices for the two bimodal items five items had indices of 35 or less. See Table C-5b.

Summary

The data obtained for individual items show even more clearly the heterogeneity of correct response with age than did the total test scores of the various cognitive tests reported in the previous section. When an age index was assigned to each item these indices were distributed over the whole age range and in fact for some rubrics there were more 65 year old and over items than there were 35 year old or younger. The mean item index, as would be expected, varied for both rubrics and sexes. However, the mean age indices in general were in the middle 40's. The test DD-2 (Death and Disease) was the one exception where the mean for the males was 55.3 and for the females 48.8. Even for this test in which the older subjects demonstrated they had far more information than did the younger there were several items that had age indices of 35 or less. The item data based on item age indices support conclusively our contention that cognitive functioning among adults attains maximum values for different age groups depending upon previous experience and interest. In fact, the expectation that older people would do as well or better than younger people has been substantiated for most of the rubrics selected and for which tests were constructed.

Adult Age Differences in Educational Background

The ease with which adults of different ages can deal effectively with demands made upon them in training or retraining programs will also depend to no small degree upon the amount of relevant knowledge and learning skills, such as reading, that they bring to such tasks. Since older adults tend to have less formal schooling than younger adults and are more remote in time from that schooling, it is reasonable to expect that they would bring less in the way of background

to the learning tasks they face. However, it is possible that social and occupational demands made upon at least some adults will result in informal learning to a degree that more than compensates for expected deficiencies. Thus, the actual level of background knowledge and educational skills that adults possess can be ascertained only by a direct check. One phase of the program consisted of a survey of the educational level of adults of various ages.

Assembling an appropriate array of items for measuring educational status did not pose the problems inherent in the selection of items for the measurement, and exploration along new and different dimensions, of cognitive abilities. In the present instance, the problem was more that of sampling relevant bodies of knowledge, and then determining the extent to which this knowledge was possessed by adults of different ages and backgrounds. An appropriate instrument for such a survey was the Adult Basic Learning Examination (ABLE). The ABLE test contains subscales relating to such knowledge and skill areas as arithmetic computation and problem solving, reading comprehension, general vocabulary, and spelling. While there is a degree of overlap between certain types of items included in this instrument and items involved in the tests of cognitive ability outlined in the preceding section, the distinction between the two is the degree to which such skills and knowledge are explicitly taught in schools. The types of items included in the survey using ABLE consist of formally-taught school materials.

While there have been some scattered studies of adult age differences in educational background, no previous study has systematically and extensively explored this matter. Most conclusions regarding such matters are based on inferences from the administration of standard intelligence tests.

Procedures. Detailed information about the development and characteristics of ABLE are given in Bjorn Karlsen, Richard Madden and Eric F. Gardner, Manual for Adult Basic Learning Examination (New York: Harcourt, Brace and Jovanovich, 1967). Since the final forms A and B of ABLE had not been developed at the time we needed to collect our data, temporary form T-1 was used for this study. Since the final forms A and B were assembled from the items in the three temporary forms (T-1, T-2, T-3) negotiations have been initiated with Harcourt, Brace, Jovanovich to equate the form used in this study with Form A which was used to gather basic validity data for the

ABLE Manual. ABLE, both temporary forms and final forms, have been used by a number of groups such as the Job Corps so that comparisons can be made between those data and the data collected in this study.

The study of educational backgrounds will be presented in two parts. 1) Changes over the age span 20-79 utilizing some of these tests and 2) Changes over the age span 20-79 focusing on individual item responses.

Differences in Educational Background Ages 20-79

The studies reported in the preceding section of this report presented data to refute the two seemingly well-established generalizations regarding change in mental functioning with age--namely, attaining maximum performance at an early age and maintaining relative stability or minimum decline thereafter on certain measures of cognitive functioning. No such hypotheses about the educational level possessed by adults have been proposed. While there have been some scattered studies of adult age differences in educational background, no previous study has systematically and extensively explored this matter. Most conclusions regarding these issues are based on inference from the administration of standard intelligence tests. Thus, the actual level of background knowledge and educational skills that adults possess can be ascertained only by a direct check.

As in the previous portion of this report data were collected by age decade from a large sample of subjects from the 20's through the 70's using the following tests from ABLE: Spelling, Reading Comprehension, Reading Retention, Arithmetic Computation, and Arithmetic Reasoning. These subjects were also used in collecting cognitive data. The analysis is identical to that utilized with the cognitive variables.

Results

ABLE (Spelling)

The mean scores in spelling are presented by age decade separately for males and females so that differences by sex over the age span 20-79 could be observed. As can be seen in

Figure 6A, there is an initial increase in mean score for the successive male age groups with a maximum mean score obtained by the 50-59 ("55" in the graph) year old group. Thereafter the mean scores decline. For females the maximum mean score occurs for the 40-49 year old group with a decline for the means of the next two age decade groups.

Since this is a cross-sectional sample in which the subjects are representative of their age group and are not, equated with respect to education, an analysis was performed in which the means of each age-sex group were adjusted by covariance to remove the effect of differing amounts of education. The results show that the age groups obtaining the largest adjusted mean score were the same as those for the unadjusted mean scores for both males and females, that 50-59 year old males and 40-49 year old females. See Figure 6A.

The results of a third analysis are presented in Figure 6B where the data are grouped by age decade and education only. The high education group contained those subjects, male or female, who had graduated from high school and who had had at least some formal post-high school education. The low education group consisted of those subjects who had obtained a high school education or less. Figure 6B shows the maximum mean score for the high education group was that of the 50-59 year olds while for the lower education group the 40-49 year olds had the largest mean score.

Also of interest is the fact that, with only one exception, the female age groups scored higher than the corresponding male groups for either unadjusted or adjusted mean scores.

ABLE (Reading Comprehension)

The mean scores in reading comprehension showed that for both males and females there was an immediate increase between the mean performance of the 20-29 year old group and the 30-39 year olds. The mean scores of successive age groups thereafter, starting with the 40-49 year olds, declined successively. See Figure 7A.

When the mean scores of the various age groups were adjusted by covariance for differences in education, the adjusted mean scores of the males was a maximum for the same

e on ABLE (Spelling)
f age, sex, and education.

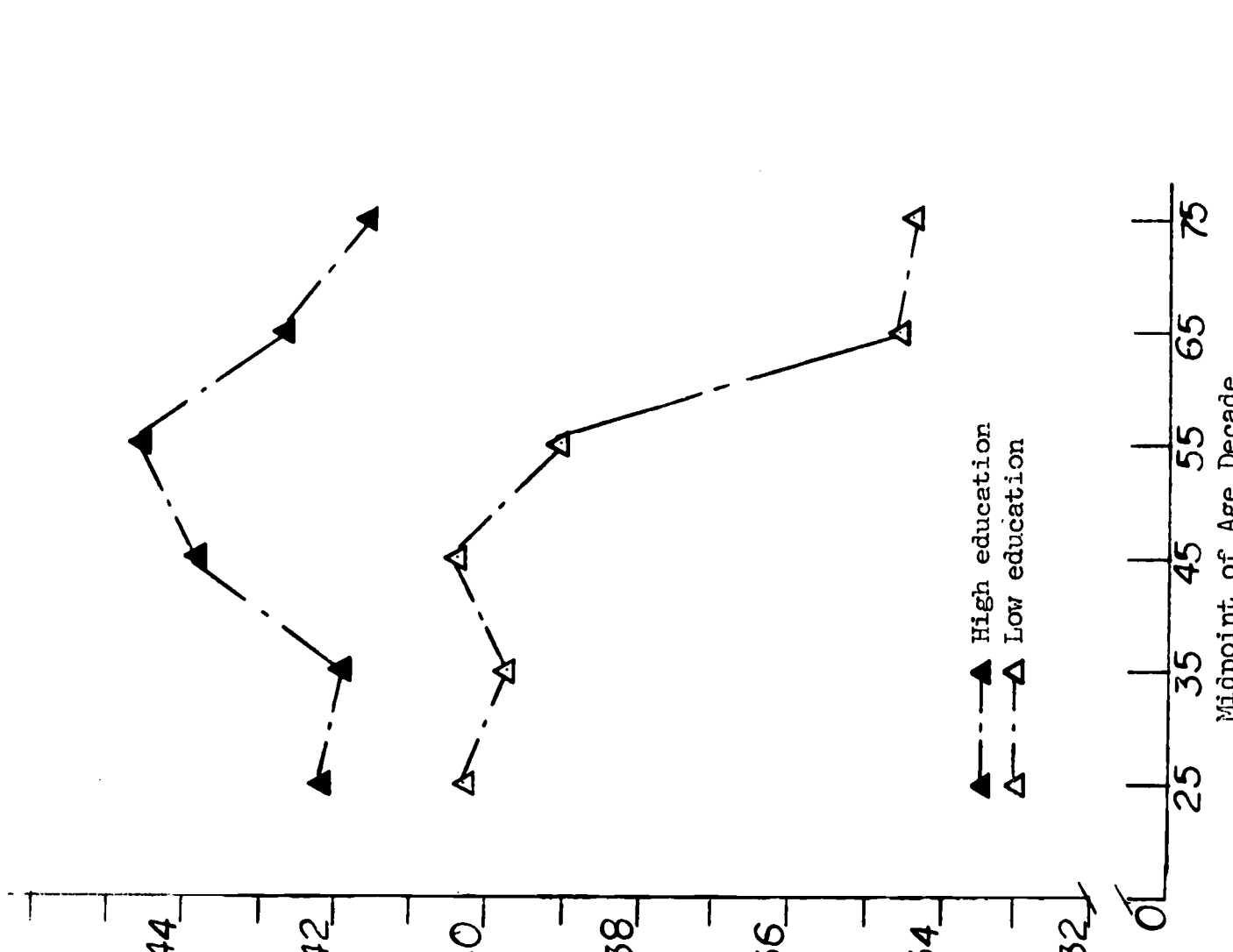
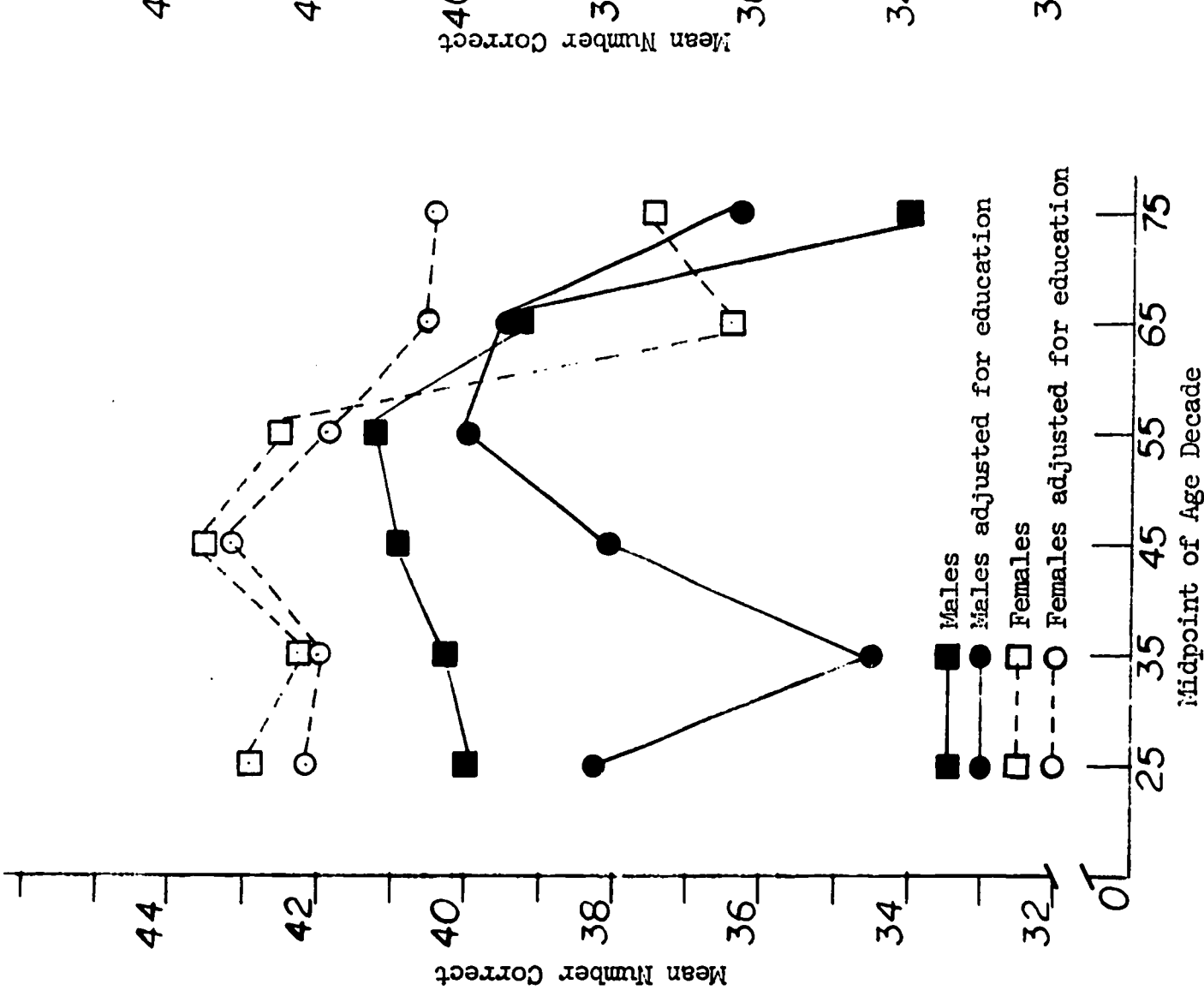


Figure 6 Performance on ABLE (Spelling)
as a function of age, sex, and education.



age group as the unadjusted (30-39). The adjusted mean female scores showed an immediate and steady decline from the 20-29 year old group on over the entire age range studied. See Figure 7A.

A comparison of differences by age decade of the data dichotomized into high and low education groups showed the maximum mean score for the higher education group occurred for the 30-39 year old group while the 20-29 year olds had the maximum mean score for the lower education group. The mean scores for successive age groups continually decreased thereafter. (See Figure 7B.)

Also of interest is the fact that except for the youngest groups (20-29 year olds) the male mean scores were larger than those of the female.

Although no systematic data were collected on the adequacy of the time specified in the Manual, conversations with a number of middle aged and older subjects indicated that they felt rushed and could have done better if they had been allowed more time.

ABLE (Reading Retention)

The mean scores in reading retention presented in Figure 8A showed that for males the 30-39 year olds had the maximum mean score although the mean scores of the successive age groups declined very slightly. The mean scores for the female age groups started with a maximum mean score for the 20-29 year olds and then declined modestly throughout the entire age range. See Figure 8A.

When the mean scores of the various age groups were adjusted by covariance for differences in education, the adjusted mean scores for the males showed a slight increase from the 20-29 year old group to the 60-69 year olds, at which time there was a slight decrease for the 70-79 year olds. The adjusted mean female scores were similar to the corresponding unadjusted scores and showed the same pattern. See Figure 8A.

A comparison of differences by age decade of the data dichotomized into high and low education groups showed the maximum mean score for the high education group was obtained

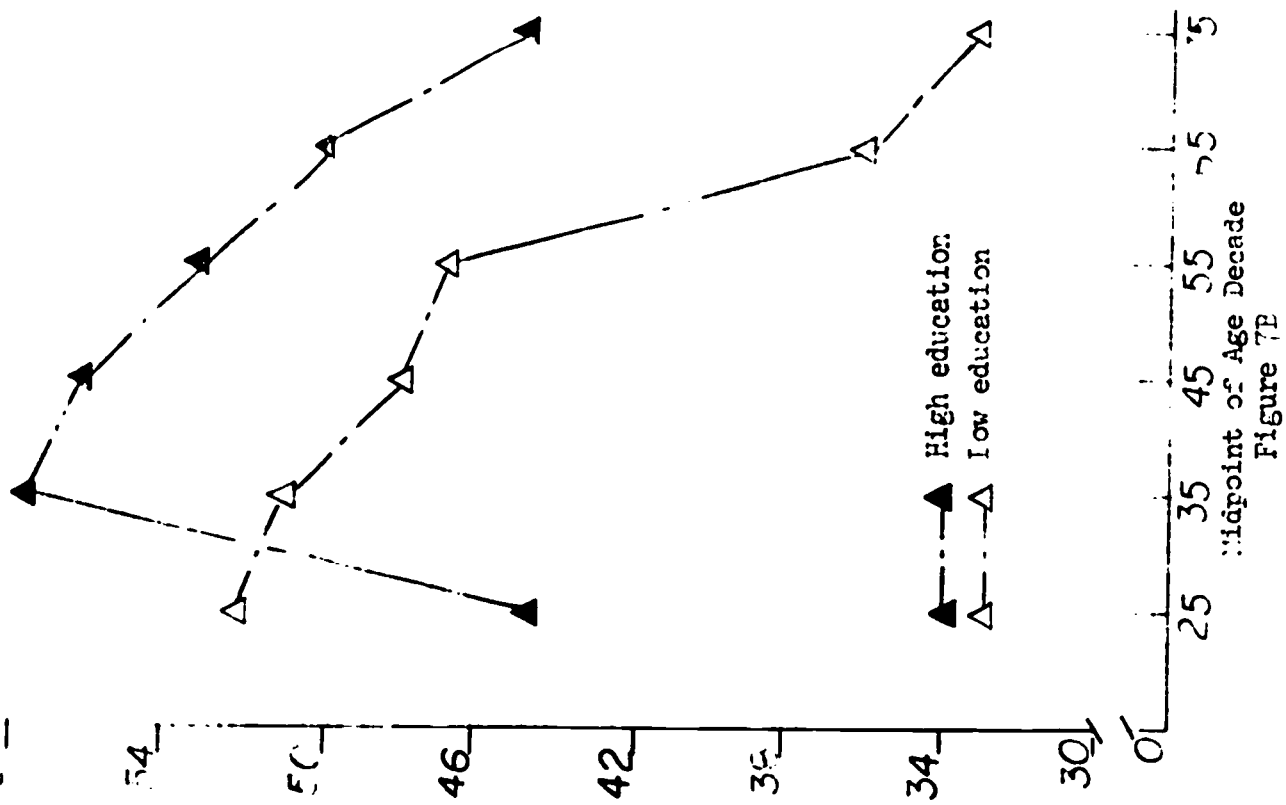


Figure 7B

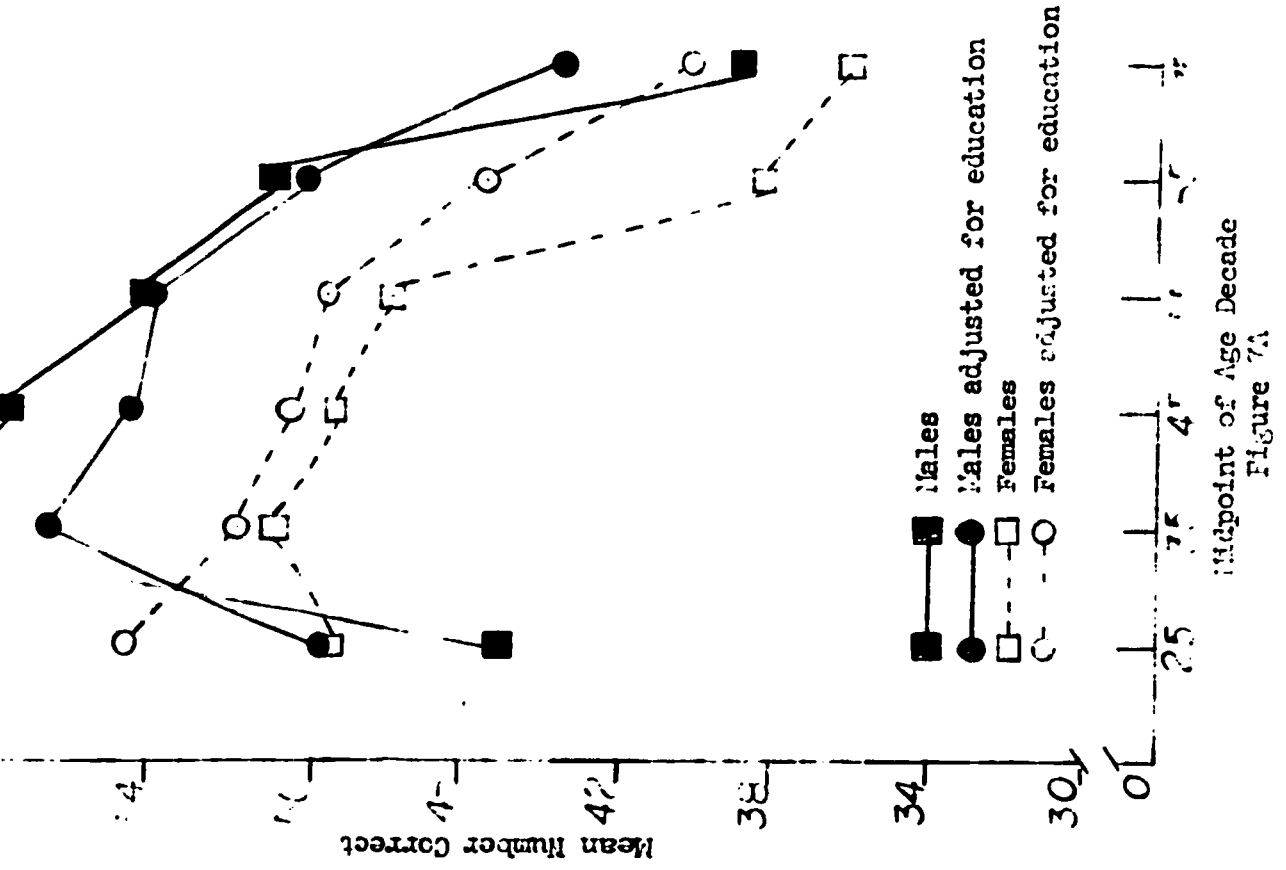


Figure 7A

by the 30-39 year old group, while the 20-29 year old group had the maximum mean score for the lower education group. See Figure 8B.

ABLE (Arithmetic Computation)

The mean scores in arithmetic computation presented in Figure 9A showed that for males the 30-39 year olds obtained the maximum mean score after which the mean scores of successive age groups declined rapidly throughout the entire age range. The mean scores for the female age groups started with a maximum mean score for the 20-29 year olds and then declined throughout the remainder of the age range. There did appear to be a leveling off in that the mean scores for the three age groups 30-39, 40-49, 50-59 were very similar.

When the mean scores of the various age groups were adjusted by covariance for differences in education, the plot of the adjusted mean scores for both males and females was very similar to the plot of the unadjusted mean scores of the females in that the maximum mean adjusted scores were obtained by the 20-29 year olds. See Figure 9A.

A comparison of differences by age decade of the data dichotomized into high and low education groups showed the 20-29 year olds for both education groups had the largest mean scores. The mean scores for both education groups (with one exception) declined for successive age groups. See Figure 9B.

ABLE (Arithmetic Problem Solving)

As can be seen from Figure 10A the patterns for both sexes, adjusted and unadjusted are very similar. The one exception is that the 30-39 year old males obtained the maximum mean score after which the mean scores of successive age groups declined throughout the entire age range. The mean scores for the female age groups started with a maximum mean score for the 20-29 year olds and then declined throughout the remainder of the age range.

A comparison of differences by age decade where the data has been dichotomozed into high and low education groups

Figure 8 Performance on ABLE (Reading Retention) as a function of age, sex, and education.

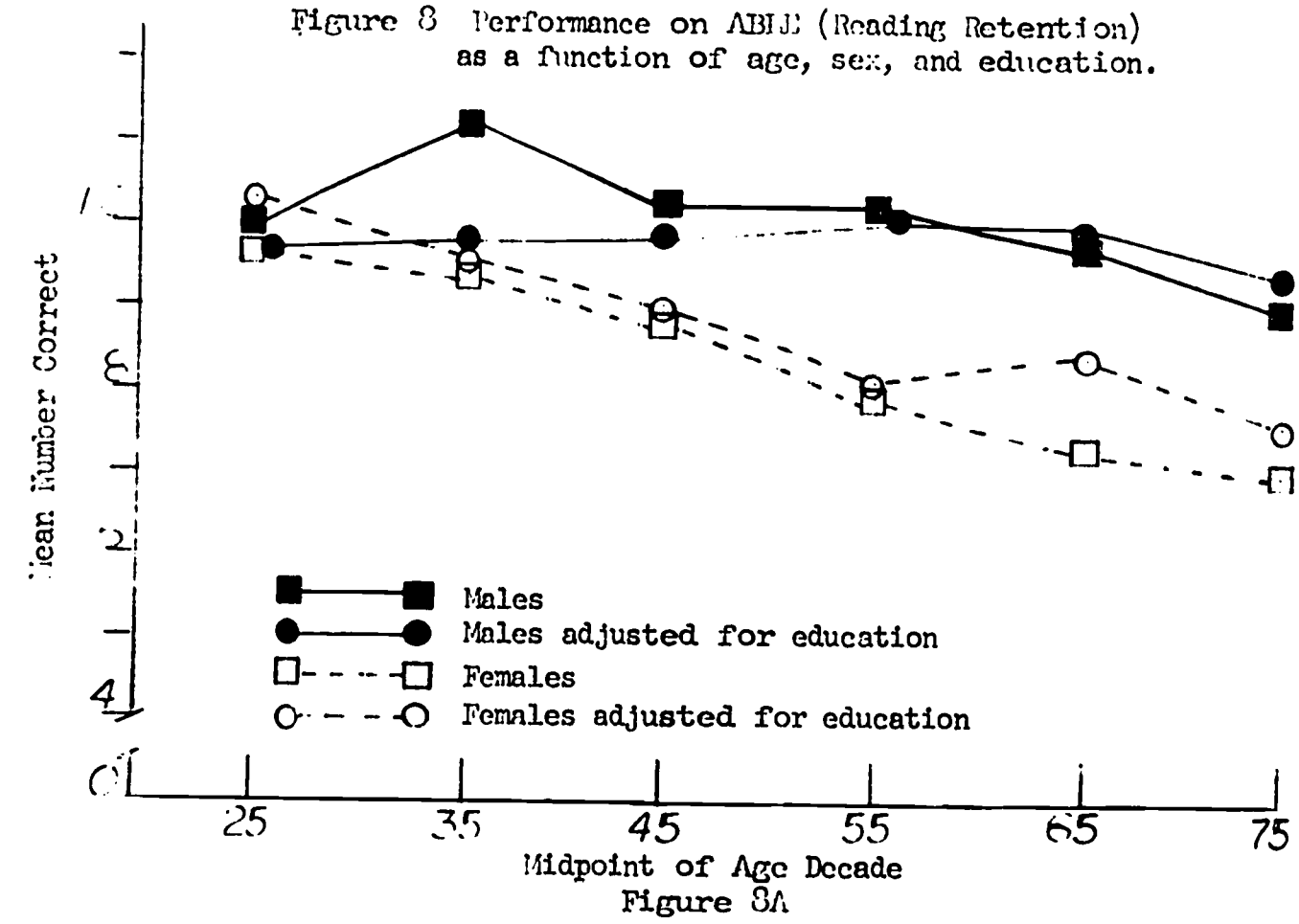


Figure 8A

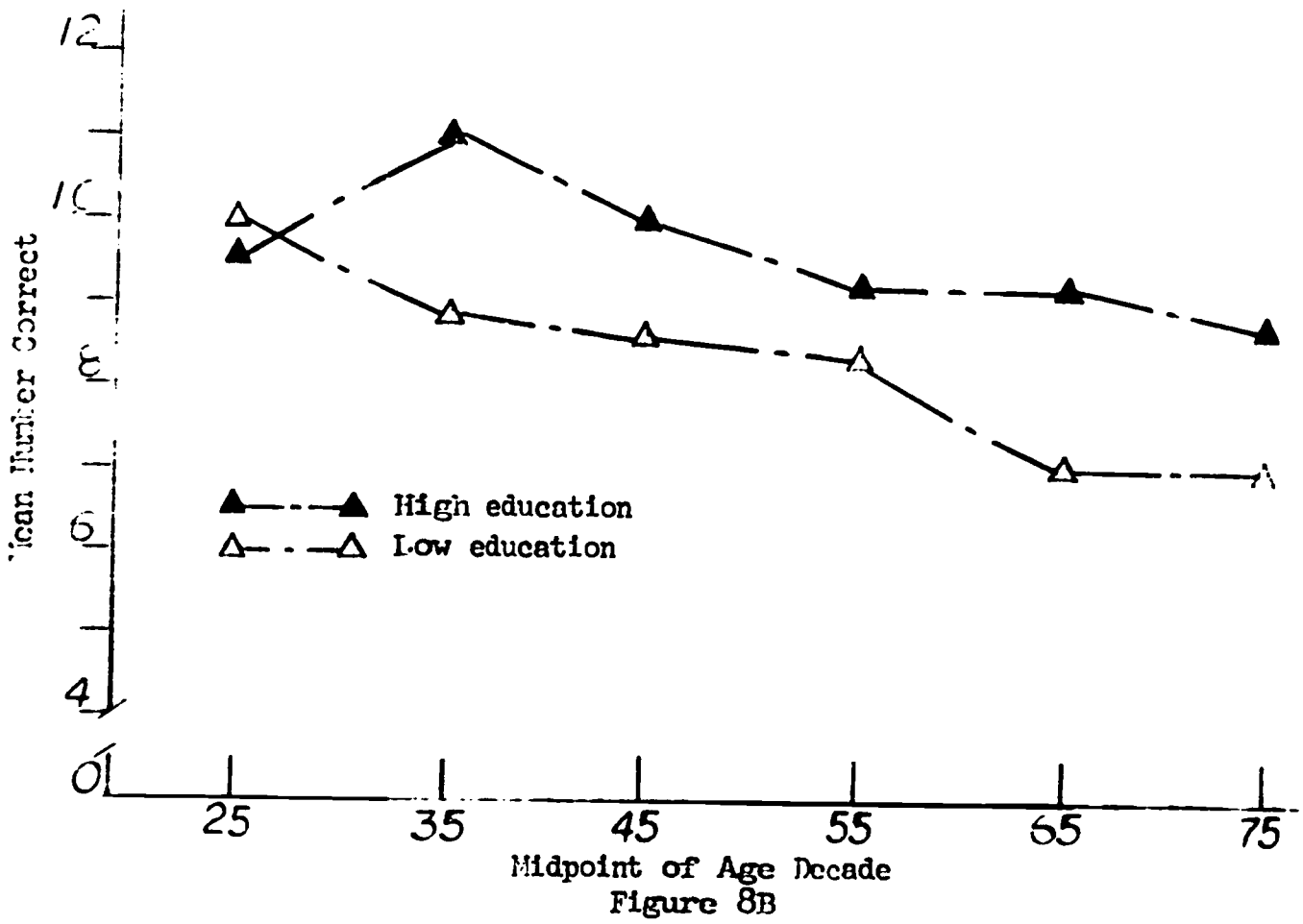
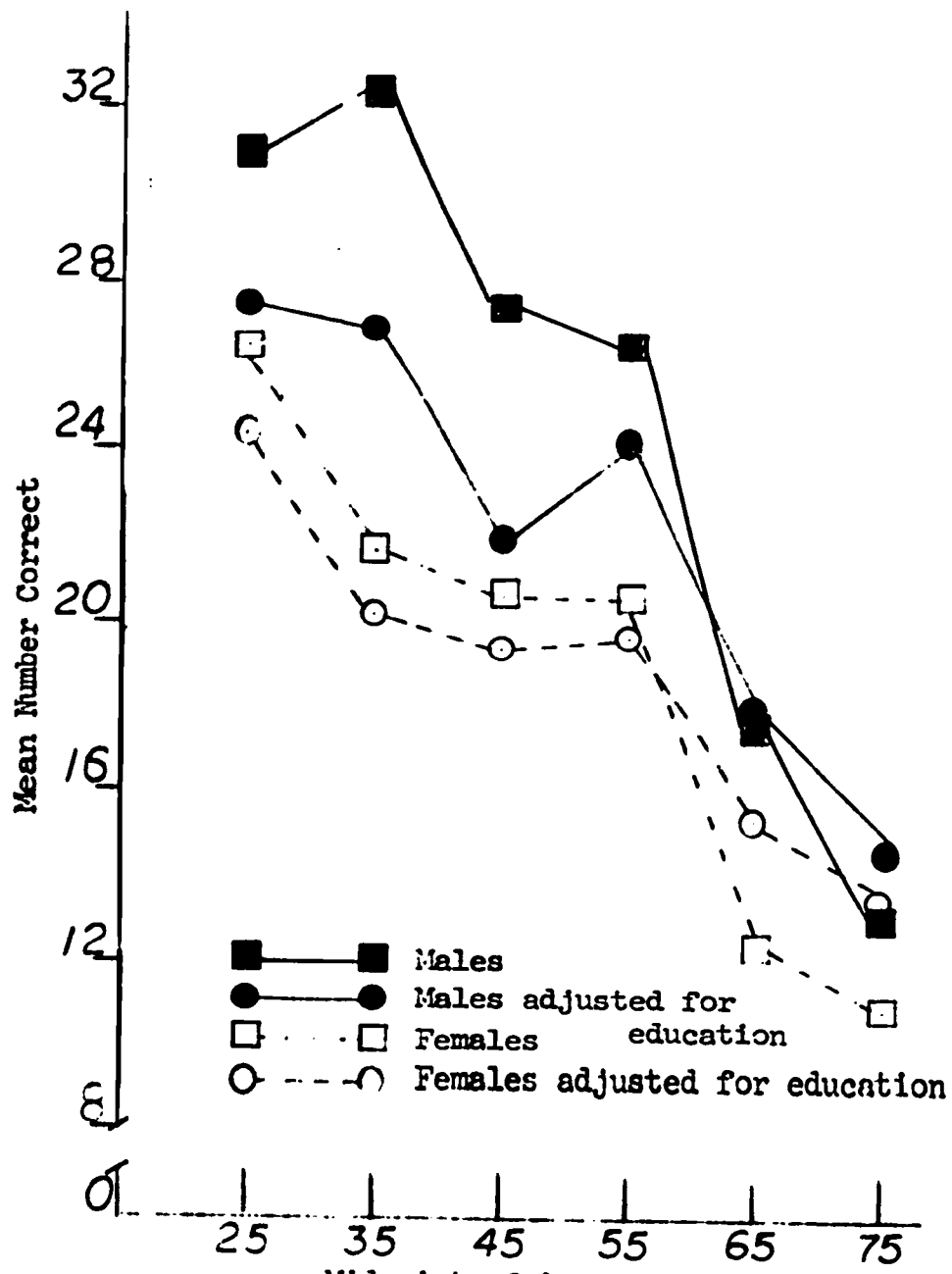
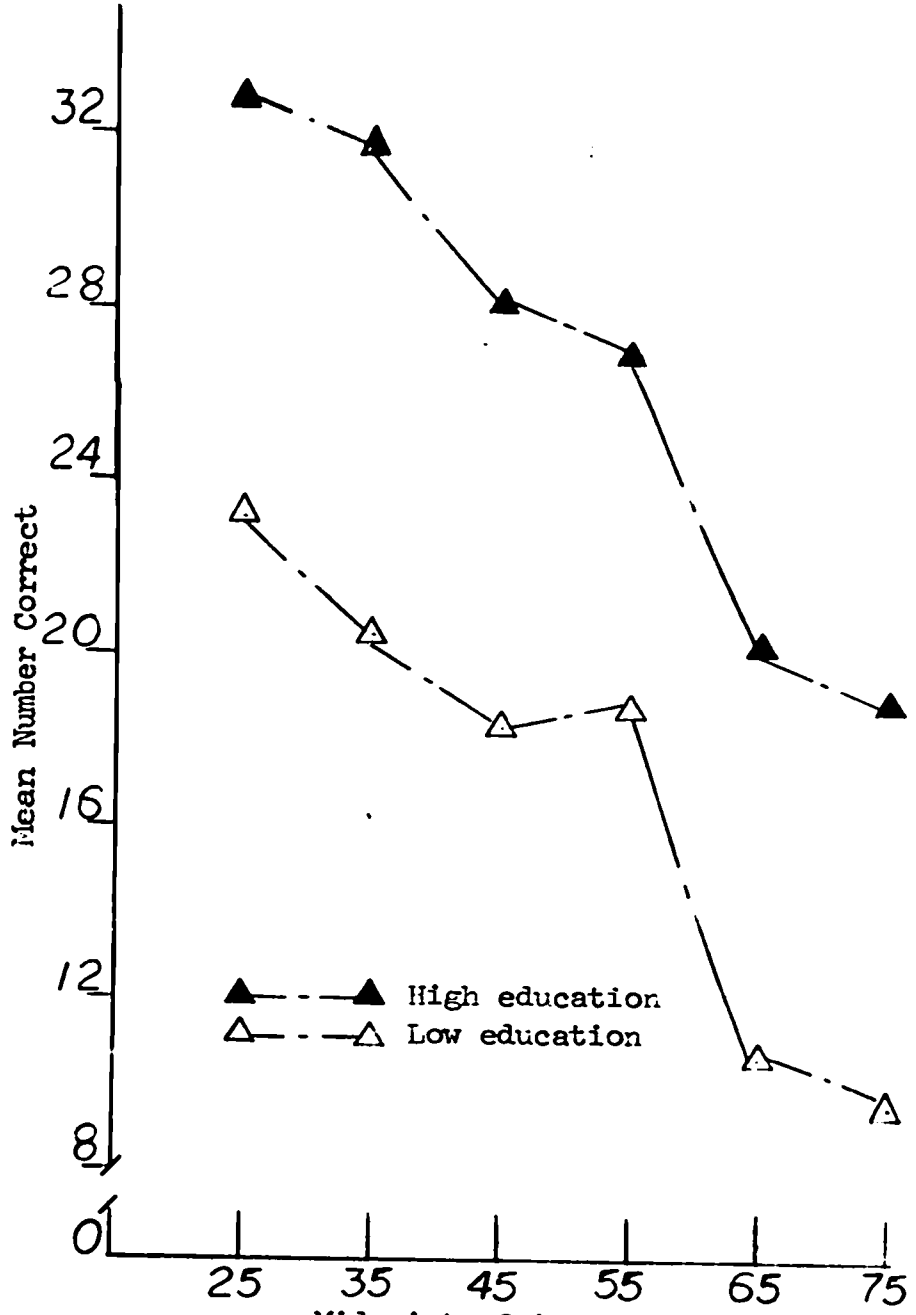


Figure 8B

Figure 9 Performance on ABLE (Arithmetic Computation) as a function of age, sex, and education.



