

Psychometric Assessment of Dysfunction in Learning and Memory

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Introduction

The research literature concerned with the psychometric assessment of older adults, whether well-functioning, or with cognitive impairment due to functional or organic causes, has been oriented primarily around issue of ability and personality variables (see Schaie and Schaie, 1977a; Schaie, 1979, for recent reviews). Yet it is clear that particularly under circumstances where only a single assessment point is available, information about the current level of function may not suffice for many clinical judgments. Since we ordinarily do not know whether an individual has either declined from a previous level of function or has never performed more successfully than is currently seen, it may be necessary in addition, to obtain concrete evidence on how well a person is going to acquire and retain information. In other words, learning and memory becomes of interest to the clinician not only because of the intrinsic importance of these dimensions, but also because intraindividual differences in learning and memory may help us understand the nature of the individual's dysfunctions.

As desirable as psychometric assessment of learning and memory might be, we are faced with the fact that most of the research literature in this area has been conducted in laboratory paradigms, which prefer for purity's sake paradigms eschewing meaningful material. Yet it is the latter which obviously must be of paramount interest to the clinician. Although traditional laboratory paradigms are to be reviewed in this book in the chapters by Dr. Robertson-Tschabo, we will review a number of laboratory studies we deem to be basic to the construction of psychometric paradigms. We will then describe some initial studies in our laboratory, which attempt to translate some of these paradigms into psychometric assessment measures, for which large-scale normative data are being collected on both community-dwelling and at-risk subject populations.

The context of our inquiry has been primarily in the area of the assessment of memory for meaningful materials. We consider the dimensions involved in the acquisition and retention of such materials to be the meat and substance of a psychometric approach to learning and memory. Our topic will be limited to a discussion of how meaningful materials are remembered.

Memory Loss and Advanced Age

The notion that there is a loss in memory with age is a common one, and may have an impact on the older individual's consciousness of his own forgetting. A 63 year old person, for example, may suddenly become aware that when he decides to obtain an item from a room other than the one he is in, he will walk into that room and have difficulty recalling the purpose for which he entered it. He will attribute this phenomenon to old age and perhaps decide that his memory is failing. Yet this may have been an unnoticed habit of his for 40 years! A very old habit may suddenly become a source of anxiety and/or negative self-expectation because of cultural expectations. The impact of this occurrence may be a negative bias in the memorizing performance of the older individual in an experiment.

We know that in virtually all studies of aging and memory, older subjects perform more poorly than the young (Walsh; 1975, Reese, 1976; Craik, 1977). Requirements of the associative and information processing paradigms used in these studies may clarify the basis for quantitative age differences in memory tasks. One feature common to both sets of studies is that performance is compared across age groups following intentional memorization. Advising subjects of the requirements to recall is considered crucial in these investigations. Yet this procedure has the potential of spuriously biasing results so that quantitative age differences are obtained. Biasing may be a function of cultural expectations, practice in memorizing, or the kind of strategy one uses to memorize.

Another potential contaminant in age comparisons of intentional recall is the recency of practice in memorization. University students who have almost invariably served as the young control group spend a great deal of time memorizing information as part of their studies. They are thus uniquely prepared to memorize, recall, and subsequently, forget the kind of material used in memory experiments. The older person, in contrast, may have been similarly well equipped to memorize if he is university educated. However, he may not have actively practiced this kind of memorizing for 40 years. Clearly, the older person is at a disadvantage in intentional memorization because of the time lapse since active practice.

The elderly may show deficiencies in recall because of the nature of mnemonic strategies taught them in their youth. Many individuals who attended institutions of higher education in the 1920s and 1930s report that rote memorization or rehearsal with recall for very specific information was required to pass examinations. This is true to an even greater extent for those older people who never received education past grade or high school. By contrast, the control groups of young college students are encouraged to use imaginary or an organizational approach to studying, and are required not only to recall information, but to demonstrate an understanding of the concepts involved in order to pass tests. Comprehension and evaluation for meaning are currently considered by memory theorists to be essential for efficient recall, and it has been found that organization of

stimuli into a meaningful framework yields recall superior to that obtained following rote memorization or rehearsal (Zelins-ki, 1978). Age differences in recall may thus be a function of the memorizing strategies to which the various age groups have been exposed.

