CHAPTER 3

Aging and Memory

MARION PERLMUTTER
DEPARTMENT OF PSYCHOLOGY,
INSTITUTE OF GERONTOLOGY, AND
CENTER FOR GROWTH AND HUMAN DEVELOPMENT

CYNTHIA ADAMS, JANE BERRY,
MICHAEL KAPLAN, DENISE PERSON,
FREDERICK VERDONIK
INSTITUTE OF GERONTOLOGY
UNIVERSITY OF MICHIGAN
ANN ARBOR, MICHIGAN

Memory involves the capacity to retain information about the past. It keeps track of events that have occurred in different times and distant places, thus expanding experience beyond the here and now. In addition, in humans memory is used to follow through on plans and projections about the future, thus enhancing effectiveness of action. Shared memories, which are the substance of relationships and communication, constitute the social systems that mediate everyday human life. In a very basic sense, then, memory is critical to both individual and societal well-being.

Not surprisingly, throughout time memory has been of interest to diverse scholars, and within psychology the study of memory consistently has been one of the most vital areas of research. This high level of activity has existed in experimental psychology (cf. Coffer, 1976; Estes, 1979), as well as in child psychology (cf. Brown, Bransford, Ferrara, & Campione, 1983; Kail & Hagen, 1977; Weinert & Perlmutter, in press) and gerontology (cf. Burke & Light, in press; Craik, 1977; Poon, 1985). In each of these subfields, there has been a

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continued and strong interest in understanding the workings and limits of memory, and in developmental research attention has focused on how memory changes with age.

This chapter reviews psychological research on memory in adulthood. Although there is also a considerable body of research on the biology of memory, that work is beyond the scope of this chapter. The goal of the present review is to gain perspective about the cognitive and behavioral manifestations of changes in everyday memory that occur in late life. Special attention is given to three questions:

1. How general within individuals, and representative within the population, are age-related changes in memory?
2. What are the possible causes of age-related changes in memory?
3. What can be done to ameliorate problematic age-related changes in memory?

A major theme developed in this chapter is that age-related decline in memory is not as general, representative, or severe as previously had been thought. Moreover, many of the memory problems observed in later life may be at least partially caused by factors that tend to correlate with age but are not inevitable consequences of aging (e.g., depression, inactivity). Furthermore, there are techniques for reducing some of the difficulties that many older adults experience with everyday memory.

CONCEPTUALIZATION OF THE MEMORY SYSTEM

Much recent research on memory aging has been carried out in experimental psychological laboratories. In general, researchers have adopted the methods and theoretical perspectives of contemporary cognitive psychology. That is, memory studies have involved single experimental tasks assumed to require the use of specific processes of memory. In the past several decades such work has been dominated by an information processing perspective (e.g., Anderson & Bower, 1973; Loftus & Loftus, 1976). This perspective uses the computer as a metaphor for human cognition. It assumes that information is first sensed, perceived, encoded, and then stored in memory. At some later time, it may be retrieved and thus reexperienced or remembered. Memory is studied by examining the experience of recollection for diverse kinds of stimuli, under a wide range of encoding and retrieval conditions.

Storage structures and transfer processes are respectively the hardware and software of the memory system (see Atkinson & Shiffrin, 1968). These capacities and skills allow an individual to record, retain, and retrieve information (data). Most research on memory has focused on these aspects of memory.

The short-term store is conceptualized as a limited-capacity working memory, perhaps analogous to the display on a computer. It occupies awareness and in many ways may be viewed simply as consciousness. The long-term store, in contrast, is probably an unlimited-capacity memory that does not occupy awareness. It may be conceived of as the holding space of the cognitive system, and as such might be compared to the backup storage of a computer system.

Encoding and retrieval processes move information in and out of the storage structures. Encoding processes may be viewed as forward-moving. They are involved in early processing. Some operate on information as it is initially received into the short-term store, and others later facilitate the movement of information into the long-term store. Attention, analysis, and elaboration are examples of encoding operations (Craik & Tulving, 1975; Shiffrin & Schneider, 1977). Retrieval processes might be viewed as backward-moving. They are involved in later processing. They move information from an unaware state in the long-term store to an aware state in the short-term store. Search and generation are examples of retrieval operations (Rabbit, 1982). Although experimentalists attempt to examine encoding and retrieval processes independently, it should be noted that in everyday memory these two types of processes are interdependent (see Gilland & Perlmuter, in press). That is, information cannot be retrieved unless it has been encoded, and evidence of encoding typically involves retrieval.

Memory contents are the data in the memory system. With few exceptions (e.g., Fitzgerald, 1980; Neisser, 1982; Perlmuter, 1980), research on memory has not focused directly on contents of memory. The relative paucity of research on memory contents may be attributable to a lack of organizational frameworks for guiding inquiry. Satisfactory frameworks for addressing memory contents may be especially difficult to develop because this aspect of memory is so diverse and so individualistic. Nevertheless, several general distinctions have been useful in considering kinds of information contained in memory.

For the present purposes, memory contents are distinguished in three ways (see Perlmuter, 1986). Autobiographical memory refers to specific, time-based information about events one has experienced personally, that is, the accumulated record of one's experience. Conceptual memory refers to generalized information about the world and about oneself that is not tied to single specific experiences but is learned through multiple experiences or instruction (e.g., by a person or from a book or other external information source). Metacognitive knowledge refers to conceptual memory that pertains specifically to the cognitive system, for example, knowledge about how memory operates or how much effort may be required to solve a problem. Other terms, including episodic and semantic memory (see Tulving, 1972), declarative and procedural knowledge (see Mandler, 1983), and figurative and operative knowing (see Piaget & Inhelder, 1973) have been applied to similar distinctions but will not be used here.
REVIEW OF KNOWLEDGE ABOUT MEMORY CHANGE WITH AGE

Stereotypes about Memory Aging

In America's youth-oriented society, the prevalent view of the older adult has been of an infirm, incompetent invalid (see Butler & Lewis, 1982; Hong, 1982; Palm, 1982; Rodin & Langer, 1980). Indeed, stereotypic images of forgetful, rambling, senile older adults are familiar and accepted, whereas images of vital, creative, and insightful seniors are rare. Recently, the acceptance of negative stereotypes about the elderly has been challenged (cf. Kalish, 1979; Schenfield, 1982). Research findings dispelling the stereotypes are becoming available (cf. Perlmutter, 1986), and there seems to be some shift in attitude such that older adults are being viewed more favorably by younger adults (Austin, 1983; Tikhoff, 1979). Nevertheless, many negative attitudes about aging probably still exist in the general population and continue to be portrayed in the media as well (see Gerber, Gross, Signorielli, & Morgan, 1980; Passuth & Cook, 1985).