Midpoint of Age Decade
Figure 9A



Midpoint of Age Decade
Figure 9B

showed similar patterns with declines for both education groups. The high education group had a maximum mean score for the 30-39 year old group after which the mean scores for successive age groups declined. See Figure 10B.

Summary

As indicated at the beginning of this section the data were collected to obtain some systematic information about the actual level of background knowledge and educational skills that adults possess. Most conclusions regarding performance on educational skills have been based on inferences obtained from the administration of standard intelligence tests.

In contrast with the measures obtained on cognitive functioning the scores on tests of educational background show that in general older people fare less well than younger people on these rubrics. With the exception of spelling where the maximum mean score was obtained by the 50-59 year old male group and the 40-49 year old female group, the mean performances of the younger age groups far exceeded those of the older subjects. For reading, both comprehension and retention, there was an increase in mean age index up through the 30-39 year old group and then a consistent decline for successively older age groups. The situation for arithmetic computation and arithmetic problem solving showed an even greater decline with age. Except for a small increase from the 20-29 year old group to the 30-39 year old group for males the largest mean scores were obtained by the youngest (20-29 year olds) and the mean scores declined for successive age groups thereafter.

These data would seem to indicate that in contrast with certain cognitive variables that proficiency in the basic skills taught in school are at their highest around 30 years old and then decline successively for the various age groups.

Figure 10 Performance on ABLE (Arithmetic Problem Solving) as a function of age, sex, and education.

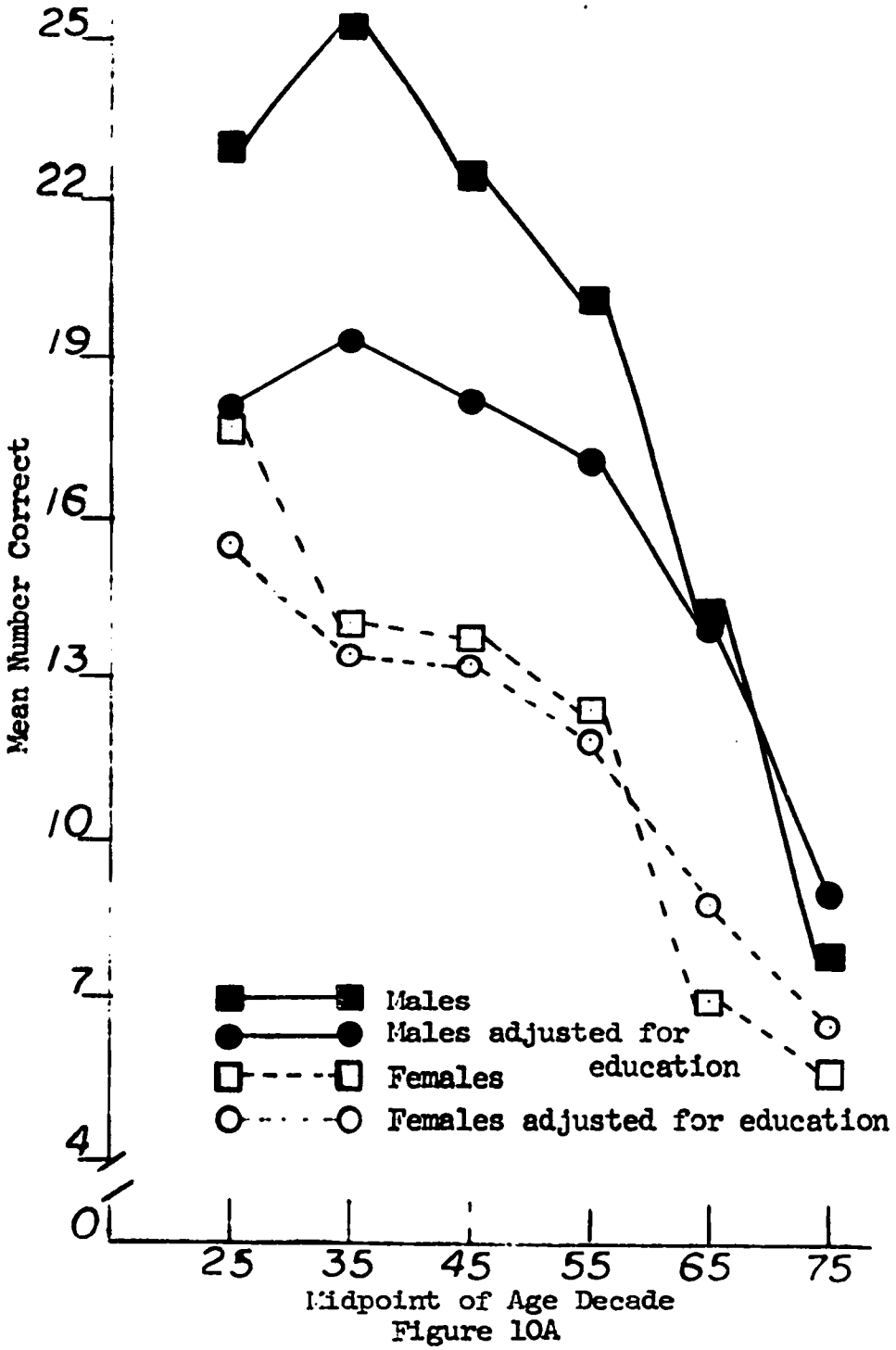


Figure 10A

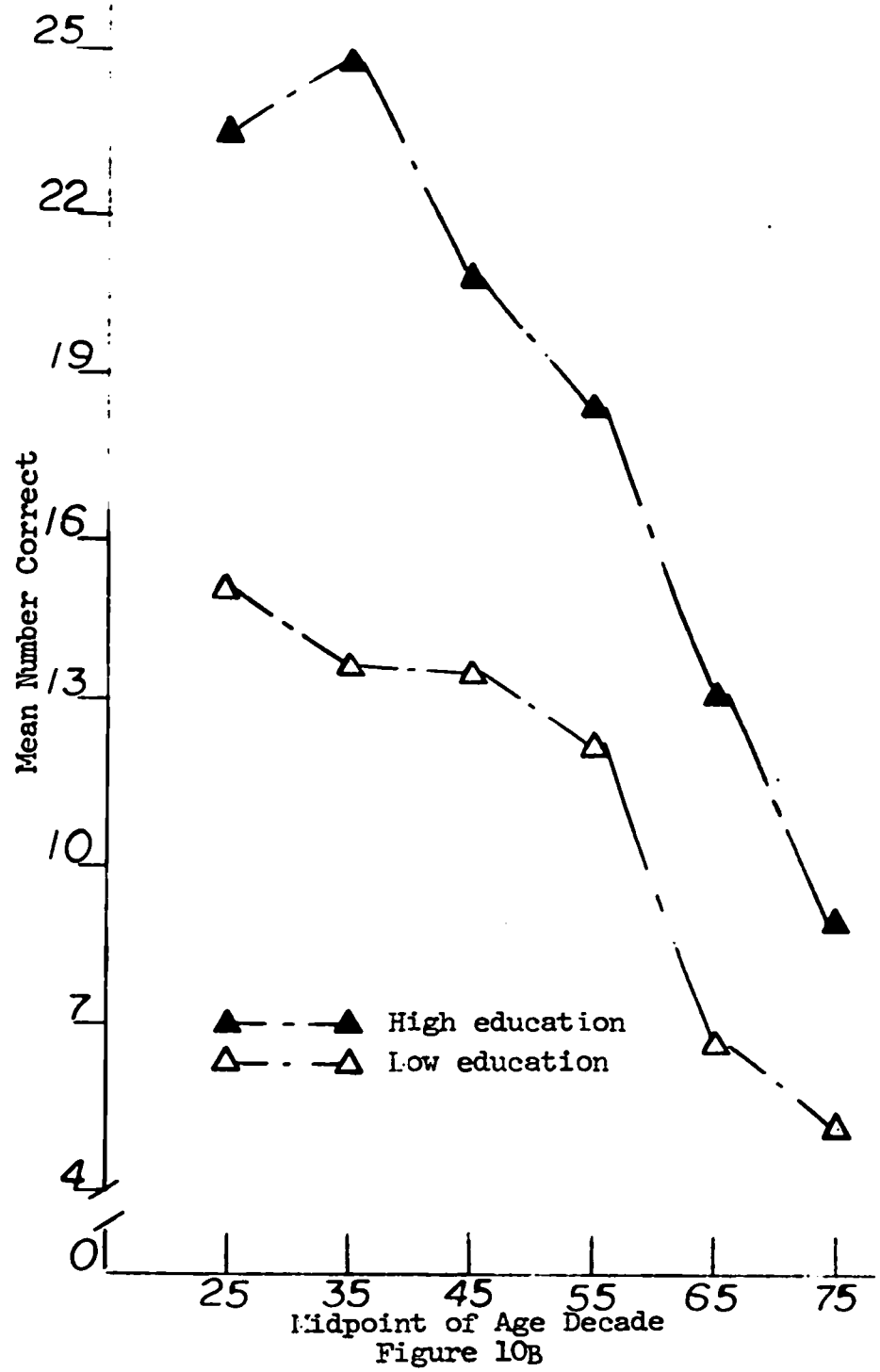


Figure 10B

Changes in Item Response for Educational Tests Over the Age Range 20-79

Introduction

As was done with respect to the cognitive tests, a study was made of responses to each individual item for each of the educational subtests: Spelling, Reading Comprehension, Reading Retention, Arithmetic Computation, and Arithmetic Problem Solving. Here, also, the proportion of subjects in each age decade group obtaining the correct answer was calculated and the item was then characterized by the age decade which obtained the largest proportion of correct answers. It was anticipated that the items would vary substantially with respect to the ability of the different age groups to answer them correctly.

The detailed data for each item and item index for ABLE-2 (Spelling), ABLE-3 (Reading Comprehension), ABLE-3 (Reading Retention), ABLE-4A (Arithmetic Computation), and ABLE-4B (Arithmetic Problem Solving) are presented in Appendix C. These tables present the proportion of individuals in each of the age decades selecting the correct answer for the various items. The last column represents the age group obtaining the largest number of individuals choosing the correct answer for the item. The item is then characterized by this modal age value. For example, if the age group with a midpoint of age 45 (40-49) has 70 per cent of this group obtaining the correct answer and this group is the one having the largest proportion of correct answers, the item is characterized as a 45 year old item. Occasionally an item was not unimodal but bimodal and in a few cases trimodal. In such a situation the item was given more than one index and such differences were taken into account in our analyses.

ABLE (Spelling)

For ABLE-2 (Spelling) spearate item indices were obtained for each item for each sex. For the male group, the item indices ranged from 25 year old items to 65 year old items with the mean = 39.7 and SD = 15.0 when the younger age index for the bimodal item was used. The mean = 40.2 and SD = 15.1 when the older age index for this item was used. Of the 50 items analyzed four had indices of 65 or

over. Twenty-eight had indices of 35 or less. See Table C-6a.

The female indices ranged from 25 year old items to 75 year old items with a mean = 37.0 and SD = 12.4 when the younger age index was used for the non-unimodal items. The mean = 39.7 and SD = 13.4 when the older age index was used for the non-unimodal items. Of the 50 items analyzed 2 had at least one index of 65 or over. Twenty-six had indices of 35 years old or less. See Table C-6b.

ABLE (Reading Comprehension)

For Reading Comprehension, separate indices were obtained for each item for each sex. For the male group the indices ranged from 25 year old items to 75 year old items with a mean = 35.9 and SD = 10.9 when the youngest age index for bimodal items was used. The mean = 39.6 and SD = 13.7 when the oldest index for the same items were used. Of the 70 items analyzed 10 had indices of 65 or over, which 53 had indices of 35 or less. See Table C-7a.

The female indices ranged from 25 year old items to 75 year old items with a mean = 31.7 and SD = 10.7 when the younger age index for bimodal items was used. The mean was 32.6 and SD = 12.0 when the older age index was used for these same items. Of the 70 items analyzed 2 had indices of 65 or over. 56 had indices of 35 years old or less. See Table C-7b.

ABLE (Reading Retention)

For Reading Retention separate indices were obtained for each item for each sex. For the male group the indices ranged from 25 year old items to 65 year old items with mean = 36.6 and SD = 16.0. Of the 16 items analyzed 3 had indices of 65 or over. Eleven had indices of 35 or less. See Table C-8a.

The female indices ranged from 25 year old items to 75 year old items with mean = 33.8 and SD = 16.5. Of the 16 items analyzed 2 had indices of 65 or over. Thirteen had indices of 35 or less. See Table C-8b.

ABLE (Arithmetic Computation)

For Arithmetic Computation separate indices were obtained for each item for each sex. For the male group the indices ranged from 25 year old items to 75 year old items with mean = 33.5 and SD = 7.6 when the younger age index for bimodal items was used. The mean = 34.6 and SD = 8.8 when the older index was used for the same items. Of the 42 items analyzed only one had an index of 65 or older. Thirty-nine had indices of 35 or less. See Table C-9a.

The female indices ranged from 25 year old items to 65 year old items with mean = 33.7 and SD = 13.8 when the younger age index for the one bimodal item was used. The mean = 34.4 and SD = 41.1 when the older age index for the same item was used. Of the 42 items analyzed 3 had indices of 65 or over, which 33 had indices of 35 or less. See Table C-9b.

ABLE 4B (Arithmetic Problem Solving)

For Arithmetic Problem Solving separate indices were obtained for each item for each sex. For the male group the indices ranged from 25 year old items to 65 year old items with a mean = 29.8 and SD = 9.0 when the younger age index for the one bimodal item was used. The mean = 30.2 and SD = 9.3 when the older index for the same item was used in the frequency distribution. Of the 42 items analyzed only one had an index of 65 or older, while 35, most of which were 25 year old items, had indices of 35 or less. See Table C-10a.

The female indices ranged from 25 year old items to 75 year old items with mean = 39.8 and SD = 18.7 when the younger age indices for the bimodal items were used. The mean = 41.4 and SD = 19.4 when the older index was used for the same items. Of the 42 items analyzed 11 had indices of 65 or over, while 28 had indices of 35 or less. See Table C-10b.

Summary

The detailed analysis of responses to the items for the various basic skill tests showed even more clearly the superiority of the younger adults to the older. Not only were

the mean item age indices in the 30's but most of them were in the early 30's. In addition there were relatively few items among all these educational rubrics that had age indices of 65 or over whereas a large majority had indices of 35 years old or less. These data indicate that performance on the specific basic skills on which the schools concentrate show almost consistent decline with age, starting around age 30.

Adult Age Differences in Learning Orientation

The extent to which adults of different ages are positively oriented toward the seeking of new educational experiences (whether these be in a voluntarily selected course in continuing education or in retraining programs necessitated by change of work) or the degree to which they react negatively to such learning opportunities because of uncertainty or apprehension may, in a practical sense, be of even greater importance than the abilities or the backgrounds they bring to such tasks. They may, in fact, avoid such situations. But even when involved in a learning program, the level of an individual's performance will likely be determined to no small degree by the extent to which he is "achievement oriented" or threatened by the situation in which he finds himself.

It has been rather clearly established, for example, that in complex types of learning, anxiety tends to have a negative effect, reducing performance. This may come about because, among other reasons, the anxious or threatened person experiences some confusion between "competing" responses, is unable to attend to the task, or tends to make up his mind too quickly as to how he should proceed. In view of the theoretical, as well as the practical, importance of such personal variables in the learning of adults of different ages, a third element was included in the survey of adult age differences, namely measures related to what has here been called "learning orientation." We were interested in determining whether middle age and old age bring positive or negative changes in these respects.

It was necessary in this phase of the study to obtain information regarding four types of characteristics: 1) motivation for learning and achievement, 2) learning apprehension

or anxiety, 3) personal rigidity, and 4) "style of life" or learning sets. Each of these will be discussed briefly in turn.

What has here been labeled "motivation for learning" refers to what is commonly called achievement motivation--the desire to achieve and accomplish either in competition with one's own self, with an absolute standard of competence, or with others. In a sense, we are concerned here with the likelihood that adults of different ages will seriously apply themselves to learning tasks. The measure employed in this study was adapted from an existing scale designed by Sarason (1957) to measure achievement motivation.

The measure of "learning apprehension" was related to the degree of apprehension, uneasiness, or nervousness generated by learning situations or various cognitive task situations that an individual faces. Two types of measures were used, one relating to what has been called "text anxiety," the other commonly referred to as "manifest anxiety." Two measures of manifest anxiety were used. One was the short form of the Taylor Manifest Anxiety Scale developed by Bendig (1956), and the other was adapted from Sarason (1957). Two measures of text anxiety were also used, one adapted from Sarason (1957) and one specially developed for the present study by R. G. Kuhlen (Form RK), which was attached as the final page to Form D-2, the vocabulary test described earlier (see Appendix A). Still another type of scale was used to measure "situational anxiety," to examine an hypothesis stated by Kuhlen (1964) that with advancing age there is a tendency for anxiety to generalize across a broad range of situations. The basic form of this situational anxiety scale was adapted from Endler, Hunt, and Rosenstein (1962).

A measure of "rigidity" (conceptualized here as a "need for structure") was included among the scales employed in this phase of the study because of the theoretical importance of rigidity in learning (see, for example, Botwinick, 1967). Prior evidence seemed to suggest that people do indeed become more rigid with increasing adult age (though the data were not entirely consistent); however, it seemed desirable to determine whether rigidity as measured by the type of instrument employed here does in fact increase with age. The prior evidence suggested that the rigid person prefers certain types

of learning tasks (school subject matter, for example) and learns more effectively with relatively structured teaching procedures. However, it was suggested, the rigid person may also pose for himself certain handicaps to learning by reaching premature decisions (premature closure) regarding solutions to problems, or by incorporating into his perception of the problem or its solution elements that are in fact irrelevant. A short form of the dogmatism scale utilized by Rokeach (1960) in research on rigidity as related to learning, problem solving, and other behaviors was used. The short form utilized the 19 best items identified by Troldahl and Powell (1965).

A final measure of personal characteristics employed relates to what might be called "style of life." It is probable that the individual who has devoted his time to recreations of a non-intellectual sort will be less competent in learning tasks than an individual who has a history of active participation in activities involving initiative, responsibility, and new learning. What is here called "style of life" refers essentially to what Harlow (1949) has referred to as learning sets. It is not unlikely that a part of the threat that seems to be posed for older adults by new learning situations stems from the fact that they are aware that they have not participated in new learning for some years, and thus do not have the appropriate orientations ("sets") for such learning. Quite aside from the extent to which threat is involved, lack of experience in learning may prove a serious handicap to the older learner. Accordingly, it seemed desirable to attempt to measure this characteristic, and to determine the degree to which adults of different ages are so characterized. The relevance of such a variable to the present study was suggested by unpublished research by W. A. Owens in which age trends between fifty and sixty years of age in performance on a measure of adult "intelligence" were found to be related to the degree to which learning activities were regularly engaged in.

As a result of research undertaken earlier at Syracuse University (Ingham, 1963), some progress had been made toward the development of an instrument designed to determine the extent to which an individual regularly participates in activities requiring new learning. This instrument consisted primarily of a survey of the types of activities in which people had engaged during the past year, the activities

being carefully selected with reference to the degree to which they involve initiative and new learning. In a sense what was being measured here was not only the character of the individual's present experience but also the degree of positive affect associated with living in general, and especially as related to new learning experiences. The work done by Dr. Roy Ingham (1963), it was learned from him, had been advanced by Dr. Ann Litchfield (1965), who kindly gave permission for the use of her Leisure Activity Survey (LAS) in this research.

Procedure

Motivation for learning was measured by adaptations of the "Demand for Achievement" items in Sarason's (1957) Autobiographical Survey. Thirteen of his 41 items were randomly selected and reworded slightly to make them applicable to the adult years. (These 13 items were interspersed with 13 of Sarason's 24 items on "General Anxiety" and 13 of his 21 items on "Test Anxiety" to form an integrated 39 item test form.) Furthermore, instead of asking subjects to characterize each item as being "true or false as applied to you," they were asked to check one of five blanks arranged between the words "Always" and "Never" to indicate the frequency with which the feelings or events described in the item were experienced.

Learning apprehension was measured in three steps. First, measures of manifest (or general) anxiety were obtained using Bendig's (1956) scale and an adaptation (as described in the preceding paragraph) of Sarason's (1957) general anxiety items. Second, test anxiety was measured with items adapted from Sarason's (1957) scale and with Kuhlen's items (Form RK) attached to the general vocabulary test, Form D-2. Third, to assess the degree to which anxiety generalizes across situations as a function of adult age, subjects took the situational anxiety test, which was developed along the lines suggested by Endler et al. (1962). Ten one-page scales were identical except for the heading, which set up the situation that the subject was to rate on each of 12 items. The situations were these: You are getting up to give a speech before a large group; You are just starting off on a long automobile trip; You've received a notice from your bank that an important check has bounced; You have just received a call from a hospital emergency room saying that your child is there;

You are going to your doctor for a routine physical examination; All the lights in your home have just gone off unexpectedly; The check-out clerk at the supermarket has just rung up a large bill for you, and you find you don't have enough money; You are about to make a long-distance telephone call; You have just been nominated for President of your organization; You have just narrowly missed a dog that ran out in front of your car." These were devised to represent plausible situations for adults of all ages, but situations having different connotations for older than for younger adults. A bounced check, for example, means something different to an aged pensioner than to a young businessman, and long-distance calls tend to be associated in the minds of older people with bad news or an emergency, where such calls tend to be more or less routine with younger adults. Five point scales were provided for subjects to rate their degree of reaction to each situation on each of 12 items, which were: Heart beats faster, Get an "uneasy feeling." Emotions disrupt action, Feel exhilarated and thrilled, Want to avoid situation, Perspire, Mouth gets dry, Become immobilized, Get full feeling in stomach, Seek experiences like this, Experience nausea, Dizzy feeling.

A measure of rigidity was provided by use of the 19 "best" items from Troldahl and Powell's (1965) developmental work on shortening the Rokeach dogmatism scale. Subjects responded to each item by circling one of six integers between +3 (high agreement with statement) to -3 (high disagreement), with zero omitted. In scoring, a value of four was added to each response to make the scores positive in sign, with a value of "4" given for an omitted response.

The long form (99 items) of Litchfield's (1965) Leisure Activity Scale was administered, and the 46 items designated as representing "educational activities" were weighted by "degree of educativeness" and "frequency of participation" (all as described by Litchfield, 1965) to obtain an "Extent of Educational Participation Score," with the total score potentially ranging from zero to 615.

Subjects were 1240 adults ranging in age from 20 to 79 years, distributed as follows: 63 males (M) and 112 females (F) in the 20-29 decade; 104M, 138F in 30-39; 117M, 139F in 40-49; 81M, 112F in 50-59; 56M, 123F in 60-69; and 62M, 133F in the 70-79 decade. They participated as anonymous, paid volunteers. They were not paid personally; rather, the

organization from which a person was recruited was paid approximately two dollars per subject-hour, the amount varying slightly as a function of other goodies (e.g., coffee and doughnuts) supplied during breaks in the test sessions. All subjects were normal, community-dwelling people who came to the group testing sessions under their own power, and were able to follow directions and complete the instruments with a minimum of help from college student proctors.

Results

Subjects were also administered Form D-2, the test of general vocabulary, and were rated on educational level by the scale previously described. These were used to describe the subjects. As noted in Table 1, an unweighted means analysis of variance of Form D-2 scores by age and sex revealed a statistically significant (but miniscule) sex difference (male mean = 17.8, female = 17.0). A similar analysis of educational level rating revealed a significant sex effect (mean for males = 6.2, females = 5.6) and a significant age decade effect (mean for 20's = 7.0, 30's = 6.6, 40's = 6.3, 50's = 5.7, 60's = 4.8, and 70's = 4.3). Thus, in educational level, males were higher than females, and level of education declined with increasing age.

Figure 11 shows the age and sex variations in the "demand for achievement" scale adapted from Sarason (1957), and Table 1 indicates a significant age effect, with the lowest point in the 30-39 age group and the peak in the 60-69 decade for females and the 70-79 decade for males.

The two measures of manifest or general anxiety are shown in Figure 12, and Table 1 indicates that the measures agreed in showing significant sex differences (with females higher in self-rated manifest anxiety at all ages than males) and age differences (with peaks in the 20-29 and 50-59 age groups for both sexes on both measures).

The first anxiety scale adapted from Sarason (1957) yielded the results shown in Figure 13. The variation with age was not significant as Table 1 indicates, but the sex difference was, with females scoring higher than males at all ages. Figure 14 shows mean ratings by age decade given by a subset of 445 subjects (sexes not separated) on two of the five items from Form RK (which was attached to Form D-2).

Table 1

Analyses of Variance of Personality and Control Variables

Variable	Mean Squares				Error Degrees of Freedom
	Sex	Age	Inter-action	W.-Cells	
Vocabulary (Form D-2)	160.1**	38.4	35.9	38.4	1217
Educational Level	47.5**	206.3**	8.5*	3.3	1226
Achievement (Sarason)	1.0	468.4**	73.2	57.9	1223
Manifest Anxiety (Bendig)	361.5**	47.5*	17.0	16.5	1200
General Anxiety (Sarason)	3037.4**	262.6**	40.2	78.4	1223
Test Anxiety (Sarason)	2345.3**	135.0	51.2	83.8	1220
Test Anxiety (Form RK #31)	N.A.	0.7	N.A.	1.1	438
Test Difficulty (Form RK #32)	N.A.	4.3**	N.A.	0.9	437
Situational Anxiety (Means)	2826.8**	79.6*	75.5*	33.1	1228
Situational Anxiety (Variances)	45.4**	3.1	0.3	4.6	1228
Dogmatism (Short Form)	704.6	17181.9**	627.3*	266.6	1207

Note: Degrees of freedom for Sex effect = 1, for Age effect and Sex-by-Age Interaction = 5. "N.A." means "not applicable" for the Form RK items since the sex differences were not analyzed.

* $p < .05$

** $p < .01$

Figure 11 Mean score on "Demand for Achievement" (Sarason) by age and sex

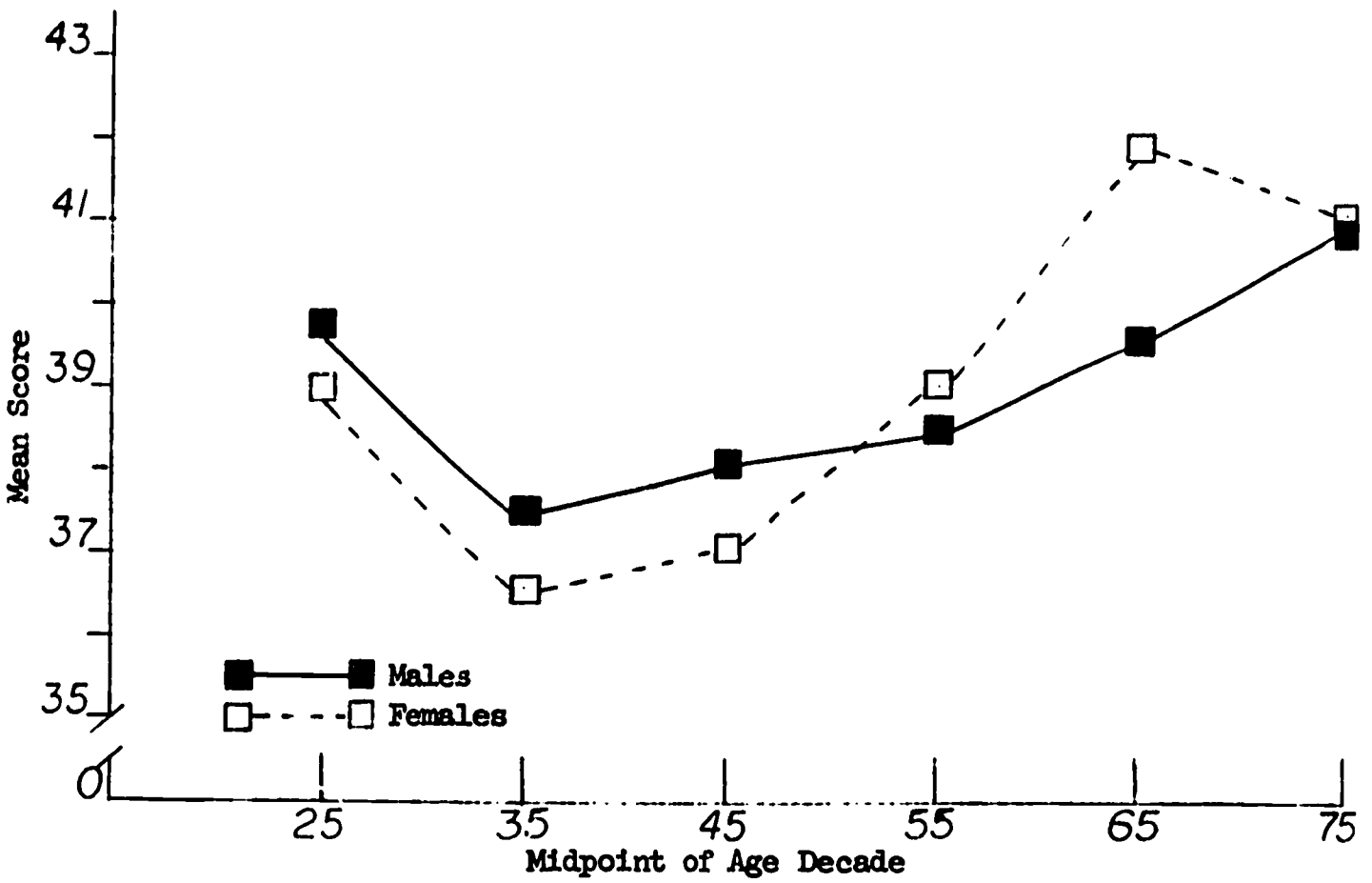


Figure 12 "Manifest Anxiety" as a function of age and sex

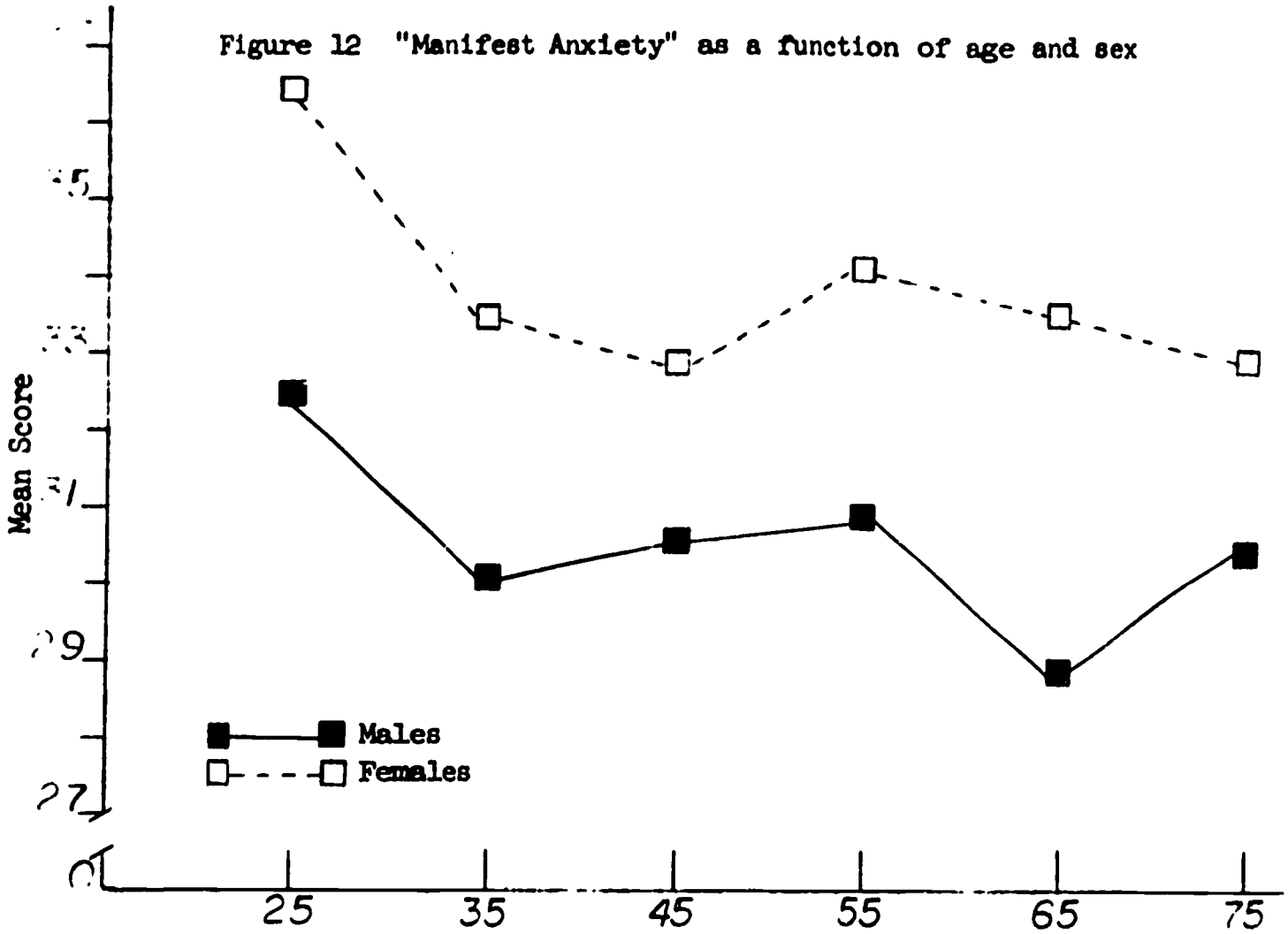


Figure 12A General Anxiety (Sarason)