Finally, when older subjects are taught to use efficient mnemonic strategies, such as imaging the words, the knowledge that they are to recall the words might affect whether they actually decide to use the newly acquired strategy instead of the one from which they know certain results will be obtained. Anxiety or low self-expectations in memory performance can interact with lack of recent practice, or use of inefficient strategies to produce poor recall. Thus, it may be predicted that even when task variables are designed to optimize recall performance in the elderly, cohort or previous experience may have a detrimental effect on recall, and result in findings of an apparent interaction between task variables and age.

Relevant Findings in Traditional Memory Literature

Although it would seem logical to first review the literature on age differences in acquisition before addressing the problem of retrieval, we will take the reverse approach. We do so because age differences in memory have historically been attributed to difficulties in retrieval before researchers became alerted to the fact, common-sense as it might seem that one cannot expect to retrieve what has not been encoded in memory (or learned) in the first place!

Age Difference in Information Retrieval

One major source of age differences in recall is an apparent age deficit in information retrieval from memory. Studies of recognition memory and cued recall suggest that retrieval presents a problem for elderly subjects. Retrieval involves obtaining stored material from memory. A simple approach to evaluate retrieval processes is to compare recall to recognition performance. A recall test is one requiring the subject to generate memorized information. Recognition requires the subject to select the memorized information from an array of items, some of which are distractors. Recall requires retrieval, while recognition does not. If elderly subjects show poorer performance in recall, but not in recognition compared to the young, it would suggest that retrieval is a problem for older individuals. Aging research in recall/recognition processes offers conflicting evidence for the retrieval-deficit hypothesis. Some studies report age differences in recall, but not in recognition of the same items (Schonfield, 1965; Schonfield and Robertson, 1966; Craik, 1971). Even when subjects memorize lists of different lengths, older persons do not show a disproportionate deficit in recognition performance compared with the young, despite "memory load" differences due to list length (Kapnick, 1971; Erber, 1974).

Making the recognition task difficult by inserting words semantically similar to original list items, for instance, does produce age deficits in performance (Fozard and Waugh, 1969; Botwinick and Storandt, 1974; Erber, 1974; Gordon and Clark, 1974). Age differences have also been found in recognition for materials of a less verbal nature, such as line drawings (Harwood and Naylor, 1969), pictures (Howell, 1972), and motion pictures (Jones, 1928). These data, however, do not negate the possibility that elderly subjects have retrieval difficulties. Material is stored in memory not as an exact duplicate of the actual stimulus experience, but rather as some representation of it. Information in the representation may therefore not include sufficient information to be matched to the recognition item because specific information which would indicate the correct item may not be accessible. Inaccessibility of specific information which would definitively identify a particular word is a form of retrieval deficit, since retrieval by definition involves accessing information from memory.

Further assurance of retrieval deficits with age comes from studies examining primacy and recency in recall data. Elderly individuals often recall the same number of final list items (recency) as young controls, but usually recall fewer items from earlier list positions (primacy) than the young (Arenberg, 1968; Craik, 1968a; Raymond, 1971). Primary effects reflect retrieval processes in secondary memory, the more durable component of memory, while recency effects reflect primary memory, the current contents of conscious memory, which does not require retrieval (cf. Waugh and Norman, 1965). Elderly subjects may therefore be manifesting difficulties in retrieval from secondary memory.

In another retrieval paradigm, Craik (1968b) presented lists from parent population pools varying in size digits (small pool), English county names (moderate pool), animal names (large pool), and unrelated words (very large pool), and required young and old to recall them. He obtained smaller age differences when the pool was small compared to when it was large. These data led Craik to suggest that the smaller the size of the pool, the fewer the items to search and retrieve from memory. When the largest pool was used, subjects had more items to search and retrieve before correctly recalling them. This requirement impaired recall performance in older subjects.

Cued-recall studies examine retrieval processes. Cues presented at recall assist in retrieval because they provide information about the specific word: its context, meaning, or acoustical properties, or instance, and thereby limit the pool of possible words which could be recalled. Providing cues about the category to which a word belongs, e.g., BIRD, for the target PARAKEET, eliminated age differences found in free recall (Laurence, 1967). However, not all cues are equally effective in reducing possible retrieval deficits. Laurence and Trotter (1971) presented lists containing homonym pairs and acoustically similar words. Although older individuals recalled fewer words overall than the young, they showed fewer decrements in homonym recall, since homonyms provide excellent acoustic cues. Smith (1977)

provided semantic or orthographic cues with words to be recalled. He found age differences in orthographic cues and uncued free recall, but no differences in semantic cued or free recall. This finding suggests that cueing at encoding with information relating to the word's meaning helps older persons develop an adequate retrieval plan, while cueing with orthographic information does not.

