Consumer Information Processing Strategies in Middle and Late Adulthood*

NOEL CAPON
Columbia University
DEANNA KUHN
Harvard University
MARIA CARMEL GURUCHARRI
Harvard University

The purpose of the present study was to investigate the extent to which performance of a complex cognitive task of a type resembling that encountered in everyday life is maintained through adulthood. A total of 80 subjects participated; 20 in their thirties, 20 in their fifties, 20 in their sixties, and 20 in their seventies. Subjects were asked to make preference judgments with respect to 32 pocket-size notebooks of a sort they might encounter as consumers in a stationery or variety store. Independently, they were also asked to express their preferences with respect to each of the four dimensions on which the notebooks varied. With only minor differences across age groups, most subjects demonstrated the ability to integrate their individual dimension preferences into a complex preference judgment of an object embodying those dimensions, in a logically consistent manner.

As the field of developmental psychology has come increasingly to encompass the entire human life span, the topic of intellectual functioning during the adult years has begun to receive a great deal of attention. The topic is a complex one, as witnessed by the lack of consensus as to whether intellectual functioning declines in later years, despite the considerable amount of data that has been collected on the topic (Horn & Donaldson, 1976; Rabbitt, 1977; Schaie, 1974; Schaie & Gribbin, 1975). Life-span developmental psychologists have been successful in elucidating the host of intricate methodological problems that make it impossible to obtain a simple, straightforward answer to this question. In this

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sense, they have provided essential groundwork for more methodologically sophisticated investigation of the topic.

More recently and increasingly, however, another kind of concern is being voiced. In contrast to the more familiar concerns pertaining to research design, it has to do with the kinds of measures that characteristically have been employed to assess adulthood intellectual functioning. Serious misgivings have been expressed regarding the fact that the majority of these measures involve academic, "school-related" tasks that bear little apparent relation to the intellectual tasks that middle-aged and older adults engage in in their everyday lives. For this reason, older adults may perform poorly on such measures. Conversely, it is quite probable that adults in the course of their everyday activity competently execute a whole variety of complex cognitive tasks of a kind not tapped by traditional measures of intellectual functioning (Labouvie-Vief, 1977; Sinnott & Guttman, 1978).

These concerns have begun to be heard from within mainstream developmental psychology, as well as from those associated with the life-span tradition. Brown, for example, comments:

> . . . we know next to nothing about demands other than those of academic settings. Both developmental and cognitive psychologists have concentrated primarily on academic intelligence, on the cognitive capabilities of the college sophomore (and children on the road to that end point). Most of our theories of adult cognition are notable for this bias. We have almost totally ignored the everyday problem-solving of the non-academic, or even of the academic members of our society for that matter. (1979, p. 37)

It was the purpose of the present study to explore one such task that would appear to be a common one in the lives of adults in their roles as consumers. It entails making preference judgments regarding consumer products, when, as is typical, the products differ from one another on multiple dimensions. In order to make such judgments, individuals presumably integrate their preferences with respect to the individual dimensions into a complex preference judgment regarding an object embodying various levels of these dimensions. Such a task is clearly a cognitively complex one, and yet it is one that individuals of all ages would appear to engage in frequently.

There in fact exists a sizable literature in psychology on processes of information integration. It stems for the most part from the program of research carried out by Anderson and his coworkers, primarily in the domain of person perception. (See Anderson, 1973, for review.) In the prototypical study, a subject is asked to rate the likeability of a hypothetical individual who is said to possess some combination of personality traits that have been rated with respect to desirability by previous samples of subjects.

The experimental paradigm used in the present study differs in a number of important ways from Anderson's. Because of the external validity it possesses with respect to consumer decision making, the task chosen for the present study

was one in which individuals were asked to indicate their preferences for actual, physically present objects they were permitted to inspect, in addition to indicating preferences regarding each of the individual attributes of the objects. Thus, in the present task there was no uncertainty about the object to be rated—it was revealed in its entirety to the subject, in contrast to Anderson's prototypical task in which a subject is asked to judge a hypothetical person based on a set of adjectives. A related difference between Anderson's experimental paradigm and that used in the present study has to do with what information is being integrated. In Anderson's paradigm, extensive precautions are taken to insure that the subject takes into account each piece of information (adjective). The information to be integrated is thus regarded as constant, and the objective is to discover the strategies subjects use in integrating this body of information.