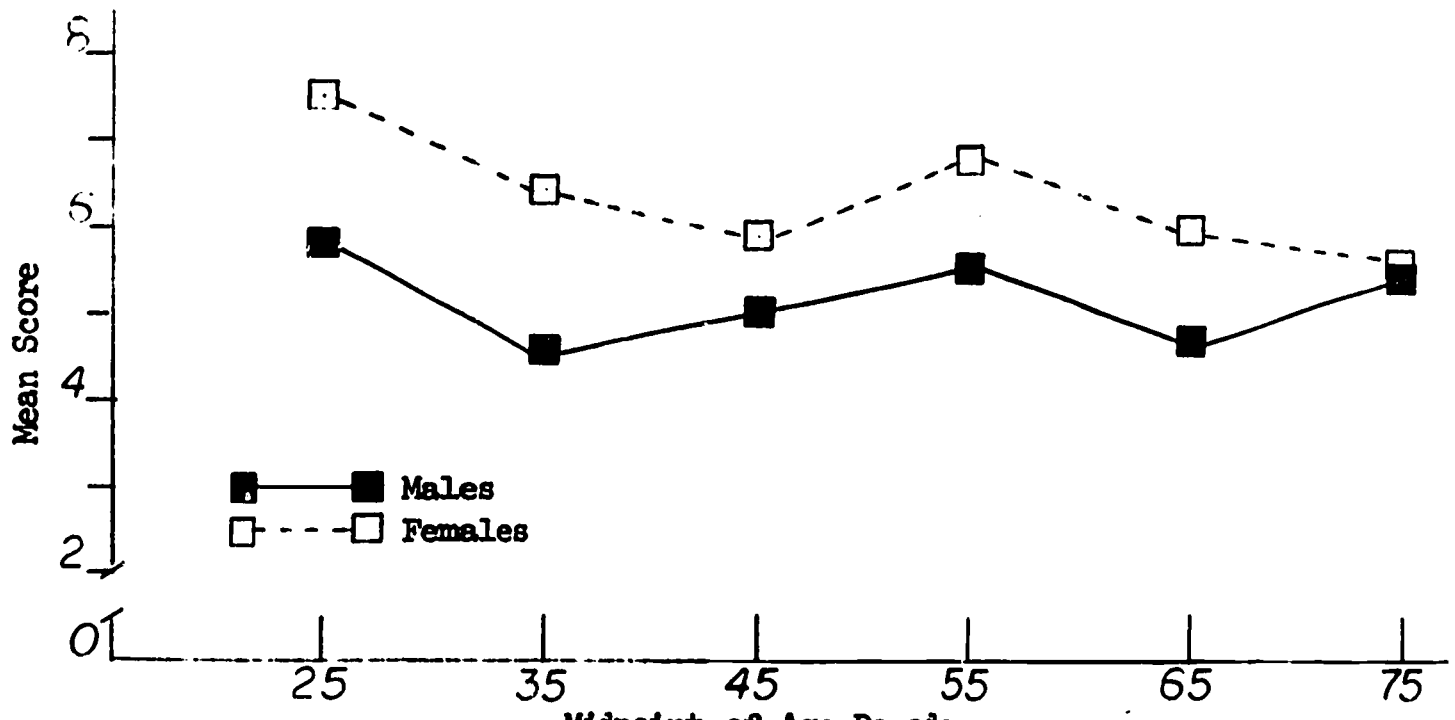
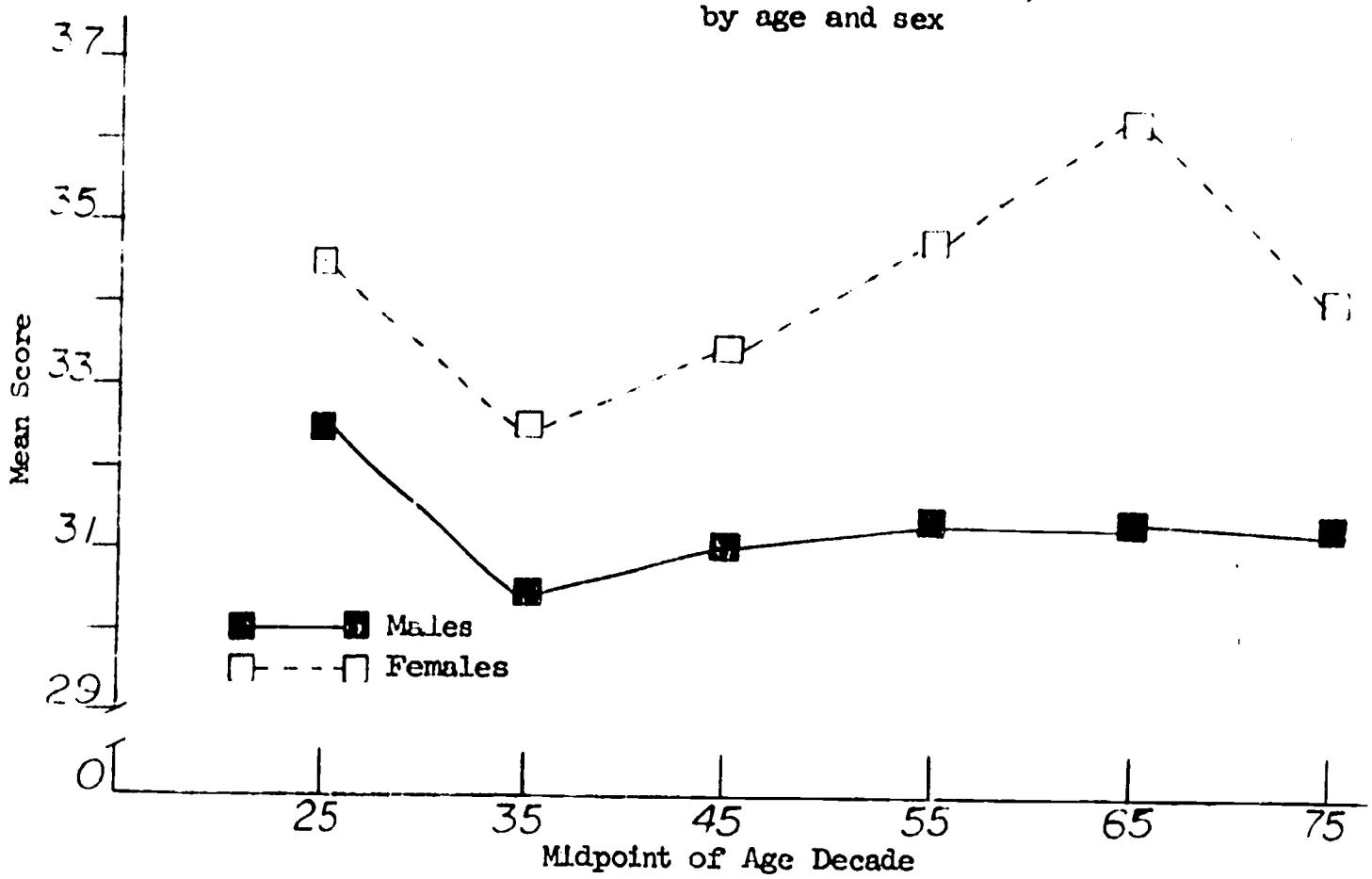


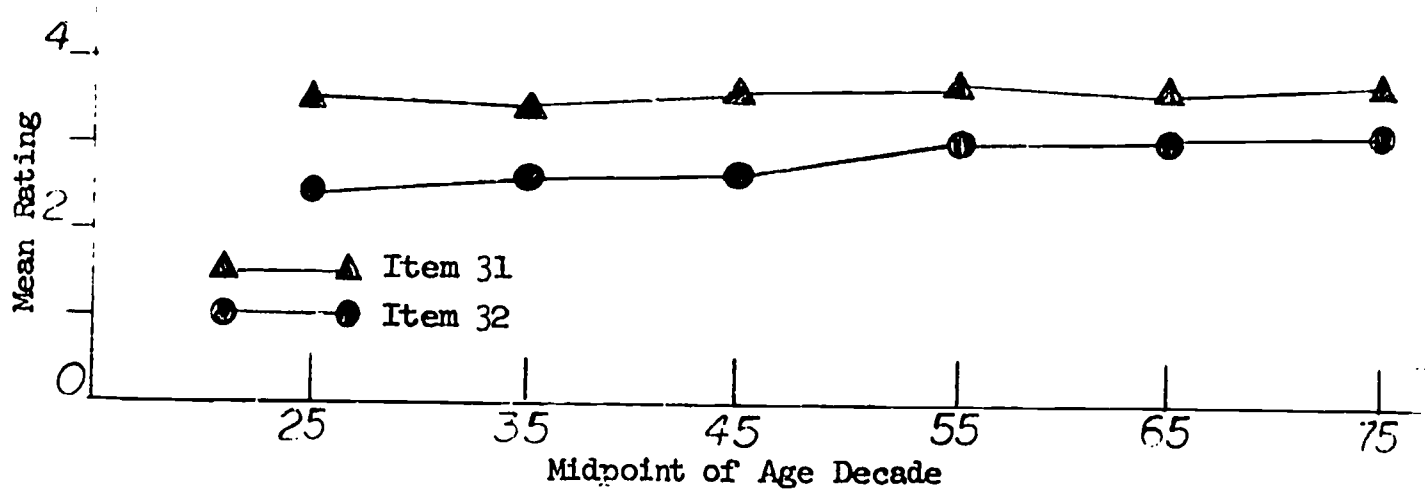
Figure 12B Manifest Anxiety (Bendig)

Figure 13 "Test Anxiety" (Sarason)
by age and sex



Midpoint of Age Decade

Figure 14 Ratings of "Test Anxiety" (Item 31) and
"Test Difficulty" (Item 32) on Form RK by age



Item 31 is included here because it was meant to assess "test anxiety." Table 1 shows that the age effect was not significant. Item 32 is included here for two reasons. First, it asked for ratings of the perceived difficulty of the test just taken (Form D-2), and second, because it was the only one of the five items on Form RK to yield a significant age difference (see Table 1). Figure 14 shows a monotonic increasing mean score with increasing age, indicating that older people rated Form D-2 as more difficult than did younger people. On the "situational anxiety" scale, there was a mean and a variance calculated for each person across the ten situations. The mean of the individuals' means for each sex and age decade was calculated to reveal the level of anxiety as a function of age and sex, and the mean of the individuals' variances was calculated (and transformed to logarithms before analysis of variance as suggested by Scheffe, 1960) to determine whether there was greater generality of anxiety--and, thus, less intraindividual variance--as a function of increasing age. Figure 15 shows the means and Figure 16 the mean log (variance) as functions of age decade and sex. Table 1 indicates that both main effects and the interaction were significant on the analysis of the means. Females score higher on level of anxiety than males. For males, the 60-69 age group was lower in anxiety than the other ages, while for females the decades of the 20's, 40's, and 50's were higher than the decades of the 30's, 60's, and 70's. In neither sex was age systematically related in a simply way to anxiety level. As for the variances, the only significant effect, as noted in Table 1, was the sex difference, with females having a higher variance than males and thus, showing less generalization of anxiety across situations than did males.

Figure 17 shows the remarkable increase in scores with age on the dogmatism scale. Females are lower than males at earlier ages (20's, 30's, and 40's), but are higher in dogmatism than males in the later years (50's, 60's, and 70's). The overall sex effect is not significant, but both the age effect and the interaction are significant, as noted in Table 1.

The "extent of educational participation" scores, derived from the Leisure Activity Survey, are shown in Figure 18 as a function of age and sex, and as a function of educational level and sex. Inspection of this figure suggests that

Figure 15 Mean of individual means on ten "Situational Anxiety" ratings by age and sex

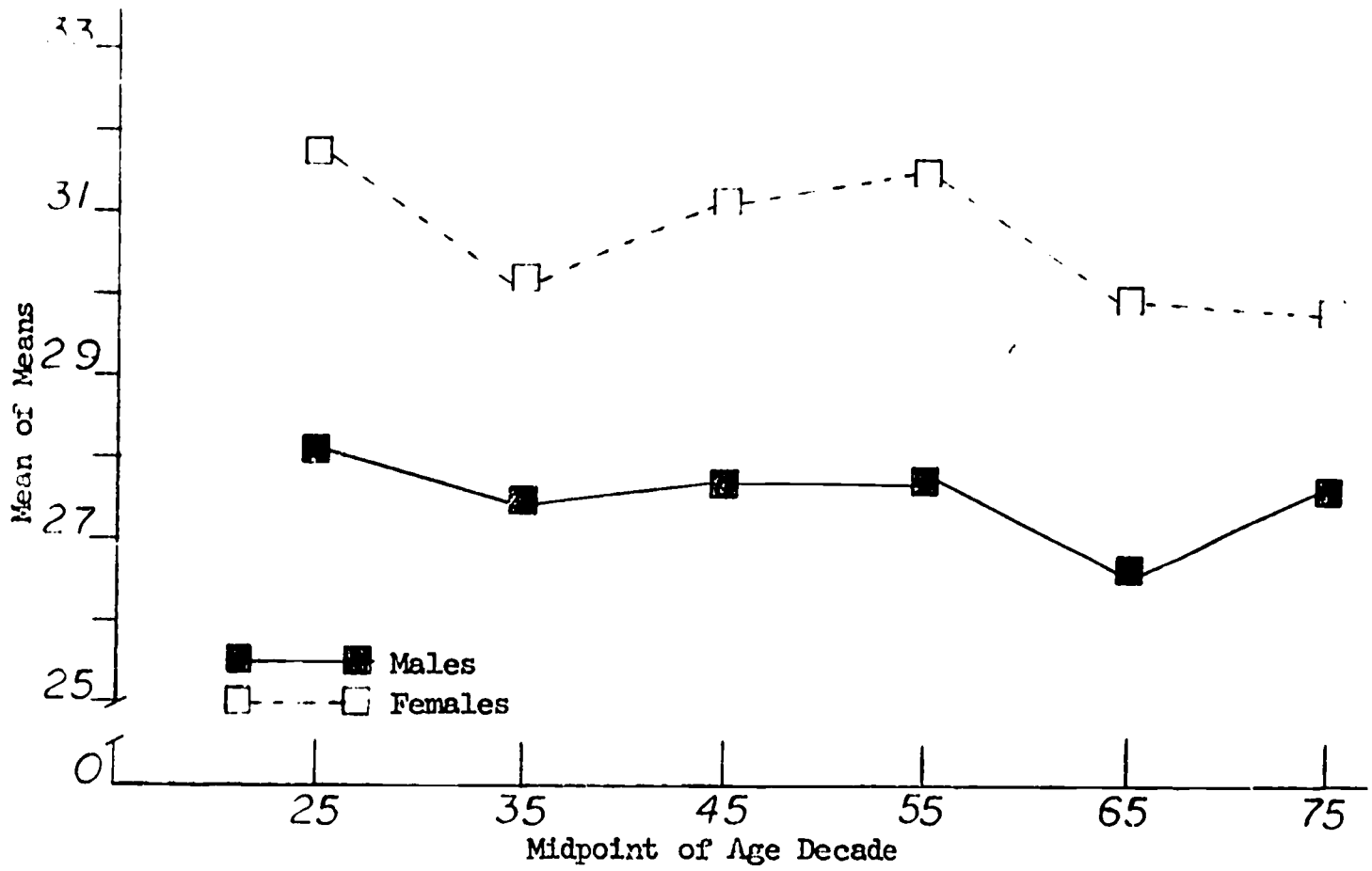


Figure 16 Mean logarithm of intraindividual variance across ten "Situational Anxiety" ratings by age and sex

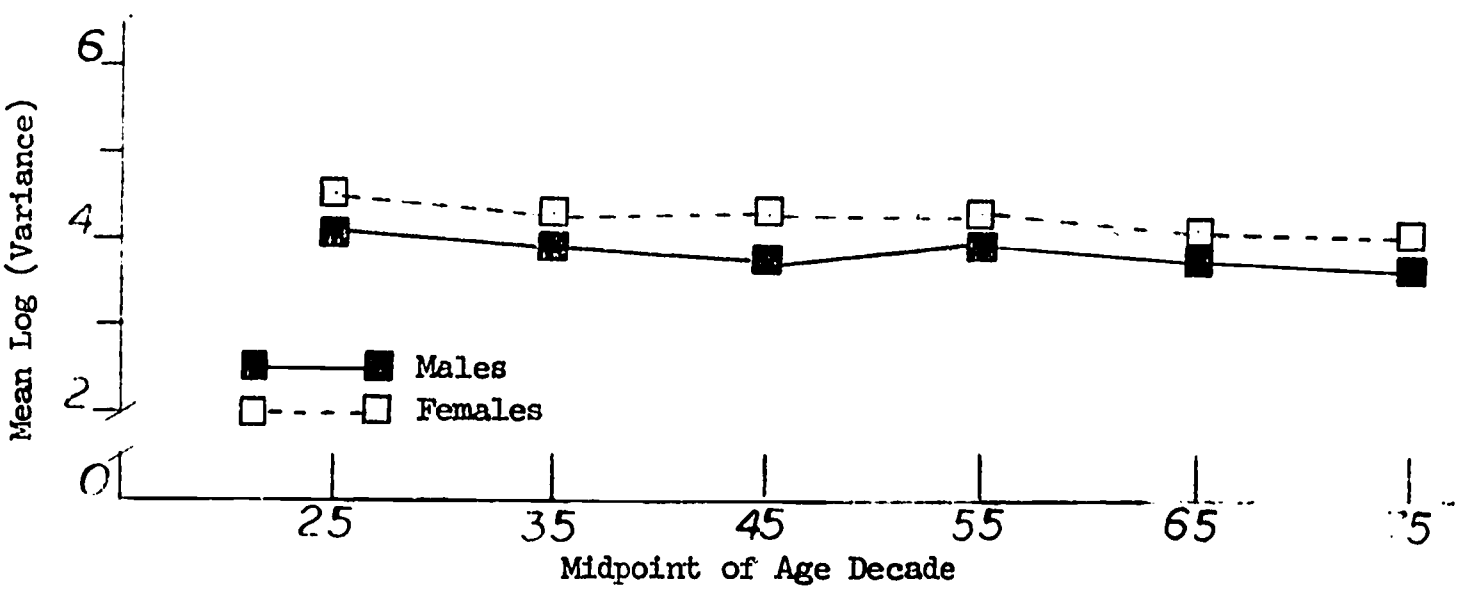
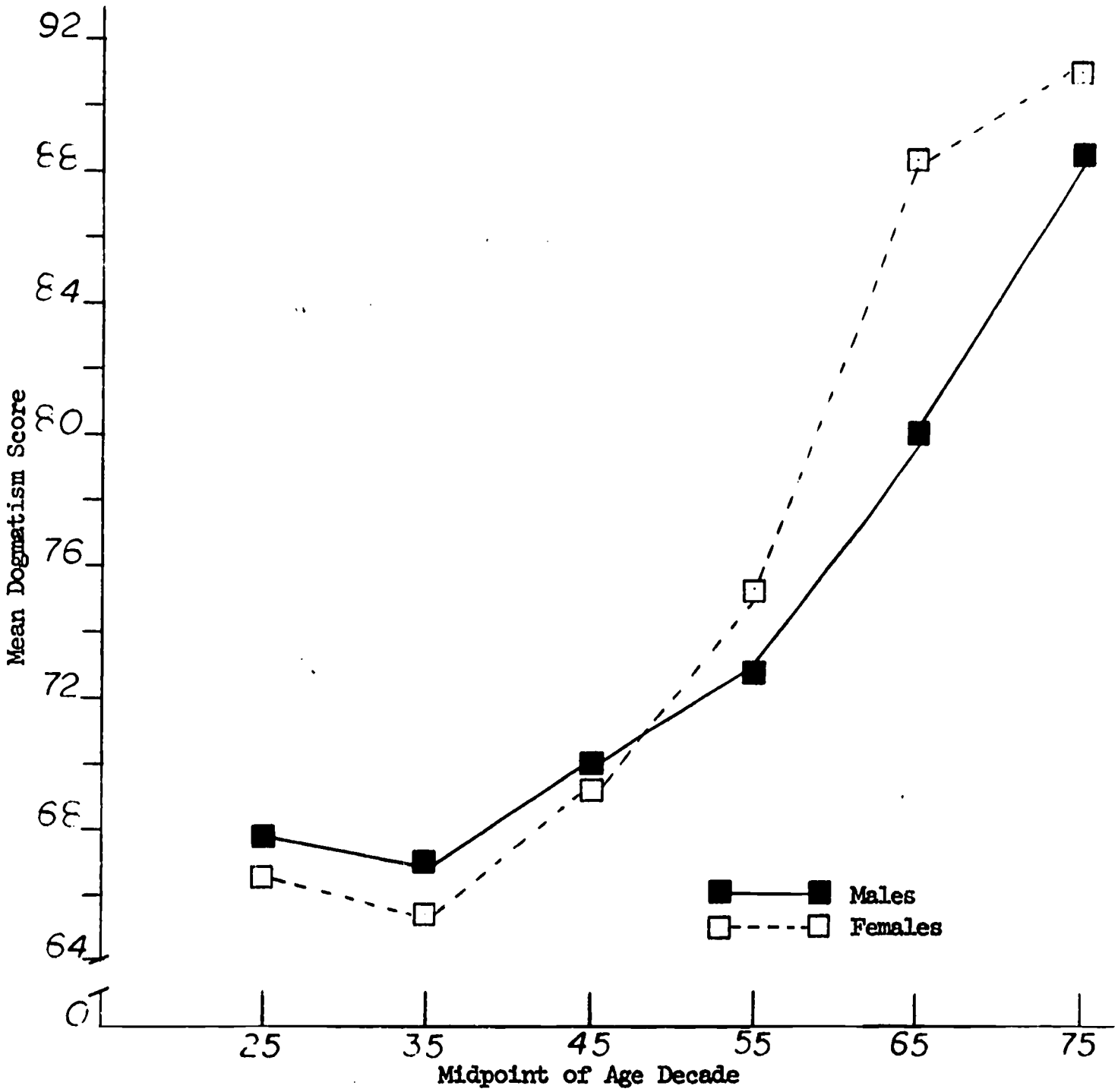


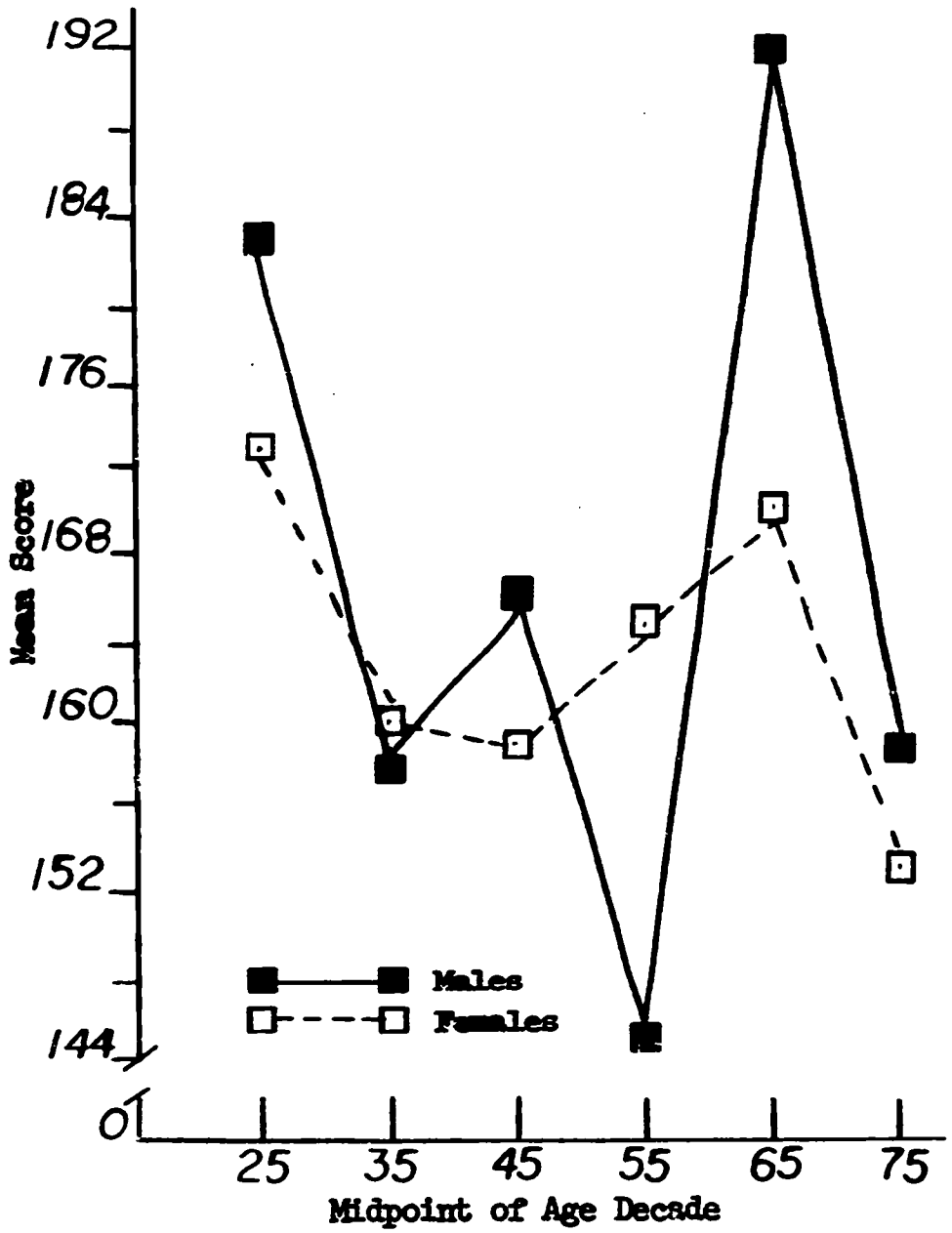
Figure 17 Mean score on short form of Dogmatism Scale by age and sex

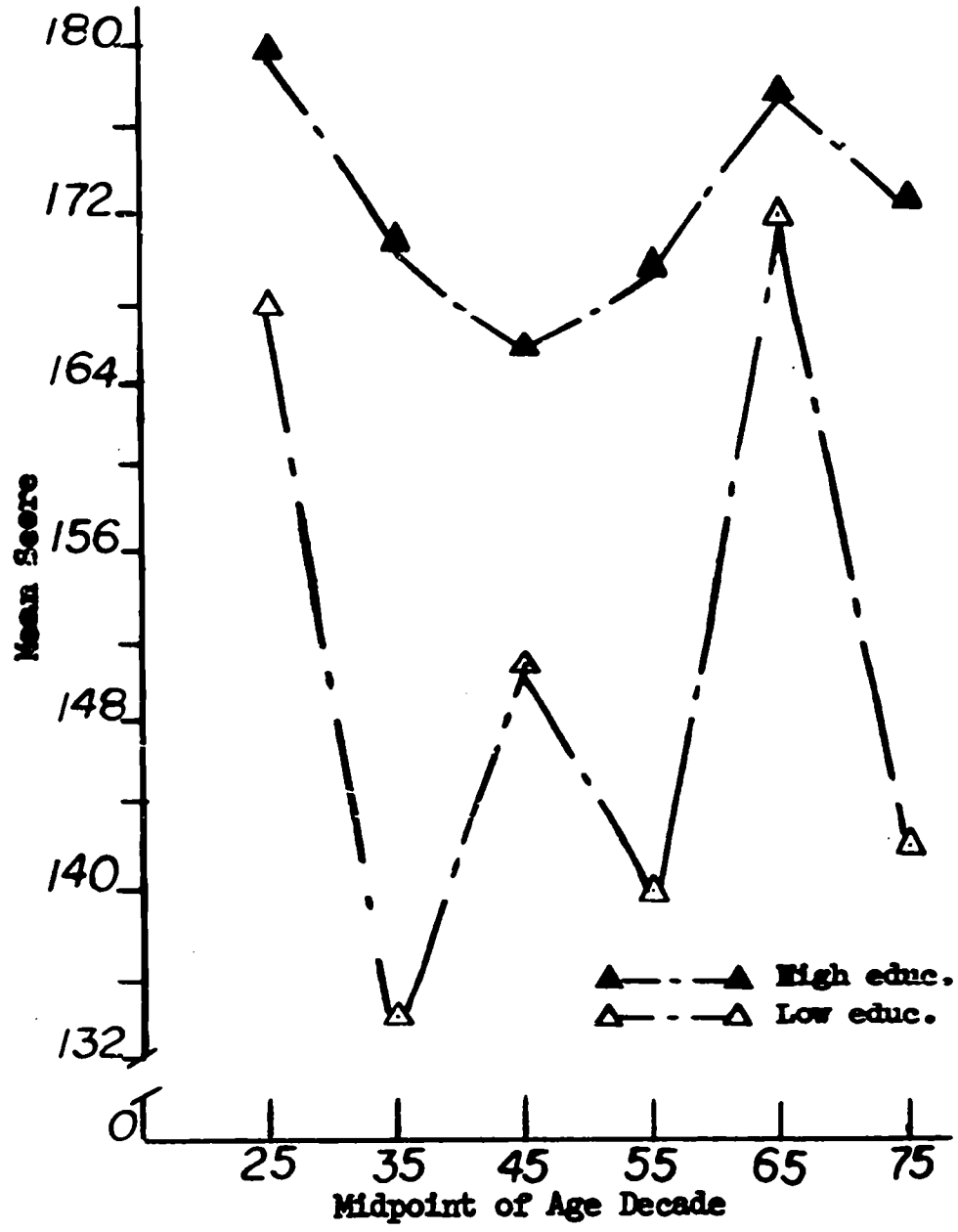


men vary more from decade-to-decade in the degree to which they participate than women do, that participation for both sexes is higher among people in the 20's and in the 60's than in the other decades, and that better educated people participate more, and more consistently across the age span from 20-79, than do people with less education.

Various combinations of the variables listed in Table 1 (except Form RK) were intercorrelated and principal components extracted and rotated to the varimax criterion (Harman, 1967). The first such analysis yielded five components with eigenvalue greater than unity, which accounted for 66.8 per cent of the total variance. The first rotated component accounted for 29.5 per cent of the variance, and was most heavily loaded with the ten individual situations from the Situational Anxiety Scale. The second rotated component accounted for 14.3 per cent of the total variance, and was loaded primarily with the three scales adapted from Sarason (1957) namely, General Anxiety, Test Anxiety, and Demand for Achievement plus the Bendig manifest anxiety scale. The third factor was most heavily loaded with age (in years) and the Dogmatism Scale, and accounted for 9.7 per cent of the total variance. The fourth factor accounted for 7.6 per cent of the total variance and was heavily loaded on Form D-2 (vocabulary) and the educational level rating. The fifth factor was defined primarily by sex (male was coded = 1 and female = 2), and accounted for 5.8 per cent of the total variance. A second analysis was run using only age (in years), sex, Form D-2 (vocabulary) score, educational level rating, Bendig's manifest anxiety score, the mean situational anxiety score for each individual across the ten situations, and the Dogmatism Scale score. Three principal components with eigenvalue greater than unity were extracted and rotated to the varimax criterion. They accounted for 66.7 per cent of the variance (a loss of one-tenth of one per cent over the first analysis described above). The first rotated component accounted for 25.7 per cent of the total variance, and had meaningful loadings (greater than $\pm$0.30) as follows: age = +0.896, Dogmatism Scale = +0.749, and educational level rating = -0.635. The second component accounted for 22.6 per cent of total variance, and its meaningful loadings were mean Situational Anxiety = +0.789, Bendig manifest anxiety = +0.770, and sex = +0.557. The third component accounted for 18.4 per cent of the variance, with meaningful loadings on Form D-2 (vocabulary) = +0.942 and educational level rating = +0.544.

Figure 18 Mean "Extent of Educational Participation Score" on Leisure Activity Survey by age, sex, and education





Summary

Examination of these analyses (and of the intercorrelations upon which the component analyses were based) leads to several suggestions. First, with respect to the various measures of anxiety, it does not appear that age is related in any simple way to either the level or the generality across situations of "anxiety" as measured by the several approaches used here. There is, on the other hand, ample evidence that our female participants rated themselves higher in every decade on every anxiety measure (except item 31, Form RK) than did our male subjects. These observations are strengthened by the data provided by the component analyses, which indicated that the anxiety measures cluster together, that they are positively associated with the female sex, and that they are independent of age (as well as of education, dogmatism, and vocabulary measures). Second, dogmatism (or closed-mindedness, rigidity, intolerance of ambiguity, etc.) is positively related to age and negatively to education. Since age and education were also negatively related, the question arises whether age, as such, is independently related to dogmatism. As one attempt to cast some light on this issue, the partial correlation of age and dogmatism score with the effect of education removed was calculated. The value was +0.43 which, with 1285 degrees of freedom, was clearly significant. (The unadjusted--zero-order--correlation of age and dogmatism was +0.50, of age and education was -0.48, and of education and dogmatism was -0.32). Thus the lower educational level of the older individual does not appear to be the primary explanation of the positive relationship between age and dogmatism. It was also noted that dogmatism was separated in the component analyses from the anxiety measures. Examination of the correlations of dogmatism with anxiety scales revealed that they ranged from -0.01 to +0.17 for the ten situations, with the mean of the intraindividual means correlating +0.14 with dogmatism. Dogmatism correlated +0.17 with the Bendig scale, and +0.18 and +0.12 with the adaptations of Sarason's test anxiety and general anxiety scales, respectively. The highest of these several correlations (+0.18) accounted for 3.2 per cent of the common variance with the dogmatism score.

Thus, Kuhlen's (1964) explanation of the increasing trend with age in dogmatism or rigidity in terms of increasing anxiety seems not to have been supported by these data. And

it cannot be too plausibly argued that dogmatism and anxiety should not co-exist if the former is supposed to be a way of controlling the latter, since Rokeach (1960) finds highly significant correlations between dogmatism and anxiety in seven different samples. However, Kuhlen's hypothesis about the increasing generality of anxiety across situations with age fares somewhat better. There was in both sexes (but more so in the females) a decline in the variance among the ten situations with age; though it was not significant. The downward trend (Figure 16) was consistent and regular except for a slight elevation among males in the 50-59 age decade. This should encourage further examination of Kuhlen's hypothesis. One possible explanation for the increase with age in rigidity or dogmatism is that ready-made, stereotyped responses are energy-conserving. Little or no thought is required, and there is little wasted action. And, more often than not, such responses are adaptive. They have, after all, been learned through oft-repeated experience and in a variety of circumstances through a long life. Some of the older subjects in this study, for example, betrayed something of this in their arguments with the proctors over how to treat the task of rating the "bounced check" and "supermarket over-run" situations. Many of the older people assured us that they would never let such things occur, and how in the world could they imagine how they might feel in such a situation? This unwillingness to experience, even vicariously, might certainly be construed as rigid behavior--but it is also symptomatic of an unremitting caution in important matters that has been translated into an iron-clad routine to avoid both trouble and the expenditure of energy that would be required to put things right.

II. Experimental Studies

The second major aspect of this program of research is related to the actual performance of individuals of different ages in tasks requiring performance of simple and complex cognitive tasks under controlled, laboratory conditions.

The major experiments (except one) have already been described by publications in scientific journals. They will be briefly summarized here, as will the minor, pilot studies that were run on special (student) samples for the sole purpose of "trying out this technique" or "smoothing out that procedure." (It should be noted, in fairness, that no small amount of effort went into these pilot studies, so necessary to the development of techniques and materials in relatively new research fields.) The studies are reported below in a logical (rather than a chronological) sequence.

Effects of Incentives on Performance

As predicted at the outset of the project, it was found to be necessary to offer money in exchange for the participation of adults in this program. While casting about for a means of assessing the effects on performance of various incentive delivery systems, we employed Dr. Harriett D. Blank, who had just completed her dissertation on the effects of reinforcement value on children's performance. With her help we conducted a series of five experiments which helped to allay our concern about the differential effects of incentive size, criterion for payment (per-task vs. per-unit-of-accomplishment), and target of payment (individual vs. organization) on the performance of our subjects. This series of studies also made a significant contribution to the theoretical conceptions of the effects of incentive size (absolute vs. relative interpretations) on human performance. The series of experiments is described in articles by Blank and Monge (1970) and by Monge and Blank (1970). The original study examined, with female subjects aged 20 to 67, the absolute and relative interpretations of incentive magnitude. Subjects sorted numbered cards into slots for either high or low reward (25 cents vs. $3.00) and were either aware or unaware of the alternative incentive size. No significant differences were noted after 13 trials. Half of each group was shifted to the alternative incentive size for trials 14-20. No effects of the shift were found. Following the original

study, a series of investigations was undertaken to systematically attempt to account for original findings of no differences in speed of card sorting due to magnitude of reward, either under conditions of awareness or unawareness of available alternatives. Since rewards had been donated to a common cause (a women's group) in the first study, it was decided to determine if differences in speed of card sorting due to differential reward magnitudes would be obtained when rewards were presented directly to individual subjects. This led to two studies essentially involving immediate reinforcement (immediate payment of subject by experimenter) and delayed reinforcement (payment by an experimenter's aid in an adjoining room). Subjects in the former study were run only under the condition of awareness of alternatives, with the proposed plan of investigating the awareness dimension only if differences based on magnitude of reward were found. Since the differences were not significant, it was apparent that the factors of recipient (common cause vs. individual) or delivery system (immediate vs. delayed) did not yet explain results of the original experiment.