Buschke (1974) used a unique cuing paradigm in which subjects recalled a list, learned which words they had forgotten, recalled the list again, and learned which words were forgotten in the second recall. This cycle continued until the subject recited the entire list correctly. Results indicated that older subjects required more cuing than the young to learn the list, and "lost" words previously recalled more inconsistently and to a greater extent than the young. Again, retrieval deficits with age are apparently responsible for age differences in performance.

Age Differences in Information Acquisition

The studies reviewed here indicate that retrieval is a complex process, and that the paradigms used to examine it probably fall short of accuracy in describing it. Yet, the consistency of the evidence that there is a retrieval deficit with age is fairly compelling. Another aspect of memory which appears to be critical in explaining age differences is encoding, the process responsible for addressing information into memory. Inadequate encoding of information makes it difficult to identify and retrieve, and reduces the probability that it will be recalled correctly. Evidence for age-related difficulties in encoding comes from a variety of sources, including studies of learning rate, stimulus meaningfulness and/or familiarity, as well as of spontaneous use of mnemonics and efficient encoding strategies.

Early findings of age differences in recall (cf. Kay, 1959) suggested that elderly individuals might need more trials than the young to reach criteria in list learning because they had not learned the list as thoroughly as had the young. When level of learning was equated for both age groups, young and older subjects performed equivalently on a subsequent recall task (Wimer and Wigdor, 1958; Hulicka and Weiss, 1965). These data suggest that equating acquisition produces equated recall in both age groups, but does not indicate what the mechanisms underlying the less efficient learning processes in the elderly might be.

Investigators working in an associationistic framework have manipulated stimulus variables in an effort to discover the basis of slow learning in older individuals. Their argument was that the effects of stimulus characteristics on recall performance of the young and old might indicate age differences in the use of information inherent in the stimuli to be learned. In all studies manipulating stimulus familiarity, the aged are benefited when recall of familiar compared to that of less familiar material is required (Canestrari, 1966; Howell, 1972; Kausler and Lair, 1966; Zaretsky and Halberstam, 1968; Lair et al., 1969; Rowe and Schnore, 1971; Botwinick and Storandt, 1974). These data indicate that older individuals have less dif-

difficult using information available from highly overlearned material in memory processing, but still do not perform as well as the young. Older persons may be less adept than the young in developing adequate encodings for all materials, but have even more severe problems when required to encode unfamiliar items.

Role of Mnemonics in Acquisition

Another consideration in examining acquisition difficulties in the elderly is to ask whether they use appropriate mnemonic encoding strategies when memorizing information. If an individual is capable of and knows how to use an efficient mnemonic strategy in memorizing, but fails to do so, this phenomenon is called a "production deficiency." Indirect evidence of a production deficiency as the bias of poor recall in the elderly comes from several sources. Older people can increase recall performance using imaginal encoding (Nebes, 1976). However, they do not do so spontaneously (Reese, 1976). There seems to be no age differences in knowledge of mnemonics in the young and old (Perlmutter, 1978). However, elderly subjects perform more poorly than the young in incidental and intentional recall. If production deficiency in memorizing is the basis of poor memory performance, age differences should be eliminated by providing appropriate mnemonics and encouraging subjects to use them. Yet, when told to use mediator's imagery, or organization, older subjects improved recall, but did not reach the performance levels of college students (Hulicka and Grossman, 1967; Canestrari, 1968; Hultsch, 1969, 1971a,b; Mason and Smith, 1977). One difficulty with the latter studies is that there is no way to indicate whether elderly subjects "trust" experimenter-supplied mnemonics and actually use them. Treat obtained age differences in recall when special imagery instructions were supplied by the experimenter, but eliminated them when subjects were told to generate their own images, suggesting that older subjects may prefer to use their own mnemonics when told to do so (Treat and Reese, 1976).

