

**NEW DIRECTIONS FOR AN
APPLIED DEVELOPMENTAL PSYCHOLOGY
OF ADULTHOOD**

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INTRODUCTION

The central thesis of my presentation will be that we now know enough about the developmental phenomena which occur past adolescence to begin to apply our basic knowledge for human welfare. Such application may involve behavioral intervention with individuals or the prescription of societal options relevant to the formulation of public policy. A number of social scientists have indeed begun to operate on the basis of this thesis, albeit often without clear understanding of both the certainties as well as the limitations imposed by the knowledge base which is now at our disposal.

I will begin by commenting briefly about adults and the elderly as target populations for applied developmental psychology. I will then sketch the premises which lead me to conclude that the requisite knowledge base exists. Next I will make some assumptions about adult development, or perhaps try to explicate certain propositions, some of which are based on fact, while other may simply be cognitive statements of belief, which are permissible only because nothing is known at the present time that would successfully falsify them. I will then give some examples of what I consider to be appropriate applications of developmental psychology to problems of adulthood and aging. And finally I will consider implications for the training and employability of what may soon become a sizable group of members of our discipline.

ADULTS AND THE ELDERLY AS A POPULATION OF CONCERN

In the early development of the behavioral sciences researchers and practitioners focused primarily upon the early stages of life, with only a slowly emerging shift of concern from infancy and childhood on towards adolescence, and then to the issues surrounding family formation. What came beyond was largely ignored, for some very good reasons!

To understand the developmentalist's neglect of adulthood, it may be well to remind us that in the year 1900 only 28 per cent of America's population, just slightly above one fourth, had attained

or passed the 35th year of age, and no more than a trivial 3 per cent had reached or exceeded the magical age of 65, often thought of in our culture to mark the threshold of old age (Knox, 1977).

By contrast, data for 1980 showed that 45 per cent of the population had reached or passed age 34, and 11 per cent are 65 years of age or older. Over the same period of time average life expectancy in the United States has improved from an average of 51.1 years to 76.4 years for women, and from an average of 48.2 years to 68.7 years for men.

Surviving beyond mid-life, in the past, was a relatively rare phenomenon, one often restricted to the most hardy and environmentally favored, indeed that rare breed of person that very likely would require little professional attention throughout their life. With respect to the middle-aged adult we find the general stereotype held, that most problems during this life-stage are unique to the individual and have no developmental implications. Professional services for middle-aged adults then are oriented about specific psycho-pathologies or subject-matter oriented life crises. Only recently has attention been given to developmental crises of middle adulthood, and then the concern has been largely of an existentially-oriented nature (e.g. Gould, 1978; Levinson, 1978; Vaillant, 1977).

When we turn to the elderly, we note that early professional opinion held that when older persons suffered severe diseases or psychopathology, successful intervention was likely to be difficult, and with post-intervention life expectancy suspected to be brief, often not deemed worthy of the professional's efforts and energy. Many professionals feel uncomfortable working with older clients, and older persons, in turn are leary of dealing with psychologists and other mental-health oriented professions. As a consequence we find that mutually aversive stereotypes have interfered with the provision of high quality services to older adults in the public sector, and services geared to the needs of this group are underdeveloped because of the often inappropriate notion that most older persons cannot afford privately financed professional services.

Many of these stereotypes require revision when we examine the factual situation of middle-aged adults and the elderly. The latter in particular remain one of our critical under-served population sub-groups, even though those requiring massive services represent a relatively small fraction of the total group. Before we describe some of the directions in which psychologists might provide new services for the adult population, we must next ask the question whether there now is a knowledge base that would provide a suitable infra-structure for our efforts (cf. also Schaie, 1982).