A third study using a different approach was then run. A digit-symbol substitution task, with a one or five cent reward to accumulate for each correct substitution within the allotted time, was used. The dimension of awareness of alternatives was also studied, thereby resulting in four experimental groups. Again, there was no difference between groups considering the magnitude of reward factor. However, a highly significant result ($p < .01$) in favor of groups aware of alternatives was found. This third study differed from previous studies in several important aspects: subjects participated in groups rather than individually, a change in task, and a payment schedule involving reinforcement per unit of work completed (i.e., for each correct substitution) rather than payment following a series of trials.

In addition a fourth study utilizing the original card sorting task with the new reinforcement schedule (i.e., one or five cents for each card sorted correctly within the allotted time) was completed, which resulted again in no differences due to reward magnitude or the awareness dimension.

Learning Set

The learning set hypothesis asserts that, for one reason or another, older adults do not know how to learn as

well as younger people. In his classic paper, Harlow (1949) defined learning set as "learning how to learn a kind of problem, or transfer from problem to problem." Thus, learning set refers to a nonspecific transfer of learning--the transfer of knowledge of the tools and techniques of learning, rather than the transfer of a specific subject matter. In the context of aging, it is proposed that as adults grow older they encounter fewer occasions requiring new learning, and therefore the habits of learning they developed during formal schooling and in the early years of maturity have deteriorated through lack of practice. To illustrate this concept in the classroom setting, the individual who has been out of the routine of formal schooling for any appreciable length of time is likely to have lost a substantial portion of whatever he may have known about how to learn. The reference here is to such "tools of learning" as knowing how to study, how to concentrate or focus attention, how to organize the work, how to take notes, and a myriad of other "mental adjustments" and attitudes towards the process of learning.

Those who have taught courses enrolling people who have been out of the school routine for some time have no doubt had the experience of dealing with students who, after the first class meeting, gather at the lectern to express serious doubts about their ability to compete in an academic setting. Some of them, to be sure, are merely having problems in rearranging the priorities of their daily lives to find time for studying, but there are those genuinely concerned about recapturing their skill in the mechanics of learning.

While the statement above of the learning set hypothesis was couched in terms of chronological age, it should be noted that age, per se, is not the critical independent variable. The critical variable is, of course, the cognitive style of life of the individual. That is, individuals who are more or less continuously engaged in making use of the tools and techniques of learning should suffer little or no deterioration in learning set. Thus older adults who have maintained learning sets may be expected to perform more nearly like young adults than will those who have not maintained learning sets.

The first of the planned series of studies in our research program was a learning set investigation (Monge, 1967; 1969). The major purposes of this study were to

examine suggestions that there are, in addition to the deficit due to loss of response speed with age, deficits in concentrating or focusing upon the materials to be learned. The paired-associate paradigm was used. The anticipation interval was held constant at 4 secs., while the inspection interval was either 2 secs. or 1 sec. to test the hypothesis that the performance of older subjects (aged 60-69) would suffer more than that of younger subjects (aged 30-39) when the time allowed to review the stimulus-response pair was limited. Furthermore, it was felt that if the predicted deficit was due to difficulty in concentrating or focusing upon the materials at a fast pace, then if subjects were given the opportunity to accustom themselves to the experimental situation--in other words, to form a learning set--the age difference should be reduced. To this end, each subject learned successively six different lists of paired associates. The most unusual finding, for which there is no ready explanation, was that the best-performing group was the older group at the slower pace. As expected, however, the older group at the faster pace was worst, and the two younger groups did not differ substantially, although the younger at the faster pace did perform worse than those at the slower pace at all list positions but the sixth in total and omission errors. Surprisingly, also, the main effect due to age was not significant in any analysis. In accordance with prediction, however, the main effect due to pace was significant and in the expected direction for the total and omission errors.

It was hypothesized, remember, that if the faster pace affected the older subjects as predicted, then the deficit might in part be due to an age-related difficulty in concentrating upon the materials to be learned, and that giving subjects the opportunity to accustom themselves to the pace, the materials, and the presentation device--in short, to form a learning set--would ameliorate the difficulty. This appeared to be the case for the older subjects at the slower, but not the faster pace. It might be conjectured that the older subjects at the faster pace did, indeed, form a learning set, but that they learned something other than what the experiment intended. That is, after a list or two they learned that the easiest way out of the situation was to simply wait out the maximum nine trials, responding only to those items that came easily. In all subsequent experiments with the paired associate technique, therefore, subjects were instructed that they must reach a criterion of one perfect recitation.

The preceding study also made clear the need for carefully calibrated lists of paired associates for future use. The work done is reported in Appendix D. Using these four lists a major pilot study was then undertaken to study, with readily available adult graduate students in education, three hypotheses regarding learning set development. The basic design of the study was a 2 X 2 factorial, with N = 16 per cell. One factor concerned the place at which the exposure of subjects to the material would end: constant number of trials (3) vs. attainment of a criterion of one perfect recitation. The other factor involved time of administration to subjects of the response words of the list just learned to test for backward (R-S) associations; after each list vs. after the fourth list only. The hypotheses were these: (1) If a major part of learning set formation involves the focusing of attention on the relevant parts of the task and learning to ignore irrelevant stimuli, then the incidental learning of the backward association will be poorer at the end than at the beginning of a learning set task. Thus, subjects who gave R-S responses after the first list should be superior to those who gave them after only the fourth list. In the "constant exposure" group, this comparison was not significant ($t = 1.21$, $df = 30$). In the "trials-to-criterion" group, the difference was opposite in direction to the prediction, and not significant ($t = -1.38$, $df = 30$). Thus, the hypothesis was not supported. (2) A learning set for backward (R-S) association formation can be formed just as can any other learning set; however, the task will focus attention on the R-S learning to the detriment of the forward (S-R) learning. Two 2 X 2 X 4 repeated measures analyses of variance were run, one on errors per list in S-R learning, and one on errors per list in R-S recall. The analysis of S-R learning yielded only a significant lists (repeated measure) effect ($F = 8.02$, $df = 3/180$; $p < .01$), while the analysis of R-S recall yielded no significant effects. Thus, the only conclusion was that an S-R learning set was formed over the course of learning four lists of paired associates. These analyses also led to the abandonment of the last hypothesis, namely: (3) S-R learning set formation, with no attentional split for R-S learning, is a function of number of lists rather than number of trials per list.

In the fourth experiment on learning set formation, it was hypothesized that the older adult has experienced a breakdown of learning sets through disuse over long periods of time, which handicaps him in learning. Furthermore, aware of his lack of recent experiences in learning, he is

threatened by the task he faces, a threat accentuated by difficult material. Twelve community-dwelling females in each of the decades from the 20s-60s learned 3 easy and 3 difficult paired associate lists, with half of the Ss in each decade learning the easy lists first. Trials to the criterion of one perfect recitation was the dependent measure. There was a significant, but disorderly-appearing age difference, with the 30s best, followed by the 50s, 20s, and 40s, with the 60s trailing badly. There was no difference between the easy-first vs. difficult-first conditions. The relationships of the age groups within the block of easy lists differed from those within the difficult block. Inspection of the means revealed little difference between the ages in the easy block; however, the 60s were severely set back by the change from easy to difficult, while the younger Ss were little affected. Set acquisition was orderly when the difficult lists were learned first. Apart from being over 60, age apparently has little to with the acquisition of this type of learning set.

A fifth learning set experiment was stimulated by Hutt (1947). It was conducted with a group of graduate students in education, each of whom participated individually. In a prior study, we had administered Terman's Concept Mastery Test: Analogies to similar students, and had conducted an item analysis on all 95 items to determine item difficulty. Then, in this experiment, subjects were assigned randomly to one of three groups. The first viewed 37 selected items with the items (projected individually on a screen and responded to with a push button in multiple-choice format) arranged from easy-to-difficult (E-D). The second group got the same 37 items in the difficult-to-easy (D-E) order, and the third group saw them in a mixed (M) order of difficulty. Subjects also pressed a button to indicate the confidence they had in the correctness of their response to each item on a three-point scale (Positive = 3, Fairly Sure = 2, Sheer Guess = 1). Galvanic Skin Response (GSR) was recorded continuously to see if any trends developed as task difficulty increased or decreased. No significant difference appeared on any of the measures. The mean number of items correct was lowest in the D-E group (23.4), intermediate in the E-D group (23.7), and highest in the M group (24.2). The overall standard deviation = 4.25. Confidence ratings were assessed separately for correct and incorrect responses. For correct responses, the mean confidence ratings were D-E = 2.46, E-D = 2.44, and M = 2.42. For incorrect responses, the mean confidence ratings were

D-E = 1.81, E-D = 1.68, and M = 1.76. The expense of analyzing the lengthy GSR recordings was not deemed worth the potential return in light of the lack of significant differences.

Two additional pilot studies were conducted using perceptual rather than verbal materials, with no appreciable return. Since they also used graduate students as subjects, and thus had no bearing on age differences, they will not be reported.

A major study in this learning set series was conducted by Dr. David F. Hultsch (1968) for his Ph.D. dissertation. It dealt with the effect on subjects of different ages of different kinds of instruction-induced sets for organizing elements to be memorized. The study has been published (Hultsch, 1969), and is summarized briefly here. Hultsch investigated the ability of males of different ages to organize material to be recalled. A 16-trial free recall task was given to males aged 16-19 years, 30-39 years, and 45-54 years. Subjects (Ss) were required to write down after each trial as many of the 20 words presented as they could recall. Three instructional conditions were used: one in which Ss were just asked to recall as many words as possible; a second which suggested that recall would be easier if the words were organized in some unspecified way, and a third which told Ss to alphabetize the words as an aid to recall. He found that the older Ss recalled fewer words than the high school seniors, although no difference was noted between the two older groups. Furthermore, those of all ages with alphabetization instructions performed best, but the interaction of age and instructions was not significant. Thus, although the older men did not recall as much, what they did recall was as well-organized as the recall of the younger Ss. They were, in other words, as able as the younger to use either their own or an instruction-induced organizational scheme.

In a later reanalysis of the data, Hultsch (1969) divided each of the three age groups into two sub-groups on the basis of their scores on a vocabulary test, and looked at the free-recall performance of the high vs. the low verbal facility individuals. In this reanalysis, he found no significant age differences among the high verbal facility group, nor were there differences due to instructional condition among this group. However, a significant age by instructions interaction was now detected in the low verbal facility groups. Under both the "standard instructions" and

"organizational instructions" conditions, the high school boys recalled more words than the two older groups, which did not differ from each other; however, no age differences were detected among subjects performing under instructions to alphabetize their recall.

This presence of an age decrement in the case of low verbal facility individuals, but not among high verbal facility people is quite interesting, particularly since it becomes apparent at such a comparatively early age, i.e., between, roughly, the late teens and the age of 40. Just why this is so is difficult to determine. It does appear, however, that at least part of the age-related decrement in recall performance was attributable to an age-related decrement in organizational processes. It appears that providing lower verbal facility people with a method of organizing material to be learned and recalled reduces age decrements in performance. Dr. Hultsch is presently following up on several suggestions produced by this research (Lange & Hultsch, 1970; Hultsch, 1971a; 1971b).

The final series of studies conducted under the general rubric of learning sets started with the finding, in an early pilot study with graduate education students, that there was a significant difference in the mean number of trials need to reach criterion favoring a group of graduate students who learned the pairs, in the usual fashion, from left-to-right, as compared with a group that learned the same pairs from right-to-left. The material to be learned consisted of sixteen pairs, with nouns as stimulus terms and adjectives as response terms, presented at a 2:1-second rate, i.e., a two-second anticipation interval and a one-second inspection interval.

This finding was explained in terms of reading habits. Since English is read from left-to-right, the significantly greater number of trials required by the right-to-left group to reach a criterion of one errorless recitation was thought to be due to interference in the learning process from being forced to read in an essentially "backwards fashion."

It was predicted from this that older individuals would be more affected by the experimental procedure than would younger people, on the grounds that the older would be more firmly entrenched in the left-to-right reading habit, and because the literature contains suggestions that performance requiring the reorganization of habits is depressed

more in older than in younger individuals. It was further reasoned that, if the right-to-left task showed age differences as predicted, then it could be used as a quickly-obtained index of the degree of cognitive rigidity present in an individual, which would be useful as a control variable in other research.

To test this prediction, 138 community-dwelling women participated in a follow-up study. They ranged in age from the early twenties through the late fifties, with approximately equal numbers in each age decade. Two sets of paired-associate lists were prepared to equate and counterbalance for effects of grammatical class of stimulus and response terms. Half of the subjects within each age decade learned, to a criterion of one errorless recitation, a list with nouns as stimuli and adjectives as responses, and the other half learned a list containing the same pairs of words, but with the adjectives as stimuli and the nouns as response terms. Within each of these age decade by list conditions, half of the subjects learned from left-to-right, and half from right-to-left. Thus, the design of the experiment was in the form of a 4 x 2 x 2 analysis of variance, with four age decades (20's, 30's, 40's, and 50's), two lists (noun-adjective vs. adjective-noun), and two learning conditions (left-to-right vs. right-to-left). The dependent measure was mean number of trials to successive criteria. Since the lists each contained ten pairs (reduced from the sixteen pairs in the pilot study to reduce task difficulty), the measures on the ten successive criteria could be, and were, used as a repeated measures dimension in the analysis of variance. The presentation pace was maintained in this, as in the pilot study, at the 2:1-second rate.

The analysis of variance was conducted by the unweighted means technique for unequal cell frequencies, and yielded significant F ratios for the lists effect, the successive criteria effect, the interaction of lists and successive criteria, and the interaction of age decade and successive criteria. Examination of the means indicated that the adjective-noun list was more difficult to learn than the noun-adjective list, and that women in the age decade of the 20's learned faster than did those in the 30's, 40's, and 50's. (The latter three age groups did not differ much from one another, although each successively older group required more trials to reach the final criterion. Surprisingly, in view of the pilot study, the left-to-right (L-R) vs. right-to-left (R-L) conditions did not differ significantly,

although the trends were in the predicted direction within all age groups but the 40's. And, with the exception of the 40's, successively larger discrepancies between the means of the L-R and R-L groups were noted, as predicted. Thus, although the age trends vis-a-vis L-R vs. R-L were not sufficiently clear to permit the task to be used as a quick-and-dirty individual measure of cognitive rigidity, the findings were of great interest and represent a new addition to knowledge of functioning in verbal learning.

Finally, a third experiment was conducted in order to confirm the results of the pilot study, since it seemed necessary to assess the reliability of the right-to-left phenomenon before going on to examine the efforts of other parameters such as list length, pace, stimulus conditions, etc. Since the pilot study used mixed-sex treatment groups and the preceding one used only females, it was decided to examine the sex difference in this experiment. Forty-eight Ss of each sex were drawn as nearly at random as possible from the Introductory Psychology Subject Pool at Syracuse University in the Spring semester of 1970. Half of the Ss of each sex were randomly assigned in order of appearance to the left-to-right treatment, and the other half to the right-to-left treatment. The procedure was identical with that described in the pilot study. The 2 (Treatments) x 2 (Sexes) analysis of variance of trials-to-criterion did not yield a significant main effect due to treatments, however, the sexes differed significantly, with the famales the better performers. This experiment actually provided two replications of the pilot study treatment conditions--one with each sex. In neither case was the difference between the left-to-right vs. right-to-left conditions found to be significant. This result plus the failure of the previous study to reveal a significant treatment effect provide the basis for grave doubts about the left-right vs. right-left effect, which does not seem to be a reliable phenomenon.

Thus, to summarize this set of three experiments: A pilot study with graduate student Ss revealed a significant difference favoring a group that learned a paired-associate list in the usual fashion as compared with one that learned the same list presented with the stimulus word on the right and the response word on the left. This difference was attributed to interference with normal English reading habits. The second experiment used community-dwelling females ranging in age from 20 to 59 years as Ss to test the hypothesis, based on the rigidity deficit explanation of age differences

in learning performance that older women would find it disproportionately more difficult to learn the right-to-left list than younger women, since the older would be more resistant to going against the left-to-right reading habit. No difference due to the treatment was found, although the gradual trend of decline with age was of interest, especially in light of the rigorous pace. A third experiment using college student Ss was conducted to confirm the pilot study result, but failed to do so. The left-to-right vs. right-to-left difference effect, it was concluded, is at best elusive, and at worst a Type I error. This set of experiments has been published (Monge, 1971).

Summary

Differences in the ability to form or use cognitive learning sets are not great through the normal working years (i.e., through the 50s), but difficult tasks--difficult because of time constraints or strangeness of the material--do pose greater problems for people in and after the retirement years (60-plus) than for younger people. The subjects in the two major studies (Monge, 1967; Hultsch, 1968) were selected rather carefully to obtain across-age homogeneity in verbal ability (vocabulary test scores) and educational and occupational backgrounds, so it is not surprising that neither study showed any relationship between the cognitive task performances, age and such "control variables" as anxiety (pre- and post-tested), dogmatism, or ratings of: fatigue experienced, interest in task, comfort with pace of task, expectations about adequacy of performance, degree of effort expended (or motivation to cooperate), etc. Finally, the series of studies by Monge (1971) investigating the effect of breaking the set for reading from left-to-right showed no age difference in the ability to break a set of this kind over the range from 20 to 59. Furthermore, this investigation casts an optimistic light on the maintenance of a high degree of verbal learning ability through the adult working years.

Attitudes, Age, and Cognitive Performance

The second general hypothesis related to the role of personality variables such as attitudes. It had been shown in previous research that individuals who hold unfavorable

attitudes have more difficulty in both learning and remembering verbal material related to those attitudes. This is a somewhat controversial area of research, with recent studies suggesting an interaction between emotional and cognitive variables in determining the poorer performance of those with attitudes unfavorable to the content of the cognitive material. In view of the presumed greater rigidity and dogmatism of the older adult, it was predicted that the emotional element would have greater weight for him than for the younger individual in this interaction than would the cognitive element. In other words, it was hypothesized that the degree to which an older adult can handle controversial material is influenced by his attitudes to a greater degree than is true for the younger adult.

Most investigators who have studied the relationship to learning outcomes attitudes toward the content of the material to be learned have failed to separate the effects of negative attitudes from the effects of deficient cognitive background brought to the learning task. Until the work by Fitzgerald and Ausubel (1963), the point was largely overlooked that individuals with negative attitudes do not learn as much about the "other side" of controversial issues. It appeared from the Fitzgerald and Ausubel study that deficiencies in related cognitive structure rather than negative attitude were responsible for learning deficiencies. These findings emphasize the importance of exercising control over relevant background independently of the attitude.

Such controls were exercised in a study done for his M.A. thesis by Dr. David F. Hultsch (1967). The study did not have an age factor in it, since it was conceptualized as a test of Ausubel's (1962; 1963) theory preliminary to its application to a wider age range. Thus, the study is only summarized here. A total of 144 graduate students in education were divided into six random groups of 24 subjects each. Each group was given a pretest to determine degree of knowledge about the construction of psychological tests. Then, two groups were given a communication designed to foster in them a positive attitude toward psychological testing, two groups were given a negative communication, and the remaining two groups were given no attitude biasing communication. All groups then took an attitude survey instrument to assess the effects of the biasing treatments, and were then given a passage to learn on the construction of psychological tests. Finally, one group from each of the attitude bias conditions took an immediate (learning) test

on the passage, while the other three groups came back one week later for the (retention) test. (In fact, all six groups took both the retention test and a retest on the attitude inventory one week later.) Briefly, the results showed that the attitude manipulations were effective, both initially and over one week, and that the groups did not differ on either the learning or the retention measures, nor was there an interaction between attitude treatments and learning vs. retention. When the subjects were divided into three bias groups on the basis of the attitude inventory scores (rather than on the basis of the attitude biasing treatment), no significant differences were detected on the learning or retention measures. Analysis of covariance performed on the learning and retention scores of the bias groups did not change the outcome appreciably, since there were no significant differences with the pretest uncontrolled. Thus, the results of this study failed to support the hypotheses that positive attitude facilitates and negative attitude inhibits the learning of meaningful material on a controversial topic, and that attitude bias has an effect on the retention of such material.

A second, major study of emotional bias and cognitive performance was conducted by Dr. Milton F. Nehrke using the approach suggested by Lefford (1946).

Lefford (1946) concluded that "unbiased reasoning is rare in affective stimulus situations." The basis for his statement was the response of college students to emotionally toned and non-emotionally toned syllogisms. He observed that the frequency distributions of correct validity judgments for the emotional syllogisms was J-shaped while the distribution for the non-emotional syllogisms was basically normally distributed. In addition, he noted that the exact distribution depended on the order in which the syllogisms were administered. When the emotional syllogisms were first, he found the distributions to be the same as noted above. However, when the non-emotional syllogisms were administered first, they had a facilitative effect on the judgment of the emotional syllogisms so that the distribution for the latter was bimodal rather than simply J-shaped and the distribution for the non-emotional syllogisms was less variable about the mode.

Lefford's analysis of logical judgments, however, is lacking in generality since it dealt with a restricted educational range, did not include sex differences and dealt

only with young adults. The present study was intended to investigate age, sex, and educational differences in judging the validity of emotional and non-emotional syllogisms.

In the original grant proposal, Kuhlen suggested that the attitudes of elderly persons should interfere with their syllogistic reasoning abilities more than would be the case for young adults. Likewise, Chown (1968) has noted that there appears to be an increase in rigidity and dogmatism with age. More directly, Weir (1961) has observed that older subjects (70-84 years) became emotionally involved with test items, and were less able to differentiate fact and value. Thus, it was predicted that there would be a decrement in syllogistic reasoning with increasing age, and that the elderly subjects would evidence greater interference from the emotional syllogisms so that the difference between the two types of syllogisms would be greater for the older subjects. With regard to education, it was expected that persons of higher educational background would make more correct validity judgments on both types of syllogisms (Morgan, 1956). The variable of sex differences was included since there are several studies (e.g., Roll, 1970; Young, 1971) which have observed that males, at least for some part of the life span, are superior to females in problem solving abilities.

A total of 1,151 persons were tested with updated forms of Lefford's (1946) syllogism scales. However, only 1,002 protocols were completely answered and contained all the necessary demographic data. The subjects were paid volunteers from the Syracuse area and from Senior Citizen's Centers in Dade County, Florida. The subjects were classified on a nine point scale of education described earlier in this report. For purposes of statistical analysis the subjects were divided into two educational levels, also described previously. The subjects were further grouped on the variables of age decade (20-79+) and sex.

The 20 emotional syllogisms were modified, in terms of content only, in order to update the material. Thus, instead of referring to World War II and President Roosevelt, the present syllogisms referred to Viet Nam and President Nixon. The form and order of the syllogisms were the same as in Lefford's (1946) study. One half of the items on each scale were valid syllogisms and half were invalid syllogisms. An example of a valid syllogism is "All enemies of a government are justifiably repressed by any measures that government may consider necessary. The Yippies are enemies of the

United States government. Therefore, the Yippies are justifiably repressed by all measures."

In all cases the syllogism tests were administered as part of a battery of tests in a group situation. For approximately half of the subjects (N = 519) the validity of the emotional syllogisms were judged first while the remaining subjects (N = 483) judged the non-emotional syllogisms first. Assignment to order of presentation was random within each cell of the design, and the dependent variable was the number of correct validity judgments on each scale. Table B-11a (Appendix B) contains a summary of the experimental design, the mean level of education per group, and the mean scores attained on the emotional and non-emotional scales.

An initial question of interest was the nature of the distribution of correct responses which Lefford (1946) found to be J-shaped for the emotional syllogisms and normal for the non-emotional syllogisms. The distributions for the emotional syllogisms were clearly not J-shaped in the present instance; rather, they were normally distributed, regardless of the order of presentation. When the data were plotted for other variables, such as age or sex, the distributions were also normally distributed. While there may be some minor effects of order, the means of the four conditions were so similar (Order I (E, NE) $\bar{X}$ Emotional = 10.92, $\bar{X}$ Non-Emotional = 13.72; Order II (NE, E) $\bar{X}$ Emotional = 10.92, $\bar{X}$ Non-Emotional = 13.80) that order effects were not included in the analysis of variance.

A 6 x 2 x 2 x 2 analysis of variance for repeated measures was used to analyze the data. A summary of the analysis is presented in Table B-11b in Appendix B. The main effects of Age, Education, Sex, and Trials (type of syllogism) were all significant. In addition, the Age x Education, Age x Trials, and Education x Trials interactions were also significant. Simple effects analyses ($p < .05$) indicated that there was a significant decline in scores across age for both levels of education, and that the difference at each age level was also significant, with the higher education subjects performing better. The simple effects analysis for the Age x Trials interaction also indicated a significant decline in syllogistic reasoning across age levels and a significant difference between the emotional and non-emotional scales, in favor of the latter, within each age decade. The Education x Trials interaction simple effects were also significant for both educational

levels, with the emotional syllogisms less frequently judged to be valid.

There is plentiful evidence in the present study that syllogisms dealing with controversial or emotional material are significantly more difficult to deal with on a logical basis than syllogisms dealing with neutral or non-arousing content. However, the overwhelming interference of emotional material on reasoning ability observed by Lefford (1946) was not replicated in the present study as is evidenced by the normal distribution of both types of syllogisms. The reasons for such a vast discrepancy in results is not obvious since the syllogisms in both studies were identical except in reference to dated events. To be speculative, it could be that college students in 1945 were more emotionally involved with topics such as World War II, Communism, and Nazism than the population of today is concerned with such topics as Viet Nam, Communism, or Yippies. It may also be a result of advances in education that better prepares the population to deal with affective material. Whatever the reasons, there is need for exploration and examination of the processes involved in the ability to reason effectively and accurately with emotionally loaded material.

With regard to the hypothesis concerning age differences in problem solving or syllogistic reasoning, the data confirm the expected decrement in ability with increasing age on both the emotional and non-emotional syllogisms. Interestingly, however, the absolute difference between the two types of syllogisms was greater for the younger subjects rather than for the older subjects. It may thus be suggested that the elderly, in spite of lower levels of performance, are not as adversely affected by emotional syllogisms as would be expected on the basis of Weir's (1961) findings. At this point, however, it is necessary to raise the question of stimulus equivalence, particularly regarding the emotional syllogisms. Are the emotional syllogisms as arousing to the elderly as they are for the young? Would they be more arousing to the elderly if they dealt with other topics which may be more directly and immediately relevant, such as death or financial matters? Again, this question remains open to empirical verification. The remaining hypotheses, concerning sex differences and educational differences, confirm previous findings and are not very surprising. As in the work of Roll (1970) the present data support the superiority of males in problem solving regardless of age, education or type of syllogism. This is somewhat in contrast to the

findings of Young (1971) who observed a significant sex difference in the 40s which then decreased through the 60s where the difference was not significant.

In relation to the variable of education, the persons of higher educational background were significantly better than persons of lesser education on both the emotional and non-emotional syllogisms. Further, within the two levels of education there exist significant age differences, which raises the issue of matching persons of different ages on the variable of education. For example, in the work of Green (1969) such a matching on education washed out the age differences that were observed in intelligence when random samples were used. The same finding may well hold regarding syllogistic reasoning.

Age, Stress, and Cognitive Performance

As noted and implied earlier, one major hypothesis advanced to explain the generally poorer performance of older as compared with younger persons concerns the greater susceptibility of the older to a variety of stressors. This point of view is not devoid of support, as the literature indicates. There is, however, some speculation about the means by which the effect of an externally-imposed stressor is mediated to cognitive performance. Eisdorfer (1968), for example, challenged the earlier assumption that the aged are usually at a low level of arousal, and suggested that, "Once aroused automatically, perhaps because of a faulty ability to suppress end organ response or because of an altered feedback system, aged Ss appear to function as if in states of high levels of autonomic activity. Perhaps aged persons are less capable of tolerating heightened arousal."

It should be noted that all of the experimental procedures--and even the testing sessions used to collect the data appearing in the first part of this report--are probably differentially arousing to people of different ages. In every case, there is reason to suspect that the older were more threatened than the younger subjects. Thus age and arousal level have been confounded to some degree throughout these investigations, and inextricably so in the absence of manipulations aimed at equalizing levels of arousal or related processes. In this section are reported one experiment aimed at assessing the shape of the response surface

that relates age to various levels of one kind of stressor (namely, constraints on speed of performance), and one experiment that attempted to manipulate the stress engendered by the social setting within which the cognitive performance was required.

The first experiment, an investigation of the effects of the pace of the performance, has been published by Monge and Hultsch (1971). As noted above, this study was designed to map the response surface relating age, anticipation interval, and inspection interval in verbal paired-associate learning. This study goes to the heart of an issue currently of great interest in the field of differences in learning processes with increasing age through the years of maturity and later life. The issue revolves around the question of whether the usually-noted decrement with age in performance in learning tasks is due to factors related to the basic process of learning, or to factors affecting performance (i.e., the <u>display</u> of learning). Previous studies by Robert Canestrari, David Arenberg, Carl Eisdorfer and the Duke group, and by us, have pointed very strongly to an age decrement associated with the necessity of making a vocal response under time pressure, but less strongly to a decrement associated with the time permitted to study materials to be learned. Until the present study was undertaken, no investigator had systematically varied both the times allotted to study (and thus, to the learning process) and those allotted to responding (i.e., performance) in the paired-associate paradigm, although others have approached the problem through the serial learning technique.

Male subjects were divided into two age groups, 20 to 39 and 40 to 66, and eight subjects in each age group were assigned at random to one of nine conditions of presentation, namely, all combinations of two, four, and six seconds anticipation and inspection intervals. (A total of 144 males participated; 72 under 40 years, and 72 aged 40 and over.) Each subject learned a list of ten pairs of words (noun-adjective) to a criterion of one errorless recitation. The design, thus, was a 3 x 3 x 2 analysis of variance of number of trials to criterion, with three levels each of anticipation and inspection intervals, and two levels of age. Variance heterogeneity dictated a logarithmic transformation of the dependent variable. The anticipation interval effect was significant at the one percent level, and the arrangement of the means indicated that performance became better as the anticipation interval increased in length

from two through four to six seconds. The effect of the inspection interval was also significant at the one percent level, with the arrangement of the means indicating improvements in performance with increased length of the interval. The interaction between the two types of intervals was not significant. The age effect was significant at the one percent level of confidence, with the younger individuals showing better performance, and the interaction of age and anticipation interval was also significant at the one percent level with the older subjects benefiting more from increased anticipation interval than the younger.

The picture limned by the present results confirmed the insights gained from previous research on the relationships of performance to age and the two pacing variables. Age interacts with the anticipation interval, but not with the inspection interval, and performance is better at all ages with longer inspection intervals.

This study also provided the additional information that the two intervals interact neither with each other nor jointly with age. This implies that the total time available per item (i.e., the sum of the anticipation and inspection intervals) is not differentially important to people of different ages. Only that portion of total time allotted to the anticipation interval makes for age differences.

Although the focus of this study was on those places in the data where significant differences were found, something more than passing attention should be given to those areas in which differences did not appear if an accurate and complete picture of the age trends is to be formed. It was notable, for example, that in at least one treatment combination the older Ss actually performed better than the younger, although not significantly so. And, as a matter of fact, in no one of the treatment combinations taken singly did the differences between the age groups reach a significant level. And even when the age group means on the anticipation intervals (collapsed on levels of the inspection interval) were compared, only at the shortest interval did the age groups differ. Attention should also be given to the fact that the age factor alone accounted for only 6.94 percent of the total variance and, in combination with the anticipation interval effect, for another 4.02 percent. Thus the role of age, while important, should not be overemphasized.

In the second experiment, which was concerned with variations in the social setting of the experiment, a total of 112 men and 150 women ranging in age from 20 to 79 were used as subjects. All were community-dwelling individuals recruited from the Syracuse, New York area. Four dollars were paid to the treasury of the organization for each person who participated in the experiment. Prior to the experiment, personnel of the Adult Development Study explained the general purpose of the overall research program at regular meetings of the various organizations. The exact nature of the study was not discussed at this time, although the members were informed that it would involve some kind of cognitive task. Two variables were of concern in the experimental design: age and stress manipulation. The subjects were divided according to age into two groups. (1) 20 to 39, with a mean of 28.0 and a standard deviation of 5.0, and (2) 40 to 79 with a mean of 52.8 and a standard deviation of 8.7. Within each of these age groups the subjects were exposed to high stress or low stress conditions. Under low stress conditions the subjects solved the experimental problems in private with access only to their own feedback. Under high stress conditions the Ss solved the experimental problems in public with access to the feedback of a confederate of the experimenter, who solved all but one of the problems quickly and correctly.

Because of technical difficulties involved with scheduling the confederates to be present at the same time as a pair of same-sexed subjects, it was impossible to assign subjects within age groups to the high or low stress conditions by random methods. In view of this lack of random assignment, the comments concerning the equality of groups discussed in the section above are even more crucial. Three dependent measures were of central concern. (1) The number of items correctly solved. (2) The confidence ratings of the subjects, and the relationship between correct solutions and confidence ratings. (3) A physiological index of performance in the form of increase in heart rate over a base line measure.

There were three basic sections to the apparatus; the subject consoles, data acquisition system, and polygraph. The subject consoles included the apparatus necessary for the presentation and viewing of the stimuli and for making a response. Three subject consoles were situated side by side in a carpeted 9 ft. x 10½ ft. experimental room. Folding partitions were hung from the ceiling between

each console. These partitions permitted subjects to be run in a private condition (partitions extended) where they were unable to see the other subjects, or a public condition (partitions collapsed) where the other subjects were in view.

Each subject console consisted of a rectangular box constructed of 3/4" plywood measuring 27" wide x 24" high x 42" long, and standing on legs 29" high. In the front of each console, 34" from the floor was a small table-like projection measuring 14" x 27." The consoles were finished in walnut stain. A Kodak Carousel 35 mm. slide projector was situated inside the box, and constituted the means of stimulus presentation. Mounted at the front end of the console was a 14" x 14" plexiglass screen to allow rear projection of the slides. Directly above the screen were feedback lights labeled, from left-to-right, Ready, Correct, Incorrect and Skip. The table-like projection under the screen contained the 9" x 9½" response panel. The basic features of this panel were two columns of buttons. The column of buttons on the left was labeled "What is the answer"? and contained five possible choice buttons for recording the subject's answer to a problem. The second column of buttons was labeled "How sure are you"? and was designed to measure how confident the S was that his answer was correct. From top-to-bottom, these buttons were labeled Sheer Guess, Better than a Guess, Fairly Sure, Almost Sure, and Positive. The button marked "Press to skip" (bottom center of panel) allowed the subject to skip the problem altogether. The light labeled "Time" (centered at top of panel) was set to blink after a preset interval to let the S know he was running out of time. Finally the button in the center of the panel labeled "Press for more time" could be used to obtain 10 seconds more. The Data Acquisition System automatically controlled the stimulus presentation, the feedback, and did the response recording. It consisted of a special unit built for the Adult Development Study by Massey Dickinson Company. Feedback was controlled by a Tally Model 625 tape recorder for perforated tape. Responses were recorded on a Tally Model 420 tape perforator. A Grass Model 7, three-channel polygraph was used for physiological measurement. Heart rate was used in the present experiment. Each S's heart rate was recorded by a Grass Model PTT1 plethysomograph attached to the ear lobe. The output of the polygraph was fed directly into the data acquisition system and a code was punched on paper tape for each subject after every 16th heart beat.

Three types of problems were used: verbal reasoning, perceptual reasoning, and mathematical reasoning. All problems consisted of a statement of the problem followed by multiple-choice answers. Each subject solved 18 problems, 6 of each type. In the case of the verbal problems, the subject was given a situation and a conclusion. This was followed by some additional information. The subject was to determine if the additional information made it more probable, less probable, or neither more or less probable that the conclusion was correct. These problems were modified items from Form B of the College Battery and Form B_R of the Advanced I Battery of the Analysis of Learning Potential Test (Harcourt, Brace & Jovanovich, Publishers). The perceptual orientation problems presented three views of a cube with one letter on each face. The task of the S was to determine which letter was opposite the named letter. These problems were modified items from Forms A and B of the College Battery of the Analysis of Learning Potential Test. The mathematical reasoning items presented a math problem followed by possible answers. These problems were modified items of the Stanford Achievement Test, Advanced Battery, Form X_R and Intermediate Battery Form X_R (Harcourt, Brace, & Jovanovich, Publishers). The three different types of problems were used in an attempt to explore the age-stress relationship with items reflecting three basic types of abilities. The 18 problems were presented to the subject one at a time on the screen in the subject's console. The order of presentation of the three types of items was counterbalanced. Within each item type, the easiest item was shown first and the most difficult item last.

An attempt was made to manipulate stress by the context in which the problems were solved. Under low stress conditions, the subjects solved the experimental problems in private, with access only to their own feedback. Under the high stress condition, the subjects solved the experimental problems in public, with access to the feedback of the confederate. The confederate was a graduate student of the same sex as the subjects, about 25 years old, who followed a prescribed pattern of behavior (as follows) while seated at the middle console:

(1) During the instruction period, the confederate would ask the Experimenter an obvious question concerning the problems.