An alternative method to using mnemonics is to use orienting tasks directly encoding processes in an incidental memory paradigm. Since subjects are unaware of recall requirements while performing orienting tasks, any difficulties arising from the subject's knowledge that they will have to remember the stimuli are bypassed. Having all subjects performing the same encoding task also aids the investigator in determining the efficiency of memory processes in a "pure" measure of recall. For example, depression may negatively affect recall by its impact on mental set, memorization strategies, or other factors not directly related to cognitive mechanisms of memory. The high incidence of self-reported depression in the elderly may be implicated in individual differences in their memory performance. Confounding effects in recall can be minimized by experimentally inducing memory processing, which should reduce any depression-related influences on recall performance in the elderly. In a study by Zelinski et al. (1978) community volunteers (n=268) in two age groups (young-old, 60-70 yrs., and old-old, 71-80 yrs.) completed the Zung Depression Scale. Those in upper (depressed) quartile were clinically depressed, and those in the lowest

quartile were not depressed, according to norms. They participated in a between Ss experiment. Individuals were presented 25 words at 10 s intervals. One group intentionally memorized the words. The other two groups performed a semantic or nonsemantic orienting task, followed by incidental recall. Recall results indicated that depressed persons recalled fewer words than nondepressed ones following memorization. Both groups recalled equivalent numbers of words following the incidental semantic and nonsemantic tasks. These data suggest that implementation of cognitive processing strategies may be useful in assessing memory more "purely" in the depressed elderly.

Eysenck (1974) has used the depth of processing model (Craik and Lockart, 1972) based on orienting task research to suggest that the aged might be unable to process deeply and thereby suffer from a "processing deficit." He had young and older subjects perform semantic and nonsemantic orienting tasks, as well as intentional memorizing. The age deficit in recall was greater for the semantic than nonsemantic tasks, although incidental recall in the elderly group was superior to intentional recall. Other investigators report the reliability of this finding (Nebes and Andrews-Kulis, 1976; Perlmutter, 1978; Zelinski et al., 1978). The orienting task data suggest an encoding deficit in the elderly.

The retrieval and encoding deficits discussed here do not exist in isolation from one another. Rather, they probably interact. Of some relevance to this point is a recent study by White (cited in Craik, 1977) which controlled both encoding and retrieval. White had subjects perform semantic and nonsemantic orienting tasks, as well as engage in memorization. Recall data showed older subjects performing worse on memorization when compared with the young. Elderly subjects improved recall following the semantic tasks, but did not reach recall levels shown by the young. When recognition was tested, older subject's recognition following the semantic task was equivalent to that of the young, but recognition following intentional memorization was significantly worse for the elderly. Thus, when encoding is equated in young and older subjects, recall but not recognition is poorer in the aged, suggesting that memory deficits in the elderly are a joint function of inadequate encoding *and* retrieval.

Assessment of Everyday Memory: Episodic Versus Semantic Memory

Our review of the literature on memory suggests that acquisition and retrieval difficulties observed in older people may interact such that the average older person appears to show memory deficit in laboratory situations. However, older people seem to remember to arrive in time for the experiment, to retrieve information about income, education, number of grandchildren, and other demographic data requested in our questionnaires, and to acquire information correctly about how to perform the experimental tasks. Old people may not spontaneously organize lists of words to be recalled, but ask a 70 year old soap opera devotee to recount the last two week's developments on "The Young and the Restless" and observe organized recall.

These anecdotal observations about memory function in older persons lead us to consider the validity of measures used traditionally in assessing memory system, or of something more specific, such as remembering based upon formal memorizing principles used in educational settings. How does formal memorizing fit in to how we remember information in everyday life?

Tulving (1972) provided a model which attempts to answer this question. He characterized memory as two major interactive systems, episodic and semantic. Once information is perceived, recognized, encoded, and otherwise operated upon, it is registered into the memory systems. The episodic system categorizes it in terms of its spatiotemporal characteristics - that is, in terms of when and how it occurred with respect to other events. An experience recorded on October 22, 1978 is registered subsequent to experiences on October 20th. The episodic system, furthermore, handles information in an autobiographical frame - I had the experience. Information encoded on October 22nd is not integrated with that encoded on February 21st. This indicates that episodic memory is specific in nature - information is not generalized across experiences. It is to be read out with as much detail as was originally encoded. However, detail, as we know, is often lost when we are recalling an event. This is because the episodic system has no internal "backup" system to recode the information into another form, as through integration. Thus, the act of recalling itself is an episodic event, and specific information may be altered because of interference with later encodings. Specific information may be altered or lost due to interference. This explains why continual retelling or an anecdote may alter original story details beyond recognizability.