THE KNOWLEDGE EXPLOSION ON ADULT DEVELOPMENT

Over the past two decades there has been an explosion of knowledge about the psychological, biological and social development of adults. For example, a single volume entitled the *HANDBOOK OF AGING AND THE INDIVIDUAL* (Birren) offered coverage of most of the Gerontological literature in 1959. Almost twenty years later the revised handbook not only had to be split into two volumes (Birren & Schaie, 1977; Finch & Hayflick, 1977), but within three short years led to two additional volumes, one on geriatric psychiatry (Busse & Blazer, 1980), and one on mental health and aging (Birren & Sloane, 1980). In addition there are now two major serial publications dealing with adult development, one of which, the *Annual Review of Gerontology and Geriatrics* (Eisdorfer, 1980) surveys broadly across many disciplines, while the other, *Life-span Development and Behavior* (Baltes, 1978) concentrates upon behavioral development with major emphasis upon the life periods beyond childhood. Several major publishers have now in place series of monographs on human aging.

The knowledge explosion can be well documented by considering the rapid increment in publications relevant to the psychological study of human aging. The first important psychological studies of adult development in the United States were published in the 1920s, but barely more than a trickle of research occurred prior to the 1950s (cf. Charles, 1970). This trickle soon thereafter grew into a stream, almost a torrent. From 1968 to 1979, for example, psychological publications on age-related phenomena in adults increased by 270 per cent. The dramatic increase in publication rate is vividly shown in Figure 1 (Poon & Welford, 1980).

Figure 1 about here

During the early stage of our discipline, with some few exceptions, developmental psychology was virtually synonymous with child psychology, or at best extended into adolescence. This state of affairs has changed radically in recent years. Nary a textbook using the title "developmental" fails to include at least some token chapters on adult development and aging (e.g. Mussen, Conger, Kagan & Geiwitz, 1979), and recent major surveys and handbooks of developmental psychology have included heavy coverage of the adult life stages (e.g. Brim & Kagan, 1980; Wolman, 1982).

Specific courses on adult development and/or aging were a rarity only a decade ago. Now they have entered the standard curriculum and virtually every major textbook publisher seems to feel the obligation to include a text on "adult development and aging" in their list (e.g. Hultsch & Deutsch, 1981; Huyck &

Hoyer, 1982; Schaie & Geiwitz, 1982; Troll, 1982). Popular and semi-popular volumes have attempted to translate this information for the increasingly better-educated lay public who are interested in their own development as adults. Examples of this literature may be found in Gail Sheehy's *PASSAGES* (1976), Levinson's (1978) treatment of male mid-life crises, Butler's (1975) Pulitzer-prize winning discussion of the elderly in America, and Kuebler-Ross' (1974) provocative formulation of stages of dying.

Following the more general treatments of adult development, there have also been a number of specific ventures into more applied topics. These have been in particular evidence in the field of clinical psychology, ranging from general treatments (e.g. Storandt, Siegler & Elias, 1978), to fairly specific topics such as a monograph on cognitive and emotional disturbance in the elderly (Eisdorfer & Friedel, 1977). Major attempts have also occurred to examine implications for adult education, beginning with Knox's (1977) comprehensive survey of adult development and learning, followed more recently by Chickering's (1981) edited volume describing the effects of an increasingly older college population on demands for instruction and instructional organization. Finally we see the beginning of an examination of adult transformations in the world of work, from the study of aging within specific industrial organizations (Bray & Howard, 1982) to more general treatments of work-related adult development (Havighurst, 1982).

SOME FUNDAMENTAL ASSUMPTIONS

The account just given suggests the presence of a substantial knowledge base and some beginning attempts to apply this knowledge base to areas of traditional concern to psychologists and other social scientists. What seems to be missing in most attempts at application, however, is a careful consideration of adult development from a life-span (or for that matter any other theoretical) point of view. In fact it seems that the major implicit assumption for applications of developmental principles is the acceptance of the stability of adult behavior when considering fields such as education or industrial psychology. However, when application is made to questions of psychopathology, the medical model, focussing on irreversible decrement, is then generally followed.

Neither of the above assumptions is necessarily wrong; in fact they may be quite valid in certain instances. What is at fault though is the typical failure to explicate basic assumptions, as well as the apparent tendency to assume certain givens to hold across all adult behaviors and for all individuals at a particular adult life stage. Since nothing could be further from the truth, I would like to spell out in some detail how

adult development differs from paradigms appropriate for early life. Important consequences for applied research and intervention evolve from these differences.