As will be suggested in later sections on the relationship between memory performance, expectations, and self-efficacy, negative stereotypes about aging can be more than simply inaccurate; they can be detrimental because they can lead to social conditions and personal attitudes that limit performance (Rodin & Langer, 1980; see also Kuyper & Bengtson, 1973). When a person expects to lose clarity and become unproductive, he or she may avoid challenges and fall into routine uninspiring circumstances that promote atrophy of both physical and mental capacities (Bandura, 1981, 1986; Suls & Mullen, 1982).

Questionnaire Data about Memory Aging

A number of self-report questionnaire studies have been carried out to assess perceptions of memory functioning and age-related change in memory (Cavanaugh, Grady, & Perlmutter, 1983; Chaffin & Hermann, 1983; Dixon & Hultsch, 1983a; Perlmutter, 1987; Williams, Deeney, & Schaeffer, 1983; Zelinski, Giliewski, & Thompson, 1980). Two important issues addressed by these studies are (1) what kinds of memory problems do younger and older adults experience? and (2) how do they view these problems? In general, older adults report more problems than younger adults (Cavanaugh, et al., 1983; Perlmutter, 1978; White & Cunningham, 1984, Zelinski, et al., 1980). For example, Roberts (1983) found that 6%, 12%, and 46%, respectively, of young, middle-aged, and older subjects participating in laboratory studies reported experiencing memory problems. These findings have been corroborated by a recent large survey study (Hertzog & Rodgers, 1986) in which older participants reported more memory difficulties than did younger participants.

Age differences in reports about memory have not been entirely consistent. However, there appear to be age differences in knowledge about basic memory processes and capacities, perception of stability of memory ability, and perception of personal control over memory (Dixon & Hultsch, 1983a). Older adults perceive that there are changes in their memory abilities (Zarr, 1982) and apparently are more upset by memory failures than are younger adults (Cavanaugh, et al., 1983). Williams et al. (1983) found that none of the 65- and 75-year-old individuals they studied expected memory to improve with age, and Perlmutter (1978) found that adults over 60 expected their memories to decline more than adults in their 20s. Williams et al. (1983) also found that older adults believe age-related memory decline is related to expectations, less use of memory skills, and decreases in activity and contact with information to be remembered.

Questionnaire studies suggest that there tends to be selectivity in the aspects of memory that are perceived to decline. For example, memory capacity generally is thought to decline more than memory strategies (Dixon & Hultsch, 1983a), and name retrieval seems to be especially troublesome in later years (Zarr, 1982). Problems in remembering conversations and people are also commonly reported by older adults (White & Cunningham, 1984), although memory for events and places is perceived to remain relatively stable (White & Cunningham, 1984).

Behavioral Data about Memory Aging

Memory Capacity. The prevalent view is that aging produces decline in memory capacity. Although it is virtually impossible to assess memory capacity independently of other components of memory, several converging sources of data can be used to draw qualified conclusions about the developmental trajectory of memory capacity. First, the consistent finding is that older adults perform somewhat worse than do younger adults on almost all tests of memory for new information (see Craik, 1977; Poon, 1983). It is almost certainly explained by a decline in memory capacities. In addition, data from tasks in which variables have been manipulated in such a way as to optimize the likelihood of obtaining relatively pure indices of memory capacity also are consistent with a decline in memory capacity on account of aging (see Baltes & Kliegel, 1986).

Transfer Processes. Most experimental studies of memory have been directed at assessing the locus of age-related processing deficits (see Salthouse, 1980; Smith, 1980). In general, laboratory studies of memory have indicated that older adults are both less efficient at encoding (e.g., Craik & Simon, 1980; Perlmutter, 1978; Smith, 1980) and less effective at retrieving (e.g., Burke &
Light, 1981) information presented than are younger adults. However, particularly in the case of encoding, part of the observed age-related deficit may be due to a lack of spontaneous use of the most effective strategies available, rather than to an inability to process information more efficiently (e.g., Perlmutter, 1978). This lack of use of the most effective strategies has been referred to as a production deficiency (Flavell, 1970) and is in contrast to a mediation deficiency (Reese, 1962), in which case potentially effective strategies are not operable. An important implication of age-related production deficiencies in processing is that performance may be amenable to remediation. For example, through modest teaching or training of memory strategies much improved performance can be achieved (e.g., Baddeley & Vital, 1982; Dentey, 1982; Scogin, Stranland, & Lott, 1985).

Memory Contents. There have been a number of investigations of adults' memory for a variety of memory contents, including people, school times, parenting, medical histories, stressful life events, criminal acts, praise, and historical events (Grunberg, Morris, & Sykes, 1978; Harris & Morris, 1984; Neisser, 1982). In general, these studies have not compared young and old. However, they suggest that much specific information that individuals believe they remember veridically probably is recollected on the basis of some information that is only remotely tied to the information originally acquired in memory. Something like a schema about the experience probably develops. With each new encounter information is encoded or organized in terms of that is already known. At the same time, the schema itself is modified in light of new input. Thus, recollection does not show directly on the original memory content about an event but rather on a schema of the experience that is a transformation of the original content.

There are some data available about age patterns in memory for particular kinds of world knowledge (see Botwinick & Stranland, 1974; Lachman & Lachman, 1980; Perlmutter, 1978). For example, psychometric tests of intelligence suggest that crystallized intelligence, which reflects accumulated world knowledge, remains stable or increases somewhat through most of adulthood (e.g., Bales & Brim, 1964; Horn, 1982; Schaie, 1979). Measures of vocabulary, which provide an index of a fairly specific sort of accumulated knowledge, also show stability or modest increases throughout adulthood (e.g., Riegel, 1968). Thus, although there is probably a decrease in rate of increase of memory content through adulthood, or a decrease in efficiency of encoding and retrieving information in memory, the healthy memory system seems able to retain old information and acquire new information throughout life. In general, then, with age one should expect to have a larger knowledge base (see Perlmutter, 1980).

Information about possible age-related changes in metacognitive knowledge is of special interest because this type of memory content is thought to play a special role in cognitive performance. That is, the cognitive system is largely susceptible to personal control and regulation, so that an individual's efforts and deliberate actions have an important impact on what information is remembered and what problems are solved. Although intent is one factor that contributes to the effectiveness of the cognitive system (e.g., Adams & Rebok, 1982), knowledge about how the system operates is also important. For example, if one does not particularly care whether or not a set of names is remembered, no special cognitive action need be taken. However, if one is intent on remembering some names, special techniques can be employed to increase the probability that the names will be recalled. Of course, metacognitive knowledge of mnemonic techniques for remembering names would be essential, and the more refined such knowledge is, the more useful it will be. For example, in the case of trying to remember names, the individual who knows that rehearsal increases the likelihood that information is remembered may use this strategy and be more effective in remembering the names than the individual who did not know about this technique. Still, the rehearser would probably not remember the names as well as an individual who knew that imaging and associating are even more effective memory strategies than is rehearsal.