Tulving (1972) pointed out that episodic processes are measures in traditional memory studies. Experimenters present information to subjects and expect them to recall or recognize it verbatim at some later interval. Researchers do not want subjects to transform the information after it is encoded into some larger system of knowledge.

But what about the semantic memory system? This system is based upon cognitive referents - concepts, linguistic rules, inference, and integration. Unlike episodic memory, it is not spatiotemporal because new information can be integrated with old, and can be generated without its actually being experienced. Using inference, we can take a set of facts learned at different times:

1. A match is made of cardboard.
2. Cardboard is made of layers of paper pressed together.
3. Paper comes from trees.

and integrate them so that we know matches come from trees without formally learning this fact. The semantic system is thus responsible for maintaining and upgrading our knowledge. It has a much greater potential for generating and storing information than the episodic system because it can abstract and generalize information, compacting it to make retrieval relatively more ef-

ficient. It also can create "backup" of recorded information through abstraction.

Before we discuss research on semantic memory, we should keep in mind that the semantic/episodic model involves extensive interaction between the two memory systems. We cannot recognize a word which is to be stored episodically without obtaining its referents from the semantic system. Similarly, we cannot operate the semantic system to acquire knowledge without episodic inputs. In the final analysis, we can only study processes which have a greater episodic than semantic component or which have a greater semantic than episodic component.

To return to our discussion, let us again consider what has been said about traditional studies of memory in the aged. The latter appears to measure a formal kind of memory, the kind good students would use to encode and recall material for examinations. If this is true, we would expect to find that people who are educated perform better on memory tests than those not so educated. Zelinski et al. (1979) collected some data addressing this question. Intentional memory and recall were studied following incidental orienting tasks in groups of elderly people. One group was very well educated for their cohort, averaging two years of college. They pursued life-styles of educated people: they read a considerable amount, watched educational, informational shows on television rather than situation comedies and variety shows, attended adult education courses and so on. In contrast, another group had low educational attainment, averaging seven years of education, read little, frequently watched the kinds of television shows intellectuals lament, and were relatively uninvolved in educational pursuits. Results showed that the highly educated group recalled significantly more words than the uneducated group, regardless of whether they intentionally memorized the words or performed an encoding task. This suggests that educated people know how to take memory tests, or perform more efficiently in remembering episodic inputs when encoding is controlled by using orienting tasks. Both groups, incidentally, performed equivalently on the Word Fluency test of the Primary Mental Abilities battery (Thurstone and Thurstone, 1949). This test measures the subject's ability to generate as many words as possible beginning with the letter S in a 5 min period.

The above data suggest that in the elderly, episodic processes are affected by life-style/socioeconomic status variables. Yet a more semantic process, of generating information from one's lexicon of words beginning with the letter S may not be. Moreover, all the subjects, regardless of background, learned how to use the answer sheets, remembered their ailments, and so on. Obviously, everyday remembering, which probably relies heavily on knowledge from the semantic memory system, is not being measured adequately by means of word recall studies.

Psychometric Assessment of Semantic Memory

Acquisition and Retrieval in Semantic Memory

Semantic processes have been explored by various investigators. Studies of how the semantic system utilizes new information provide an analog to the processing of acquisition outlined in episodic memory research. Walsh and Baldwin (1977a) used Bransford and Frank's (1971) "abstraction of linguistic ideas" paradigm to test semantic processes in integrating new information. They found no age differences in semantic integration of either concrete or abstract material (Walsh and Baldwin, 1977b). Hurlbut (1977) reported similar results using a modified version of the same paradigm. Data on retrieval from semantic memory also indicate that there may be no age-related deficits. Eysenck (1975) reported that older subjects had no difficulty retrieving words from semantic memory when cued. Thornesbury et al. (1977) further found no age differences in subject's ratings of their awareness that they "knew," but were unable to retrieve responses to questions they could not answer.