(2) Immediately following the instructions, the confederate mentioned to his fellow subjects that he thought the task was going to be difficult and confusing.

(3) While solving problems, the confederate answered all but one problem correctly, and at an increasing rate of speed.

(4) During the task, the confederate made certain comments.

(The confederate's "routine" is given at the end of this section.) It should be noted that while the confederate always solved all problems but one at an increasing rate of speed, he could not always make the prescribed comments indicated because of the nature of the interactions going on with the subjects who, of course, followed no script. An attempt was made to use these comments, but interaction with the subjects varied according to the individuals involved.

Each subject was run in the Adult Development Study laboratory. Under the high stress condition, either one or two subjects were run at once in addition to the confederate, who was always introduced and treated by the Experimenter, the receptionist, and other staff as a subject. In the case of the low stress condition, either one, two, or three Ss were run at once, although they were unable to observe one another in the experimental situation because the partitions were extended between the consoles.

When the subject appeared at the laboratory, he was assigned a code number. The Experimenter explained that the code number would appear on all of the subject's data to insure anonymity. (This was true; no record of names vs. code numbers was kept.) Subjects were assigned at random to the three subject consoles with the exception of the confederate who always sat at the center console. After seating the subjects, the Experimenter read preliminary instructions and attached the plethysmographs to the subjects-ears. The Experimenter then left the room and recorded base line heart rate. Following this, he described and illustrated (with slides) the three types of problems and gave instructions for making responses and observing feedback. Following the instructions, each subject attempted the 18 problems, working at his own rate. The time sequence for each problem was as follows: The Ready light came on for 0.5 seconds indicating a problem was about to appear. The

experimental problem appeared on the screen for 71.5 seconds unless the subject responded prior to the end of this interval. In that case the sequence moved to the inter-problem interval (see below). After the stimulus had been on the screen for 61.5 seconds the "Time" light began to blink to let the subject know he was running out of time. After a response was made, or the 71.5 second interval expired, the stimulus went off the screen. If a response had been made, the appropriate feedback light (correct or incorrect) activated. There was a 13.5 second interproblem interval until the Ready light came on again.

Following the 18 problems all subjects filled out a personal data form and took any other tests required for other parts of this project.

Table 2 summarizes the analyses of variance, which were done by the unweighted means technique due to unequal cell sizes, conducted on each type of item (verbal, spatial, and arithmetic) and on the total number correct across all three item types. The factors analyzed were stress (high vs. low), sex (male vs. female), age (20-39 years vs. 40 and over), and their interactions. With respect to the two main variables, none of the analyses showed a difference as a function of stress, nor was any interaction of age and stress (A x C) significant; however, there was an age difference favoring the younger subjects on the spatial reasoning items. Taking the item types one at a time, the numerical results may be summarized thus: (1) Verbal reasoning--grand mean was 3.3; the stress by sex (A x B) interaction resulted from a large difference between the males (high = 3.3, low = 4.6) at the two levels of stress than between the females (high = 3.9, low = 4.0). It would appear that the stress manipulation was more effective when applied to the males. (2) Spatial reasoning--grand mean was 2.7 items correct; males (3.3) were superior to females (2.3), and the younger (3.3) were superior to the older (2.4). (As previously noted, the younger subjects and the males also tended to be the better educated.) (3) Arithmetic reasoning--grand mean was 3.1; males (3.8) were superior to females (2.6). (4) Total score, which is probably a relatively meaningless composite, yielded a grand mean of 9.0 out of 18 possible; males (10.6) did better than females (8.0). Overall, the materials seemed appropriate, with plenty of ceiling. Apparently the kind of stress engendered by working in a social setting of the type described here, analogous to a classroom, does not adversely affect older people.

TABLE 2

Summary of Results of the Social Stress Study

Unweighted Means Analyses of Variance of Number of Correct Responses

Source of Variation	Type of Item: Verbal MS	Verbal F	Spatial MS	Spatial F	Arithmetic MS	Arithmetic F	Total Score MS	Total Score F
Stress (A)	2.3	1.5	3.3	<1	0.0	<1	12.4	1.3
Sex (B)	0.1	<1	11.5	5.7*	23.6	10.7**	62.7	6.7**
Age (C)	1.5	<1	16.1	8.1**	0.0	<1	7.9	<1
A x B	7.5	4.9*	3.8	1.9	1.7	<1	35.3	3.8
A x C	0.7	<1	0.4	<1	4.2	1.9	12.4	1.3
B x C	1.5	<1	0.0	<1	1.1	<1	5.7	<1
AxBxC	0.2	<1	1.3	<1	1.9	<1	0.5	<1
Within-cells	1.5	-	2.0	-	2.2	-	9.3	-

Note--All figures rounded from three-decimal calculations. Degrees of freedom were one for each main effect and interaction, and were 254 for the within-cells term (MS = mean square, F = F-ratio).

Confederate's Routine

A. During instructions ask Experimenter an obvious question concerning the problems, or ask him to repeat part of the instructions.

B. After instructions and before first problem indicate the task looks difficult, e.g., "This looks pretty tough. I'm usually not good at this sort of thing--even the instructions were confusing."

C. Sequence for the 18 problems.

Slide	Behavior
1.	Keep up with but do not exceed pace of other subjects. Problem is answered correctly.
2,3,4	Problem is answered correctly.
5.	Increase speed of solution but answering correctly. After problem 5 say "five for five--that's not bad."
6,7	Increase speed of solution answering correctly.
8.	Increase speed of solution, answering correctly.
9.	During solution say "Hey, there's a trick to solving these block problems."
10,11, 12.	Increase speed of solution still more, answering block problems very quickly; answers are correct.
13,14	Increase speed of solution still more, answering block problems very quickly; answers are correct.
15.	An error is made. Say "Ah, missed it. But that's only one wrong so far--how are you doing"?
16,17, 18.	Speed of solution is rapid and answer is correct.

D. When leaving say "That wasn't so bad." (Subjects could leave the room individually as they finished the 18th problem)

APPENDIX A: Tests Developed

CONTENTS

Appendix A

The actual forms of the tests developed by us, as they were administered, are reproduced here. The form designation (e.g., Form D-2) is given in the upper right-hand corner of each test, and it is this designation that is referred to in the earlier parts of this report. The name given to the test (in the centered heading on each form) tends to be misleading. We learned through the development period that the word "test" was to be avoided, so we labeled the tests "Word Familiarity Surveys," whether the test was of vocabulary or of information. For obvious reasons, too, we characterized Form DD-2 as "Life Termination" rather than "Death and Disease." The unequivocal guides to the reader of this report are the form designations.

KEYS FOR TESTS DEVELOPED

Answers

Item	D-2	TR-2	DD-2	SL-2	FI-2	RE	FA	AR	PH
1	4	2	4	1	3	3	5	5	1
2	4	4	1	3	5	4	1	4	2
3	1	1	5	1	3	5	3	3	5
4	2	5	1	3	3	4	4	3	4
5	1	5	3	2	5	4	1	1	1
6	4	1	1	3	5	4	4	4	5
7	4	4	5	4	1	2	2	3	3
8	2	2	4	3	1	4	5	1	3
9	5	2	4	4	3	1	4	2	3
10	4	3	5	5	1	5	5	2	1
11	1	4	3	1	1	2	3	2	2
12	5	2	1	4	4	4	2	1	5
13	4	2	5	3	5	4	2	2	4
14	2	2	3	3	1	5	4	1	1
15	3	1	5	4	3	4	5	3	3
16	1	4	3	5	1	2	4	2	4
17	5	1	4	1	2	3	5	3	3
18	1	3	2	5	4	2	4	1	1
19	1	1	5	1	1	2	2	5	2
20	2	3	4	5	2	3	4	2	4
21	5	2		4		3	2	3	4
22	4	1		1		1	1	5	2
23	5	4		1		1	1	1	1
24	5			1		2	2	4	5
25	4			1		3	5	1	3
26	2					3	4	4	4
27	3					5	1	4	1
28	4					3	4	3	5
29	3					1	3	1	4
30	2					3	1	2	3
31						4	3	4	3
32						5	2	1	4
33						3	5	5	2
34						1	1	1	3
35						1	4	2	1
36						2	4	3	3
37						3	3	5	1
38						1	3	4	4
39						1	5	2	3
40						5	5	3	5

KEYS FOR TESTS DEVELOPED
(continued)

Answers

Item	SP	CA	F-1	F-2	F-3	R-3	R-6	Q-1
1	1	1	N	4	EW4	1	3	Equals
2	2	4	S	1	E23	2	5	Less
3	1	3	N	4	EW4	1	1	Less
4	4	4	E	2	N2	3	6	More
5	2	1	E	2	N2	2	2	Less
6	1	3	E	2	N2	3	6	More
7	4	4	W	3	S1	1	4	Equals
8	3	1	S	1	E23	1	5	More
9	2	4	N	4	EW4	2	4	More
10	3	5	W	3	S1	3	3	Equals
11	5	4	E	2	N2	2	2	Equals
12	1	1	N	4	EW4	3	6	More, Less
13	3	3	S	1	E23	1	4	Equals
14	3	5	S	1	E32	1	3	More, Less
15	1	2	E	2	N2	3	1	Equals
16	4	1	W	3	1S	2	2	More, Less
17	4	4	N	4	EW4	1	3	Less
18	2	1	S	1	3E2	2	1	Equals
19	1	1	E	2	N2	3	4	More, Less
20	4	2	W	3	1S	2	2	Less
21	2	1					3	
22	1	5					6	
23	4	3						
24	5	1						
25	5	5						
26	5	3						
27	3	2						
28	3	4						
29	2	4						
30	4	1						
31	5	5						
32	2	1						
33	4	3						
34	1	2						
35	2	4						
36	1	1						
37	4	4						
38	1	4						
39	3	3						
40	1	5						

KEYS FOR TESTS DEVELOPED
(continued)

Answers

Item	Q-2	Common Tasks	Coding	Recipes	Pegboard	NW	MN
1	Multiply	10	C	3,1,2	2	5	B
2	Subtract	9	B	2,3,1	3	2	A
3	Divide	16	A	1,3,2	3	1	C
4	Divide	4	D	2,3,1	0	3	D
5	Add	11	C	3,2,1	1,3	1	C
6	Subtract	15	B	2,3,1	1,2,3	3	A
7	Multiply	2	D	3,2,1	1	4	A
8	Divide	12	C	2,3,1	2	2	D
9	Subtract	7	B	1,3,2	3	1	B
10	Add	14	A	2,1,3	2,3	5	B
11	Divide		B	4,1,3,2	3	5	A
12	Multiply, Subtract		C	3,4,1,2	0	5	A
13	Add, Divide		B	2,3,4,1	1	4	C
14	Subtract, Multiply, Add		A	1,3,2,4	0	4	C
15	Divide		C	4,3,2,1	2	2	C
16	Add, Multiply, Subtract		B	2,4,3,1	3	3	B
17	Divide		C	3,1,2,4	0	5	B
18	Multiply, Subtract		B	1,3,2,4	2,3	1	D
19	Divide		C	4,3,1,2	3	2	C
20	Multiply, Add, Subtract		C	2,1,4,3	1,3	5	B
21				4,1,5,2,3		4	B
22				4,3,2,5,1		3	D
23				3,1,2,5,4		2	A
24				1,5,4,2,3		2	A
25				4,2,5,1,3		2	C
26				1,5,3,4,2		4	A
27				2,5,3,1,4		1	B
28				5,1,3,2,4		4	C
29				2,5,1,3,4		3	D
30				1,4,2,3,5		1	B
31						3	B
32						3	A
33						3	A
34						5	A
35						5	A
36						4	D
37						3	A
38						1	C
39						2	B
40						3	A
41						1	D
42						1	D
43						4	A
44						4	B
45						1	B
46						4	D

KEYS FOR TESTS DEVELOPED
(continued)

Answers

Item	Q-2	Common Tasks	Coding	Recipes	Pegboard	NW	MN
47						1	
48						2	
49						5	
50						1	
51						4	
52						5	
53						1	
54						5	
55						5	
56						2	

SYRACUSE UNIVERSITY
ADULT DEVELOPMENT STUDY

Form D-2

WORD FAMILIARITY SURVEY - GENERAL

DIRECTIONS: Fill in the spaces marked NAME, SEX, and DATE OF BIRTH on the answer sheet which you have received with your test booklet. Then copy the form number from the upper right hand corner of the test booklet in the space marked NAME OF TEST.

For each of the items below select the numbered word or phrase that MOST NEARLY corresponds in meaning to the word in CAPITAL LETTERS. Look at the number of this word. Mark the answer space on the answer sheet which is numbered the SAME as the word you have chosen.

---

1. CAPSIZE:
   1)leak, 2)race, 3)grow, 4)overturn 5)measure

2. PROLONG:
   1)prompt, 2)decrease, 3)difficult, 4)extend, 5)waste

3. SUCCULENT:
   1)juicy, 2)raw, 3)cooked, 4)spoiled, 5)spicy

4. AGITATED:
   1)hungry, 2)excited, 3)agile, 4)tired, 5)sick

5. FRUGAL:
   1)sparing, 2)huge, 3)tasty, 4)fashionable, 5)musical

6. MOLEST:
   1)purchase, 2)muffle, 3)lowest, 4)annoy, 5)groom

7. APATHY:
   1)understanding, 2)leniency, 3)rage, 4)indifference, 5)danger

8. WEIGHTY:
   1)sly, 2)serious, 3)shabby, 4)spry, 5)innocent

9. FANATIC:
   1)follower, 2)strange, 3)untrustworthy, 4)sly, 5)zealous

10. BUSTLE:
    1)tree, 2)ornament, 3)bureau, 4)movement, 5)cluster

11. LASCIVIOUS:
    1)lustful, 2)liberal, 3)final, 4)loser, 5)inclined

12. RECAPITULATE:
    1)surrender, 2)brief, 3)rebuild, 4)relay, 5)restate

13.	REMUNERATE:				
	1)check,	2)count,	3)replete,	4)compensate,	5)satisfy
14.	EFFECTUATE:				
	1)praise,	2)accomplish,	3)dissimulate,	4)nullify,	5)pretend
15.	BRAVADO:				
	1)celebrity,	2)outlaw,	3)boasting,	4)turmoil,	5)salutation
16.	CURSORY:				
	1)hasty,	2)dilatory,	3)intrinsic,	4)profane,	5)dire
17.	INDIGENT:				
	1)obnoxious,	2)moody,	3)sleep,	4)nasty,	5)poor
18.	LOQUACIOUS:				
	1)garrulous,	2)ostentatious,	3)frivolous,	4)limpid,	5)dowdy
19.	HIATUS:				
	1)break,	2)swamp,	3)fence,	4)disgust	5)flower
20.	BANAL:				
	1)evil,	2)trite,	3)prohibitory,	4)jovial,	5)decaying
21.	TEDIUM:				
	1)dilatory,	2)anxiety,	3)exhaustion,	4)weakening,	5)dull
22.	LASSITUDE:				
	1)contempt,	2)convenience,	3)permissiveness,	4)lethargy,	5)levity
23.	DIAPHANOUS:				
	1)nocturnal,	2)quarrelsome,	3)morbid,	4)logical,	5)etheral
24.	SPLEEN:				
	1)grudge,	2)caprice,	3)impetuosity,	4)melancholy,	5)malice
25.	HORDE:				
	1)greed,	2)bully,	3)harvest,	4)crowd,	5)content
26.	HIRSUTE:				
	1)woman,	2)shaggy,	3)chamber,	4)quaint,	5)sorrowful
27.	CAUDAL:				
	1)brutal,	2)careful,	3)posterior,	4)nervy,	5)recent
28.	GUIDON:				
	1)miniature,	2)hat,	3)hero,	4)flag,	5)achiever
29.	VICISSITUDE:				
	1)direction,	2)generosity,	3)hardship,	4)ceremony	5)ferocity
30.	SEVERALLY:				
	1)unkindly,	2)respectively	3)continuously,	4)abruptly,	5)harshly

Form RK
Code No._____

Please answer the following questions regarding your reaction to the test you just completed. Circle the number of the answer that you feel is appropriate for each of these five questions.

31. Did you experience any nervousness, tension or stress while taking the test?

1. I was extremely relaxed and free of tension
2. I was moderately calm and relaxed
3. I was neither particularly nervous nor particularly relaxed
4. I was moderately nervous and tense
5. I was extremely nervous and tense

32. How did you find it as to difficulty?

1. It was extremely easy
2. It was moderately easy
3. It was of average difficulty--neither really easy nor difficult
4. It was moderately difficult
5. It was extremely difficult

33. How confident do you feel regarding the quality of your performance?

1. I think I did a very excellent job
2. I think I did moderately well
3. I did satisfactorily--neither well nor poorly
4. I did poorly
5. I did extremely poorly

34. Do you feel that your performance on this particular test is a good reflection of your ability to handle "intellectual type" material under normal circumstances?

1. No, I did much better on this than I would generally do
2. No, I did better on this than I would generally do
3. Yes, a reasonably fair sample of my performance for this type of material
4. No, I did not do as well as I should, but nearly so
5. No, I did not do nearly as well as I should

35. How well do you think you did compared to other people?

1. Much better than others
2. Somewhat better than others
3. About the same as others
4. Somewhat poorer than others
5. Much more poorly than others

SYRACUSE UNIVERSITY
ADULT DEVELOPMENT STUDY

Form E

WORD FAMILIARITY SURVEY - GENERAL

DIRECTIONS: Fill in the spaces marked NAME, SEX, and DATE OF BIRTH on the answer sheet which you have received with your test booklet. Then copy the form number from the upper right hand corner of the test booklet in the space marked NAME OF TEST.

For each of the items below select the numbered word or phrase that MOST NEARLY corresponds in meaning to the word in CAPITAL LETTERS. Look at the number of this word. Mark the answer space on the answer sheet which is numbered the same as the word you have chosen.

---

1. JOVIAL:
   1)somber, 2)fatigued, 3)satisfied, 4)merry, 5)angry
2. EWE:
   1)yearling, 2)cow, 3)sheep, 4)pony, 5)llama
3. ROBUST:
   1)sturdy, 2)fat, 3)busy, 4)reserved, 5)automatic
4. CAPRICIOUS:
   1)austere, 2)steady, 3)changeable, 4)sedate, 5)cautious
5. SUAVE:
   1)rude, 2)polite, 3)awkward, 4)loud, 5)rich
6. OBSTINATE:
   1)remove, 2)heir, 3)stubborn, 4)wise, 5)calm
7. MUSE:
   1)glance, 2)street, 3)ponder, 4)code, 5)describe
8. EDIFICE:
   1)capital, 2)structure, 3)colonnade, 4)shallow, 5)net
9. PINNACLE:
   1)summit, 2)upright, 3)buttress, 4)achievement, 5)status
10. EMULATE:
    1)sharpen, 2)imitate, 3)emanate, 4)pursue, 5)escape
11. TRUDGE:
    1)tramp, 2)drag, 3)carry, 4)battle, 5)quarrel
12. ABETTOR:
    1)instigator, 2)gambler, 3)bishop, 4)loser, 5)clown

13.	SERAPHIC: 1)heretic,	2)beautific,	3)angelic,	4)wild,	5)dull
14.	NEBULOUS: 1)translucent,	2)story,	3)indistinct	4)drab,	5)hidden
15.	RANSOM: 1)auction,	2)redeem,	3)expiate,	4)pattern,	5)deliver
16.	ABATE: 1)wharf,	2)disturb,	3)repay,	4)deter,	5)subside
17.	SATIATE: 1)gargle,	2)glut,	3)regress,	4)destroy,	5)emulate
18.	OCCULT: 1)drained,	2)group,	3)mysterious,	4)burned,	5)visible
19.	SAGACIOUS: 1)fabled,	2)rapacious,	3)shrewd,	4)discreet,	5)diabolic
20.	AMBIVALENCE: 1)fluctuation,	2)cation,	3)contradiction,	4)nervousness,	5)persistence
21.	ABSTEMIOUS: 1)truant,	2)uprooted,	3)timid,	4)temperate,	5)resurgent
22.	EMBLAZON: 1)anger,	2)decorate,	3)poison,	4)arouse,	5)emulate
23.	DEPRAVED: 1)drunk,	2)needy,	3)morbid,	4)bereft,	5)perverse
24.	BOREAL: 1)serpentine,	2)perforated,	3)fatiguing,	4)northern,	5)geographic
25.	ABRADE: 1)entwine,	2)chafe,	3)exhaust,	4)smooth,	5)discourage
26.	ECLECTIC: 1)ecumene,	2)defensive,	3)sickly,	4)retort,	5)selective
27.	BLENT: 1)mixed,	2)thrashed,	3)quarter,	4)urgent,	5)decided
28.	PENURIOUS: 1)plentiful,	2)hesitant,	3)strict,	4)needy,	5)contagious
29.	INVEIGH: 1)supplement,	2)transport,	3)overwhelm,	4)investigate,	5)remonstrate
30.	PERMUTE: 1)silence,	2)extol,	3)allow,	4)invade,	5)rearrange

SYRACUSE UNIVERSITY
ADULT DEVELOPMENT STUDY

Form DD-2

WORD FAMILIARITY SURVEY - LIFE TERMINATION

DIRECTIONS: Fill in the spaces marked NAME, SEX, and DATE OF BIRTH on the answer sheet which you have received with your test booklet. Then copy the form number from the upper right hand corner of the test booklet in the space marked NAME OF TEST.

Read each item. Decide which one of the answers given below is the best. Then, on your answer sheet, fill in the space which has the SAME number as the answer you have chosen.

---

1. The removal and examination of tissue from the living body is a (an)
   1)paregoric, 2)internal, 3)dissection, 4)biopsy, 5)autopsy,

2. An inscription on a grave or tomb is a (an)
   1)epitaph, 2)eulogy, 3)idyll, 4)thesis, 5)epithet

3. Arteriosclerosis is arterial
   1)bleeding, 2)tearing, 3)spasm, 4)softening, 5)hardening

4. The branch of medicine dealing with old age is
   1)geriatrics, 2)pediatrics, 3)podiatry, 4)pedantry, 5)gynecology

5. A doctor who treats bone injuries and diseases is a
   1)podiatrist, 2)pediatrician, 3)orthopedist, 4)opthamologist, 5)pedantrist

6. A soft substance which is heated and spread on a cloth to apply to an inflammation is a
   1)poultice, 2)paregoric, 3)prosthesis, 4)homily, 5)panacea

7. Wrinkles around the outer corners of the eyes are called
   1)meninges, 2)epicanthic folds, 3)wattles, 4)velum 5)crow's-feet

8. The music heard at a funeral is a (an)
   1)epitaph, 2)eulogy, 3)idyll, 4)dirge, 5)eucharist

9. The formation or presence of a blood clot is called
   1)entropy, 2)colitis, 3)dyspepsia, 4)thrombosis, 5)angina pectoris

10. A preparation swallowed to facilitate fluoroscopic diagnosis of ulcers is
    1)fluoride, 2)Gelucil, 3)paregoric, 4)mescaline, 5)barium meal

11. Chronic indigestion is called
1)embolism, 2)distention, 3)dyspepsia, 4)toxemia, 5)angina pectoris

12. Maalox is used to treat
1)heartburn, 2)neuralgia, 3)lumbago, 4)bursitis, 5)rheumatism

13. A drug used in certain heart conditions is
1)angina, 2)pectin, 3)pectoris, 4)mescaline, 5)nitroglycerine

14. Consumption is also called
1)apoplexy, 2)colic, 3)TB, 4)gout, 5)dystrophy

15. A disease characterized by short periodic attacks of chest pain is
1)dyspepsia, 2)entropy, 3)colitis, 4)distention, 5)angina pectoris

16. A stand on which a coffin is placed is a
1)pyre, 2)repository, 3)bier, 4)crypt, 5)sepulcher

17. A common childhood disease is
1)apoplexy, 2)entropy, 3)toxemia, 4)rubella, 5)atrophy

18. A placebo is a
1)cure-all, 2)sugar pill, 3)leech, 4)suction cup, 5)denture

19. One who makes false teeth is a
1)pseudophile, 2)paradontist, 3)polydontist, 4)periodontist, 5)prosthodontist

20. Loose flesh hanging from the jaw is called
1)steotopygia, 2)hackles, 3)wattles, 4)jowls, 5)dermatome

SYRACUSE UNIVERSITY
ADULT DEVELOPMENT STUDY

Form TR-2

WORD FAMILIARITY SURVEY -- TRANSPORTATION

DIRECTIONS: Fill in the spaces marked NAME, SEX, and DATE OF BIRTH on the answer sheet which you have received with your test booklet. Then copy the form number from the upper right hand corner of the test booklet in the space marked NAME OF TEST.

Read each item. Decide which one of the answers given below is the best. Then, on your answer sheet, fill in the space which has the SAME number as the answer you have chosen.

- -

1. The part of a bridle that is inserted in a horse's mouth is the
   1)tether, 2)bit, 3)chomp, 4)spur, 5)crop

2. A hack is a
   1)hotrod, 2)vendor, 3)subway, 4)taxi, 5)heap

3. A wagon used to carry food is called a
   1)chuck wagon, 2)mess wagon, 3)water wagon, 4)track wagon, 5)trek wagon

4. A long canvas-covered wagon is called a
   1)sidewinder, 2)caboose, 3)calaboose, 4)trail-blazer, 5)prairie schooner

5. A riding whip with a short straight stock is called a
   1)pole, 2)shaft, 3)liner, 4)stick, 5)crop

6. To wade across a river is to
   1)ford, 2)shuttle, 3)jitney, 4)forge, 5)barge

7. A light two-wheeled carriage for one person is a
   1)surrey, 2)shay, 3)stall, 4)sulky, 5)ferry

8. A carriage with its horses is called a
   1)stall, 2)rig, 3)sulky, 4)shay, 5)gig

9. A strong girth for a saddle is a
   1)winch, 2)cinch, 3)gibbet, 4)stirrup, 5)harness

10. A windjammer is a (an)
    1)airplane, 2)seaplane, 3)boat, 4)helicopter, 5)velocipede

11. The main function of a livery stable is to
    1)buy horses, 2)shoe horses, 3)train horses, 4)rent horses, 5)sell horses

12. A broad-wheeled covered wagon is called a
1)caravel, 2)conestoga, 3)trail-wagon, 4)trekker, 5)cross-country

13. Toy racing cars operated by remote control are
1)minicars, 2)slot cars, 3)hand-cars, 4)relay cars, 5)speedsters

14. A boat with twin hulls is called a
1)cat boat, 2)catamaran, 3)bimaran, 4)mariner, 5)sloop

15. The long piece of wood on a wagon to which a horse is hitched is called the
1)shaft, 2)buggy pole, 3)line, 4)center pole, 5)hitching pole

16. Which one of the following does not drive a rig?
1)teamster, 2)muleteer, 3)wagoner, 4)drover, 5)mule skinner

17. A strong low cart or wagon used for carrying heavy loads is a
1)dray, 2)drudge, 3)trunchion, 4)trudgeon, 5)trawl

18. The ridge between the shoulder bones of a horse is called
1)widgets, 2)fetters, 3)withers, 4)wattles, 5)dithers

19. A 2-wheeled covered carriage with the driver's seat elevated behind is a
1)hansom, 2)hackney coach, 3)ferry, 4)surrey, 5)hummel

20. A light two-wheeled one-horse carriage is a
1)shay, 2)sway, 3)gig, 4)rig, 5)ferry

21. A folding carriage top is called a
1)calabash, 2)calash, 3)soft-top, 4)surrey, 5)umbrella

22. A two-door electrically driven sedan is a
1)brougham, 2)herdic, 3)tourister, 4)gibson, 5)jaunting car

23. "Haw" is a command to a horse which means
1) turn right, 2)slow down, 3)stop, 4)turn left, 5)move ahead

SYRACUSE UNIVERSITY
ADULT DEVELOPMENT STUDY

Form SL-2

WORD FAMILIARITY SURVEY - SLANG

DIRECTIONS: Fill in the spaces marked NAME, SEX, and DATE OF BIRTH on the answer sheet which you have received with your test booklet. Then copy the form number from the upper right hand corner of the test booklet in the space marked NAME OF TEST.

Read each item. Decide which one of the answers given below is the best. Then, on your answer sheet, fill in the space which has the SAME number as the answer you have chosen.

---

1. An easy mark is called a

   1)pigeon, 2)donkey, 3)mule, 4)coop 5)prey

2. A newcomer to the Old West was called a

   1)dandy, 2)fop, 3)dude, 4)gringo, 5)scout

3. Sometimes a cigarette is called a

   1)fag, 2)drag, 3)nag, 4)plug, 5)bat

4. Flattery or nonsense is called

   1)tea, 2)clod, 3)applesauce, 4)juice, 5)bones

5. When something is out of order it is on the

   1)outs, 2)fritz, 3)lam, 4)rocks, 5)skids

6. A remark or action intended to mock and deflate is a

   1)dig-out, 2)let-off, 3)put-down, 4)put-on, 5)put-off

7. To put the kibosh on is to

   1)dress up, 2)ridicule, 3)bluff, 4)squelch, 5)arrest

8. To grumble or complain is to

   1)grease, 2)blab, 3)grouse, 4)flounce, 5)fluff

9. Another word for flatfoot is

   1)flack, 2)floss, 3)shivs, 4)fuzz, 5)brannigan

10. A pill that is taken to keep one awake is a (an)

    1)alky, 2)leaner, 3)cuffer, 4)Louie, 5)Benny

11. A crape hanger is a (an)
1) undertaker, 2)dressmaker, 3)decorator, 4)designer, 5)executioner

12. Something that is enjoyable is
1)freaky, 2)wicked, 3)flappy, 4)groovy, 5)gamey

13. A problem that bothers someone very much over a period of time is a
1)bring down, 2)fummer, 3)hang-up, 4)bundle, 5)fake-out

14. Someone's pad is his
1)circle of friends, 2)fat, 3)house, 4)syringe, 5)family

15. A psychedelic trip starts with LSD taken in a
1)fix, 2)shot, 3)fag, 4)cube, 5)goofball

16. A small, cheap, old dilapidated car is called a
1)goofball, 2)caboose, 3)Molly, 4)Nellie, 5)flivver

17. A put-on is a (an)
1)farce, 2)garment, 3)come-on, 4)scene, 5)English act

18. A small shuttle bus is also called a
1)bash, 2)tram, 3)pram, 4)metro, 5)jitney

19. A musician's temporary job is called a
1)gig, 2)fink, 3)cube, 4)trip, 5)stall

20. An old-fashioned person is a (an)
1)lemon, 2)epithet, 3)ringer, 4)flashback, 5)back number

21. A word that does not mean money is
1)bread, 2)loot, 3)jack, 4)slats, 5)dib

22. A pickpocket is called a
1)dip, 2)bagman, 3)pearl-diver, 4)con man, 5)fingerman

23. Something that is corny but meant to be taken seriously is described as
1)camp, 2)clubby, 3)crummy, 4)crass, 5)blue-stocking

24. Another word for heroin is
1)horse, 2)plug, 3)drops, 4)reefer, 5)coffin varnish

25. A flogger is a (an)
1)overcoat, 2)beater, 3)whipper, 4)vest, 5)hat

SYRACUSE UNIVERSITY
ADULT DEVELOPMENT STUDY

Form FI-2

WORD FAMILIARITY SURVEY - FINANCE

DIRECTIONS: Fill in the spaces marked NAME, SEX, and DATE OF BIRTH on the answer sheet which you have received with your test booklet. Then copy the form number from the upper right hand corner of the test booklet in the space marked NAME OF TEST.

Read each item. Decide which one of the answers given below is the best. Then, on your answer sheet, fill in the space which has the SAME number as the answer you have chosen.

---

1. The person who is appointed to see that a will is carried out is the

   1)probationer, 2)legatee, 3)executor, 4)contestant, 5)testator

2. Revenue means

   1)security, 2)subsidy, 3)rebate, 4)audit, 5)income

3. A word relating to financial matters is

   1)ventral, 2)dorsal, 3)fiscal, 4)apical, 5)montage

4. Gratis means

   1)security, 2)liable, 3)free, 4)solvent, 5)equal

5. Debts not paid on time are called

   1)concessions, 2)rebates, 3)remits, 4)recalls, 5)arrears

6. A person who cannot pay his debts is

   1)urbane, 2)salient, 3)erudite, 4)exhumed. 5)insolvent

7. The money value of a property after claims against it are paid is called

   1)equity, 2)subsidy, 3)commission, 4)payload, 5)interest

8. A printed statement describing a business and distributed to potential investors is called a (an)

   1)prospectus, 2)bid, 3)operational manual, 4)draft, 5)customer's book

9. A type of mortgage is a

   1)moratorium, 2)garnishee, 3)chattel, 4)fiduciary, 5)cartel

10. Current income forgone to produce a later higher income at a retirement is called
1)deferred income, 2)delayed income, 3)revised income, 4)partial income, 5)postponed income

11. A trust company that invests the funds of others is described as
1)fiduciary, 2)ethereal, 3)ephemeral, 4)elective, 5)probationary

12. Lending money at an exorbitant rate of interest is called
1)surety, 2)currency, 3)exorbtion, 4)usury, 5)receivership

13. The judicial determination of the validity of a will is called
1)contingency, 2)testament, 3)legation, 4)contestation, 5)probate

14. One who leaves a will is called a
1)testator, 2)executor, 3)contestant, 4)legatee, 5)probate

15. The nominal value of securities is called
1)point, 2)share, 3)par, 4)payload, 5)commission

16. A period of delay in the payment of a debt is called a (an)
1)moratorium, 2)hindrance, 3)post-mortem, 4)demurrage, 5)allotment

17. An addition to a will is a (an)
1)indemnity, 2)codicil, 3)contingent, 4)probate, 5)excerpt

18. To water stock is to
1)liquidate it, 2)buy it cheaply, 3)split it, 4)falsify it, 5)convert it into cash

19. A piece of paper used as evidence that the holder is entitled to receive something of financial value is called
1)scrip, 2)bail, 3)graft, 4)script, 5)gratis

20. The word "condominium" has to do with
1)life insurance, 2)real estate, 3)income tax, 4)wills, 5)stocks

Form RE

SYRACUSE UNIVERSITY
ADULT DEVELOPMENT STUDY
TEST OF GENERAL VOCABULARY

DIRECTIONS: Fill in the spaces marked NAME, SEX, and DATE OF BIRTH on the answer sheet which you have received with your test booklet. Then copy the form number from the upper right hand corner of the test booklet in the space marked NAME OF TEST.

Read each item. Decide which one of the answers given below is the best. Then, on your answer sheet, fill in the space which has the same number as the answer you have chosen.