Presumably, metacognitive knowledge increases throughout life. However, research results have not been entirely consistent with this view. In some research little or no age differences are detected (e.g., Bruce, Coyle, & Botwinick, 1982; Lachman, Lachman & Thomsen, 1979; Perlmutter, 1978; Rabkinowitz, Ackerman, Craik, & Hinchley, 1982). However, in other research, age differences have been obtained (e.g., Dixon & Hultsch, 1983; Murphy, Sanders, Gabrielski, & Schmitt, 1981). At least part of this inconsistent pattern probably results from the fact that metacognition is still a fairly new concept that is not yet well articulated (see Cavanaugh & Perlmutter, 1982), and instrument development is still at a relatively early stage (see Cavanaugh & Perlmutter, 1982; Dixon & Hultsch, in press). In addition, the very idea of metacognitive knowledge implies a life relevance that probably has not been characteristic of many past assessments, and the life irrelevance of memory and metamemory tests undoubtedly has been more severe for older than younger adults.

Summary. Behavioral research on memory in younger and older adults suggests that there is some decline in memory capacities with age. Still, in all but very ill adults, memory contents can continue to increase throughout the adult years. Moreover, the memory system utilizes memory contents about past experience to process and retrieve new experience. Thus, some of the limitations in the memory system that occur at all ages can be compensated for by knowledge-based strategies that extend memory capacities. The degree to which declining memory impede performance of older adults is determined by the degree to which tasks deviate from tasks and situations that the memory system has come to remember. The increase in conceptual and metacognitive memory content that accrues through adulthood can be used to overcome many declines in memory capacity, but such compensation will not be possible in all situations or on all tasks. Despite some inconvenience, in all likelihood many age changes in memory are adaptive and advantageous in most important life situations. For
example, it would be confusing to remember all of the locations that one previously used when parking in a particular parking lot.

**AGE-CORRELATED FACTORS THAT AFFECT MEMORY**

It is likely that some changes in memory functioning are experienced by most people during their middle and later adult years. However, the onset and subsequent perception of memory changes is likely to occur gradually, and in many instances (e.g., active, cognitively challenged, and healthy lifestyle) as nonthreatening and with little or no negative effect. The mentally and physically healthy adult should adopt to cognitive changes and experience only minor disruption of everyday functioning. Relatively healthy adults should not become preoccupied with occasional instances of forgetting or memory failures. It is likely that younger adults also experience memory failures but are less concerned than older adults by them.

In contrast to the relatively minor memory loss that seems typical in older adults, consistent and abundant memory complaints have been noted by practitioners, service providers, and researchers (Kahn, Zarit, Hilbert, & Niederehe, 1975; Kra, 1986; Lowenthal et al., 1967; Popkin, Gallagher, Thompson, & Moore, 1982; West, 1986). Indeed, it appears that failing memory is a prevalent stereotype and concern about aging (Zarit, Cule, & Guider, 1981). This stereotype may result in an unwarranted fear and preoccupation with otherwise normal instances of everyday forgetting. For example, older adults report greater concern when they experience memory failures than do younger adults (Cavanaugh et al., 1983).

In this section, some explanations for the memory problems experienced by older adults are discussed. It may be useful, first, to distinguish between three sets of factors that contribute to memory impairments. Although these factors can affect memory performance at any age, they tend to be correlated with age and therefore become more important in later adulthood. The first set of factors relates to psychological state. Poor adaptation to the aging process may result in a psychological state that impairs memory performance. Many of these states have been found to be relatively transient and/or susceptible to intervention.

The second set of factors reflects transitory physical states. These states often result from problematic health conditions that become more prevalent as people age (Ford, 1985). It should be noted, however, that although acute health problems are more common in older people, they do not necessarily reflect inevitable consequences of aging. The effects of these types of influences on memory performance also are susceptible to remediation when properly diagnosed and treated.

The third set of factors reflects chronic physical states. They result from physiologic impairments that are not yet known to be reversible. They may range in severity from relatively modest sensory or perceptual impairment to complete loss of hearing or sight, loss of mobility, or various stages of degenerative brain diseases (e.g., dementia of the Alzheimer's type; see Thompson, Gong, Haskins, & Gallagher, this volume). These severe physical problems often impede memory, but they are beyond the scope of this chapter.

The following sections describe some psychological factors, transitory physical factors, and less severe chronic physical factors that influence memory. Each factor is introduced with research on its relationship to memory or more general cognitive functioning. Some evidence linking these factors to chronological age is then reviewed, with the intent to challenge the notion that memory deficits observed in older individuals are due predominantly to age per se. Rather, the position taken is that these extraneous factors are often correlated with age and may be amenable to remediation. Thus, memory functioning in older adults may be optimized when the effects of such mediators variables are modified.

Psychological Expectations

Memory functioning does not occur in a vacuum; psychological factors such as mood, perception, motivation, self-esteem, and attitude contribute to memory performance. Expectations are the beliefs or judgments one holds about one's abilities regarding potential performance (Campbell & Fahey, 1985). These cognitions include the relative degree of expected success or failure on a given task and the causes attributed to such outcomes. Across behavioral domains (e.g., intellectual, interpersonal, athletic), performance expectations have been found to have a positive relationship with actual performance (Anderson, 1983; Bandura & Schunk, 1981; Weinberg, Gould, & Jackson, 1979; Weinberg, Yukelson, & Jackson, 1980). That is, positive expectations are predictive of successful outcomes and negative expectations are predictive of failure. Implied here is the notion that expectations or subjective evaluations are not necessarily accurate representations of the abilities or skills in question. In fact, the goal of cognitive psychotherapies (Beck, 1976; Ellis & Grieger, 1978; Meichenbaum, 1977) has been to modify self-appraisal so that it more accurately matches ability. Moreover, research has demonstrated that negative expectations can be raised or changed in such a way as to enhance performance (Anderson, 1983; Dweck, 1975).

Research on expectations has been extensive and diverse. Different processes may contribute directly or indirectly to the development of negative expectations or may serve to lower existing levels of expectations. For example, studies of
learned helplessness (the expectation of inability to produce or control desired outcomes) suggest that expectations of helplessness are related to cognitive, motivational, and behavioral deficits (Abramson, Seligman, & Teasdale, 1978; see also Garber & Seligman, 1980, for a review of human helplessness). A closely related concept is perceived locus of control (Shupe, 1983). Research has shown that people's beliefs about whether personal events are due to factors such as luck, chance, fate, and powerful others (i.e., external locus of control) are associated with depressed cognitive functioning (Lefcourt, 1970). A third body of literature on expectations documents effects of self-efficacy on performance. Self-efficacy expectations refer to judgments regarding one's ability to perform in a stressful situation. It has been proposed that such expectations have two distinct behavioral manifestations: (1) approach and avoidance of task, and (2) amount of effort and persistence devoted to task mastery. Studies of self-efficacy have illustrated that negative expectations can inhibit performance (Bandura, 1986; Bandura, Adams, Hardy & Howells, 1980; Bandura, Reese & Adams, 1982; Bandura & Schunk, 1981; Condie & Lichtenstein, 1981; Schunk, 1981).