Older persons who are able to predict their ability to recall or recognize items are indeed correct (Thornesbury et al., 1977; Perlmutter, 1978). The semantic memory studies reviewed here suggest that the elderly perform equivalently to the young on acquisition and retrieval-related tasks and in awareness of knowledge that they remember information. However, there are many more questions about how the elderly process "everyday" information that are not addressed by the semantic memory studies reported here.

Remote Memory

There is a popular stereotype that the elderly can remember events from years long past, but have difficulty with recalling what happened hours ago. If this stereotype were true, it would suggest that long-term retrieval processes are superior in the elderly. Several investigators examined long-term recall and recognition with two types of material: historical facts and personal information.

Warrington and her colleagues (Warrington and Sanders, 1971; Warrington and Silberstein, 1970) developed tests involving recall and recognition of historical events and faces of important figures during several decades (1930 - 1960s). They found that elderly subjects recalled and recognized significantly less information for all decades compared with younger subjects.

Botwinick and Storandt (1974) developed another questionnaire about historical information for the decades from the 1900s to the 1970s. They found no significant age decrements. Perlmutter (1978) used Botwinick and Storandt's (1974) instrument and found age *increments* in recall and recognition. Differences in results between the remote instruments may be related to test difficulty, cultural differences in acquisition, and other problems.

Recall for personality-experienced events is in general poorer in the aged. Schonfield (1972) reported an informal study in which elderly and young subjects were asked to list names of former teachers. Although the elderly did not recall as many as the young, they did remember the names of over two-thirds of their former teachers. Bahrlick et al. (1975) obtained photographs and names of subject's colleagues and high school yearbooks and found age decrements in recall and recognition. Bahrlick (1977) reported another study in which alumni of Ohio Wesleyan University were asked to recall names and spatial locations of streets from their college town of Delaware, Ohio. Ability to do so declined as a function of years between graduation and test, which may be due to long-term forgetting. The data suggest that older people have retrieval difficulties even with "old" memories.

Memory for Connected Discourse

One way to assess everyday memory processes in the elderly is to control for acquisition, recency of exposure to material, and information content in a semantic memory framework by presenting stimulus materials similar to those they normally use to acquire information. People of all ages obtain information from books, magazines, or newspapers. They do not wade through articles and attempt to memorize major points. Yet they can often outline information obtained through reading. But we know little about how people process what they read, how they remember, and how remembering is affected by thematic information, although how well older people remember prose has been researched by several investigators. Some studies utilized stimuli from standard reading tests or tests of intellectual function and found age differences in recall of the number of "memories" (as determined by the test constructors) produced correctly (Gilbert, 1941; Taub, 1975) and in recognition of statements from text (Moenster, 1972). Other investigators developed their own materials and reported age decrements in recall and recognition (Botwinick and Storandt, 1974; Gordon and Clark, 1974). Except for the last cited study, the underlying structure of information presented in the passages was not systematically manipulated. This is analogous to creating a word list for a free recall study without determining the nature of stimulus attributes which may affect remembering, such as frequency, abstractness/concreteness, meaningfulness, or imagery. Prose recall studies provide us with some information about aging process in memory, but offer insufficient evidence to definitively show that age differences exist in prose recall or recognition. Although Gordon and Clark (1974) used a systematic story format, there is evidence (Thorndyke, 1977) that recall for a story with almost the identical structure is poorer than recall for a story with a simpler structure. Their work may be suggesting that elderly persons have difficulty remembering complex relations in prose.

Another important aspect of reading is comprehension. Gordon (1975) found that older subjects had difficulty comprehending sentences. More work must be done to ascertain locus of comprehension problems in a systematic way. We are currently conducting an in-depth series of studies examining recall of essay

and story materials, recognition, and inference from information presented in story formats, and of comprehension of related sentences.