The Difference Between Development and Aging

It is obviously possible to use the terms "aging" and "development" interchangeably as indicators for a process which, throughout life, may take a variety of directions, intensity and ranges of occurrence (Baltes & Willis, 1977). For the applied developmental psychologist, who frequently was trained and oriented toward an appreciation of early development, it is important, however, to understand the subtle ways in which our interests must shift as we move from matters relevant to the analysis and intervention of emergent behavior to a concern with the plateau of apparent adult stability, and beyond that to eventual decline, deficit and death.

Early development is characterized by a remarkable degree of isomorphism between physiological structures required for the establishment of a given behavior and the observation of that behavior's emergence (Flavell & Wohlwill, 1969). Most noteworthy behavior changes that occur between birth and maturity can readily be observed in practically every surviving individual. Individual differences on early adaptive behaviors are typically quite small. Moreover, the time interval distinguishing the occurrence of the behavior in the least and most advanced individual is usually at most of the order of two or three years. On the contrary, as adulthood is reached, the isomorphic relation between structure and function, for the most part, can no longer be readily observed. In the realm of cognitive behavior, for example, attainment of the Piagetian stage of formal operations does not seem to depend upon the appearance of specific structural properties of the organism (Piaget, 1972). In old age, moreover, performance decrements in behavior are only rarely observed as direct consequences of specific physiological deficits (Birren & Renner, 1977).

Another important distinction between development and aging involves the shift of behavioral goals of most individuals from the acquisition of skills in childhood to the application of these acquired skills and then to their use in the performance of responsible societal roles and other tasks of adulthood (Chickering & Havighurst, 1980; Kohlberg, 1973). Behavioral goals may again be impacted as persons get older by the desire to engage in adaptive behaviors within the constraints of less stable physiological structures; such goals may, of course, be perceived by younger observers as largely egocentric in nature. A useful schema characterizing these changes is given in Figure 2 (Schaie, 1977/78).

Figure 2 about here

Of importance also is the progressively increased range of individual differences in the maintenance of adaptive functions and in the ability to modify undesirable behaviors or to relearn lost skills (Baltes & Schaie, 1976; Baltes & Willis, 1978). It should be stressed that the range of observed behavior at any given age increases markedly in adulthood, such that many elderly adults will still perform well above the average for young adults (Schaie, 1979). Indeed there are many instances of persons in quite advanced age displaying selected behaviors which lack any substantial decline from previous levels, a finding which suggests that interventions designed to restore presumed age-related deficits may be eminently practical (cf. Baltes & Willis, 1982; Willis & Schaie, 1981). Finally, it should be noted, that contrary to what we would find in childhood, adults tend to maximize individual differences because of self-initiated life styles which may markedly effect the maintenance or decline of complex behaviors and of optimal physiological adaptation (Gribbin, Schaie & Parham, 1980; Schaie, 1981).

Basic Models for Adult Development

It is quite possible to view childhood development as a unidirectional phenomenon leading from simple to more complex expressions of behavior. No such unitary assumption is warranted beyond adolescence. I have previously indicated that students of physiological and cognitive changes during adulthood have generally posited an irreversible decrement model (also at times referred to as a medical model) while those interested in personality have generally preferred a stability model. An attempt will now be made to explicate the assumptions for these models as well as to describe a third possible model, decrement with compensation, which I find far more useful for much work in applied developmental psychology (for more detail see Schaie, 1973).

Each of these models imply assumptions about the nature of the data base required to support them as well. Although this is not the proper occasion to talk about the design of developmental data collections it may help to review briefly the several designs currently in vogue for that purpose. Such a review is provided by Figure 3 (for an elementary introduction to these matters see Schaie and Geiwitz, 1982, chapter 1).