Learned helplessness, locus of control, and self-efficacy represent three variables that influence expectations and, in turn, may influence memory functioning. Moreover, these variables may be related to age and thereby contribute to lowered memory functioning in older adults. This perspective is increasingly evident in research on aging and memory (Herzog, Dixon, Schaltenberg, & Heilsh, in press; Scogin et al., 1985; West, Berry, & Powlston, 1986; West, Bentwright, & Schleser, 1984; Zarit, Cole, & Gildar, 1981). Specifically, it has been hypothesized that older adults are more likely to view their memory abilities negatively, due possibly to internalization of popular stereotypes of aging (Rodin & Ringer, 1980) and greater awareness of changes in cognition (Cavanaugh et al., 1983). For example, West et al. (1986) found that older adults who complained of memory problems had lower self-efficacy than younger adults. Moreover, the way in which negative views (and other memory-related beliefs; see Cavanaugh & Perlmutter, 1982; Dixon & Herzog, in press, for reviews of the metamemory in adulthood literature) affect actual memory functioning are beginning to be understood (Berry, 1986; Cavanaugh & Poon, 1985; Coyne, 1985; West et al., 1984, 1986). For example, it appears that low self-efficacy may produce decreased effort and persistence, a sort of "why bother?" attitude, perpetuated by the view that memory failure is inevitable and beyond one's control. If personal responsibility is taken for memory functioning, and occasional memory failure is viewed as the consequence of inadequate effort (e.g., Berry, 1986; Dweck, 1975; Murphy et al., 1981), then functioning may be improved. A goal, then, is to change inaccurate beliefs that interfere with memory behavior. By assuming control over component memory skills and task effort, performance expectations may be raised and the probability of satisfactory memory functioning enhanced.

**Mental Health**

A number of psychological disorders may predispose individuals to distorted thought processes, resulting in suboptimal cognitive functioning. Two of the more common types of these disorders, depression and anxiety, have been researched extensively (see Paykel, 1982). Depression and anxiety are affective states that may be characterized respectively as feelings of hopelessness and helplessness. Moreover, anxiety is also considered a symptom of depression (Klerman, 1983) and is correlated with depression in college students (Gollib, 1984). The negative effect of depressed affect and anxiety on memory functioning has been hypothesized to account for some memory deficits observed in older adults. That is, older adults' memory problems may be due in part to age-related change in affective mood states rather than to aging per se.

**Depression.** A persistent dysphoric mood state characterized by psychological and somatic symptoms (see DSM-III, 1980, for diagnostic criteria), has been called the common cold of mental disorders (Goodstein, 1985). Its prevalence in the general population is relatively high (George, Blazer, Winfield-Laird, Leaf, & Fischl, 1986) and varies as a function of method of assessment, age, and sex (see Blazer, 1983; George et al., in press; Gurland, 1976; Zarit, 1980). The hypothesized causes of depression range from biochemical factors to distorted and negative self-concept and unresolved inner conflicts. The influence of depressed mood on memory and task performance has been demonstrated empirically (Bower, 1981; Strack, Blaney, Gunemann, & Coyne, 1985; Strongman, 1977), and clinical models describe the impact of depression on cognition and behavior in everyday life (Beck, 1967, 1976; Garber & Seligman, 1980). This work suggests that the common mechanisms by which depression influences behavior include the development of negative expectations, decreased concentration, and attentional deficits (Goodstein, 1985; Strack et al., 1985).

There is also evidence that anxiety influences cognitive functioning (see Lazarus & Folkman, 1984; Sarason, 1980). Anxiety is characterized as inner distress accompanied by physiological arousal and vague fears. As proposed by Hebb (1955), the arousal component of anxiety operates in a curvilinear manner where both under- and overarousal lead to behavioral deficits. More recent studies of anxiety and cognitive performance argue for an attentional (versus arousal) interpretation; that is, anxiety inhibits performance through excessive self-focusing and "worrying" (Paulman & Kennelly, 1984; Strack et al., 1985; Wine, 1971).

Increasingly, affective variables such as anxiety (Cavanaugh & Murphy, 1986; West et al., 1984; Yenavogue, Rosa, & Spiegel, 1982) and especially depression (Cavanaugh & Poon, 1985; Kahn et al., 1975; Kennelly, Hayslip, & Richardson, 1985; Neiderer & Camp, 1985; Zarit, 1982) have been examined in relation to memory and aging. The poorer performance of older adults on memory tasks may be the consequence of the anxiety and/or depression prevalent.
in this age group. It is often assumed that these variables may be manifested differentially at different ages. For example, Eisendof, Nowlin, & Wilkie (1970) reported increased levels of autonomic arousal (which may indicate state anxiety) in older adults performing laboratory settings. It is also believed that depression is more common in older adults (Buiter, & Lewis, 1982; Zarit, 1980; Coates, 1985) suggests that one in four older adults is depressed. It should be noted, however, that anxiety as a personality characteristic (i.e., neurotic trait anxiety) appears stable across the life span (Costa & McCrae, 1980; Costa, 1986). In addition, the relationship obtained between depression and age may depend on method of assessment. The diagnosis of clinical depression is more likely in younger adults, whereas frequency of depressive symptoms is greater in older adults (Garland, 1976). Such measurement issues must be considered in the assessment of anxiety and depressed affect, with conclusions tempered accordingly.

Evidence suggests that affective components contribute to the observed age differences in memory performance. Yonavage and his colleagues (Yonavage & Jacob, 1984; Yonavage et al., 1982) have reported decreases in memory deficits following anxiety reduction in older adults. Likewise, improvements in memory have been reported following treatments aimed at decreasing depression (Popkin et al., 1982; Zarit, Gallagher, & Kramer, 1981), although the data are not unequivocal (Scogin et al., 1985). The discrepant results may be a function of severity of depression and type of treatment (see O'Hara, Hemenick, Kohout, Wallace, & Lenz, 1986). Regardless, it is plausible that memory deficits reflect underlying affective symptoms that could be remediated to improve functioning in at least some older adults.