Recommendations for Memory Assessment

As we have suggested, assessment of semantic memory has great potential in delineating the nature of memory problems in the aged. But many of the studies reviewed in this chapter are fraught with difficulties. Fact memory studies, for instance, do not control whether subjects ever learned the information, the difficulty of items, and the possible number of repeated exposures to the material to be remembered. However, Squire and Slater (1975) devised an ingenious fact memory assessment instrument in which these problems were circumvented. They used questions about television series which aired for only 1 year (and would therefore not be repeated) between 1962 and 1976, and were watched by equivalent percentages of the American population, according to the Nielson ratings. Although this instrument has thus far been used only in amnesia studies, it has great potential for measuring retention of information acquired in an "everyday" setting. Validation studies conducted by Squire and Slater (1975) show that individuals not exposed to the programs, either because they were not in the United States or were too young to have seen the shows when they were being aired, did not know the answers to the questions about the programs above a chance level. Thus, their television fact memory test avoids many of the difficulties encountered in fact memory tests.

Another aspect of memory important in assessment of dysfunction is in delayed recall. Erickson and Scott (1977) as well as others (Rozin, 1976) indicate that delayed recall is a critical measure in differentiating pathology, since even amnesia patients can recall information as well as normals immediately after its presentation, but not after a delay as short as 20 min. In our semantic memory research program, we are therefore including immediate and delayed recall and recognition/inference of prose materials.

A third area of inquiry is concerned with how aware the individual is of his memory deficits. Depressed persons and Korsakoff patients, for instance, may be highly aware of memory problems, which those with other organic syndromes may not. Thus metamemory, the knowledge of ability to remember, should be assessed. We are currently developing a questionnaire about normal everyday memory dysfunction (such as losing keys or eyeglasses) to determine the extent to which adults of different ages experience such problems.

Scoring procedures appear to be important in differential pathology as well. Albert and Kaplan (1979) indicate that the nature of errors made in neuropsychological assessment can reveal locus of lesions, they argue that observing how the subject arrives at the solution to an assessment task reveals much about the nature

of brain damage. In psychometric assessment, this is not always feasible. However, Butters (1979) suggests that scoring for omission errors, and for the kinds of incorrect answers made in memory tests provides a yardstick for differentiating the basis of deficits. He reports that in a Brown-Peterson short-term memory task, subjects diagnosed as Korsakoff or demented patients score similarly. When the kinds of errors made are examined, Korsakoffs omit responses, while demented patients give extra list responses. This kind of scoring lends itself to psychometric assessment methodology, since it is simple and does not have to be interpreted by highly trained individuals. We are scoring our data for omissions, extra list intrusions, and synonyms.

There are many other aspects of semantic memory which must yet be considered in future assessment research. For instance, it should be determined how memory processes relate to cognitive functioning as it is traditionally measured psychometrically. Does reasoning ability, for example, relate to the ability to make inferences based on reading a passage? Elucidating the relationship of semantic memory functions to traditional psychometric measures may further indicate the ecological validity of traditional assessment instruments, and suggest which instruments currently in use are most effective of differentiating normal versus pathological memory function.

Finally, attention must be given to the problem of norms in working with older clinical populations. As has been discussed extensively for the area of ability measurement (cf. Schaie and Schaie, 1977a; Schaie, 1979), there are some questions of interest to clinicians which require comparison with young adult norms to determine absolute levels of function. More often than not, however, we wish to determine how well an elderly person's memory compares with that of the average person of his or her own age. The latter data are simply unavailable for large representative samples at this time. As a major effort of our research group, we are therefore currently collecting data on a variety of meaningful memory tasks for several members of a prepaid health plan over the age range from 55 to 80. These data will permit us to describe norms for older individuals on a highly portable psychometric battery of memory tests, as well as their relation to tests of mental abilities and criterion measures of self-evaluated competence in a variety of situations indigenous to the elderly (Scheidt and Schaie, 1978). Hopefully, we will thus soon be able to present a methodology which can permit applying the principles reviewed in this chapter to clinical application.

Summary

Psychometric assessment of memory has often meant no more than including some brief measures of digit span or memory for common facts within the context of cognitive assessment batteries. On the other hand, there is vast literature of laboratory paradigms for the study of many aspects of memory which in the past have not been directly related to the work of the clinician who wishes to study memory as it affects the everyday behavior of the older

person. In this chapter, we have reviewed the relevant findings in the traditional memory literature, including the evidence on age differences in information retrieval, information acquisition, and the role of mnemonics in information acquisition. We then reviewed the important distinction between episodic and semantic memory as it affects assessment of everyday memory, and discussed the relatively sparse literature on psychometric assessment of semantic memory. Finally, recommendations were given for ways in which memory assessment of older people might be of use in clinical applications.

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