1. One who doubts the existence of God is a (an)

   1. heathen 2. pagan 3. agnostic 4. heretic 5. blasphemous

2. Changing religious services into one's own language requires which kind of translation?

   1. metaphysical 2. isometric 3. avuncular 4. vernacular 5. syntactical

3. Religious ritual is called

   1. tithe 2. blasphemy 3. epiphany 4. heresy 5. liturgy

4. To speak irreverently is to

   1. atone 2. censer 3. deify 4. blaspheme 5. genuflect

5. Vespers are

   1. pagans 2. angels 3. garments 4. prayers 5. skeptics

6. In the church, pardon is called

   1. resolution 2. unction 3. homage 4. absolution 5. idolatry

7. In religion, the act of kneeling is to

   1. consecrate 2. genuflect 3. censer 4. sacralize 5. dogmatize

8. The word "rabbi" means

   1. bible 2. student 3. worship 4. teacher 5. lawgiver

9. A religious law is a (an)

   1. canon 2. epistle 3. disciple 4. ordinance 5. statute

10. Ecumenical means

   1. bigoted 2. parochial 3. sectarian 4. oppositional 5. universal

11. An appearance or revelatory manifestation of a god is called a (an)

   1. canon 2. epiphany 3. absolution 4. epistle 5. encyclical

12. A church tax is called a

1. hieratic 2. levy 3. libation 4. tithe 5. syntax

13. One who conforms strictly to his religion in every detail is called

1. reformed 2. conservative 3. secular 4. orthodox 5. radical

14. The word "catholic" means

1. priestly 2. holy 3. devout 4. religious 5. universal

15. The holy city of Islam is

1. Salaam 2. Jihad 3. Delhi 4. Benares 4. Mecca

16. An epistle is a (an)

1. prophet 2. letter 3. theory 4. priest 5. follower

17. In religion, a series of questions with officially correct answers is called

1. canon 2. nirvana 3. catechism 4. rosary 5. sacrament

18. A papal letter to the bishops of the world is called a (an)

1. epiphany 2. encyclical 3. vesper 4. orison 5. epistle

19. The act of anointing is called

1. baptism 2. unction 3. libation 4. catechism 5. holism

20. A church council is called a (an)

1. colloquium 2. liturgy 3. synod 4. encyclical 5. seminary

21. A word that means worldly is

1. hieratic 2. sacred 3. secular 4. parochial 5. sectarian

22. Another name for paradise is

1. nirvana 2. purana 3. melonium 4. dogma 5. miasma

23. Church music can be described as

1. ecclesiastical 2. encyclical 3. secular 4. synodic 5. acapella

24. The koran belongs to what religion?

1. Judaism 2. Islam 3. Zen Buddhism 4. Hinduism 5. Shintoism

25. The mosque is a place of worship for the

1. Buddhists 2. Shintos 3. Muslims 4. Samurais 5. Hindus

26. The combination of the five books of the Old Testament is called the

1. talmud 2. koran 3. torah 4. koan 5. apocrapha

27. One who attacks established religious beliefs is a (an)

1. evangelist 2. revivalist 3. dogmatist 4. epistemologist 5. iconoclast

28. A vessel for burning incense is a (an)

1. chalice 2. grail 3. censer 4. dactyl 5. incant

29. A religion that seeks the conversion of others to its beliefs is

1. evangelical 2. secular 3. solicitors 4. parochial 5. encyclical

30. A Hindu priest is a (an)

1. Raja 2. Atman 3. Brahmin 4. Kharma 5. Mahatma

31. In Judaism, a bar mitzvah is held when a boy is

1. 1 week old 2. 1 month old 3. 12 years old 4. 13 years old 5. 16 years old

32. The torii belongs to what religion?

1. Judaism 2. Islam 3. Mormon 4. Hinduism 5. Shintoism

33. To be sanctimonious is to be a (an)

1. atheist 2. blasphemer 3. hypocrite 4. heathen 5. idolator

34. The spiritual goal of Zen Buddhism is

1. satori 2. salaam 3. pogrum 4. banzai 5. soraya

35. The authoritative body of Jewish law and tradition is the

1. talmud 2. koran 3. torah 4. koan 5. torii

36. A candidate for admission to the novitiate is a

1. novice 2. postulant 3. nun 4. prostrate 5. cleric

37. The koan belongs to what religion?

1. Judaism 2. Islam 3. Zen Buddhism 4. Morman 5. Druid

38. A Muslim crier who calls the hour of daily prayers is called a (an)

1. muezzin 2. satori 3. pogrumi 4. salaam 5. deacon

39. A drink taken ceremoniously in religion is called a

1. libation 2. grail 3. chalice 4. communion 5. tithe

40. A pogrum is a (an)

1. religious service 2. prophet 3. call to prayer 4.divine vision 5.organized massacre

Form NW

SYRACUSE UNIVERSITY
ADULT DEVELOPMENT STUDY
TEST OF GENERAL VOCABULARY

DIRECTIONS: Fill in the spaces marked NAME, SEX, and DATE OF BIRTH on the answer sheet which you have received with your test booklet. Then copy the form number from the upper right hand corner of the test booklet in the space marked NAME OF TEST.

Read each item. Decide which one of the answers given below is the best. Then, on your answer sheet, fill in the space which has the same number as the answer you have chosen.

1. Someone whose behavior or ideas are extreme is called

   1. crazy 2. wild 3. with it 4. touched 5. far-out

2. The landing of a manned spacecraft is called

   1. countdown 2. splashdown 3. fallout 4. splashoff 5. splashout

3. A short and narrow board on wheels is called a

   1. skateboard 2. slideboard 3. whizzer 4. runner 5. shuffleboard

4. A drug that induces hallucinations is

   1. R.N.A. 2. D.N.A. 3. mescalin 4. silicate 5. mesquite

5. Someone who is eccentric is called a

   1. kook 2. dope 3. jerk 4. fink 5. hoke

6. A car that has a roof which slopes toward the rear bumper is called a (an)

   1. autoclave 2. hardback 3. fastback 4. racer 5. roadster

7. To lose one's self-control is to

   1. flub 2. goof 3. grind 4. flip 5. hang loose

8. Articles of clothing designed to be worn together are called

   1. pairs 2. coordinates 3. contrasts 4. alternates 5. units

9. To announce the start of broadcasting for the day is to

   1. sign on 2. sign in 3. turn on 4. check in 5. clock in

10. A high thin heel is a

    1. Cuban heel 2. Oxford heel 3. wedge heel 4. platform heel 5. stiletto heel

11. A manually operated gearshift mounted on the floor of a car is called a

1. bar shift 2. gear stick 3, shift stick 4. hand stick 5. stick shift

12. An economic unit formed to remove trade barriers among its members is the

1. Trade Guild 2. World Exchange Board 3. Central Trade Board

4. World Market 5. Common Market

13. A new Brazilian dance which is a jazz samba is the

1. maxixe 2. cimballa 3. villa nova 4. bossa nova 5. maraca

14. A fat that is capable of dissolving or being absorbed is said to be

1. polyesterized 2. fluoridated 3. glycerated 4. polyunsaturated 5. viscerized

15. The practice of presenting several plays in the same season is called

1. scenario 2. repertory 3. improvisation 4. living theater 5. potpouri

16. The type of art in which commonplace objects are physically incorporated is

1. statuary 2. non-art 3. pop art 4. objective art 5. pre-art

17. An episode of a new TV program that is made to show to prospective sponsors is a

1. screening 2. cutting 3. test film 4. preview 5. pilot film

18. Close-fitting pants with tapered legs extending almost to the ankles are

1. Capri pants 2. snuggies 3. reefers 4. surfers 5. jerkins

19. Nonobjective art using geometric patterns for the effect of perspective or motion is called

1. living art 2. op art 3. collage 4. angle art 5. genre

20. A method for early detection of cancer is

1. histogram 2. radiation 3. cobalt 4. galvanometer 5. pap smear

21. A heel made of layers of leather in alternating colors is a

1. Dutch heel 2 Spanish heel 3. quarter heel 4. stacked heel 5. spike heel

22. A device that prevents continuing on a bombing mission according to a preconceived plan is

1. lock-out 2. bomblock 3. fail-safe 4. safe-lock 5. wrap-up

23. A West Indian acrobatic dance is the

1. Apache 2. limbo 3. serape 4. Navaho 5. gringo

24. A defensive rush on a passer in football is called a

1. slalom 2. blitz 3. blue dog 4. yellow dog 5. penalty play

25. Drugs which cause hallucinations and psychotic behavior are said to be

1. psychometric 2. psychedelic 3. psychogens 4. halogens 5. psychogenic

26. The practice of minimal desegregation is called

1. separatism 2. equalism 3. legalism 4. tokenism 5. marginism

27. A night club where records are played for dancing is called a (an)

1. discotheque 2. dance-o-rama 3. disc-O-mat 4. discorama 5. autodisc

28. A staged performance resembling incongruous, pointless charades and using weird effects is called a

1. trip 2. hoedown 3. hootenany 4. happening 5. chivaree

29. A television receiver not using electron tubes is

1. kinescope 2. kinetic 3. solid-state 4. UHF 5. VHF

30. Exercises involving contraction of facial muscles are called

1. isometrics 2. projections 3. isomorphics 4. isotonics 5. protometrics

31. A payment to an actor for each rerun of a TV tape is called a

1. preemption 2. release 3. residual 4. dollop 5. replay fee

32. A fast pleasure sailboat with three hulls side by side is a

1. triplex 2. trident 3. trimaran 4. triple-luft 5. sea-dog

33. A Bircher is a

1. liberal 2. anarchist 3. reactionary 4. Communist 5. Nazi

34. Special depreciation allowances that reduce taxes on current earnings are called

1. support areas 2. support levels 3. tax sales 4. high rises 5. tax shelters

35. A long pass in football is called a

1. charge 2. drive 3. liner 4. change-up 5. bomb

36. A motorboat with fins which lift the hull above the water is called a (an)

1. hydroplane 2. seaplane 3. eggbeater 4. hydrofoil 5. wingboat

37. A means of identifying someone from his speech is called

1. polygraph 2. vocalistics 3. voiceprint 4. speechprint 5. electrotape

38. A small vivid theatrical role limited to one scene is a (an)

1. cameo 2. stop-off 3. screenplay 4. episode 5. blow-up

39. A timid, meek, ineffectual person is a

1. drag 2. nebbish 3. squelch 4. clam 5. wet blanket

40. Three-dimensional art made from discarded material is called

1. trash art 2. montage art 3. junk art 4. salvage art 5. representational a

41. A meeting of college students and faculty for discussions on U. S. foreign policy is called a (an)

1. teach-in 2. confab 3. lobby 4. caucus 5. emposium

42. A store that sells automotive parts to hot rodders is called a

1. speed shop 2. road shop 3. rod garage 4. wheel shop 5. speed store

43. A nonrepresentational art form using improvised techniques is

1. panorama 2. still life 3. graphic painting 4. action painting 5. flash painti

44. Destroying an enemy with a force larger than necessary is called

1. overload 2. override 3. overshoot 4. overkill 5. overstrike

45. Music having the style and feeling of blues would be called

1. funky 2. finky 3. flaky 4. fleecy 5. swishy

46. A football player on offense who is on the line on the strong side is called the

1. split half 2. pivot 3. linebacker 4. tight end 5. lateral

47. A wind instrument with a mouthpiece and finger keys like those of a piano is a (an)

1. melodica 2. mouthorgan 3. autoharp 4. harmonica 5. clarendella

48. An administrative or ruling body of three is called a

1. triparte 2. troika 3. trident 4. triptych 5. triad

49. An everyday object that is selected and displayed as a work of art is called a

1. prop 2. marker 3. realistic 4. factual 5. readymade

50. A drink of liquor served over cracked ice with a twist of lemon peel is a

1. mist 2. gimlet 3. screwdriver 4. glaze 5. sidecar

51. An oral diuretic used to control high blood pressure is

1. thiamine 2. rhyozoid 3. histomine 4. thiazide 5. Gelucil

52. A book that is hurriedly or carelessly written primarily for profit is called a

1. folio 2. tract 3. fast book 4. unbook 5. nonbook

53. A government official in some countries who receives complaints made by the people against public officials is a (an)

1. ombudsman 2. consort 3. regent 4. consular 5. ambulant

54. A TV show taken from a character or an episode of an existing show is called a

1. take-off 2. parody 3. review 4. satire 5. spin-off

55. Music played by a group consisting of or including nonstandard instruments such as jugs or washboards is called

1. razzle 2. gig 3. riff 4. noise 5. skiffle

56. Pride in the values that make up the African heritage is called

1. negroism 2. negritude 3. Africanism 4. Jim Crowism 5. Uncle Tomism

Form MN

SYRACUSE UNIVERSITY
ADULT DEVELOPMENT STUDY
WORD FAMILIARITY SURVEY - NEW

DIRECTIONS: Fill in the spaces marked NAME, SEX and DATE OF BIRTH on the answer sheet which you have received with this test booklet. Then copy the form number from the upper right hand corner of this test booklet in the space marked NAME OF TEST.

Read each item. Decide which one of the answers given below is the BEST. Then, on your answer sheet, fill in the space which has the same letter as the word you have choosen.

---

1. To require more workmen than is needed for a job is to
   A. LOGROLL B. FEATHERBED C. PORK BARREL D. TEAPOT

2. A compact room with cooking facilities is called a
   A. KITCHENETTE B. DINETTE C. LIVETTE D. ROOMETTE

3. To convert something into normal language patterns is to
   A. TRANSFER B. REWRITE C. DECODE D. REFILE

4. One who plays baseball in local leagues or lowly minor leagues is referred to as a
   A. SCRAPPER B. HANGER C. LOOSER D. BUSHER

5. Prolonged and intensive indoctrination may also be called
   A. ESP B. PARAPSYCHOLOGY C. BRAINWASHING D. GLEIZATION

6. Disbelief in the desirability of victory for one's own side may be referred to as
   A. DEFEATISM B. NIHLISM C. CHAUVINISM D. TRAITORISM

7. An estate granted by the holder of an estate is a (an)
   A. SUBFIEF B. SHORTFALL C. KOHUANA D. WASALL

8. A concentration of energy in crystalline semi-conductors is referred to as a (an)
   A. ZACATON B. NAO C. PROTON D. EXCITON

9. A roentgenogram which is focused on one part while the rest is blurred is referred to as a (an)
   A. GOOTEE B. PLANIGRAM C. FOBRAEA D. PEDIPALPID

10. The device on the end of a harpoon used to tire whales when running or sounding is called a
    A. HAND B. DROGUE C. BARREL D. WHALEITO

11. To take a spill or tumble is to take a
    A. PURLER B. TOLLER C. DUANT D. PURUHA

12. Life away from water is referred to as
A. ANHYDROBIOSIS B. SYMBIOSIS C. HYDOSTATICS D. HYDROCULTURE

13. A sedimentary stratum rich in fossil remain of fish is called a (an)
A. ORTHOLAYER B. PICES C. FISHBED D. BAERIA

14. Another name for asphalt is
A. PROPLNYL B. WITTITE C. PYROBITUMEN D. CAMDENOL

15. When something extends across an ocean it is said to be
A. INTEROCEAN B. EXTRAOCEAN C. TRANSOCEAN D. ULTRAOCEAN

16. A description of the nervous system is a _____ description.
A. NEUROLINIC B. NEUROGRAPHIC C. NEUROPHASIC D. NEUROLITHIC

17. A pointed bullet is known as a
A. SHARPY B. SPITZER C. SLUG D. BUSHER

18. The smallest unit signaling a meaning in a language is a
A. VAIS B. DORSET C. MELIOLALES D. GLOSSEMATIC

19. Something which is studded with nails is referred to as being
A. CLIPPED B. RIBBONED C. CLINKERED D. HAILED

20. One of the stages in the bacterial life cycle is
A. MALLEOSTAGE B. CYCLOSTAGE C. CYTOSTAGE D. MALOSTAGE

21. To differentiate into new species is to
A. SEDATE B. SPECIATE C. EXPIATE D. AFFILATE

22. An instrument varying light pattern and color permitting combination analogus to phases of music is a (an)
A. PUERILISTER B. IMPOSTURE C. STOPBLOCK D. CLAVILUX

23. A musical voice part one octave higher than the mean is a
A. QUATRIBLE B. DECIBLE C. CENTIBLE D. TRECIBLE

24. Recutting the worn rifling in the barrel of a firearm is referred to as
A. FRESHING B. DUBING C. SCALING D. GOBING

25. The Algonquin Indians have a ceremonial dance called a
A. AMAUTA B. SCHHWAN C. CANTICO D. SHANKALLA

26. Another name for Bancroftian Filariasis which may lead to elephantiasis is
A. MUMU B. EAD C. FORHOO D. AFFLY

27. A description of the surface of the planet Mars
A. GEOGRAPHY B. AREOGRAPHY C. ARGYSIN D. MARSOLOGY

28. Having a saddle is described by the word
A. CANTICO B. HASIMITO C. SELLATE D. OECIUM

TABLE B-6a

Number Correct on ABLE (Spelling)

SEX	EDUCATION		MIDPOINT OF AGE DECADE						
			25	35	45	55	65	75	85
MALE	LOW	N	25	20	39	35	32	61	18
		Mean	38.40	33.30	36.46	38.43	36.12	31.77	26.78
		SD	7.73	11.14	7.95	10.18	12.22	14.87	13.33
	HIGH	N	65	102	81	48	24	31	7
		Mean	40.63	41.61	43.16	43.90	43.67	38.52	32.14
		SD	6.54	7.20	5.52	5.94	4.72	10.30	15.80
	TOTAL	N	90	122	120	83	56	92	25
		Mean	40.01	40.24	40.98	41.59	39.35	34.04	28.28
FEMALE	LOW	N	46	59	72	46	124	154	32
		Mean	41.43	41.95	42.61	39.59	34.28	34.57	29.19
		SD	6.32	5.14	5.44	11.02	13.80	12.65	14.84
	HIGH	N	41	41	73	53	46	53	13
		Mean	44.71	42.80	44.62	45.19	42.24	43.60	41.69
		SD	3.66	7.23	4.87	4.03	7.78	5.23	6.20
	TOTAL	N	87	100	145	99	170	203	45
		Mean	42.98	42.30	43.62	42.58	36.44	37.61	32.80
GRAND TOTAL		N	177	222	265	182	226	295	70
		Mean	41.47	41.17	42.42	42.13	37.16	36.49	31.18
EDUCATION	LOW	N	71	79	111	81	156	211	50
		Mean	40.37	39.76	40.45	39.08	34.66	34.42	28.32
	HIGH	N	106	143	154	101	70	84	20
		Mean	42.21	41.95	43.85	44.57	42.72	41.72	38.35

TABLE B-6b

Educational Level Rating for Subjects Taking

ABLE (Spelling)

SEX	EDUCATION		MIDPOINT OF AGE DECADE						
			25	35	45	55	65	75	85
MALE	LOW	N	25	20	39	35	32	61	18
		Mean	4.76	4.60	4.54	4.26	3.66	2.66	2.33
		SD	0.60	0.75	0.76	1.17	1.36	1.33	1.28
	HIGH	N	65	102	81	48	24	31	7
		Mean	7.37	7.74	7.63	7.48	7.62	7.48	7.71
		SD	0.86	0.91	0.86	1.09	1.13	1.06	1.38
	TOTAL	N	90	122	120	83	56	92	25
		Mean	6.64	7.23	6.62	6.12	5.36	4.28	3.84
FEMALE	LOW	N	46	59	72	46	124	153	32
		Mean	4.72	4.78	4.68	4.13	2.90	2.88	2.56
		SD	0.62	0.59	0.73	1.31	1.24	1.30	1.04
	HIGH	N	41	41	73	53	46	53	13
		Mean	7.32	7.24	6.88	6.98	6.80	7.09	6.54
		SD	0.82	1.04	0.90	0.93	1.13	1.08	0.66
	TOTAL	N	87	100	145	99	170	203	45
		Mean	5.94	5.79	5.79	5.66	3.95	4.02	3.44
GRAND TOTAL		N	177	222	265	182	226	295	70
		Mean	6.30	6.58	6.17	5.87	4.30	4.10	3.58
EDUCATION	LOW	N	71	79	111	81	156	211	50
		Mean	4.73	4.73	4.63	4.18	3.05	2.85	2.36
	HIGH	N	106	143	154	101	70	84	20
		Mean	7.35	7.60	7.27	7.22	7.09	7.24	6.65

TABLE B-6c

Occupational Level Rating for Subjects Taking

ABLE (Spelling)

SEX	EDUCATION		MIDPOINT OF AGE DECADE						
			25	35	45	55	65	75	85
MALE	LOW	N	25	20	39	35	32	61	18
		Mean	5.48	5.40	5.82	6.20	4.84	4.87	5.17
		SD	2.35	2.06	1.76	2.01	2.94	2.19	1.58
	HIGH	N	65	102	81	48	24	31	7
		Mean	7.65	8.09	7.60	7.54	7.00	6.90	7.71
		SD	1.91	1.45	1.62	1.72	3.39	2.09	1.89
	TOTAL	N	90	122	120	83	56	92	25
		Mean	7.04	7.65	7.02	6.98	5.77	5.55	5.88
FEMALE	LOW	N	46	59	72	46	124	150	30
		Mean	6.00	6.68	6.19	5.65	5.42	5.55	5.77
		SD	2.16	1.76	2.15	2.19	2.24	2.25	2.24
	HIGH	N	41	41	73	53	45	53	13
		Mean	7.88	7.76	7.55	7.24	7.36	7.58	7.62
		SD	1.55	2.11	2.12	2.08	2.02	2.11	1.66
	TOTAL	N	87	100	145	99	169	203	43
		Mean	6.88	7.12	6.88	6.50	5.93	6.08	6.32
GRAND TOTAL		N	177	222	265	182	225	295	68
		Mean	6.97	7.41	6.94	6.72	5.89	5.92	6.16
EDUCATION	LOW	N	71	79	111	81	156	211	48
		Mean	5.82	6.35	6.06	5.89	5.30	5.36	5.54
	HIGH	N	106	143	154	101	69	84	20
		Mean	7.74	7.99	7.58	7.39	7.23	7.33	7.65

TABLE B-7a

Number Correct on ABLE (Reading Comprehension)

SEX	EDUCATION		MIDPOINT OF AGE DECADE						
			25	35	45	55	65	75	85
MALE	LOW	N	3	7	16	18	10	18	2
		Mean	47.67	54.57	50.13	52.28	48.50	32.89	34.00
		SD	15.04	8.58	8.98	11.10	10.30	12.44	4.24
	HIGH	N	15	44	52	29	14	11	1
		Mean	44.47	61.52	60.15	55.34	52.79	48.82	43.00
		SD	27.82	5.54	6.33	13.52	9.12	8.81	0.00
	TOTAL	N	18	51	68	47	24	29	3
		Mean	45.00	60.57	57.79	54.17	51.00	38.93	37.00
FEMALE	LOW	N	23	42	52	29	44	50	10
		Mean	52.70	50.60	47.27	43.45	33.20	33.56	33.60
		SD	7.30	8.56	9.08	15.90	16.61	11.55	12.72
	HIGH	N	17	27	45	37	22	19	3
		Mean	44.82	51.52	51.73	51.46	48.50	42.47	43.00
		SD	25.23	13.52	14.65	13.42	11.12	9.49	7.94
	TOTAL	N	40	69	97	66	66	69	13
		Mean	49.35	50.96	49.34	47.94	38.30	36.01	35.77
GRAND TOTAL		N	58	120	165	113	90	98	16
		Mean	48.00	55.04	52.82	50.53	41.69	36.88	36.00
EDUCATION	LOW	N	26	49	68	47	54	68	12
		Mean	52.12	51.16	47.94	46.83	36.04	33.38	33.67
	HIGH	N	32	71	97	66	36	30	4
		Mean	44.66	57.72	56.25	53.17	50.17	44.80	43.00

TABLE B-7b

Educational Level Rating for Subjects Taking

ABLE (Reading Comprehension)

SEX	EDUCATION		MIDPOINT OF AGE DECADE						
			25	35	45	55	65	75	85
MALE	LOW	N	3	7	16	18	10	18	2
		Mean	5.00	4.29	4.38	4.28	4.30	2.28	2.00
		SD	0.00	.95	.89	1.13	1.16	.75	1.41
	HIGH	N	15	44	52	29	14	11	1
		Mean	8.27	7.86	7.65	7.72	7.29	7.55	9.00
		SD	.88	.88	.90	1.13	1.19	1.04	0.00
	TOTAL	N	18	51	68	47	24	29	3
		Mean	7.72	7.37	6.88	6.40	6.33	4.28	4.33
FEMALE	LOW	N	23	42	52	29	44	50	10
		Mean	4.74	4.69	4.71	4.14	2.68	2.84	2.80
		SD	.62	.68	.72	1.36	1.22	1.28	.92
	HIGH	N	17	27	45	37	22	19	3
		Mean	7.94	7.30	6.96	7.03	7.18	6.95	7.00
		SD	.97	1.20	.98	1.07	1.30	1.03	1.00
	TOTAL	N	40	69	97	66	66	69	13
		Mean	6.10	5.71	5.75	5.76	4.18	3.97	3.77
GRAND TOTAL		N	58	120	165	113	90	98	16
		Mean	6.60	6.42	6.22	6.03	4.76	4.06	3.88
EDUCATION	LOW	N	26	49	68	47	54	68	12
		Mean	4.77	4.63	4.63	4.19	2.98	2.69	2.67
	HIGH	N	32	71	97	66	36	30	4
		Mean	8.09	7.65	7.33	7.33	7.42	7.17	7.50

TABLE B-7c

Occupational Level Rating for Subjects Taking

ABLE (Reading Comprehension)

SEX	EDUCATION		MIDPOINT OF AGE DECADE						
			25	35	45	55	65	75	85
MALE	LOW	N	3	7	15	18	10	18	2
		Mean	3.33	5.43	5.75	6.56	5.30	4.39	5.00
		SD	2.08	1.27	2.18	1.65	2.11	2.15	0.00
	HIGH	N	12	44	52	28	14	11	1
		Mean	8.33	8.30	7.58	7.79	7.79	7.18	9.00
		SD	1.37	1.27	1.63	1.26	2.91	1.40	0.00
	TOTAL	N	15	51	68	46	24	29	3
		Mean	7.33	7.90	7.15	7.30	6.75	5.45	6.33
FEMALE	LOW	N	23	42	52	29	44	49	9
		Mean	6.30	6.60	6.60	5.62	5.50	5.45	6.11
		SD	1.94	1.64	1.88	2.19	2.32	2.04	1.96
	HIGH	N	17	27	45	37	22	19	3
		Mean	8.18	7.63	7.69	7.11	7.05	7.63	8.00
		SD	1.59	2.29	1.52	2.31	2.63	2.17	1.00
	TOTAL	N	40	69	97	66	66	68	12
		Mean	7.10	7.00	7.14	6.45	6.02	6.06	6.58
GRAND TOTAL		N	55	120	165	112	90	97	15
		Mean	7.16	7.38	7.12	6.80	6.21	5.88	6.53
EDUCATION	LOW	N	26	49	68	47	54	67	11
		Mean	5.96	6.43	6.40	5.98	5.46	5.16	5.91
	HIGH	N	29	71	97	65	36	30	4
		Mean	8.24	8.04	7.63	7.40	7.33	7.47	8.25

TABLE B-8a

Number Correct on ABLE (Reading Retention)

SEX	EDUCATION		MIDPOINT OF AGE DECADE						
			25	35	45	55	65	75	85
MALE	LOW	N	3	7	15	17	10	16	2
		Mean	9.00	8.71	9.33	10.29	10.10	8.31	4.50
		SD	3.00	3.20	2.35	1.72	2.47	2.47	6.36
	HIGH	N	15	44	51	29	14	11	1
		Mean	10.27	11.64	10.67	10.38	9.50	10.00	9.00
		SD	4.11	2.01	2.53	2.48	3.23	2.14	0.00
	TOTAL	N	18	51	66	46	24	27	3
		Mean	10.06	11.24	10.36	10.35	9.75	9.00	6.00
FEMALE	LOW	N	23	41	51	27	41	50	10
		Mean	10.22	8.95	8.49	7.22	6.44	6.58	6.60
		SD	1.93	2.71	2.66	3.04	3.51	2.91	3.78
	HIGH	N	17	27	46	38	21	19	3
		Mean	9.00	10.11	9.26	8.45	9.19	8.05	6.67
		SD	3.54	2.94	3.32	2.91	3.59	3.22	.58
	TOTAL	N	40	68	97	65	62	69	13
		Mean	9.70	9.41	8.86	7.94	7.37	6.99	6.62
GRAND TOTAL		N	58	119	163	111	86	96	16
		Mean	9.81	10.19	9.47	8.94	8.03	7.55	6.50
EDUCATION	LOW	N	26	48	66	44	51	66	12
		Mean	10.08	8.92	8.68	8.41	7.16	7.00	6.25
	HIGH	N	32	71	97	67	35	30	4
		Mean	9.59	11.06	10.00	9.28	9.31	8.77	7.25

TABLE B-8b

Educational Level Rating for Subjects Taking

ABLE (Reading Retention)

SEX	EDUCATION		MIDPOINT OF AGE DECADE						
			25	35	45	55	65	75	85
MALE	LOW	N	3	7	15	17	10	16	2
		Mean	5.00	4.29	4.33	4.41	4.30	2.38	2.00
		SD	0.00	.95	.90	1.00	1.16	.72	1.41
	HIGH	N	15	44	51	29	14	11	1
		Mean	8.27	7.86	7.65	7.72	7.79	7.55	9.00
		SD	.88	.88	.91	1.13	1.19	1.04	0.00
	TOTAL	N	18	51	66	46	24	27	3
		Mean	7.72	7.37	6.89	6.50	6.33	4.48	3.67
FEMALE	LOW	N	23	41	51	27	41	50	10
		Mean	4.74	4.68	4.71	4.15	2.78	2.84	2.80
		SD	.62	.69	.73	1.38	1.19	1.28	.92
	HIGH	N	17	27	46	38	21	19	3
		Mean	7.94	7.30	6.96	7.00	7.14	6.95	7.00
		SD	.97	1.20	.97	1.07	1.31	1.03	1.00
	TOTAL	N	40	68	97	65	62	69	13
		Mean	6.10	5.72	5.77	5.82	4.26	3.97	3.77
GRAND TOTAL		N	58	119	163	111	86	96	16
		Mean	6.60	6.43	6.23	6.10	4.84	4.11	3.38
EDUCATION	LOW	N	26	48	66	44	51	66	12
		Mean	4.77	4.63	4.62	4.25	3.08	2.73	3.08
	HIGH	N	32	71	97	67	35	30	4
		Mean	8.09	7.65	7.32	7.31	7.40	7.17	6.25

TABLE B-8c

Occupational Level Rating for Subjects Taking

ABLE (Reading Retention)

SEX	EDUCATION		MIDPOINT OF AGE DECADE						
			25	35	45	55	65	75	85
MALE	LOW	N	3	7	15	17	10	16	2
		Mean	3.33	5.43	5.67	6.65	5.30	4.75	5.00
		SD	2.08	1.27	2.23	1.66	2.11	1.91	0.00
	HIGH	N	12	44	51	28	14	11	1
		Mean	8.33	8.30	7.61	7.79	7.79	7.18	9.00
		SD	1.37	1.27	1.63	1.26	2.91	1.40	0.00
	TOTAL	N	15	51	66	45	24	27	3
		Mean	7.33	7.90	7.17	7.36	6.75	5.74	6.33
FEMALE	LOW	N	23	41	51	27	41	49	9
		Mean	6.30	6.63	6.59	5.56	5.61	5.45	6.11
		SD	1.94	1.64	1.90	2.22	2.23	2.04	1.96
	HIGH	N	17	27	46	38	21	19	3
		Mean	8.18	7.63	7.72	7.13	7.14	7.63	8.00
		SD	1.59	2.29	1.52	2.28	2.65	2.17	1.00
	TOTAL	N	40	68	97	65	62	68	12
		Mean	7.10	7.03	7.12	6.48	6.13	6.06	6.58
GRAND TOTAL		N	55	119	163	110	86	95	15
		Mean	7.16	7.40	7.14	6.84	6.30	5.97	6.53
EDUCATION	LOW	N	26	48	66	44	51	65	11
		Mean	5.96	6.46	6.38	5.98	5.55	5.28	5.91
	HIGH	N	29	71	97	66	35	30	4
		Mean	8.24	8.04	7.66	7.41	7.40	7.47	8.25

TABLE B-9a

Number Correct on ABLE (Arithmetic Computation)

SEX	EDUCATION		MIDPOINT OF AGE DECADE						
			25	35	45	55	65	75	85
MALE	LOW	N	22	13	28	21	27	61	18
		Mean	27.41	26.31	18.89	22.90	13.56	10.75	7.28
		SD	8.67	6.69	7.44	10.15	9.68	6.99	5.23
	HIGH	N	55	78	57	29	16	29	7
		Mean	32.64	33.49	31.53	29.17	23.81	18.10	16.00
		SD	7.28	7.80	7.49	7.66	8.47	10.28	11.96
	TOTAL	N	77	91	85	50	43	90	25
		Mean	31.14	32.46	27.36	26.54	17.37	13.12	9.72
FEMALE	LOW	N	37	33	43	32	121	153	32
		Mean	20.73	18.24	17.70	15.91	9.89	9.09	6.88
		SD	7.44	5.79	7.76	8.27	6.97	6.94	7.51
	HIGH	N	34	24	44	36	45	53	13
		Mean	32.88	26.88	23.70	25.08	18.91	16.28	11.15
		SD	6.89	8.58	9.07	8.10	9.24	8.92	8.36
	TOTAL	N	71	57	87	68	166	206	45
		Mean	26.55	21.88	20.74	20.76	12.34	10.94	8.11
GRAND TOTAL		N	148	148	172	118	209	296	70
		Mean	28.94	28.39	24.01	23.21	13.37	11.60	8.69
EDUCATION	LOW	N	59	46	71	53	148	214	50
		Mean	23.20	20.52	18.17	18.68	10.56	9.57	7.02
	HIGH	N	89	102	101	65	61	82	20
		Mean	32.73	31.93	28.12	26.91	20.20	18.93	12.85

TABLE B-9b

Educational Level Rating for Subjects Taking

ABLE (Arithmetic Computation)

SEX	EDUCATION		MIDPOINT OF AGE DECADE						
			25	35	45	55	65	75	85
MALE	LOW	N	22	13	28	21	27	61	18
		Mean	4.82	4.62	4.50	4.43	3.48	2.66	2.33
		SD	.50	.77	.79	1.03	1.40	1.33	1.28
	HIGH	N	55	78	57	29	16	29	7
		Mean	7.25	7.72	7.68	7.41	7.69	7.48	7.71
		SD	.80	.88	.91	1.12	1.25	1.09	1.38
	TOTAL	N	77	91	85	50	43	90	25
		Mean	6.56	7.27	6.64	6.16	5.05	4.21	3.84
FEMALE	LOW	N	37	33	43	32	121	152	32
		Mean	4.70	4.79	4.72	3.94	2.92	2.86	2.56
		SD	.62	.60	.67	1.37	1.24	1.29	1.05
	HIGH	N	34	24	44	36	45	53	13
		Mean	7.35	7.13	6.68	7.06	6.82	7.09	6.54
		SD	.85	.95	.83	.98	1.13	1.08	.66
	TOTAL	N	71	57	87	68	166	205	45
		Mean	5.97	5.77	5.71	5.59	3.98	3.96	3.71
GRAND TOTAL		N	148	148	172	118	209	295	70
		Mean	6.28	6.70	6.17	5.83	4.20	4.03	3.76
EDUCATION	LOW	N	59	46	71	53	148	213	50
		Mean	4.75	4.74	4.63	4.13	3.02	2.80	2.48
	HIGH	N	89	102	101	65	61	82	20
		Mean	7.45	7.58	7.25	7.22	7.05	7.23	6.95

TABLE B-9c

Occupational Level Rating for Subjects Taking

ABLE (Arithmetic Computation)

SEX	EDUCATION		MIDPOINT OF AGE DECADE						
			25	35	45	55	65	75	85
MALE	LOW	N	22	13	28	21	27	61	18
		Mean	5.85	5.77	5.75	6.14	5.15	4.87	5.17
		SD	2.12	2.01	1.71	2.20	2.66	2.19	1.58
	HIGH	N	55	78	57	29	16	29	7
		Mean	7.84	8.10	7.58	7.48	6.94	7.21	7.71
		SD	1.65	1.50	1.68	2.01	3.59	1.66	1.89
	TOTAL	N	77	91	85	50	43	90	25
		Mean	7.27	7.77	6.98	6.92	5.81	5.62	5.88
FEMALE	LOW	N	37	33	43	32	121	149	30
		Mean	5.95	6.70	6.11	3.94	5.52	5.56	5.77
		SD	1.57	1.70	2.21	1.76	1.70	2.11	1.66
	HIGH	N	34	24	44	36	44	53	13
		Mean	7.76	7.88	7.41	7.58	7.52	7.58	7.62
		SD	1.57	1.70	2.21	1.76	1.70	2.11	1.66
	TOTAL	N	71	57	87	68	165	202	43
		Mean	6.82	7.19	6.77	5.87	6.05	6.09	6.33
GRAND TOTAL		N	148	148	172	118	208	292	68
		Mean	7.05	7.55	6.87	6.78	6.00	5.95	6.16
EDUCATION	LOW	N	59	46	71	53	148	210	48
		Mean	5.92	6.43	5.97	5.85	5.45	5.36	5.54
	HIGH	N	89	102	101	65	60	82	20
		Mean	7.45	8.05	7.50	7.54	7.37	7.45	7.65

TABLE B-10a

Number Correct on ABLE (Arithmetic Problem Solving)