In the present situation, in contrast, no attempt was made to ensure that each of the attributes in terms of which the objects varied entered into a subject's judgments. Rather, to the contrary, our interest was in investigating how many attributes individuals spontaneously take into account when evaluating multiattribute objects, as well as examining the strategies by which they integrate information about the relevant attributes.

In addition, again in contrast to Anderson's typical procedure, we obtained separate judgments of a subject's preferences with respect to the multiple levels of each individual attribute. Our interest was whether, in making their object ratings, subjects take into account each of their dimension preferences and integrate these stated preferences in some systematic, consistent way.

The objects employed were a set of pocket-size notebooks of the type that might be purchased in a five-and-ten-cent variety store. The notebooks varied on four dimensions, with two levels of each dimension represented. The dimensions were color (red or green), surface (dull or shiny), shape (long/thin or short/wide), and fastening (side or top). Each of the 16 possible combinations was represented in two identical notebooks, yielding a total set of 32 notebooks. Subjects were presented each notebook individually, in a random order, and asked to indicate their liking for the notebook on a nine-point scale, using an apparatus described in detail in the Methods section. In a separate task, subjects were asked to indicate their preferences with respect to each of the four dimensions, using a separate apparatus to be described.

In an earlier study (Capon & Kuhn, 1980) we established that the ability to make such judgments in a logical and consistent manner develops gradually during childhood, and that by college age, subjects carry out the task in a very cognitively sophisticated and highly consistent way. Subjects in this earlier study were kindergarteners, fourth graders, eighth graders, and college students. Subjects of all ages expressed reliable preferences with respect to most (three or four) of the individual dimensions, e.g., indicated a preference for red over green as the color of the notebook. In the ratings of the notebooks themselves, kindergarteners appeared to use a "shifting single-dimension" strategy: Some one particu-

lar dimension preference is attended to in judging a notebook; the dimension being attended to, however, fluctuates frequently. By fourth grade, this fluctuation began to diminish, such that a subject attended to a single dimension preference, e.g., color, in judging the entire set of notebooks, and by eighth grade this single-dimension strategy became the predominant pattern. By college age, in contrast, subjects' preference judgments indicated attention to multiple dimensions, with the integration of dimension preferences occurring most often in terms of a simple linear model but sometimes with small interaction effects.

The question of interest in the present study is the extent to which these complex cognitive abilities are maintained during adulthood and old age. The specific questions to be investigated at each age level are these: (a) How consistent are subjects in their preference judgments regarding multi-dimension objects? (i.e., how similar are a subject's ratings of the two sets of identical notebooks?); (b) How many individual dimension-preferences does a subject take into account in rating multi-dimension objects and in what way does the subject integrate preferences on individual dimensions into a judgment of the object embodying these dimensions? (e.g., additive versus interactive); (c) To what extent are a subject's stated preferences regarding the individual dimensions reflected accurately in the subject's object ratings?

METHOD

Subjects

The design was a cross-sectional sampling of four age groups: 30–39 years, 50–59 years, 60–69 years, and 70–79 years. There were 20 subjects in each age group. In the 30-year-old and 50-year-old groups, there were ten subjects of each sex. In the 60-year-old group, 17 of the subjects were female; in the 70-year-old group, 14 of the subjects were female. Participants in their thirties and fifties were all residents of a middle-income housing development. Participants in their sixties and seventies were members of three senior citizen centers covering the same socioeconomic range.

Procedure

The procedure consisted of three phases: introduction, object-rating task, and dimension-rating task. Half the subjects in each age group received the dimension-rating task first; the remainder received the object-rating task first.

Introduction. For both the introductory presentation and the dimension-rating task, to be described below, stimuli were devised for representing independently each of the four dimensions in terms of which the notebooks varied:

color, shape, fastening, and surface. For representing color, two cardboard surfaces 12 cm by 6 cm were used, representing a size and shape intermediate between the two shapes represented in the actual notebooks (15 cm by 5 cm and 10 cm by 7.5 cm), one with the green and one with the red covering used in the actual notebooks. Another set of cardboard surfaces of the same size were used to represent the dull versus shiny dimension, both surfaces of a neutral (gray) color. A similar set of cardboard surfaces of the same size and color were used to represent the fastening dimension: one had the common type of spiral coil used to fasten notebooks attached across the left side and the other had the coil attached across the top. The final dimension, shape, was represented by two cardboard surfaces of the same neutral color and of the two shapes (15 cm by 5 cm and 10 cm by 7.5 cm) represented in the actual notebooks. Each of the eight stimuli just described had a felt backing for attachment to a felt board used in the dimension-rating task. The introductory presentation to the subject was as follows:

> I have some notebooks and I'm trying to find out how people like them. I'm going to ask you how much you like each of the notebooks. Will you help me by thinking really carefully, and then telling me how much you like each of the notebooks? Let me tell you about the notebooks first. Some are red and some are green. (Experimenter displayed the two appropriate stimuli.) Some have a dull surface like this and some have a shiny surface like this. Some are long and thin, like this, and some are short and fat, like this. Some open at the side, like this, and some open at the top, like this. (Appropriate stimuli were displayed as the experimenter mentioned each dimension.)