Figure 3 about here

IRREVERSIBLE DECREMENT. This is the model implicitly assumed to prevail in most traditional discussions of physiological and cognitive behavior changes past the prime of life. The model is attractive, where true, because age functions fitting this assumption can indeed be used to predict behavior change from knowledge of a person's chronological age. Also on variables conforming to the model, individuals could readily be classified as behaving like average persons of a younger or older age level. Unfortunately, implicit acceptance of this model will focus attention on those behavior characteristics which are substantially affected by the impact of adult decremental changes in the peripheral sensory functions and response speed, all of which might be compensable by the provision of prosthetic strategies and environments. Cross-sectionally obtained data on age differences are irrelevant to a test of the validity of the irreversible decrement model; such data confound age changes with cohort differences. Only longitudinal data can provide relevant information, and the cohort-sequential strategy (see Schaie, 1977; Schaie & Hertzog, 1982) would be preferred to examine the generality of decrement functions over successive cohorts. An important assumption for the validity of this model is the absence of secular trends (or period effects), since such effects, if negative could masquerade as decrement or if positive could make it difficult to detect decrement.

ADULT STABILITY. Here it is assumed that behavior will remain stable once the most adaptive maturational level is attained in young adulthood. The model has most frequently been advocated in the personality realm, but it may also be valid for certain cognitive abilities of a crystallized nature; i.e. if all environmentally available information has been mastered and none is lost, behavior ought to remain stable (cf. Cattell, 1963). Note that given the stability model interest no longer centers in age-related behavior change, but instead the concern must then be with the secular trends and generational differences that may affect adaptive behavior. In the presence of generational differences, cross-sectional data would spuriously challenge this model as would longitudinal data in the presence of period effects. Consequently, the cross-sequential strategy would be preferred to examine data sets thought to support the model.

DECREMENT WITH COMPENSATION. A much more reasonable model for adult behavior change, particularly for those of us who are intervention-minded, is to agree that there may indeed be cumulative unfavorable effects upon biologically fragile organisms, such as we all are, as a function of adapting to the demands of an environment which may not always be as favorable or friendly as we would like it to be. The model can, but does not need to accept linear decrement; it would be quite compatible with recursive functions, involving partial spontaneous remissions or improvements of performance. It generally, however, would assume

progressively accelerating patterns of decrement accompanied by reversals occasioned by active interventions. Such interventions might consist of the fitting or adjusting of mechanical prostheses (such as hearing aids, eye glasses or computerized memory aides), but would also include prosthetic manipulations of the physical environment, as well as changes in social support systems, stereotypes and educational practices. This model is best evaluated by conducting traditional controlled pretest-intervention-posttest manipulative studies. However, when the concern is with age-relevant naturalistic interventions, application of the time-sequential strategy may be needed, if we are willing to assume further that such interventions are neutral with respect to cohort differences.

Having considered some of the meta-concerns facing the adult developmentalist who wishes to apply his knowledge base to practical matters and societal issues, we are now finally ready to begin sketching a number of examples that I feel point to some of the new directions we are about to see being explored more widely.

NEW AREAS OF APPLICATION

Perhaps the substantively most important area that might well be considered part and parcel of an applied developmental psychology of adulthood has thus far been the use of our knowledge on changes in cognitive behavior to the differentiation of normal and pathological aging in the context of clinical practice. Since these applications are well known, (see Birren and Sloane, 1980, for many examples), I have elected to ignore them in this presentation. Instead I would now like to indicate a number of other areas where our knowledge base on aging phenomena, cognitive or otherwise, might prove to be rather useful. My presentation will certainly not be exhaustive, but is rather designed to give some examples and point to what I think are fruitful directions that will likely be pursued in the proximal future.

I will begin by talking about some behavioral age changes which impact our environment and might involve areas traditionally considered to be within the concerns of the human factors psychologist. Next, I will consider a number of issues concerned with the impact of aging upon the individual as a worker, both in the workplace and as persons consider the transition from work to retirement; matters otherwise of concern to the industrial-organizational psychologist as well as to the counseling psychologist. And finally I will speak to the issue of the adult learner, a population thus far largely neglected by educational psychologists, even though adult education is clearly a major growth area for most institutions of higher education.