A variable related to affective status is memory complaint, or the concerns expressed by older adults regarding their memory abilities and failures. This variable has received increased attention in studies of aging and memory self-assessment (Birren, 1980; Cavanaugh et al., 1983; Kahn et al., 1975; O'Hara et al., 1985; Scogin et al., 1985; West et al., 1984, 1986). The memory complaints of older adults seem to be associated more with affective distress than actual memory ability (Cavanaugh & Poon, 1985; O'Hara et al., 1986; Zarit, Cole, & Guiler, 1981). Thus, the influence of complaints on memory performance may operate indirectly. A persistent question that will need to be addressed in future studies is whether depressed or anxious affect or poor performance is antecedent to the high level of memory complaints reported by older adults (Lovett et al., 1965; Roberts, 1983; Rodin, 1986).

A comprehensive evaluation of memory functioning in older adults should include measures of current subjective mood state as well as a mental health history. Complaints of memory functioning should be explored rather than dismissed as "normal" concomitants of aging, with the intent to (1) rule out possibly accurate appraisals of more serious memory problems such as those experienced in early stages of Alzheimer's disease, and (2) identify potential affective disorders. If an affective disorder is indicated, both drug (Plotkin, Mintz, & Jarvik, 1985) and nonpharmacologic (Yonavage, 1985) therapies may be effective in alleviating symptoms and enhancing memory.

Physical Fitness

It is well established that physical exercise has a positive influence on physical health throughout the life span. Indeed, research over the last two decades has shown that vigorous physical conditioning can even partially reverse some of the functional losses that typically accompany normal aging (for reviews, see de Vries, 1983). For example, significant improvements have been observed in the cardiovascular (e.g., Ninimau & Shepard, 1978) and respiratory systems (e.g., de Vries, 1983) of older adults as a function of exercise. Since optimal cognitive functioning is, at least partially, dependent on cerebrovascular circulation and aerobic capacity, it is reasonable to suggest that the physiological improvements resulting from an exercise program could contribute to improvements in mental functioning as well (see Wisniewski, 1980). Thus, physical fitness may be another important factor to take into account when evaluating the memory performance of older adults.

Physical fitness refers technically to an individual's physical work capacity, which is defined as the maximum level of physical work which the individual is capable. Physical work capacity is reported in terms of oxygen consumption per kilogram of body weight per minute. This index decreases as physical activity or exercise decreases. To the extent that a link exists between physical work capacity and mental status, chronic inactivity could have a deleterious impact on everyday cognitive functioning.

The relationship between physical fitness and mental functioning recently has begun to receive scientific attention. Two research approaches characterize this literature. In one, comparisons between individuals in different categories of physical fitness (e.g., fit versus unfit) are made on performance variables. In the other, the effect of physical training on cognitive functioning in both humans and animals is tested. Although few studies have focused on physical fitness and memory, several studies have included a number of performance variables that may be related to everyday memory. In particular, the role of physical fitness and/or exercise in fluid intelligence and short-term memory has been investigated.

Fluid intelligence is thought to be tied directly to neurological functioning and, moreover, is assumed to underlie learning of new information. Thus, the potential modifiability of fluid functioning has implications for memory performance. In both comparison and training studies, physical fitness has been observed to be related to fluid ability scores. For example, in a study of 71 men ranging in age from 34 to 75 years, Powell and Pochwird (1971) observed that physical fitness...
was related positively to fluid ability measures. A later training study by Powell (1974) demonstrated improved fluid performance of geriatric mental patients following an exercise therapy program. In a more recent study, Elsayed, Ismail, and Young (1980) observed that regardless of age (young versus old), “high fit” subjects performed better on tests of fluid intelligence than did “low-fit” subjects. The young subjects, however, scored higher than the old subjects. In addition to these group comparisons, performances for all four groups (high-fit young, high-fit old, low-fit young, low-fit old) improved after a vigorous 4-month physical fitness program, thus confirming the results of Powell’s earlier studies.

In a few studies, the role of physical exercise in memory performance has been investigated more directly. Davey (1973), for example, reported significant improvements in short-term memory for young adults after exercise on a bicycle ergometer. With an older adult sample, Dustman et al. (1984) observed that aerobic exercise improved digit span memory. And in Powell’s (1974) study with geriatric patients, WAIS scores improved significantly for an exercise therapy group compared to social therapy and control groups. Finally, in a recent study with middle-aged and older mice, exercise was shown to significantly improve memory (Samara i et al., 1985).

Taken together, these studies suggest that physical fitness may indeed be an important mediating factor of memory performance in old age. However, because of a number of methodological problems, these studies must be interpreted with caution. For example, there are sampling problems in the comparison studies in that subjects are self-selected as “active.” Such individuals are likely to differ from “inactive” subjects on variables other than physical fitness (see Welford, 1984). Moreover, the causal relationship between physical fitness and cognitive function is suspect because variables such as health may mediate both activity level and cognitive functioning. Finally, there remains the potential problem of practice effects when pre- and posttest scores are used to evaluate training effects.

There is clearly a need to investigate further the role of physical fitness in older adults’ memory performance. Because the old are not likely to engage in regular exercise (see Wiswell, 1980), they are especially vulnerable to the deleterious effects that may be a consequence of chronic inactivity. Therefore, observed memory deficits may be at least partially due to poor physical fitness, a transient state that is potentially reversible through exercise therapy.

Nutritional Status

The importance of diet and nutrition for the maintenance of health and well-being is widely accepted. It is reasonable, therefore, to suggest that nutritional factors also may be related to mental functioning, including memory performance.

Because elderly adults comprise a population that may be especially vulnerable to nutritional deficiencies (see Fanelli & Kaufman, 1983; Rao, 1973), nutritional status could be an important variable to consider when their memory performance is evaluated.

Nutritional status is an indicator of how well nutritional requirements are met in a given individual (Barrows & Kekwick, 1984). There are various ways to assess nutritional status. These include the use of food intake records and biochemical measurements. Food intake records provide information about the adequacy of dietary intake relative to a standard (e.g., 1980 Recommended Dietary Allowances), whereas biochemical assessments provide information about blood and urine levels of specific nutrients. Biochemical information makes it possible to determine whether consumed nutrients are absorbed and metabolized (Schneider, 1984).

Unfortunately, because the role of nutritional status in mental functioning has received very little scientific attention to date (Goodwin, Goodwin, & Garr, 1983), it is not yet clear what impact nutritional deficiencies may have on everyday cognitive functioning. Nevertheless, data that are available suggest that certain nutrient deficiencies may be functionally related to poor memory performance. For example, a number of specific vitamin deficiencies have been associated with reversible memory disorders. Thiamine has been implicated in memory failures in humans (e.g., “beriberi anemia,” Cherkin, 1984) and in laboratory rats (Yoshimura et al., 1976). Likewise, niacin and B12 deficiencies have been linked to diseases (e.g., pellagra and pernicious anemia, respectively) in which memory failure is a major symptom (see Rosenthal & Goodwin, 1985), and B12 deficiencies unrelated to anemia are also associated with impaired mental functioning (e.g., Roos & Willanger, 1977). Several other vitamin deficiencies have been linked to cognitive impairments, although the associations are not yet clearly understood. These include folate, vitamin C, and multiple vitamin deficiencies (for review, see Rosenthal & Goodwin, 1985).