Object-Rating Task. The experimenter displayed a three-dimensional formboard of sturdy colored cardboard. The formboard contained a row of nine equal-sized compartments of adequate size to accommodate one of the notebooks. The back surface of the formboard extended upwards above the compartments, enabling a schematic representation of a face to be displayed directly above each compartment. Each face consisted of a circle cut out of white paper and pasted onto the orange cardboard over one of the compartments. Each circle was 5 cm in diameter and contained two dots representing eyes, an angle representing a nose, and a line mouth 2.3 cm in width, all in a standard position on the face. The nine faces differed only with respect to the curvature of the mouth. The mouth of the face above the center compartment was a straight line. The four faces above the compartments to the right of the center one had mouths which were turned upward, in a smiling position. The degree of smile was gradated by varying the height of the center of the mouth—either 0.4, 0.7, 1.0 or 1.3 cm—with the greater heights further from the center. The four faces above the compartments to the left of the center one had mouths which were turned downward, in a frowning position, with the degree of frown similarly gradated. Instructions to the subject were as follows:

> For this part, I'd like you to tell me how much you like the different notebooks. We'll use this board for you to tell me. I'll show you the notebooks one at a time. If you like a notebook a really really lot, then put it in here (9), by the very happy face. If you like

> it, but not so much, put it in here by one of these faces that aren't quite as happy (8–6). If you really don't like it, put it in here (1), by the very sad face. If you don't like it very much, put it in one of these (2–4). If you don't like it but don't not like it—if you sort of feel just in between—put it here in this middle one (5). Okay?
>
> Let's try some practice ones with the board. (The experimenter displayed three cardboard cut-out pictures of fruits.) If you had to say how much you like lettuce as something to eat, which face would you put the picture of the lettuce by? (Subject responded.) If you had to say how much you like grapes, which face would you put the picture of the grapes by? (Subject responded.) If you had to say how much you like a tomato, which face would you put the picture of the tomato by? (Subject responded.)

The experimenter answered any questions the subject had about the rating procedure before proceeding. He then presented each of the 32 notebooks, one at a time in random order, removing each notebook from view after the subject had placed it in one of the nine compartments and the placement had been recorded.

Dimension-Rating Task. The experimenter presented a felt-covered board divided into nine equal 5 cm sections, with a larger space 7 cm long at either end. The same eight stimuli employed in the introductory presentation were used in the dimension ratings. Each pair of stimuli was in turn attached to opposite ends of the board. Instructions were as follows:

> For this part, I'd like you to tell me how you feel about each of the different things about the notebooks. We can use this board for you to tell me. Here is a special felt square. I'd like to to put the square somewhere on the board to tell how you feel. Remember, some of the notebooks are *red* and some *green*. (Experimenter attached appropriate stimuli to ends of felt board.) Do you like notebooks better that are *red* or *green*? If you really like *red* much more than *green*, then put your square here (1). If you like *red* a little more than *green*, then put it in one of these (2–4). If you like *green* a little more, put it in one of these (6–8). If you like *green* a really lot more, put it here (9). If you like *red* and *green* just the same, then put it here (5).
>
> Let's try a practice one. If you had to say how much you like an apple or an orange for an afternoon snack, where would you put your square? (Experimenter attached felt-backed pictures of apple and orange to ends of board.) If you really, really like an apple much more than an orange, then put your square here (1). If you like an apple a little more than an orange, then put it in one of these (2–4). If you like an orange a little more put it in one of these (6–8). If you like an orange a really lot more, put it here (9). If you like an apple and an orange just the same, then put it here (5). Okay, now why don't you put the square where it goes to tell how you feel. (Subject responded.) Here's another one. If you had to say how much you like a baseball or a football to play ball with where would you put your square? (Appropriate stimuli displayed and subject responded.)