Development as a Human Factors Problem

It is sometimes convenient to conceptualize adult behavior as a dialectic interaction between a changing environment and the developing organism. More specifically, we may note that relatively regular biological changes lead to modifications of the environment which in turn program adaptive behaviors designed to cope with the changed attributes of the environment. I will not attempt here to chart a formal dialectic model of adult development. That has been done by others more qualified, notably the late Klaus Riegel (1975, 1976). What I mean to do instead is to examine the consequences for adaptive behavior of those biological changes which require an environmental response if a behavioral equilibrium is to be maintained for the individual that assures maximal opportunities for effective functioning.

When we consider human factors for which compensatory interventions may be required, we are particularly impressed by a number of fairly normative age changes affecting sensory and perceptual capabilities at least from the forties on. Figure 4 provides a dramatic illustration of population values gathered by the National Center for Health Statistics for the proportion of persons at various ages who have some impairment of visual acuity and/or hearing losses which affect the ability to perceive speech.

Figure 4 about here

CHANGES IN VISUAL ACUITY. During the fourth decade of life, structural changes begin to occur that effectively reduce light transmission and accommodation power. The cortex region of the crystalline lens thickens progressively and yellowing of the lens decreases sensitivity to the shorter wave length of the visible spectrum (Fozard et al., 1977). These changes have significant behavioral consequences. For example, older persons have difficulty in discriminating between blue, blue-green and violet, and consequently may have difficulties with product codes and/or computer displays commonly utilizing blue and green discriminants. The reduced accommodative power of the eye also affects unfavorably distance vision, sensitivity to glare, and depth perception. Moreover, by the sixth decade, a variety of circulatory and metabolic changes for many persons lead to a reduction of the visual field, decreased sensitivity to flicker and to low quantities of light.

Now none of these changes lead to absolute response failures for many persons, and many are clearly susceptible to intervention. But intervention cannot simply consist of advising middle-aged and elderly persons to seek regular consultations

with their optometrist or ophthalmologist. The fitting of proper eye glasses is, of course, a necessary but by no means a sufficient intervention. Additional interventions, for example, might involve the careful analysis of the interaction of specific visual changes with the visual environment. In fact we know that one of the most critical factors for visual acuity is the brightness of the image reaching the retina, but that increased illumination will not help much unless we also avoid increasing glare. We can certainly modify displays to take into account the reduced visual field of older persons, and we can go to appropriate efforts to develop color codes and contrasts which will not penalize many older adults.

CHANGES IN AUDITORY ACUITY. Hearing loss of some magnitude has been reported for men as early as age 32 and for women at age 37 (Lebo & Reddell, 1972). These changes are normally due to physiological degeneration in the auditory system involving a sensorineural loss of auditory acuity, a condition called presbycusis. The behavioral consequences of this condition found progressively in virtually all individuals to some degree as we age include decreased thresholds for pure tones, speech and pitch discrimination. High frequency losses in particular interfere with optimal communication because they result in difficulties in discriminating phonetically similar words. Communication problems are made even more difficult under unfavorable background conditions where the signal-to-noise ratio is low (Corso, 1977).

Hearing losses from presbycusis can often be compensated for by fitting appropriate hearing aids, but few hearing aid salesmen are qualified or interested in treating auditory prosthesis as the complex human factors problem that it typically turns out to be. Rarely does hearing loss proceed symmetrically and the fitting of binaural devices is not simple; inadequate fitting may result in pseudo-paranoias and other difficulties familiar to us from the dichotic listening literature. As important as proper hearing aids may be appropriate interventions to improve the acoustic properties of private and public areas frequented by older individuals and attention training and other ways of teaching more effective listening techniques may be quite effective.

CHANGES IN PERCEPTUAL SPEED. Age-related slowing of behavior has typically been attributed in the past to slowed mediation processes in the central nervous system (see Birren, Woods & Williams, 1980, for a recent comprehensive discussion). Recent studies of the phenomenon of perceptual masking, however, implicate as well changes in the peripheral perceptual system. "Perceptual masking" is the failure to perceive a visual or auditory stimulus if the display or sound is followed too rapidly by a second competing stimulus. At least by age 60 it appears that adults require substantially greater inter-stimulus intervals between two successive stimuli to be able to discriminate them

(Walsh, Till & Williams, 1978). With increasing age it is also found that additional scanning time is required in order to digest complex information.