Interest in evaluating the nutritional status of the elderly population in the United States has emerged only in the past two decades. In this period, data from a number of early government-sponsored nutritional surveys (e.g., Ten-State Nutrition Survey (CDC, 1972); Health and Nutrition Examination Survey I (DHEW, 1974)) indicated an age-related decline in caloric intake and in the intake of a number of essential nutrients including calcium, iron, vitamin A, and vitamin C (for review, see O’Hanlon & Kohrs, 1978). Although more recent surveys have indicated improvement in the nutritional status of older Americans (e.g., Health and Nutrition Examination Survey II, in Fanelli & Kaufman, 1985), it is estimated that anywhere from 15% to over 50% of older Americans are suffering from some form of nutritional deficiency (Eckholm, 1985; Kohrs & Czajka-Narins, 1986).

There are few published reports that specifically link vitamin deficiencies to mental functioning in the elderly. The available data, however, suggest that such
a relationship may exist. In a recent study of healthy elderly, low blood levels of vitamins C and B₁₂ were found to be associated with poor performance on the Wechsler Memory Scale (Goodwin et al., 1983). This relationship was significant even when age, gender, income level, and educational level were controlled statistically. However, a 2-year study on placebo versus vitamin C supplementation failed to demonstrate improvements in paired-associate learning in a community-dwelling elderly sample (Barr, Harvey, & Sweetnam, 1975).

Choline deficiencies also have been implicated in memory dysfunction. In particular, disruption of acetylcholine transmission in the brain has been shown to be related to learning and memory disorders (for reviews, see Bartus, Dean, Beer, & Lippa, 1982; Drachman & Leavitt, 1974). Because the nutrient choline is known to be a precursor to acetylcholine formation, low choline levels have been causally implicated in the impairment of acetylcholine transmission.

The selective depletion of acetylcholine levels has been observed consistently in the brains of Alzheimer's patients who suffer from severe memory loss (Bartus, Dean, Pontecorvo, & Flicker, 1985). Researchers have thus reasoned that modulation of acetylcholine levels in the brain may improve the cognitive functioning of Alzheimer's patients and may even enhance the memory performance of nondepressed elderly. Because the consumption of choline-rich foods (e.g., cauliflower, cabbage) and lecithin-rich foods (e.g., eggs, soybeans, liver) has been shown to elevate plasma choline levels (see Wurtman & Zeisel, 1982), the facilitative effects of choline and lecithin (a dietary source of choline) on memory have been studied in both human clinical trial studies and animal experiments.

The results of human clinical trial studies have been disappointing thus far (for review, see Bartus, Dean, & Bear, 1984). In most of the studies with humans, the administration of either choline or lecithin has failed to improve memory in normal (i.e., nondemented) elderly (e.g., Dumino, Anton, Duff, Far, & Gerson, 1982; Sanchez, Hooper, Garry, Goodwin, & Goodwin, 1984), or in subjects with Alzheimer's disease (e.g., Sullivan, Shuluck, Corkin, & Growdon, 1982; Thal, Rosen, Sharpless, & Crystal, 1981). In one study, however, learning and memory were reported to improve in patients with early-stage Alzheimer's disease following administration of these drugs (Signoret, Whiteley, & Lhermitte, 1978).

The data from the studies just described do not alone disconfirm the relationship between acetylcholine and memory. Indeed, supportive evidence has been garnered from studies in which a number of other methodological approaches have been applied to the problem. For example, reliable improvements in memory have been observed in clinical trials using the anticholinesterase physostigmine (for review, see Bartus et al., 1984). Thus, although the cholinergic system appears to be involved in learning and memory, dietary choline deficiencies may not be an important source of memory problems in old age (see Bartus et al., 1984). Moreover, although certain vitamin deficiencies (e.g., thiamine, niacin, vitamin B₆) have been linked strongly with memory disorders, the role of vitamin deficiencies in genetic memory is as yet unclear because research examining the relationship between nutrition and memory is only beginning. In light of older adults' vulnerability to malnutrition and the memory deficits typically associated with aging, future research should address the question of how nutritional status influences mental functioning.

Alcohol

Most studies on the effects of alcohol intake on cognitive performance show a negative linear relationship between amount of alcohol consumed on a single occasion and performance on cognitive and memory tasks (see Rybak, 1971, for a review). The alcohol-related declines in memory performances may be independent of age (Drum, Noble, 1977), although some research suggests that older adults may be more sensitive to the effects of alcohol than younger adults (Zanid, 1980). Hence, it is important to consider both the immediate and the possible long-term cumulative effects of alcohol intake on memory functioning of older adults. Furthermore, it is useful to think about alcohol intake as varying along a continuum that ranges from low to high amounts on any single occasion or multiple occasions (Park, Noble, & Aitken, 1977; Rybak, 1971).

Alcohol is the most widely used drug in the United States. Nearly 70% of the population take a drink at some time during any given year, and approximately 80% drink at least once a month (Abelson, Fishburne, & Cain, 1977). Moreover, the average daily consumption of alcohol appears to peak after age 34 (Mair, Wilson, Williams, & Aitken, 1976). Still, negative effects of alcohol on memory are not restricted to alcohol abuse. Research on middle-aged moderate drinkers suggests that low levels of intoxication can have negative effects on different aspects of the memory system.

With few exceptions (e.g., Jones, 1973), most research indicates that alcohol produces no negative effects on immediate memory (Davis, Gibbs, Davis, Jetter, & Trowbridge, 1944; Hutchinson, Toutchie, Gray, & Steinberg, 1964; Talland, Mendelson, & Ryack, 1964). Likewise, research indicates that small doses of alcohol do not interfere with long-term memory. In contrast, several studies (Hutchinson et al., 1964; Jones, 1973; Moller, Tarpey, Giorgi, Mirone, & Rourke, 1964) show that relatively small doses of alcohol (e.g., 0.01 to 0.21 oz) can adversely affect short-term memory (Jones, 1973; see Loftus, 1980, for a review). In general, then, it appears that modest alcohol use interferes primarily with short-term memory.

Most definitions of alcohol abuse are based on functional criteria. That is, alcohol abuse has been defined as consumption of alcohol that interferes with health, personal relationships, work, and social functioning. Findings from a
A nationwide survey of alcohol abuse in the United States indicates that every all age groups at least 10% of respondents can be classified as alcoholics. Alcoholism seems to peak at about 10% of adults between the ages of 35 and 50, it is estimated that 2% to 10% of adults over age 55 are alcoholics, although estimates of alcoholism may be underestimated (Schuckit & Miller, 1976). Indeed, records from general hospitals and psychiatric hospitals show that alcoholism among older adults as high as 60% (cited in Schuckit & Miller, 1976). Thus, the extent of alcohol abuse among the elderly may be greater than indicated by present surveys.