After answering any questions about the rating procedure, the experimenter continued:

> Now let's do the ones about the notebooks. If you had to say how much you like *red* or *green* as the color of the notebook, where would you put your square? (Appropriate stimuli displayed.) (Repeated for remaining dimensions—plain/shiny; long & thin/short & fat; side/top fastening. Order of presentation was randomized across subjects.)

RESULTS

Dimension Ratings

Performance on the dimension-rating task confirmed that subjects of all age groups had preferences with respect to most or all of the four dimensions on which the notebooks varied. A majority of subjects at all age levels indicated non-neutral preferences (i.e., a point on the dimension-rating scale other than 5) in the case of at least three of the four dimensions. (The lowest percentage was 80%, among the 70-year-olds.) The majority of the remainder indicated non-neutral preferences in the case of two of the four dimensions.[1]

Establishing that subjects did in fact have preferences with respect to the dimensions on which the notebooks varied is essential for the analyses of object-rating performance that follow. If a subject had no preference on a given dimension, e.g., preferred red and green equally, it would follow that this subject should show no main effect for color in the object ratings. In other words, to study how subjects integrate their individual dimension preferences, it must first be established that they do in fact have preferences on the dimensions utilized.

Object Ratings

The tradition established in Anderson's information integration research (1970) was followed, by treating each of a subject's object ratings as an independent judgment to be entered into an analysis of variance for that subject. Each subject's ANOVA included four independent variables (color, shape, fastening, and surface); the two replications of the 16 unique notebooks provided the error term.[2]

The number of effects to emerge in a subject's ANOVA is of course in part a function of the error variance, which in the present case was determined by the consistency with which the subject rated the two replications (identical sets) of notebooks. It is therefore important to examine first the consistency of the object ratings at each age level. A correlation coefficient between the ratings of the two sets of identical notebooks was computed for each subject. As a point of comparison, the average coefficient among a college group in our earlier work was .72. Among the age groups in the present study, average coefficients were .85 for 30-year-olds, .75 for 50-year-olds, .64 for 60-year-olds, and .68 for 70-year-olds. The percentages of subjects with coefficients of .50 or above were 95%, 95%, 70%, and 70% in the four age groups respectively. (The comparable figure for college students was 80%.)

[1]Reliability of the dimension ratings was not assessed in this study. In our earlier work using the present method (Capon & Kuhn, 1980), however, reliability of the dimension ratings was established via a test-retest procedure.

[2]The .01 level of significance was used throughout.

TABLE 1
Patterns of Performance in the Object Ratings by Age Group

Pattern	Age Group				
	College	30's	50's	60's	70's
No effects	1	1	1	5	5
One main effect	4	8	7	7	7
One main and one or more interaction effects	1	0	1	3	0
Two or three main effects	7	5	9	2	2
Two or three main effects and one or more interaction effects	7	6	2	3	6
Total	(20)	(20)	(20)	(20)	(20)

Subjects at all ages thus showed considerable consistency in their object ratings. Proceeding then to the analyses of variance with respect to object ratings, one can look first simply at the total number of significant effects. This number did not vary appreciably across age groups. Total number by age group was as follows: 30-year-olds—39; 50-year-olds—35, 60-year-olds—31, and 70-year-olds—39.

In order to make comparisons across age groups, subjects were categorized according to the pattern of effects that emerged in their individual ANOVAs. The category system employed and the resulting frequencies are presented in Table 1.[3] The college-student data from the Capon and Kuhn (1980) study are included for purposes of comparison. Table 1 illustrates that these patterns are approximately equivalent across age groups. The two minor (nonsignificant) exceptions are that the elderly groups (sixties and seventies) show a slightly higher incidence of no effects and a slightly lower incidence of multiple effects, relative to younger subjects.[4] Subjects in their fifties and sixties show relatively few interaction effects, but subjects in their seventies show patterns involving interaction effects as frequently as younger adults.

[3]For those subjects who show multiple effects, there is the question of the specific manner in which the attribute information is combined. Anderson (1970, 1973) has marshalled considerable evidence in favor of an averaging model, in which attribute information is averaged with a neutral initial impression to form an overall judgment. The major competing alternative is an adding model, in which attribute information is combined additively. (See Wyer, 1974, for a thorough discussion of the evidence in favor of each model.) In the analysis of variance framework, the finding of simple main effects can be accounted for by either an adding model, or by an averaging model in which equal weight is given to each item of information. Interaction effects can be explained by an averaging model in which information items are given unequal weights, but not by an unequal-weighted adding model (which would produce only main effects), or they can be explained as true configural effects.