SEX	EDUCATION		MIDPOINT OF AGE DECADE						
			25	35	45	55	65	75	85
MALE	LOW	N	16	10	19	17	24	58	18
		Mean	17.94	18.70	16.95	16.06	10.92	6.31	3.56
		SD	6.01	8.46	6.78	9.34	8.20	5.12	3.28
	HIGH	N	59	77	58	35	20	31	7
		Mean	24.42	26.31	24.38	22.34	19.10	11.16	8.71
		SD	8.71	9.04	8.10	8.56	7.18	7.53	6.60
	TOTAL	N	75	87	77	52	44	89	25
		Mean	23.04	25.44	22.55	20.29	14.64	8.00	5.00
FEMALE	LOW	N	26	27	37	30	117	148	31
		Mean	13.35	11.85	11.89	9.87	5.75	4.89	3.58
		SD	5.67	3.36	9.43	5.64	4.10	3.90	4.35
	HIGH	N	29	17	38	37	44	53	12
		Mean	21.55	18.00	15.66	14.59	10.39	7.92	7.00
		SD	7.09	7.66	6.21	6.45	5.94	5.21	4.82
	TOTAL	N	55	44	75	67	161	201	43
		Mean	17.67	14.23	13.80	12.48	7.02	5.69	4.53
GRAND TOTAL		N	130	131	152	119	205	290	68
		Mean	20.77	21.67	18.23	15.89	8.65	6.40	4.71
EDUCATION	LOW	N	42	37	56	47	141	206	49
		Mean	15.10	13.70	13.61	12.11	6.63	5.29	3.57
	HIGH	N	88	94	46	72	64	84	19
		Mean	23.48	24.81	20.93	18.36	13.11	9.12	7.63

TABLE B-10b

Educational Level Rating for Subjects Taking

ABLE (Arithmetic Problem Solving)

SEX	EDUCATION		MIDPOINT OF AGE DECADE						
			25	35	45	55	65	75	85
MALE	LOW	N	16	10	19	17	24	58	18
		Mean	4.75	4.60	4.58	4.47	3.67	2.67	2.33
		SD	.58	.70	.77	1.18	1.43	1.36	1.28
	HIGH	N	59	77	58	35	20	31	7
		Mean	7.37	7.87	7.67	7.60	7.70	7.48	7.71
		SD	.83	.78	.91	1.03	1.17	1.06	1.38
	TOTAL	N	75	87	77	52	44	89	25
		Mean	6.81	7.49	6.91	6.58	5.50	4.35	3.84
FEMALE	LOW	N	26	27	37	30	117	148	31
		Mean	4.62	4.74	4.78	3.97	2.85	2.87	2.55
		SD	.79	.66	.63	1.43	1.22	1.31	1.06
	HIGH	N	29	17	38	37	44	53	12
		Mean	7.38	7.00	6.74	7.00	6.84	7.09	6.58
		SD	.86	1.06	.83	.97	1.14	1.08	.67
	TOTAL	N	55	44	75	67	161	201	43
		Mean	6.07	5.61	5.77	5.64	3.94	3.99	3.67
GRAND TOTAL		N	130	131	152	119	205	290	68
		Mean	6.50	6.86	6.35	6.05	4.28	4.10	3.74
EDUCATION	LOW	N	42	37	56	47	141	206	49
		Mean	4.67	4.70	4.71	4.15	2.99	2.82	2.47
	HIGH	N	88	94	96	72	64	84	19
		Mean	7.38	7.71	7.30	7.29	7.11	7.24	7.00

TABLE B-10c

Occupational Level Rating for Subjects Taking

ABLE (Arithmetic Problem Solving)

SEX	EDUCATION		MIDPOINT OF AGE DECADE						
			25	35	45	55	65	75	85
MALE	LOW	N	16	10	19	17	24	58	18
		Mean	5.13	4.50	6.21	6.76	5.25	5.12	5.17
		SD	2.58	1.51	1.81	1.82	2.69	1.94	1.58
	HIGH	N	59	77	58	35	20	31	7
		Mean	7.66	8.32	7.66	7.80	7.05	6.90	7.71
		SD	1.95	1.24	1.71	1.28	3.27	2.09	1.89
	TOTAL	N	75	87	77	52	44	89	25
		Mean	7.12	2.56	7.30	7.46	6.07	5.74	5.88
FEMALE	LOW	N	26	27	37	30	117	144	29
		Mean	6.50	6.59	6.22	5.67	5.65	5.75	5.97
		SD	1.77	2.06	2.25	2.28	2.00	2.04	1.99
	HIGH	N	29	17	38	37	43	53	12
		Mean	7.38	7.53	7.45	7.68	7.49	7.58	8.00
		SD	.86	1.91	2.26	1.70	1.71	2.11	.95
	TOTAL	N	55	44	75	67	160	197	41
		Mean	7.13	6.95	6.84	6.78	6.14	6.24	6.56
GRAND TOTAL		N	130	131	152	119	204	286	66
		Mean	7.12	7.57	7.07	7.08	6.13	6.09	6.30
EDUCATION	LOW	N	42	37	56	47	141	202	47
		Mean	5.98	6.03	6.21	6.06	5.58	5.57	5.66
	HIGH	N	88	94	96	72	63	84	19
		Mean	7.38	7.81	7.57	7.74	7.35	7.33	7.89

Table B-11a

Description of Subjects' Levels of Education and the Means and Standard Deviations of Correct Judgments on the Emotional and Non-Emotional Syllogisms

Age	Education	Sex	Number of Ss	$\bar{X}$ Level of Education	Emotional		Non-Emotional	
					$\bar{X}$	SD	$\bar{X}$	SD
20-29	High	M	39	7.74	13.10	2.50	15.89	2.10
		F	59	7.49	11.95	2.08	15.10	2.57
	Low	M	12	5.00	10.50	1.73	13.00	2.98
		F	22	4.72	11.13	2.12	12.59	2.79
30-39	High	M	68	7.70	12.29	2.37	15.56	2.75
		F	64	7.43	11.15	2.34	15.25	1.90
	Low	M	22	4.50	10.77	2.139	13.59	2.61
		F	42	4.71	10.16	1.837	13.47	1.99
40-49	High	M	60	7.48	11.53	1.83	15.63	2.52
		F	56	7.16	10.77	1.89	14.39	2.76
	Low	M	36	4.88	10.97	1.90	13.69	2.30
		F	38	4.71	10.74	2.11	12.71	2.90
50-59	High	M	35	7.25	11.26	1.67	14.63	2.69
		F	38	7.13	10.74	2.05	14.18	2.60
	Low	M	38	4.44	10.58	2.22	13.84	3.46
		F	44	4.11	10.36	2.30	12.84	2.39
60-69	High	M	24	7.58	11.54	2.04	14.46	2.24
		F	34	6.68	10.00	2.17	12.88	3.36
	Low	M	27	3.59	11.04	1.99	12.85	2.74
		F	63	3.31	9.97	2.65	12.06	2.98
70+	High	M	21	7.38	10.14	1.62	13.48	2.71
		F	42	6.71	10.36	1.86	13.00	2.87
	Low	M	41	2.90	10.22	2.90	11.66	3.18
		F	77	3.19	10.06	2.86	11.52	3.45

Table B-11b

Summary of the Analysis of Variance on Validity Judgments

	df	MS
Age (A)	5	127.32**
Education (B)	1	578.75**
Sex (C)	1	215.31**
A x B	5	17.52**
A x C	5	8.51
B x C	1	2.31
A x B x C	5	2.85
error	978	7.28
Trials (D)	1	4,044.56**
A x D	5	20.56**
B x D	1	118.62**
C x D	1	.18
A x B x D	5	3.24
A x C x D	5	4.42
B x C x D	1	1.81
A x B x C x D	5	2.21
error	978	5.22

*p < .05

**p < .01

APPENDIX C

PROPORTION OF RESPONSES BY AGE DECADE FOR EACH ITEM OF THE COGNITIVE AND EDUCATIONAL TESTS ADMINISTERED

Table C-1b

Proportion of Low Education Males in Each Age Decade

Obtaining Correct Answer for Each Item in Form D-2

(Word Familiarity Survey - General)

ITEM NUMBER	MIDPOINT OF AGE DECADE 25	35	45	55	65	75	MODAL AGE INDEX
1	1.00	.95	.89	.95	.83	.84	25
2	1.00	1.00	.97	.97	.93	.80	30
3	.80	.81	.87	.74	.71	.74	45
4	.67	.86	.73	.84	.79	.74	35
5	.47	.86	.76	.68	.69	.54	35
6	1.00	.95	.97	.97	.93	.78	25
7	.33	.38	.43	.68	.62	.55	55
8	.47	.62	.68	.66	.52	.51	45
9	.47	.48	.41	.61	.33	.33	55
10	.73	.67	.73	.68	.55	.57	25 45
11	.40	.57	.51	.79	.71	.61	55
12	.33	.57	.38	.58	.43	.41	55
13	.13	.43	.32	.61	.60	.46	55
14	.53	.48	.51	.63	.67	.54	65
15	.40	.57	.60	.68	.69	.67	65
16	.13	.24	.30	.40	.18	.30	55
17	.07	.24	.19	.40	.43	.45	75
18	.13	.19	.27	.32	.45	.36	65
19	.13	.24	.19	.29	.33	.35	75
20	.20	.29	.24	.24	.31	.23	65
21	.27	.33	.43	.53	.41	.33	55
22	.13	.33	.16	.45	.36	.38	55
23	.07	.10	.14	.45	.41	.17	55
24	.33	.24	.11	.50	.31	.23	55
25	.20	.24	.16	.47	.33	.32	55
26	.07	.10	.22	.37	.43	.26	65
27	.20	.14	.22	.18	.21	.15	45
28	.20	.19	.24	.55	.26	.19	55
29	.27	.14	.03	.24	.43	.25	65
30	.00	.10	.03	.24	.24	.20	60
Number of Subjects	15	21	37	38	42	69	

Characteristics of Modal Age Indices

Lowest: Mean = 52.33, SD = 13.71

Highest: Mean = 53.00 SD = 12.81

Table C-1a

Proportion of High Education Males in Each Age Decade Obtaining Correct Answer for Each Item in Form D-2 (Word Familiarity Survey - General)

ITEM NUMBER	MIDPOINT OF AGE DECADE 25	35	45	55	65	75	MODAL AGE INDEX
1	1.00	.97	.96	.92	1.00	.97	25 65
2	1.00	.99	.99	.98	1.00	.97	25 65
3	.94	.93	.94	.90	.96	.91	65
4	.94	.92	.94	.88	1.00	.97	65
5	.94	.90	.92	.94	.91	.81	25 65
6	.94	.99	.98	.98	1.00	.94	65
7	.89	.79	.85	.81	.91	.91	70
8	.86	.85	.88	.90	.73	.78	55
9	.86	.78	.82	.79	.59	.53	25
10	.78	.80	.83	.90	.86	.56	55
11	.75	.73	.78	.75	.91	.57	65
12	.86	.77	.80	.79	.77	.63	25
13	.61	.73	.86	.79	.82	.78	45
14	.78	.72	.75	.85	.96	.84	65
15	.69	.73	.87	.85	.96	.91	65
16	.53	.66	.76	.67	.68	.50	45
17	.47	.58	.64	.63	.68	.84	75
18	.47	.44	.54	.50	.55	.56	75
19	.64	.46	.61	.69	.59	.56	55
20	.50	.38	.41	.46	.59	.38	65
21	.58	.63	.61	.63	.55	.44	35 55
22	.39	.39	.59	.58	.77	.59	65
23	.42	.41	.50	.44	.55	.47	65
24	.50	.35	.53	.54	.59	.50	65
25	.36	.41	.54	.60	.50	.31	55
26	.42	.35	.35	.52	.55	.31	65
27	.11	.22	.20	.44	.32	.25	55
28	.42	.52	.47	.52	.50	.47	35 55
29	.25	.28	.33	.50	.50	.47	60
30	.22	.27	.33	.50	.46	.53	75
Number of Subjects	36	95	92	48	22	32	

Characteristics of Modal Age Indices

Lowest: Mean = 54.33, SD = 16.37

Highest: Mean = 59.67, SD = 11.90

Table C-1d

Proportion of Low Education Females in Each Age Decade Obtaining Correct Answer for Each Item in Form D-2 (Word Familiarity Survey - General)

ITEM NUMBER	MIDPOINT OF AGE DECADE 25	35	45	55	65	75	MODAL AGE INDEX
1	.97	.97	.96	.89	.86	.85	30
2	.97	.92	.93	.89	.90	.88	25
3	.91	.87	.88	.80	.76	.72	25
4	.74	.78	.79	.73	.85	.75	65
5	.86	.82	.87	.77	.74	.69	45
6	.91	.87	.93	.94	.89	.85	55
7	.50	.41	.51	.64	.60	.55	55
8	.62	.76	.73	.64	.56	.61	35
9	.55	.50	.53	.58	.24	.31	55
10	.71	.80	.84	.73	.65	.60	45
11	.50	.50	.60	.63	.70	.66	65
12	.41	.51	.60	.50	.30	.31	45
13	.36	.39	.44	.45	.43	.44	55
14	.53	.64	.57	.47	.51	.47	35
15	.53	.60	.61	.70	.57	.62	55
16	.33	.23	.40	.42	.29	.29	55
17	.17	.19	.30	.42	.53	.43	65
18	.24	.20	.38	.44	.40	.36	55
19	.31	.46	.48	.58	.34	.28	55
20	.38	.27	.47	.41	.31	.28	45
21	.57	.35	.51	.45	.37	.38	25
22	.21	.34	.43	.56	.39	.36	55
23	.21	.26	.25	.30	.27	.29	55
24	.19	.28	.35	.36	.29	.25	55
25	.16	.18	.27	.34	.26	.21	55
26	.26	.16	.20	.28	.28	.29	75
27	.24	.20	.21	.27	.17	.13	55
28	.12	.03	.10	.14	.10	.08	55
29	.22	.19	.21	.28	.29	.25	65
30	.12	.07	.09	.25	.19	.18	55
Number of Subjects	58	74	94	64	157	185	

Characteristics of Modal Age Indices
Mean = 50.5, SD = 12.54

Table C-1c

Proportion of High Education Females in Each Age Decade Obtaining Correct Answer for Each Item in Form D-2 (Word Familiarity Survey - General)

ITEM NUMBER	MIDPOINT OF AGE DECADE 25	35	45	55	65	75	MODAL AGE INDEX
1	.96	.99	.96	.97	.98	.86	35
2	.96	.98	.98	.95	.96	.93	40
3	.93	.91	.95	.93	.88	.87	45
4	.95	.93	.88	.93	.88	.93	25
5	.91	.94	.91	.95	.89	.80	55
6	.96	.95	.97	.96	.94	.99	75
7	.71	.77	.80	.83	.82	.86	75
8	.86	.89	.88	.90	.77	.84	55
9	.75	.70	.71	.73	.57	.43	25
10	.79	.88	.88	.85	.75	.69	40
11	.68	.77	.79	.85	.86	.89	75
12	.68	.70	.70	.71	.54	.46	55
13	.52	.61	.73	.79	.62	.63	75
14	.64	.67	.71	.71	.74	.63	65
15	.52	.82	.81	.77	.84	.84	60
16	.52	.58	.66	.63	.51	.43	45
17	.55	.59	.64	.65	.65	.69	75
18	.55	.68	.65	.67	.62	.61	35
19	.45	.59	.76	.75	.48	.54	45
20	.46	.62	.52	.58	.48	.41	35
21	.48	.59	.64	.67	.62	.51	55
22	.43	.64	.66	.62	.69	.74	75
23	.32	.46	.57	.66	.53	.51	55
24	.27	.37	.49	.48	.32	.34	45
25	.18	.33	.48	.52	.37	.26	55
26	.27	.32	.39	.45	.36	.36	55
27	.34	.42	.48	.43	.26	.21	45
28	.14	.21	.17	.22	.17	.13	55
29	.29	.26	.41	.50	.59	.43	65
30	.11	.19	.23	.38	.40	.29	55
Number of Subjects	56	81	143	103	81	70	

Characteristics of Modal Age Indices
Mean = 53.17, SD = 14.67

Table C-2b

Proportion of Low Education Males in Each Age Decade Obtaining Correct Answer for Each Item in Form SL-2 (Slang)

ITEM NUMBER	MIDPOINT OF AGE DECADE 25	35	45	55	65	75	MODAL AGE INDEX
1	.69	.89	.84	.74	.66	.49	35
2	.79	.93	.82	.90	.84	.66	35
3	.69	.80	.89	.93	.77	.63	55
4	.46	.48	.66	.82	.89	.83	65
5	.90	.86	.77	.85	.71	.68	25
6	.72	.68	.69	.52	.38	.48	25
7	.62	.73	.70	.79	.57	.41	55
8	.35	.36	.43	.52	.36	.32	55
9	.72	.96	.91	.77	.55	.27	35
10	.76	.75	.84	.50	.57	.44	45
11	.10	.32	.49	.58	.64	.69	75
12	1.00	.98	.95	.92	.89	.70	25
13	.90	.82	.69	.52	.52	.48	25
14	.93	.89	.84	.80	.70	.49	25
15	.46	.52	.37	.32	.14	.09	35
16	.00	.48	.82	.94	.88	.76	55
17	.59	.61	.53	.42	.39	.41	35
18	.31	.23	.50	.58	.77	.66	65
19	.69	.71	.55	.55	.53	.37	35
20	.17	.23	.42	.63	.82	.77	65
21	.48	.50	.62	.57	.55	.20	45
22	.17	.36	.54	.61	.59	.51	55
23	.07	.18	.11	.16	.07	.03	35
24	.35	.59	.46	.37	.23	.20	35
Number of Subjects	29	44	74	66	56	71	

Characteristics of Modal Age Indices
Mean = 43.33, SD = 14.97

Table C-2a

Proportion of High Education Males in Each Age Decade Obtaining Correct Answer for Each Item in Form SL-2 (Slang)

ITEM NUMBER	MIDPOINT OF AGE DECADE 25	35	45	55	65	75	MODAL AGE INDEX
1	.73	.83	.87	.87	.75	.61	50
2	.86	.92	.89	.81	.84	.73	35
3	.76	.85	.95	.92	.88	.70	45
4	.71	.71	.90	.89	.91	.91	70
5	.82	.84	.92	.85	.84	.76	45
6	.85	.85	.81	.72	.81	.52	30
7	.61	.85	.91	.92	.91	.58	55
8	.65	.65	.75	.75	.63	.70	50
9	.85	.92	.92	.80	.72	.49	40
10	.85	.86	.78	.76	.75	.49	35
11	.34	.58	.71	.83	.75	.76	55
12	.96	.96	.96	.97	1.00	.76	65
13	.91	.90	.89	.80	.78	.55	25
14	.96	.98	.97	.93	.84	.67	35
15	.79	.71	.56	.49	.38	.12	25
16	.29	.53	.92	.91	.91	.85	45
17	.70	.64	.60	.48	.41	.36	25
18	.28	.33	.55	.77	.78	.64	65
19	.82	.65	.57	.63	.66	.36	25
20	.29	.31	.56	.84	.88	.73	65
21	.53	.63	.66	.68	.66	.39	55
22	.29	.52	.73	.72	.75	.55	65
23	.35	.36	.19	.19	.22	.03	35
24	.66	.62	.57	.53	.44	.09	25
Number of Subjects	79	159	142	75	32	33	

Characteristics of Modal Age Indices
Mean = 44.38, SD = 14.72

Table C-2d

Proportion of Low Education Females in Each Age Decade Obtaining Correct Answer for Each Item in Form SL-2 (Slang)

ITEM NUMBER	MIDPOINT OF AGE DECADE 25	35	45	55	65	75	MODAL AGE INDEX
1	.71	.75	.72	.71	.61	.45	35
2	.67	.74	.75	.74	.66	.71	45
3	.62	.78	.87	.74	.55	.59	45
4	.62	.68	.83	.85	.87	.82	65
5	.77	.89	.87	.88	.68	.58	35
6	.84	.86	.76	.60	.55	.46	35
7	.40	.73	.77	.70	.53	.49	45
8	.56	.54	.61	.62	.50	.42	55
9	.67	.87	.91	.75	.51	.41	45
10	.69	.74	.71	.57	.51	.37	35
11	.37	.57	.69	.72	.74	.72	65
12	.96	.97	.98	.96	.84	.75	45
13	.89	.87	.78	.72	.54	.46	25
14	.95	.94	.90	.78	.66	.49	25
15	.58	.52	.43	.34	.19	.10	25
16	.15	.45	.79	.83	.83	.79	60
17	.77	.61	.58	.59	.45	.43	25
18	.29	.32	.52	.56	.59	.54	65
19	.78	.64	.58	.55	.48	.41	25
20	.30	.36	.57	.64	.73	.73	70
21	.40	.55	.56	.51	.30	.24	45
22	.14	.32	.41	.40	.47	.32	65
23	.15	.21	.15	.09	.08	.03	35
24	.38	.51	.35	.27	.22	.15	35
Number of Subjects	73	115	127	91	150	166	

Characteristics of Modal Age Indices
Mean = 43.75, SD = 14.59

Table C-2c

Proportion of High Education Females in Each Age Decade Obtaining Correct Answer for Each Item in Form SL-2 (Slang)

ITEM NUMBER	MIDPOINT OF AGE DECADE 25	35	45	55	65	75	MODAL AGE INDEX
1	.74	.74	.77	.63	.53	.47	45
2	.63	.82	.87	.82	.77	.61	45
3	.55	.73	.81	.86	.77	.69	55
4	.68	.84	.88	.96	.93	.95	55
5	.82	.87	.88	.89	.80	.58	55
6	.90	.84	.89	.77	.62	.66	25
7	.48	.86	.87	.89	.70	.69	55
8	.59	.73	.81	.82	.62	.66	55
9	.64	.85	.86	.84	.57	.34	45
10	.71	.79	.81	.71	.54	.45	45
11	.55	.74	.82	.84	.81	.83	55
12	.96	.96	.98	.98	.92	.91	50
13	.95	.91	.87	.84	.75	.50	25
14	.94	.90	.88	.88	.77	.66	25
15	.77	.69	.56	.60	.24	.09	25
16	.16	.37	.83	.92	.80	.83	55
17	.73	.71	.67	.59	.44	.47	25
18	.27	.45	.58	.75	.64	.56	55
19	.79	.64	.53	.57	.51	.48	25
20	.27	.45	.69	.83	.85	.80	65
21	.29	.60	.58	.57	.40	.25	35
22	.18	.37	.47	.50	.58	.39	65
23	.39	.37	.35	.31	.10	.03	25
24	.56	.64	.49	.33	.29	.13	35
Number of Subjects	119	135	166	111	72	64	

Characteristics of Modal Age Indices
Mean = 43.54, SD = 13.81

Table C-3b

Proportion of Females in Each Age decade Obtaining Correct Answer for Each Item in Form TR-2 (Transportation)

ITEM NUMBER	MIDPOINT OF AGE DECADE 25	35	45	55	65	75	MODAL AGE INDEX
1	.98	.90	.94	.92	.88	.91	25
2	.91	.95	.92	.94	.87	.83	35
3	.76	.90	.83	.75	.68	.71	35
4	.81	.88	.79	.94	.61	.61	55
5	.76	.85	.81	.83	.69	.72	35
6	.67	.70	.75	.79	.67	.64	55
7	.43	.68	.81	.87	.65	.57	55
8	.88	.70	.76	.69	.61	.60	25
9	.69	.68	.57	.64	.40	.35	25
10	.64	.56	.62	.62	.52	.55	25
11	.45	.64	.64	.75	.69	.72	55
12	.62	.46	.52	.50	.28	.22	25
13	.50	.53	.54	.52	.31	.24	45
14	.38	.49	.49	.39	.32	.28	45
15	.43	.48	.52	.67	.63	.69	75
16	.45	.41	.47	.46	.27	.27	45
17	.31	.41	.55	.69	.52	.53	55
18	.33	.31	.40	.39	.11	.18	45
19	.38	.59	.58	.58	.46	.54	35
20	.21	.24	.24	.27	.22	.16	55
21	.10	.15	.20	.15	.03	.03	45
22	.10	.09	.19	.54	.38	.49	55
23	.10	.07	.25	.29	.15	.16	55
Number of Subjects	42	59	89	52	100	116	

Characteristics of Modal Age Indices
Mean = 43.70, SD = 13.27

Table C-3a

Proportion of Males in Each Age Decade Obtaining Correct Answer for Each Item in Form TR-2 (Transportation)

ITEM NUMBER	MIDPOINT OF AGE DECADE 25	35	45	55	65	75	MODAL AGE INDEX
1	.92	.94	.92	1.00	1.00	.91	60
2	.83	.96	.90	.91	.89	.89	35
3	.96	.91	.92	.77	.82	.70	25
4	1.00	1.00	.94	.94	.93	.67	30
5	.83	.87	.77	.82	.89	.72	65
6	.75	.94	.81	.85	.89	.78	35
7	.75	.85	.85	.79	.79	.80	40
8	.96	.89	.71	.77	.79	.67	25
9	.67	.76	.79	.85	.71	.57	55
10	.71	.76	.79	.68	.96	.67	65
11	.50	.83	.87	.88	.82	.87	55
12	.67	.63	.65	.62	.50	.17	25
13	.83	.76	.75	.56	.46	.37	25
14	.58	.76	.81	.68	.71	.58	45
15	.29	.39	.35	.56	.82	.63	65
16	.54	.61	.60	.53	.54	.44	35
17	.29	.41	.62	.79	.61	.63	55
18	.17	.33	.44	.53	.39	.26	55
19	.38	.48	.50	.65	.61	.59	55
20	.21	.15	.14	.21	.18	.11	25 55
21	.08	.17	.14	.03	.00	.07	35
22	.25	.22	.52	.56	.57	.46	65
23	.08	.17	.37	.24	.29	.22	45
Number of Subjects	24	46	52	34	28	46	

Characteristics of Modal Age Indices

Lowest: Mean = 44.35, SD = 14.68

Highest: Mean = 45.65, SD = 14.24

Table C-4b

Proportion of Females in Each Age Decade Obtaining Correct Answer for Each Item in Form DD-2 (Death and Disease)

ITEM NUMBER	MIDPOINT OF AGE DECADE 25	35	45	55	65	75	MODAL AGE INDEX
1	.76	.93	.91	.96	.85	.76	55
2	.88	.90	.90	.86	.84	.77	40
3	.71	.90	.88	.94	.83	.77	55
4	.88	.93	.89	.88	.82	.73	35
5	.64	.81	.89	.90	.77	.74	55
6	.81	.81	.93	.96	.89	.90	55
7	.83	.88	.94	.90	.90	.88	45
8	.69	.67	.73	.84	.62	.62	55
9	.62	.84	.80	.92	.85	.77	55
10	.69	.84	.82	.82	.73	.65	35
11	.64	.67	.78	.84	.80	.76	55
12	.79	.86	.91	.80	.88	.75	45
13	.64	.81	.85	.78	.91	.80	65
14	.43	.58	.88	.96	.92	.84	55
15	.57	.79	.91	.90	.82	.74	45
16	.67	.74	.81	.78	.69	.67	45
17	.79	.93	.89	.86	.55	.35	35
18	.48	.46	.56	.57	.45	.36	55
19	.21	.23	.38	.45	.24	.21	55
20	.76	.90	.78	.84	.69	.62	35
Number of Subjects	42	57	89	51	92	109	

Characteristics of Modal Age Indices
Mean = 48.75, SD = 8.79

Table C-4a

Proportion of Males in Each Age Decade Obtaining Correct Answer for Each Item in Form DD-2 (Death and Disease)

ITEM NUMBER	MIDPOINT OF AGE DECADE 25	35	45	55	65	75	MODAL AGE INDEX
1	.62	.91	.82	.93	.73	.73	55
2	.91	.91	.78	.87	.81	.84	30
3	.67	.80	.86	.87	.89	.76	65
4	.67	.83	.75	.80	.85	.69	65
5	.76	.70	.69	.83	.77	.60	55
6	.52	.78	.82	.93	.89	.80	55
7	.62	.65	.75	.80	.85	.76	65
8	.62	.76	.67	.80	.65	.69	55
9	.62	.76	.73	.80	.69	.76	55
10	.62	.80	.90	.77	.62	.58	45
11	.38	.57	.59	.80	.81	.76	65
12	.81	.80	.71	.80	.85	.67	65
13	.52	.78	.80	.93	.92	.84	55
14	.48	.59	.71	.87	.81	.82	55
15	.38	.61	.61	.70	.81	.76	65
16	.57	.70	.80	.80	.80	.69	55
17	.52	.83	.71	.67	.50	.36	35
18	.52	.61	.39	.57	.65	.42	65
19	.38	.41	.39	.50	.42	.29	55
20	.67	.80	.84	.77	.73	.69	45
Number of Subjects	21	46	51	30	26	45	

Characteristics of Modal Age Indices
Mean = 55.25, SD = 9.81

Table C-5b

Proportion of Females in Each Age Decade Obtaining Correct Answer for Each Item in Form FI-2 (Finance)

ITEM NUMBER	MIDPOINT OF AGE DECADE 25	35	45	55	65	75	MODAL AGE INDEX
1	.91	.97	.95	.97	.90	.91	35 55
2	.91	1.00	.97	.94	.81	.77	35
3	.91	1.00	.95	.88	.70	.72	35
4	.82	1.00	1.00	1.00	.91	.81	45
5	.91	.91	.97	.91	.82	.84	45
6	.86	.94	.95	1.00	.89	.80	55
7	.77	.97	.97	.97	.83	.81	45
8	.86	.91	.81	.91	.53	.54	35 55
9	.41	.69	.81	.78	.74	.73	45
10	.77	.94	.83	.97	.53	.34	55
11	.68	.77	.81	.84	.84	.63	50
12	.73	.71	.77	.72	.54	.49	45
13	.55	.91	.75	.84	.70	.62	35
14	.64	.60	.68	.69	.60	.45	55
15	.36	.49	.68	.88	.49	.43	55
16	.46	.54	.67	.69	.53	.49	55
17	.55	.63	.74	.84	.69	.66	55
18	.36	.60	.42	.63	.33	.32	55
19	.46	.49	.53	.59	.37	.36	55
20	.59	.71	.68	.78	.78	.70	60
Number of Subjects	22	35	57	32	89	118	

Characteristics of Modal Age Indices

Lowest: Mean = 47.50, SD = 8.44

Highest: Mean = 49.50, SD = 7.57

Table C-5a

Proportion of Males in Each Age Decade Obtaining Correct Answer for Each Item in Form FI-2 (Finance)

ITEM NUMBER	MIDPOINT OF AGE DECADE 25	35	45	55	65	75	MODAL AGE INDEX
1	.90	.92	1.00	.86	.88	.92	45
2	1.00	1.00	1.00	1.00	.94	.92	40
3	1.00	.96	.95	1.00	.71	.80	25 55
4	.90	.92	.95	.86	.88	.86	45
5	.70	.88	.95	.86	.88	.88	45
6	1.00	.96	.91	.86	.88	.96	25
7	.90	1.00	.95	1.00	.77	.96	35 55
8	.80	.96	.95	.86	.65	.75	35
9	.70	.83	.95	1.00	.82	.90	55
10	1.00	.96	.95	.71	.65	.57	25
11	.80	.96	.91	1.00	.53	.80	55
12	.70	.92	.91	.86	.71	.73	35
13	.80	.88	.86	1.00	.82	.80	55
14	.40	.71	.76	.86	.47	.67	55
15	.60	.88	.86	.71	.65	.59	35
16	.40	.50	.76	.71	.82	.80	65
17	.50	.58	.67	.71	.59	.73	75
18	.70	.63	.71	.71	.35	.41	50
19	.50	.71	.67	.71	.29	.49	35 55
20	.60	.67	.81	.71	.77	.82	75
Number of Subjects	10	24	21	7	17	51	

Characteristics of Modal Age Indices

Lowest: Mean = 45.50, SD = 14.73

Highest: Mean = 49.00, SD = 13.65

Table C-6a--Continued

ITEM NUMBER	MIDPOINT OF AGE DECADE 25	35	45	55	65	75	MODAL AGE INDEX
31	.81	.83	.86	.91	.92	.71	65
32	.81	.79	.94	.87	.83	.63	45
33	.40	.34	.31	.45	.36	.17	55
34	.93	.96	.94	.95	.92	.82	35
35	.56	.66	.56	.58	.62	.37	35
36	.51	.51	.46	.50	.47	.27	30
37	.56	.54	.60	.67	.77	.41	65
38	.81	.83	.87	.83	.75	.63	45
39	.93	.78	.84	.81	.81	.59	25
40	.81	.73	.78	.78	.77	.56	25
41	.67	.69	.60	.60	.51	.39	35
42	.40	.31	.26	.36	.37	.26	25
43	.91	.87	.93	.92	.78	.62	45
44	.84	.84	.90	.91	.80	.71	55
45	.74	.71	.72	.83	.63	.53	55
46	.88	.83	.84	.83	.85	.63	25
47	.81	.77	.83	.85	.78	.70	55
48	.65	.73	.75	.73	.72	.52	45
49	.93	.80	.80	.76	.76	.59	25
50	.86	.73	.74	.77	.74	.55	25
Number of Subjects	43	96	104	78	48	35	

Characteristics of Modal Age Indices

Lowest: Mean = 39.70, SD = 14.98

Highest: Mean = 40.20, SD = 15.06

Table C-6a

Proportion of Males in Each Age Decade Obtaining Correct Answer for Each Item in ABLE (Spelling)

ITEM NUMBER	MIDPOINT OF AGE DECADE 25	35	45	55	65	75	MODAL AGE INDEX
1	.95	.95	.94	.95	.88	.86	30 55
2	1.00	.98	.95	.94	.94	.89	25
3	.93	.96	.94	.94	.92	.88	35
4	.95	.82	.91	.90	.87	.71	25
5	.84	.77	.83	.95	.83	.86	55
6	.98	.93	.92	.94	.96	.83	25
7	1.00	1.00	.99	.99	.96	.89	30
8	.88	.82	.83	.87	.77	.57	25
9	.93	.91	.89	.95	.92	.83	55
10	.88	.90	.89	.92	.92	.91	60
11	.63	.74	.74	.80	.81	.71	65
12	.86	.82	.92	.96	.85	.66	55
13	.88	.91	.85	.89	.88	.74	35
14	.98	.93	.93	.92	.96	.80	25
15	.98	.93	.91	.91	.79	.91	25
16	.88	.87	.87	.87	.92	.83	65
17	.98	.89	.93	.92	.92	.80	25
18	.98	.91	.96	.99	.96	.83	55
19	.98	.88	.96	.90	.85	.86	25
20	.95	.83	.90	.92	.92	.86	25
21	.91	.90	.94	.96	.96	.83	60
22	.86	.90	.92	.97	.92	.86	55
23	.93	.79	.89	.87	.81	.74	25
24	1.00	.96	.92	.94	.94	.89	25
25	.93	.92	.89	.92	.90	.77	25
26	.84	.88	.89	.92	.88	.80	55
27	.72	.73	.70	.83	.85	.66	65
28	.79	.75	.73	.72	.72	.50	25
29	.84	.80	.77	.82	.79	.65	25
30	.95	.93	.97	.95	.90	.82	45

Table C-6b--Continued

ITEM NUMBER	MIDPOINT OF AGE DECADE 25	35	45	55	65	75	MODAL AGE INDEX
41	.93	.79	.80	.69	.54	.56	25
42	.47	.41	.45	.52	.42	.36	55
43	.91	.95	.91	.85	.71	.85	35
44	.91	.93	.93	.88	.76	.88	40
45	.74	.77	.81	.77	.59	.71	45
46	.95	.86	.94	.86	.73	.79	25
47	.91	.85	.88	.81	.70	.79	25
48	.90	.83	.84	.72	.62	.83	25
49	.91	.87	.86	.83	.68	.70	25
50	.88	.81	.81	.76	.59	.74	25
Number of Subjects	58	93	128	88	71	74	

Characteristics of Modal Age Indices

Lowest: Mean = 37.00, SD = 12.40

Highest: Mean = 39.80, SD = 13.39

Table C-6b

Proportion of Females in Each Age Decade Obtaining Correct Answer for Each Item in ABLE (Spelling)

ITEM NUMBER	MIDPOINT OF AGE DECADE 25	35	45	55	65	75	MODAL AGE INDEX
1	.97	.90	.94	.91	.85	.91	25
2	.98	.97	.99	.94	.88	.93	45
3	1.00	.96	.97	.96	.88	.83	25
4	.95	.87	.93	.91	.76	.80	25
5	.83	.93	.91	.94	.74	.84	55
6	.98	.94	.97	.94	.86	.79	25
7	.98	.99	.99	.98	.92	.99	40 75
8	.93	.84	.89	.90	.76	.76	25
9	.97	.94	.99	.96	.85	.89	45
10	.90	.90	.98	.86	.81	.88	45
11	.78	.87	.92	.85	.70	.72	45
12	.83	.95	.93	.90	.80	.81	35
13	.91	.91	.95	.92	.77	.83	55
14	.95	.94	.95	.92	.86	.90	25 45
15	.97	.96	.96	.93	.86	.86	25
16	.97	.82	.95	.92	.83	.88	25
17	.97	.94	.98	.97	.82	.87	45
18	.95	.95	.98	.94	.85	.88	45
19	.93	.93	.97	.94	.81	.81	45
20	.98	.96	.98	.96	.82	.87	25 45
21	.98	.96	.97	.98	.89	.89	25 55
22	.93	.89	.92	.98	.89	.92	55
23	.97	.91	.95	.91	.79	.77	25
24	.98	.94	.96	.98	.89	.92	25 55
25	.95	.95	.96	.96	.84	.85	50
26	.93	.89	.92	.91	.82	.84	25
27	.71	.71	.83	.77	.60	.74	45
28	.79	.70	.74	.80	.61	.66	55
29	.91	.85	.84	.85	.66	.77	25
30	.98	.96	.97	.97	.71	.88	25
31	.86	.90	.93	.91	.75	.77	45
32	.85	.93	.93	.93	.78	.75	45
33	.29	.43	.50	.55	.47	.39	55
34	.98	.97	.95	.93	.84	.90	25
35	.60	.74	.80	.71	.66	.58	45
36	.40	.54	.59	.57	.44	.52	45
37	.60	.67	.66	.66	.63	.60	35
38	.93	.93	.88	.86	.77	.69	30
39	.86	.76	.84	.84	.65	.88	75
40	.86	.87	.89	.86	.75	.82	45