Memory losses due to long-term or severe alcoholism seem to take two forms: “grayouts” and blackouts. A grayout generally refers to memory loss for some events that occur while drinking alcohol. If a grayout occurs, memories for events experienced as fuzzy, vague, and fragmented; however, the person remembers some aspects of the events. In contrast, a blackout typically refers to a total loss of memory for events that occur while drinking alcohol (see Goodwin, 1977, for a review of terminology and research). A blackout occurs, it is likely that a person’s immediate and long-term memory will not be affected. Rather, research indicates that memory loss may be restricted to short-term memory (Goodwin, Gottheil, Halpern, & Freiden, 1970).

High doses of alcohol over prolonged periods of time may also have long-term effects on memory performance. Specifically, significant negative correlations between past history of alcohol intake and performance on laboratory memory tests (Parke & Noble, 1977). These findings imply negative “carry over” effect of heavy drinking on memory performance when a person is not drinking or intoxicated.

Research on alcohol intervention in middle-aged adults (e.g., detoxification) suggests that after initial phases of physical withdrawal, improvement is possible (Goodwin & Hill, 1975; Parsons & Frigato, 1977). Moreover, improvements in cognitive performance occur with little residual decrement after 1 year (Lang & McLaughlin, 1974). Thus, under some conditions the effects of alcoholism on memory performance are potentially reversible. Although older adults have not been the target population of these intervention studies, benefits of intervention on memory of older adults may be expected.

In addition to the direct effects of alcohol on memory performance, there are indirect effects that may result from psychological and physiological states produced by drinking. For example, alcohol is a depressant that slows the rate of neuronal firing (Mishara & Kastenbaum, 1980). Insomia as decreased alertness and sensory functioning are associated with decreases in memory functioning (see “Sensory Functioning,” below), alcohol intake may indirectly decrease memory functioning. Also, nutritional status often declines with heavy drinking because alcohol provides energy (calories) without nutritional content. Alcohol-related deficiencies of vitamin B12 can result in Korsakoff’s syndrome (Mishara & Kastenbaum, 1980), a chronic organic brain disorder; and as indicated earlier, deficits of vitamin B12 appear to be associated with impaired mental functioning (Rosenthal & Goodwin, 1983).

Drugs

Research on memory loss due to prescription and over-the-counter drugs is particularly important because of the widespread use of medications by older adults. In the United States, the proportional use of medications of all kinds is higher for adults over 65. For example, psychotropic drugs (e.g., neuroleptics) are commonly used by older adults in nursing homes, and over-the-counter drug use (e.g., sleeping pills and pain relievers) is higher for community-dwelling older adults than for younger adults. As noted by Avorn (1983), “this cohort, which comprises only 11% of the United States population, consumes 25% of all prescription drugs” (p. 138).

Diazepam (i.e., Valium®), a sedative commonly used by older adults, has been found to impair memory performance (Block, DeVoe, Stanley, Stanley, & Pomer, 1985). For example, 10mg doses significantly reduce recall, and the side effects of a variety of doses (2.5 to 10mg) are similar to symptoms of memory loss associated with Alzheimer’s disease. Moreover, older adults are more sensitive to the side effects than younger adults.

The side effects of medications on memory require further attention. Older adults commonly take many medications that may not be metabolized in the same way that they are by younger adults. Moreover, the possible interactive effects of multiple medications are not as yet adequately understood. Until the relationship between drugs and memory is better understood, assessment of memory in older adults may overestimate or misdiagnose problems (Avorn, 1983). In addition, continued use of drugs such as psychoactive medications may have long-term negative effects on memory that may hasten and amplify memory loss.

Sensory Functioning

The senses receive information and structure perceptions of the world. Much research suggests that age-related declines in sensory functioning are correlated with declines in cognitive functioning (Birren, Botwinick, Weiss, & Morris, 1963; Ochs, Carin, & Harman, 1981; Sklar & Edwards, 1962). The auditory system’s relation to memory function probably has been most widely researched. Age-related declines in auditory reception are very common, especially for high frequencies (Weiss, 1959). For example, it has been estimated that approximately 15% of the population is deaf by age 75 and a considerably larger proportion has some form of hearing impairment (Rockstein & Sussman, 1976). In fact,
Statistics indicate that hearing impairments are the second most common chronic condition of older adults (Corso, 1977, 1984), and the severity of hearing impairments tends to increase with age (Kapp, 1970; Rockstein & Susserman, 1979). The recognition of this age change in hearing is that some information is simply not heard and is unavailable for storage and retrieval (Thomas et al., 1983). In some conditions, failures to hear are not obvious, and in others the extent of hearing loss may be intentionally hidden by older adults. Yet failures by older adults to produce verbal information on requests to remember may be mistakenly attributed to decline of memory abilities or symptoms of dementia.

Auditory deficits have implications for memory functioning that go beyond failure to pick up information. For example, presbycusis, a progressive age-related loss in the ability to hear high-frequency sounds, may lead to distortions of information. In particular, because high-frequency consonants (e.g., s, z, f, and g) are less audible, the normal flow of a conversation may be disrupted (Corso, 1977, 1982), and older adults may strain to follow a conversation (Corso, 1977). Indeed, some research indicates that by the age of 60 a person can miss up to 25% of the words in a conversation (Goldman & Regier, 1967). As a result, older adults may incorrectly infer the content of a discussion. Such inaccuracies may create an illusion of cognitive and memory incompetency.

The older adult with hearing difficulties may feel embarrassed, inferior, and anxious in conversations (Corso, 1977; Hull, 1978; Weinstein & Ventry, 1982). Moreover, stress experienced by older hearing-impaired adults may be compounded during formal interactions such as speaking with professionals (e.g., doctor, lawyer, or social worker). In fact, under such potentially evaluative conditions, an older adult may experience levels of stress that further impair his or her ability to understand speech (cf. Corso, 1977), and, as discussed earlier, anxiety may also contribute to memory problems.

**Remediation of Memory Problems**

The high incidence of memory complaints by the aged that was discussed previously has resulted in the proliferation of geriatric memory screening and training programs (e.g., Kuhl et al., 1975) and a sizable body of research on cognitive training (e.g., Poor, Fozard, & Treat, 1978; Poor, Walsh-Sweeney, & Fozard, 1983; Smith, 1980; Yesavage, 1984; Zarit, Gallagher, & Cramer, 1981). In the sections that follow, issues relevant to memory training are discussed. First, a brief review of strategies that can be used to aid memory performance is presented; then factors considered important for the development of better intervention programs are suggested.