[4]It should be noted that these differences are not independent of the modest differences found in object-rating consistency across age groups. Lower consistency results in higher error terms, thus lessening the likelihood of significant effects.

Consistency between Object Ratings and Dimension Ratings

In one sense there is considerable consistency between object ratings and dimension ratings and in another there is not, depending on the direction in which the relationship is viewed. In the majority of cases, those main effects that appeared in the object ratings were reflected accurately in the dimension ratings. This was true for 88% of main effects among 30-year-olds, 81% of main effects among 50-year-olds, 74% of main effects among 60-year-olds, and 63% of main effects among 70-year-olds. In a majority of the discrepant cases, a subject showed a main effect in the object ratings while indicating a neutral preference with respect to that dimension (i.e., choice of the center point on the dimension-rating scale). Only infrequently did a subject show a main effect in the object ratings while indicating a contradicting preference in the dimension ratings (e.g., indicating a preference towards side-fastening in the dimension ratings while assigning significantly higher ratings to top-fastening notebooks in the object ratings).

It is important, however, to consider the results when the relation between object and dimension ratings is viewed in the opposite direction. Though the preferences indicated by subjects' object ratings were in general reflected as well in their dimension ratings, the reverse was not true: In their dimension ratings subjects indicated nonneutral preferences with respect to more dimensions than those for which significant effects emerged in their object ratings. This result is reflected in the group data presented earlier: Subjects of all age groups tended to express nonneutral preferences on most (three or four) of the dimensions; there occurred far fewer effects than this, however, in the object ratings. This pattern is also reflected in the data for individual subjects. A typical subject, for example, showed preferences on the dimension-rating task on three dimensions and no preference on the fourth; in the object-rating task, however, she showed effects for only two of these three dimensions.[5] The same pattern was evident among college subjects in our earlier research.

DISCUSSION

The object of this study was to explore the extent to which performance of complex cognitive tasks resembling those encountered in everyday life is maintained through adulthood. With respect to the particular task investigated, the sophisticated performance of college students in an earlier study provided a standard with which to compare the performance of older subjects in the present study.

[5]It is important to note in this regard that a subject's ANOVA pattern did not tend to consist of a set of effects in roughly the same neighborhood of magnitude, some of which reached and others narrowly missed significance. The modal pattern, rather, was one of one or two substantial effects, with the remaining dimensions contributing minimally in terms of accounting for the overall variance.

The results support the position that a high level of performance on such a task is maintained throughout the adulthood years and indeed well into old age: A substantial proportion of subjects of each age group (40% or greater) demonstrated an ability to integrate their preferences on a number of individual dimensions into consistent complex preference judgments regarding objects embodying those dimensions, using either a simple linear model or one that incorporated interaction effects (Table 1). Performance of subjects in their thirties and fifties was if anything superior to that of college students, in every aspect. The performance of subjects in their sixties and seventies was also of a very high level of sophistication, though there were some modest differences between the elderly and middle adulthood subjects in (a) consistency of object ratings, (b) consistency between object and dimension ratings, and (c) patterns of effects in the object ratings (Table 1).

However, it is the generally high level of performance of all adult subjects, rather than the modest differences between the middle adulthood and elderly subjects, that we wish to emphasize in the present discussion. Sufficient discussion of the issues has occurred that most researchers are by now properly cautious in advancing causal explanations regarding performance differences across adult age groups, especially when such differences are based on cross-sectional data. In the case of the present data, there are indeed a multiplicity of alternative (and additive) causes to which to attribute the age group differences that appeared.

In addition to the influence of all of the prior differences that undoubtedly exist across age groups due to cohort differences, there is no reason to assume that subjects of the different age groups interpreted the task in an identical manner or had comparable motivation to perform it. The interviewer took appropriate care in this regard to establish rapport with each subject and to ensure that the subject felt comfortable and confident in what he or she was to do. Nevertheless, older subjects may have understood the instructions less well, or, most likely, been less convinced of the meaningfulness and value of the information that was being obtained; hence, they may have been less motivated to exercise the care and precision necessary to make the required judgments in a highly consistent manner. Supportive of the presence of such differences is the finding that elderly subjects did not show higher usage of the ''single-dimension'' strategy, relative to the middle adulthood subjects. A ''regression'' hypothesis would predict this higher incidence, given that the single-dimension strategy was found to be the modal strategy among eighth graders, as mentioned previously. Instead, elderly subjects showed increased incidence of a pattern of no effects, suggesting that these elderly subjects related to the task in a very different way than the younger adult or adolescent subjects. It should be mentioned in this connection that on all aspects of the task, including consistency between object and dimension ratings and within object ratings, inspection of the data indicated that the slightly lower group performance of the elderly age groups was due to decidedly inferior (i.e., less complex or less consistent) performance of a few individuals, rather than a slight decline among all subjects.