Table C-7a

Proportion of Males in Each Age Decade Obtaining Correct Answer for Each Item in ABLE (Reading Comprehension)

ITEM NUMBER	MIDPOINT OF AGE DECADE 25	35	45	55	65	75	MODAL AGE INDEX
1	1.00	1.00	.99	.94	1.00	.93	30 65
2	.64	.84	.79	.70	.58	.59	35
3	.93	.92	.94	.91	.92	.70	45
4	.79	.78	.68	.70	.54	.50	25
5	1.00	.96	.97	.94	.87	.83	25
6	1.00	.96	.99	.98	.87	.87	25
7	1.00	.96	.99	.94	.88	.77	25
8	.93	.92	.84	.89	.92	.63	25
9	.93	.96	.96	1.00	1.00	.87	60
10	.93	.94	.85	.89	.88	.67	35
11	.93	.98	.94	.91	.92	.67	35
12	1.00	.96	.85	.87	.92	.87	25
13	1.00	.98	1.00	.98	1.00	.80	25 45 65
14	1.00	1.00	.99	.96	.96	.90	30
15	1.00	1.00	1.00	.96	1.00	.90	35 65
16	.93	.98	.96	.98	.96	.72	35 55
17	.86	.96	.99	.98	.92	.83	45
18	.86	.98	.99	.96	.87	.67	45
19	.93	.98	1.00	1.00	1.00	.90	55
20	.79	1.00	.94	.89	.92	.72	35
21	.86	1.00	.94	.96	1.00	.87	35 65
22	.86	.98	.91	.91	.87	.63	35
23	.86	.92	.93	.85	.71	.70	45
24	.71	.80	.74	.72	.67	.43	35
25	.79	.92	.90	.85	.92	.70	35 65
26	.93	.96	1.00	.94	.96	.80	45
27	.93	.94	.94	.85	.83	.53	40
28	.79	.88	.90	.91	.79	.53	55
29	.86	.82	.63	.63	.50	.57	25
30	1.00	.96	1.00	.94	1.99	.90	25 45 65
31	.86	.98	.90	.78	.71	.40	35
32	1.00	.90	.79	.76	.71	.46	25
33	.64	.88	.87	.83	.96	.86	65
34	.93	.65	.71	.54	.58	.43	25
35	.93	.94	.85	.61	.54	.28	35
36	.93	.82	.87	.89	.88	.90	25
37	.93	.94	.77	.72	.50	.27	35
38	.57	.49	.46	.53	.50	.10	25
39	1.00	.98	.97	.98	1.00	.76	25 65
40	.79	.75	.63	.63	.67	.48	25

Table C-7a--Continued

ITEM NUMBER	MIDPOINT OF AGE DECADE 25	35	45	55	65	75	MODAL AGE INDEX
41	.93	.90	.93	.94	.83	.66	55
42	.86	.92	.84	.80	.58	.21	35
43	.93	.88	.94	.91	.79	.64	45
44	.86	.96	.81	.74	.54	.54	35
45	.71	.92	.85	.76	.71	.57	35
46	.93	.96	.91	.67	.79	.25	35
47	.93	1.00	.97	.98	.92	.89	35
48	.86	.80	.66	.72	.67	.67	25
49	.93	.90	.97	.96	.92	.85	45
50	1.00	.98	.99	.94	.92	.93	25
51	.86	.90	.84	.78	.61	.41	35
52	.79	.92	.90	.87	.77	.59	35
53	.29	.49	.47	.37	.30	.54	75
54	.86	.80	.84	.80	.78	.40	25
55	.93	.96	.91	.87	.70	.64	35
56	.79	.88	.90	.85	.78	.65	45
57	.43	.45	.62	.57	.44	.32	45
58	.86	.78	.74	.74	.71	.29	25
59	.79	.63	.63	.70	.50	.33	25
60	.86	.94	.90	.87	.90	.69	35
61	.71	.92	.85	.83	.90	.63	35
62	.36	.65	.47	.50	.40	.27	35
63	.79	.82	.62	.67	.75	.47	35
64	.79	.75	.77	.67	.55	.47	25
65	.36	.26	.38	.24	.44	.31	65
66	.50	.59	.47	.37	.39	.25	35
67	.36	.69	.58	.39	.44	.08	35
68	.64	.80	.71	.61	.63	.58	35
69	.71	.78	.68	.63	.69	.46	35
70	.50	.71	.52	.44	.56	.27	35
Number of Subjects	14	51	68	46	24	29	

Characteristics of Modal Age Indices

Mean (1) = 35.86, SD = 10.86
Mean (2) = 39.07, SD = 13.05
Mean (3) = 39.64, SD = 13.72

Table C-7b

Proportion of Females in Each Age Decade Obtaining Correct Answer for Each Item in ABLE (Reading Comprehension)

ITEM NUMBER	MIDPOINT OF AGE DECADE 25	35	45	55	65	75	MODAL AGE INDEX
1	.97	1.00	.93	.92	.91	.92	35
2	.69	.77	.80	.79	.58	.63	45
3	.94	.96	.97	.86	.79	.72	45
4	.69	.63	.77	.80	.51	.37	55
5	1.00	.94	.95	.92	.85	.89	25
6	1.00	.93	.93	.96	.87	.91	25
7	.97	.91	.94	.85	.78	.85	25
8	.89	.79	.77	.82	.70	.71	25
9	.89	.81	.89	.86	.79	.82	25 45
10	.97	.91	.90	.86	.70	.58	25
11	.97	.93	.92	.86	.62	.67	25
12	.89	.88	.85	.77	.92	.82	65
13	1.00	.96	.96	.92	.89	.96	25
14	1.00	1.00	.97	.97	.94	1.00	30 75
15	.94	.96	.95	.94	.94	.91	35
16	.94	.91	.97	.88	.79	.80	45
17	.78	.88	.90	.86	.79	.71	45
18	.89	.81	.88	.79	.69	.61	25
19	.97	.91	.91	.91	.84	.80	25
20	.86	.77	.79	.83	.76	.66	25
21	1.00	.96	.90	.92	.88	.91	25
22	.92	.81	.85	.82	.61	.58	25
23	.81	.82	.92	.77	.81	.78	45
24	.64	.69	.55	.59	.36	.35	35
25	.86	.71	.72	.79	.58	.73	25
26	.97	.96	.92	.86	.67	.75	25
27	.92	.79	.73	.73	.58	.59	25
28	.83	.74	.74	.64	.63	.49	25
29	.64	.72	.71	.53	.43	.49	35
30	.94	.96	.96	.91	.82	.87	40
31	1.00	.93	.91	.83	.49	.44	25
32	.94	.82	.73	.74	.52	.32	25
33	.67	.75	.78	.85	.76	.87	75
34	.58	.40	.45	.35	.28	.18	25
35	.92	.81	.73	.68	.44	.35	25
36	.78	.82	.89	.86	.73	.85	45
37	.92	.87	.80	.58	.41	.35	25
38	.19	.24	.25	.18	.17	.13	45
39	.97	.91	.95	.86	.76	.80	25
40	.75	.62	.56	.52	.39	.36	25

Table C-7b--Continued

ITEM NUMBER	MIDPOINT OF AGE DECADE 25	35	45	55	65	75	MODAL AGE INDEX
41	.89	.72	.82	.82	.64	.66	25
42	.94	.87	.81	.73	.38	.34	25
43	.83	.79	.82	.68	.58	.66	25
44	.81	.74	.74	.68	.34	.45	25
45	.61	.66	.63	.71	.50	.53	55
46	.92	.81	.70	.74	.31	.22	25
47	.97	.99	.96	.86	.70	.67	35
48	.36	.63	.46	.49	.36	.28	35
49	.94	.93	.81	.86	.72	.74	25
50	.97	.97	.92	.91	.82	.88	30
51	.81	.90	.70	.71	.31	.33	35
52	.75	.81	.79	.74	.59	.56	35
53	.33	.34	.34	.29	.29	.25	40
54	.75	.62	.48	.62	.43	.40	25
55	.94	.88	.83	.70	.67	.65	25
56	.78	.69	.73	.61	.50	.65	25
57	.56	.59	.54	.47	.48	.41	35
58	.44	.49	.48	.58	.51	.37	55
59	.61	.47	.45	.44	.35	.29	25
60	.92	.81	.66	.65	.73	.80	25
61	.78	.71	.56	.59	.60	.50	25
62	.42	.31	.30	.28	.32	.19	25
63	.53	.50	.48	.42	.38	.17	25
64	.75	.57	.46	.35	.54	.50	25
65	.19	.34	.24	.19	.32	.21	35
66	.19	.29	.24	.23	.14	.10	35
67	.42	.27	.25	.25	.27	.18	25
68	.64	.40	.33	.40	.49	.48	25
69	.58	.35	.36	.31	.47	.41	25
70	.56	.31	.33	.28	.28	.15	25
Number of Subjects	36	68	96	66	66	67	

Characteristics of Modal Age Indices

Lowest: Mean = 31.71, SD = 10.73

Highest: Mean = 32.64, SD = 11.95

Table C-8a

Proportion of Males in Each Age Decade Obtaining Correct Answer for Each Item in ABLE (Reading Retention)

ITEM NUMBER	MIDPOINT OF AGE DECADE 25	35	45	55	65	75	MODAL AGE INDEX
1	.79	.75	.67	.74	.71	.47	25
2	.50	.59	.49	.48	.63	.48	65
3	.29	.37	.36	.41	.38	.07	55
4	1.00	.98	.94	.94	.88	.62	25
5	.93	.98	.94	.96	.79	.72	35
6	1.00	.90	.88	.87	.58	.73	25
7	.64	.41	.35	.37	.46	.47	25
8	.43	.39	.30	.28	.17	.18	25
9	.79	.75	.64	.61	.63	.54	25
10	.71	.71	.67	.63	.42	.47	30
11	.57	.49	.41	.46	.46	.30	25
12	.93	.75	.82	.78	.65	.63	25
13	.93	.96	1.00	.98	.92	.77	45
14	.71	.80	.71	.78	.83	.73	65
15	.79	.88	.77	.78	.96	.83	65
16	.57	.53	.42	.30	.33	.30	25
Number of Subjects	14	51	66	46	24	30	

Characteristics of Modal Age Indices
Mean = 36.56, SD = 15.98

Table C-8b

Proportion of Females in Each Age Decade Obtaining Correct Answer for Each Item in ABLE (Reading Retention)

ITEM NUMBER	MIDPOINT OF AGE DECADE 25	35	45	55	65	75	MODAL AGE INDEX
1	.67	.66	.58	.52	.54	.53	25
2	.64	.59	.59	.51	.46	.33	25
3	.28	.38	.26	.25	.26	.16	35
4	.94	.84	.76	.74	.65	.77	25
5	.94	.85	.84	.82	.59	.55	25
6	.86	.78	.75	.65	.57	.73	25
7	.33	.32	.37	.22	.30	.20	45
8	.28	.35	.33	.34	.24	.18	35
9	.67	.60	.50	.48	.40	.43	25
10	.58	.57	.52	.32	.29	.20	25
11	.58	.31	.35	.22	.26	.50	25
12	.75	.71	.65	.68	.63	.57	25
13	1.00	.88	.90	.85	.76	.79	25
14	.69	.46	.53	.57	.64	.73	75
15	.75	.69	.78	.63	.71	.88	75
16	.39	.37	.31	.14	.25	.23	25
Number of Subjects	36	68	95	65	63	62	

Characteristics of Modal Age Indices
Mean = 33.75, SD = 16.53

Table C-9a

Proportion of Males in Each Age Decade Obtaining Correct Answer for Each Item in ABLE (Arithmetic Computation)

ITEM NUMBER	MIDPOINT OF AGE DECADE 25	35	45	55	65	75	MODAL AGE INDEX
1	.90	.92	.90	.84	.79	.83	35
2	.90	.82	.79	.89	.50	.70	25
3	.87	.91	.90	.91	.77	.83	35 55
4	.83	.80	.81	.82	.68	.58	25
5	.50	.62	.62	.58	.38	.59	40
6	.87	.91	.87	.87	.82	.73	35
7	.73	.85	.81	.82	.69	.70	35
8	.53	.62	.57	.51	.36	.45	35
9	.60	.75	.68	.60	.46	.52	35
10	.80	.86	.68	.80	.81	.62	35
11	.87	.86	.81	.87	.56	.46	25 55
12	.70	.82	.74	.77	.84	.73	65
13	.80	.75	.59	.62	.52	.42	25
14	.93	1.00	.87	.96	.88	.83	35
15	.80	.82	.72	.84	.69	.54	55
16	.63	.62	.52	.62	.41	.21	25
17	.60	.69	.56	.58	.41	.44	35
18	.93	.91	.78	.67	.44	.35	25
19	.33	.60	.42	.36	.29	.38	35
20	.87	.88	.78	.82	.73	.60	35
21	.57	.55	.41	.49	.29	.39	25
22	.70	.89	.69	.76	.56	.42	35
23	.93	.85	.74	.80	.72	.50	25
24	.90	.79	.65	.64	.43	.33	25
25	.63	.69	.52	.51	.24	.39	35
26	.90	.89	.74	.80	.60	.63	25
27	.63	.77	.58	.53	.25	.40	35
28	.47	.42	.31	.42	.11	.29	25
29	.43	.49	.32	.22	.00	.07	35
30	.67	.80	.52	.64	.33	.11	35
31	.53	.63	.49	.44	.22	.25	35
32	.60	.66	.48	.51	.30	.23	35
33	.67	.85	.56	.69	.35	.54	35
34	.33	.39	.22	.24	.08	.00	35
35	.90	.95	.82	.91	.63	.54	35
36	.60	.68	.49	.56	.29	.23	35
37	.77	.79	.63	.62	.40	.47	35
38	.77	.86	.70	.69	.50	.47	35
39	.73	.80	.63	.64	.41	.36	35
40	.43	.37	.24	.18	.00	.00	25
41	.57	.72	.49	.44	.30	.08	35
42	.70	.80	.43	.49	.26	.23	35
Number of Subjects	30	65	68	45	34	30	

Characteristics of Modal Age Indices

Lowest: Mean = 33.45, SD = 7.61

Highest: Mean = 34.64, SD = 8.76

Table C-9b

Proportion of Females in Each Age Decade Obtaining Correct Answer for Each Item in ABLE (Arithmetic Computation)

ITEM NUMBER	MIDPOINT OF AGE DECADE 25	35	45	55	65	75	MODAL AGE INDEX
1	.77	.86	.81	.91	.75	.72	55
2	.70	.80	.79	.72	.59	.47	35
3	.91	.80	.81	.91	.75	.75	25 55
4	.81	.84	.83	.69	.71	.48	35
5	.37	.51	.60	.53	.63	.48	65
6	.81	.86	.81	.79	.69	.70	35
7	.67	.71	.63	.76	.66	.61	55
8	.42	.49	.53	.59	.50	.42	55
9	.61	.39	.47	.52	.47	.36	25
10	.72	.51	.64	.57	.52	.40	25
11	.74	.86	.75	.62	.57	.34	35
12	.67	.43	.50	.57	.60	.53	25
13	.54	.35	.36	.37	.39	.20	25
14	.88	.78	.82	.81	.69	.68	25
15	.67	.65	.63	.71	.54	.56	55
16	.33	.10	.23	.26	.20	.15	25
17	.47	.33	.43	.52	.54	.29	65
18	.84	.78	.67	.69	.49	.53	25
19	.42	.39	.36	.45	.41	.27	55
20	.81	.88	.71	.72	.58	.44	35
21	.28	.28	.32	.29	.26	.19	45
22	.67	.37	.43	.50	.34	.27	25
23	.79	.61	.53	.59	.57	.48	25
24	.67	.53	.53	.41	.39	.29	25
25	.35	.31	.30	.31	.25	.44	75
26	.67	.53	.51	.49	.66	.61	25
27	.51	.20	.36	.25	.24	.26	25
28	.30	.18	.08	.07	.16	.12	25
29	.21	.06	.10	.12	.11	.09	25
30	.61	.49	.41	.37	.26	.27	25
31	.44	.20	.16	.22	.21	.26	25
32	.44	.41	.26	.32	.11	.20	25
33	.51	.51	.37	.37	.33	.20	30
34	.14	.06	.03	.07	.08	.11	25
35	.86	.86	.69	.64	.62	.80	30
36	.54	.49	.30	.32	.23	.26	25
37	.58	.55	.38	.44	.44	.51	25
38	.74	.67	.47	.54	.53	.44	25
39	.58	.43	.29	.48	.44	.32	25
40	.16	.16	.08	.03	.09	.00	30
41	.40	.35	.33	.29	.31	.23	25
42	.63	.61	.36	.31	.32	.36	25
Number of Subjects	43	51	72	58	65	65	

Characteristics of Modal Age Indices

Lowest: Mean = 33.69, SD = 13.8

Highest: Mean = 34.40, SD = 14.12

Table C-10a

Proportion of Males in Each Age Decade Obtaining Correct Answer for Each Item in ABLE (Arithmetic Problem Solving)

ITEM NUMBER	MIDPOINT OF AGE DECADE 25	35	45	55	65	75	MODAL AGE INDEX
1	.89	.89	.85	.81	.85	.83	30
2	.61	.69	.64	.60	.56	.48	35
3	.57	.39	.51	.45	.10	.38	25
4	.32	.29	.33	.30	.13	.27	45
5	.89	.87	.82	.87	.91	.52	65
6	.68	.77	.77	.81	.73	.61	55
7	.79	.84	.79	.66	.63	.23	35
8	.32	.39	.30	.23	.13	.05	35
9	.86	.86	.92	.87	.91	.75	45
10	.61	.55	.57	.51	.44	.27	25
11	.64	.63	.39	.43	.39	.23	25
12	.68	.50	.36	.47	.39	.13	25
13	.57	.57	.48	.55	.37	.17	30
14	.79	.82	.79	.72	.75	.67	35
15	.71	.74	.57	.57	.39	.21	35
16	.86	.82	.79	.85	.70	.61	25
17	.89	.77	.71	.66	.53	.42	25
18	.57	.52	.38	.47	.21	.13	25
19	.82	.76	.72	.81	.67	.70	25
20	.86	.71	.71	.57	.70	.56	25
21	.79	.71	.79	.75	.55	.37	25 45
22	.64	.57	.51	.55	.40	.33	25
23	.29	.24	.31	.28	.07	.15	45
24	.75	.71	.67	.57	.58	.39	25
25	.79	.53	.53	.64	.31	.33	25
26	.86	.63	.59	.66	.44	.26	25
27	1.00	.87	.82	.79	.84	.67	25
28	.86	.79	.79	.64	.50	.33	25
29	.75	.63	.48	.47	.35	.31	25
30	.64	.50	.33	.34	.14	.13	25
31	.68	.66	.51	.53	.31	.29	25
32	.57	.52	.38	.34	.26	.20	25
33	.61	.57	.43	.23	.26	.27	25
34	.82	.77	.49	.51	.48	.40	25
35	.71	.69	.39	.28	.11	.20	25
36	.50	.40	.20	.19	.13	.15	25
37	.29	.24	.07	.04	.11	.00	25
38	.54	.39	.10	.17	.07	.13	25
39	.14	.23	.18	.17	.07	.18	35
40	.54	.48	.20	.20	.08	.09	25
41	.71	.48	.20	.22	.08	.00	25
42	.54	.40	.25	.13	.27	.00	25
Number of Subjects	28	62	61	47	32	22	

Characteristics of Modal Age Indices

Lowest: Mean = 29.76, SD = 9.00

Highest: Mean = 30.24, SD = 9.25

Table C-10b

Proportion of Females in Each Age Decade Obtaining Correct Answer for Each Item in ABLE (Arithmetic Problem Solving)

ITEM NUMBER	MIDPOINT OF AGE DECADE: 25	35	45	55	65	75	MODAL AGE INDEX
1	.67	.84	.78	.82	.81	.78	35
2	.56	.74	.54	.38	.44	.29	35
3	.15	.26	.22	.11	.09	.30	75
4	.11	.08	.14	.15	.16	.15	65
5	.70	.71	.68	.60	.57	.62	35
6	.44	.26	.44	.38	.45	.40	65
7	.44	.34	.39	.44	.37	.21	25 55
8	.04	.05	.05	.09	.15	.00	65
9	.70	.66	.68	.76	.64	.61	55
10	.22	.16	.17	.26	.17	.14	55
11	.67	.37	.32	.35	.36	.38	25
12	.19	.40	.19	.36	.15	.15	35
13	.30	.29	.07	.27	.27	.29	25
14	.78	.74	.66	.73	.48	.58	25
15	.56	.34	.34	.44	.33	.32	25
16	.63	.63	.59	.64	.60	.51	55
17	.63	.53	.58	.56	.49	.47	25
18	.30	.13	.09	.15	.11	.24	25
19	.70	.61	.61	.56	.65	.43	25
20	.70	.50	.58	.51	.61	.56	25
21	.44	.29	.37	.27	.45	.24	65
22	.22	.08	.12	.20	.29	.18	65
23	.07	.16	.10	.09	.03	.16	35 75
24	.37	.37	.34	.49	.29	.32	55
25	.26	.24	.19	.24	.07	.19	25
26	.44	.29	.29	.31	.21	.14	25
27	.85	.82	.63	.60	.46	.43	25
28	.59	.47	.58	.53	.46	.39	25
29	.33	.13	.14	.26	.25	.10	25
30	.15	.05	.05	.09	.18	.11	65
31	.63	.37	.41	.20	.28	.17	25
32	.33	.32	.12	.11	.08	.10	25
33	.26	.24	.25	.16	.11	.04	25
34	.63	.26	.31	.26	.45	.30	25
35	.59	.32	.12	.09	.22	.22	25
36	.15	.26	.00	.07	.11	.18	35
37	.07	.00	.00	.02	.04	.10	75
38	.15	.00	.05	.02	.08	.07	25
39	.00	.03	.03	.02	.09	.17	75
40	.41	.16	.05	.07	.00	.06	25
41	.26	.05	.05	.06	.04	.22	25
42	.22	.11	.03	.04	.20	.71	75
Number of Subjects	27	38	59	55	49	47	

Characteristics of Modal Age Indices
Lowest: Mean = 39.76, SD = 18.67
Highest: Mean = 41.43, SD = 19.37

TABLE C-11a

Mean Self Ratings on Form RK With Respect to Performance on Form D-2

Item No.	Age Decades					
	20-29	30-39	40-49	50-59	60-69	70-79
31	3.50	3.45	3.59	3.76	3.69	3.76
32	2.38	2.61	2.63	3.02	3.07	3.17
33	3.12	3.10	3.17	3.53	3.28	3.41
34	2.75	2.48	2.35	2.83	2.52	2.64
35	3.12	3.13	3.13	3.20	3.13	3.20
N =	8	31	54	45	123	188

TABLE C-11b

Analyses of Variance of Age Group Means of Ratings on Form RK

Item No.	Between Age Decades MS	df	Within Age Decades MS	df	F
31	0.71	5	1.06	438	0.67
32	4.28	5	0.89	437	4.83**
33	1.37	5	0.72	443	1.90
34	1.39	5	0.69	432	2.02
35	0.11	5	0.51	431	0.22

Note - Ns varied from item-to-item because of omitted responses.

**$p < .01$

CONSTRUCTION OF PAIRED ASSOCIATE WORD LISTS

The following four twelve-word, noun-adjective paired associate lists were constructed. Four pairs were eliminated at random from each list, thereby forming four eight-word lists (*- eliminated pairs).

LIST I		LIST II	
NOUNS	ADJECTIVES	NOUNS	ADJECTIVES
*LEADER	YOUNG	AIRPLANE	SERIOUS
TABLE	IMPORTANT	BROTHER	GLAD
RADIO	SWEET	FINANCE	BLUE
WATER	FOREIGN	*NATURE	ROUND
GARDEN	LATE	*SUMMER	EXPENSIVE
SHOULDER	CLEAN	POTATO	ALONE
*QUESTION	BETTER	HOSPITAL	QUICK
PICTURE	ASLEEP	*GOVERNMENT	MIDDLE
EVENING	DIFFERENT	MOON	TENDER
BUSINESS	HAPPY	DIRECTION	INTERESTING
*MOUNTAIN	POSSIBLE	*RECORD	FRIENDLY
*DOCTOR	GREEN	VISION	NECESSARY

LIST III		LIST IV	
NOUNS	ADJECTIVES	NOUNS	ADJECTIVES
BOTTLE	PERFECT	ATTENTION	NORMAL
ANIMAL	SPECIAL	*STRANGER	FAVORITE
*FLOWER	THICK	TICKET	ANGRY
HOUSE	DEFINITE	WEATHER	OPEN
MESSAGE	COMMON	*KITCHEN	CERTAIN
PEPPER	NERVOUS	HABIT	DELICATE
*SHADOW	ORIGINAL	COLLEGE	LOOSE
RAILROAD	FAMOUS	FACTORY	READY
TEACHER	BROKEN	*DIAMOND	SIMPLE
*VACATION	CLEVER	INSURANCE	PLEASANT
DISTANCE	ALIVE	LAWYER	EMPTY
*HEAVEN	WARM	*MARKET	UNUSUAL

The lists were compiled in the following manner.

All words were rated at least A in the Lorge Magazine count (Thorndike & Lorge, 1944).

An attempt was made to control for the three types of intralist similarity: formal (number of repeated letters); meaningful (word synonymity); and conceptual (e.g., words belonging to the same class). (Underwood, Ekstrand & Keppel, 1965).

Since not all of the words are contained in standardized free association lists, the entire list (96 words) was administered as a free association list to insure that none of the associations would have thus been formed.

The four eight-pair lists were then administered (as paired-associate tasks) in four counterbalanced orders to N = 16 graduate students in education to calibrate the association difficulty of each pair. The results are given in the following table. These lists, or derivations of them, were used in subsequent studies.

O = Omit
C = Commit
T = Total

Association Difficulty

N = 16--each S learning to criterion of one perfect recitation, on each of 4 eight-pair lists

Assn.	Total # of Errors			$\bar{X}$ Errors		
	O	C	T	O	C	T
Hospital-Quick	1	0	1	0.06	0.00	0.06
Finance-Blue	2	0	2	0.13	0.00	0.13
Water-Foreign	2	1	3	0.13	0.06	0.19
Shoulder-Clean	3	0	3	0.19	0.00	0.19
Brother-Glad	2	1	3	0.13	0.06	0.19
Potato-Alone	1	3	4	0.06	0.19	0.25
Moon-Tender	2	3	5	0.13	0.19	0.31
College-Loose	5	0	5	0.31	0.00	0.31
Direction-Inter'g	2	4	6	0.13	0.25	0.38
Teacher-Broken	7	1	8	0.44	0.06	0.50
Airplane-Serious	7	2	9	0.44	0.13	0.56
Bottle-Perfect	7	2	9	0.44	0.13	0.56
Weather-Open	6	4	10	0.38	0.25	0.63
Radio-Sweet	3	8	11	0.19	0.50	0.69
Garden-Late	8	3	11	0.50	0.19	0.69
Factory-Ready	10	2	12	0.63	0.13	0.75
Pepper-Nervous	7	5	12	0.44	0.31	0.75
Ticket-Angry	10	4	14	0.63	0.25	0.88
Railroad-Famous	11	3	14	0.69	0.19	0.88
Message-Common	9	6	15	0.56	0.38	0.94
Vision-Necessary	12	3	15	0.75	0.19	0.94

ASSOCIATION DIFFICULTY--Cont.

O = Omit
C = Commit
T = Total

N = 16--each S learning to criterion of one perfect recitation, on each of 4 eight-pair lists

Assn.	Total # of Errors			$\bar{X}$ Errors		
Picture-Asleep	12	8	20	0.75	0.50	1.25
House-Definite	12	8	20	0.75	0.50	1.25
Animal-Special	18	4	22	1.13	0.25	1.38
Business-Happy	16	7	23	1.00	0.44	1.44
Distance-Alive	19	5	24	1.19	0.31	1.50
Table-Important	8	16	24	0.50	1.00	1.50
Insurance-Pleasant	18	6	24	1.13	0.38	1.50
Att'n-Normal	16	9	25	1.00	0.56	1.56
Habit-Delicate	24	8	32	1.50	0.50	2.00
Evening-Different	21	16	37	1.31	1.00	2.31
Lawyer-Empty	35	9	44	2.19	2.56	2.75

Drs. H. D. Blank & R. H. Monge, Syracuse University, Summer, 1967.

References:

Thorndike, E. L. and Lorge, I The teacher's word book of 30,000 words. New York: Teachers College, 1944.

Underwood, B. J., Ekstrand, B. R. and Keppel, G. An analysis of intralist similarity in verbal learning with experiments on conceptual similarity. Journal of Verbal Learning and Verbal Behavior, 1965, 4, 447-462.

REFERENCES

Ausabel, D. P. A subsumption theory of meaningful learning and retention. Journal of General Psychology, 1962, 66, 213-224.

Ausabel, D. P. The psychology of meaningful verbal learning. New York: Grune & Stratton, 1963.

Bayley, N., and Oden, M. H. The maintenance of intellectual ability in gifted adults. Journal of Gerontology, 1955, 10, 91-107.

Bendig, A. W. The development of a short form of the Manifest Anxiety Scale. Journal of Consulting Psychology, 1956, 20, 384.

Blank, H. D., and Monge, R. H. Effects of awareness of alternative incentive magnitude and shifts in magnitude on card sorting. Psychological Reports, 1970, 27, 119-125.

Botwinick, J. Cognitive processes in maturity and old age. New York: Springer, 1967.

Campbell, D. T. A cross-sectional and longitudinal study of scholastic ability over twenty-five years. Journal of Counseling Psychology, 1965, 12, 55-61.

Chown, S. M. Personality and aging. In K. W. Schaie (Ed.), Theory and methods of research on aging. Morgantown, West Virginia: West Virginia University, 1968.

Damon, A. Discrepancies between findings of longitudinal and cross-sectional studies in adult life: Physique and physiology. Human Development, 1965, 8, 16-22.

Demming, J. A., and Pressey, S. L. Tests "indigenous" to the adult and older years. Journal of Counseling Psychology, 1957, 2, 144-148.

Eisdorfer, C. Arousal and performance: Experiments in verbal learning and a tentative theory. In G. A. Talland (Ed.), Human aging and behavior. New York: Academic Press, 1968. Pp. 189-216.

Endler, N. S., Hunt, J. McV., and Rosenstein, A. J. An S-R inventory of anxiousness. Psychological Monographs, 1962, 76 (17, Whole No. 536).

Fitzgerald, D., and Ausabel, D. P. Cognitive versus affective factors in the learning and retention of controversial material. Journal of Educational Psychology, 1963, 54, 73-84.

Flanagan, J. C. Critical requirements: A new approach to employee evaluation. Personnel Psychology, 1949, 2, 419-425.

Green, R. F. Age-Intelligence relationships between ages sixteen and sixty-four: A rising trend. Developmental Psychology, 1969, 1, 618-627.

Harlow, H. F. The formation of learning sets. Psychological Review, 1949, 56, 51-65.

Hultsch, D. F. Cognitive and affective factors of attitude in the learning and retention of meaningful material on a controversial topic. (Unpublished M.A. thesis, Syracuse University, 1967.)

Hultsch, D. F. Subjective organization in free recall as a function of adult age and type of instructions. (Unpublished Ph.D. dissertation, Syracuse University, 1968.)

Hultsch, D. F. Adult age differences in the organization of free recall. Developmental Psychology, 1969, 1, 673-678.

Hultsch, D. F. Adult age differences in free classification and free recall. Developmental Psychology, 1971a, 4, 338-342.

Hultsch, D. F. Organization and memory in adulthood. Human Development, 1971b, 14, 16-29.

Hutt, M. L. A clinical study of "consecutive" and "adaptive" testing. Journal of Consulting Psychology, 1947, 11, 93-103.

Ingham, R. J. The measurement of educative behavior and its relationship to the leisure satisfactions of college alumni. (Unpublished Ph.D. dissertation, University of Chicago, 1963.)

Jerome, E. A. Age and learning--Experimental studies. In J. E. Birren (Ed.), Handbook of aging and the individual. Chicago: University of Chicago Press, 1959. Pp. 655-699.

Kuhlen, R. G. Age and intelligence: The significance of cultural change in longitudinal vs. cross-sectional findings. Vita Humana, 1963, 6, 113-124.

Kuhlen, R. G. Personality change with age. In P. Worchal and D. Byrne (Eds.), Personality change. New York: Wiley, 1964. Pp. 524-555.

Lange, G. W., and Hultsch, D. F. The development of free classification and free recall in children. Developmental Psychology, 1970, 3, 408.

Lefford, A. The influence of emotional subject matter on logical reasoning. Journal of General Psychology, 1946, 34, 127-151.

Litchfield, Ann. The nature and pattern of participation in adult education activities. (Unpublished Ph.D. dissertation, University of Chicago, 1965.)

Monge, R. H. Adult age differences in paired associate verbal learning set formation. (Unpublished Ph.D. dissertation, Syracuse University, 1967.)

Monge, R. H. Learning in the adult years: Set or rigidity. Human Development, 1969, 12, 131-140.

Monge, R. H. Studies of verbal learning from the college years through middle age. Journal of Gerontology, 1971, 26, 324-329.

Monge, R. H., and Blank, H. D. Is there an incentive magnitude effect on adult performance? Psychological Reports, 1970, 27, 983-992.

Monge, R. H., and Hultsch, D. F. Paired-associate learning as a function of adult age and the length of the anticipation and inspection intervals. Journal of Gerontology, 1971, 26, 157-162.

Morgan, A. B. Differences in logical reasoning associated with age and higher education. Psychological Reports, 1956, 2, 235-240.

Partridge, E. A dictionary of slang and unconventional English. New York: MacMillan, 1950.

Rokeach, M. The open and closed mind. New York: Basic Books, 1960.

Roll, S. Sex differences in problem solving as a function of content and order of presentation. Psychonomic Science, 1970, 19, 97.

Sarason, I. G. Test anxiety, general anxiety, and intellectual performance. Journal of Consulting Psychology, 1957, 21, 485-490. (Specifically, the "Autobiographical Survey," Document No. 5517, ADI Auxiliary Publications Project, Library of Congress, Washington, D.C.)

Schaie, K. W. A general model for the study of developmental problems. Psychological Bulletin, 1965, 64, 92-107.

Scheffé, H. A. The analysis of variance. New York: Wiley, 1960.

Thorndike, E. L., Bregman, E. D. Tilton, J. W., and Woodyard, E. Adult learning. New York: MacMillan, 1928.

Troldahl, V. C., and Powell, F. A. A short-form dogmatism scale for use in field studies. Social Forces, 1965, 44, 211-215.

U.S. Bureau of the Census. Classified index of occupations and industries. Washington: U.S. Department of Commerce, 1960.

Webster's New international dictionary of the English language. Springfield, Mass: G. & C. Merriam Co., 1913.

Webster's third new international dictionary of the English language unabridged. Springfield, Mass.: G. & C. Merriam Co., 1966.

Wechsler, D. The measurement and appraisal of adult intelligence. (4th ed.) Baltimore: Williams & Wilkins, 1958.

Weingarten, J. A. An American dictionary of slang and colloquial speech. New York: Author, 1954.

Weir, A. J. Value judgments and personality in old age. Acta Psychologica, 1961, 19, 148-149.

Welford, A. T. Ageing and human skill. London: Oxford University Press, 1958.

Wentworth, H. Dictionary of American slang. New York: Crowell, 1960.

Young, M. L. Age and Sex differences in problem solving. Journal of Gerontology, 1971, 26, 330-336.