**Strategies**

The notion that memory skills can be developed in much the same way as athletic skills has led to the publication of a number of self-help books on memory (Cermak, 1975; Loiselle, 1989; Lorayne & Lucas, 1974; Montgomery, 1972; Roth, 1918; West, 1986; Wood, 1937), as well as reports about memory experts (e.g., Luria, 1968; Yates, 1966). Three major methods of improving memory (see Harris, 1980) are (1) physical treatments (e.g., drugs), (2) external aids (e.g., diaries, notebooks, and electronic gadgets), and (3) internal aids (e.g., rehearsal and imaging). In addition, because some memory problems of older adults probably are attributable to high anxiety and/or poor concentration (see previous discussion), strategies to increase attention (e.g., Zait, Gallagher, & Cramer, 1981) or reduce anxiety (e.g., Yesavage, 1984) might be helpful to older adults.

**Memory Aids.** *External memory aids are objects such as diaries, address books, calendars, note pads, pill boxes, digital watches, timers, microcomputers, and electronic devices commonly used to support memory in everyday situations.* (Cavannaugh et al., 1983; Harris, 1980). Some external memory aids involve the use of externals to aid storage of information, and the others involve the use of externals to cue actions. An example of externally aids storage is writing down intermediate results during mental calculations. An example of externally cues action is writing in notes in a diary to remember to acknowledge a special occasion. Harris (1980) suggests that for cues to be effective they should (1) be given close to the time that action is required, (2) be active rather than passive, and (3) be specific to the particular action. In addition, he suggests that internal memory aids should (1) be portable, (2) fit a wide range of situations, (3) store many cues for long periods of time, (4) be easy to use, and (5) not require a pen or pencil.

**Internal Memory Aids are mental strategies that can enhance learning and later recall of information.** (Bellezza, 1981). In general, they supply meaning and order to information, that is, they embellish what is being learned (Morris, 1979). Examples of such embellishing strategies are letter identification, rhyming, story relating, peg or hook methods, place or loci methods, turning numbers into letters, face-name association, mental rehearsing, and search through the alphabet (for detailed descriptions and discussions of schemes, see Higbee, 1977; Lorayne & Lucas, 1974; Morris, 1979). According to Harris (1978), two internal aids, mental rehearsing and alphabetical searching, are used most frequently in everyday life. They are different from most internal aids in that they require no special encoding effort to use.

**Attention Enhancement and Anxiety Reduction.** It has been suggested that the aged suffer from impairments of concentration and attention that may limit memory (e.g., Yesavage & Rose, 1983; Zarit et al., 1983). Because relaxation training often enhances attention, a number of investigators concerned with...
memory problems of older adults have attempted to teach them to use relaxation techniques. Yesavage (1984) found that relaxation training reduced anxiety and improved recall of older adults. It is interesting that the improvement seen in Yesavage's (1984) study was of similar magnitude to the age-related deficits typically observed in studies of memory. This pattern supports the view that relaxation treatment could have practical benefits for the elderly. It is important to note, however, that relaxation training (Yesavage, 1984; Yesavage et al., 1982) has not yet been shown to have long-term positive effects on memory. As in studies of test anxiety in college students, general anxiety is not reduced without additional training in required learning skills (Eisdorfer, 1968).

Memory Training Programs

Future research on memory training should focus on the discovery of more effective mnemonic techniques, adjust to individual differences, and aim at the development of better diagnostic procedures.

Discovery of More Effective Mnemonic Techniques. Because research has demonstrated age-related declines in both acquisition and retrieval processes, memory training for the elderly should include techniques to aid both acquisition and retrieval. Unfortunately, most cognitive-skills training focuses only on acquisition. Moreover, training typically involves a broad-spectrum or multi-faceted approach of underdemonstrated utility. More effective techniques need to be discovered before memory training can be expected to be optimally valuable for the elderly (Winograd & Simon, 1980).

Attention to Individual Differences. The elderly are a heterogeneous population. For example, they vary considerably in number of years of formal schooling and occupational experience. Treat. Poon, Pozzard, and Popkin (1978) argued that these factors should be considered in designing training programs for the elderly. They cite a study by Bellin and Bellin (1968) demonstrating that individuals who participated in almost any kind of formal course work after leaving school benefited more from skills training than did age peers who had not had such experiences. Individual differences in temperament, cognitive style, and other personality characteristics also are likely to affect cognitive functioning (Cavanaugh & Murphy, 1980; Treat et al., 1978), as in depression (Kahn et al., 1975), anxiety (Eisdorfer, 1968), and attention (Treat et al., 1978). Training will be most effective when changes in affective status (Popkin et al., 1982; Yesavage et al., 1982) and underlying belief systems (Berry, 1986; Cavanaugh & Murphy, 1980; Lachman, Steinberg, & Trotter, 1985) are goals of the program. Likewise, training will be more effective when individual differences in cognitive style are considered. For example, some people may benefit from mental imagery, whereas others may benefit more from verbal elaboration (Winograd & Simon, 1980). Training programs should be designed with these and other individual differences in mind (Yesavage & Rose, 1983).

Development of Better Diagnostic Procedures. Adequate instruments to differentiate memory problems due to mild and/or moderate cases of gradual onset or organic brain syndrome from those due to normal age-related encoding difficulties, transient affective states, or noxious environments are not available at the present time. Poon et al. (1978) argued that although short and portable assessment questionnaires are preferred by clinicians, these instruments do not provide enough information to evaluate more subtle changes in specific types of memory functions. In addition, to obtain a more comprehensive description and understanding of the impact of the complaints among the aged, instruments that aid the individual in subjectively articulating complaints need to be developed. These instruments would provide detailed information concerning individuals' self-perceptions of their memory and related problems. That information, along with objective measures of memory performance, should add to understanding about why some younger adults have poor memory, whereas some older adults retain good memory throughout their later years.

SUMMARY AND CONCLUSIONS

Although some age-related decline in memory probably occurs, most memory changes that result from normal aging are not as extensive within individuals or as representative within the population as previously had been believed (Zant et al., 1981). Still, when older adults become aware of memory problems, many become quite alarmed (see Poon et al., 1980). One reason for the alarm is that memory loss has been found to be a reliable early sign of organic brain disease. Despite the sadness and severity of problems experienced by these patients and their families, the actual incidence of organic brain disease in older adults remains quite low. Unfortunately, it is possible that older adults' concern about less significant memory loss may compound or magnify problems that do exist. Therefore, when working with relatively healthy older adults, it is important first to consider possible transitory, nonmemory factors that could be contributing to memory problems and then to provide the clients with some perspective on their memory failures.

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Reading Comprehension and Aging

Chapter 4

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