Subjects in all age groups, it was noted, indicated preferences on more dimensions than those they actually took into account in the object ratings. Thus, there is some possibility that information processing capacities of subjects may have posed limitations on the number of dimensions taken into account in making the object ratings, though the differences across the adult age groups are not pronounced enough to suggest differences in these processing limits across age groups. There are alternatives, however, other than processing limitations that need to be considered. Whereas cognitive processing limitations of some sort are likely to enter into the explanation for younger subjects, the issue cannot be decided definitely for adults until a number of additional parameters are investigated, including the number of dimensions on which objects vary, their salience to the subject, and the salience of the object class as a whole.[6] If further research were to confirm the generality of the finding that adults take on average only two dimensions into account in making preference judgments regarding multidimension objects, such a finding would appear to have implications in a wide variety of basic and applied domains.

We wish to close this discussion on a note of caution. The present results are supportive of the view that in the course of their everyday lives, adults carry out complex cognitive tasks in a sophisticated manner, and continue to do so well into old age. It does not follow, however, that we can readily predict which of the various tasks that may confront them adults carry out with greater or lesser effectiveness. In an earlier study, just to cite one simple example, it was found that adults were surprisingly poor at utilizing a simple proportional reasoning strategy to determine which of two sizes of a supermarket product was the better buy (Capon & Kuhn, 1979). We can conclude, then, that it will require a great deal of careful investigation in order to discover the effectiveness with which adults carry out complex cognitive tasks that confront them in their everyday lives.

REFERENCES

Anderson, N. Functional measurement and psychological judgment. *Psychological Review*, 1970, *77*, 153–170.

Anderson, N. Algebraic models in perception. In E. Carterette & M. Friedman (Eds.), *Handbook of Perception*. New York: Academic Press, 1973.

[6]It may be the case, for example, that while subjects have preference with respect to the levels of a given dimension, the dimension itself is of such limited salience that this preference does not show up in the object ratings. (At issue here is Anderson's distinction between weight and scale value; see Anderson, 1970.) This issue also arises in interpretation of the age group differences. Though subjects of each age indicated preferences on the four dimensions to an approximately equivalent extent, the salience of the dimensions themselves (as opposed to preference on the dimension) may conceivably have differed systematically across age groups. This possibility makes it desirable to replicate the findings using new dimensions and/or objects to insure that the less complex performance of some age groups was not confined to the specific dimensions or objects used in the present study.

Brown, A. Learning and development: The problems of compatibility, access, and induction. Manuscript based on invited address given at S.R.C.D. meetings, San Francisco, 1979.

Capon, N., & Kuhn, D. Logical reasoning in the supermarket: Adult females' use of a proportional reasoning strategy in an everyday context. *Developmental Psychology*, 1979, *15*, 450–452.

Capon, N., & Kuhn, D. A developmental study of consumer information processing strategies. *Journal of Consumer Research*, 1980, *7*, 225–233.

Horn, J., & Donaldson, G. On the myth of intellectual decline in adulthood. *American Psychologist*, 1976, *31*, 701–719.

Labouvie-Vief, G. Adult cognitive development: In search of alternative interpretations. *Merrill-Palmer Quarterly*, 1977, *23*, 227–263.

Rabbitt, P. Changes in problem solving ability in old age. In J. Birren & K. Schaie (Eds.), *Handbook of the psychology of aging*. New York: Van Nostrand-Reinhold, 1977.

Schaie, K. Translations in gerontology—from lab to life: Intellectual functioning. *American Psychologist* 1974, *29*, 802–807.

Schaie, K., & Gribbin, K. Adult development and aging. *Annual Review of Psychology*, 1975, *26*, 65–96.

Sinnott, J., & Guttmann, D. Dialectics of decision making in older adults. *Human Development*, 1978, *21*, 190–200.

Wyer, R. *Cognitive organization and change: An information processing approach*. Potomac, Md.: Laurence Erlbaum Associates, 1974.