The changes in perceptual speed have implications for a variety of communication situations, including educational settings. Some interventions which would be of substantial help to the aging adult involve slower rates of exposure of visual displays, increased redundancy of information, use of self-paced procedures whenever possible, and decreasing the amount of information complexity of any individual communication. The data on perceptual masking are obviously also relevant to highway safety and other instances where the temporal spacing of signals or cautionary instructions should be based on the whole range of users rather than the processing speed characteristic of a young-adult engineer!

Development as an Industrial-Organizational Problem

Most adults are members of the work force in one manner or another, and thus the changes enumerated above also directly impact the work-place. The more so as recent changes in mandatory retirement laws (age 70 on a national basis, with no age cap in certain states such as California and Maine) will result in increases in the average age of workers in most organizations, exacerbated by changes in the age structure of the population which has the baby boom (now at mid-life) followed by significantly sparser cohorts. But as the work force ages some additional parameters become equally prominent. Some of these are favorable, such as the lower incidence of accidents in older workers, although accidents which do occur are likely to be more severe. Some may be tradeoffs, such as increase in accuracy and involvement in the job and organization, compensating for slowing of performance. Others are less favorable, such as the increasing obsolescence, particularly in high-technology fields, as the workers temporal distance from his formal training increases.

Applied developmental psychologists with greater frequency will be asked to become involved in the assessment of older workers, to determine the need for retraining and/or reassignment. I have already had the opportunity personally to become involved in a number of cases of presumed age discrimination, questions such as a determination of reasonable arbitrary retirement ages in occupations involving public safety (e.g. commercial airline pilots), and the question of executive burnout. Every one of these matters has required detailed analyses of the research literature to extrapolate our knowledge base to specific applied issues, and I was pleased to note that it was not always necessary to plead ignorance or an under-developed state-of-the-art.

Of particular interest to applied developmental psychologists

within the industrial-organizational should be the phenomena of the mid-life crisis, obsolescence-resistant behavior or the remediation of obsolescence, and retirement as the transition from the world of work to other life roles.

THE MIDLIFE CRISIS. Although considered by many to be a broader existential phenomenon, the midlife crisis in men more often than not centers about the lack of attainment or the futility of obtained vocational goals (cf. Levinson, 1978). Some would argue that it is an inevitable characteristic of adulthood in an achievement-oriented society, indeed it has been studied mostly with white middle-class men in high status occupation. It's prevalence itself is controversial; Levinson (1978) claims to find it in 80 per cent of his men, while Bray and Howard (1982) suggest that such crises are far more rare, perhaps occurring in no more than a fourth of employed males. Be this as it may, there is clear evidence for career concerns related to developmental changes in goals, motives and sometimes abilities that require developmentally oriented career counseling in mid-life for many.

OBSOLESCENCE REDUCTION. We do know that older workers are at a disadvantage to their younger peers because of lower levels of formal education and being further removed from that formal training. In the developmental literature on abilities this fact has been most often discussed in studies addressing cohort differences in performance (cf. Schaie, 1979; Willis & Baltes, 1980). One of the more pressing developmental issues in an industrial context is the question as to what extent older workers will benefit in a cost-effective manner from on-the-job training or retraining activities. A pressing area of concern for the applied developmental psychologist is the question whether such remedial activities must be tailor-made to quite specific job situations or whether we can suggest more generalized ability training such as that found in the cognitive training literature (cf. Baltes & Willis, 1982; Willis & Schaie, 1981). Some of the literature on cautiousness in older persons would suggest that modifications of incentives (which frequently induce or reinforce cautiousness) may be quite promising (Birkhill & Schaie, 1975; Botwinick, 1969). But before we can move much further in this area we will also need to learn more about the kind of personal characteristics that induce some persons to be remarkably resistant to obsolescence, and we will have to find some better way to measure just what we mean by obsolescence in many career fields (see Dubin, 1971, for further discussion of some early approaches to these issues).

RETIREMENT. The eventual retirement of older workers is essential for the renewal of any organization. That decision, however, has now come increasingly under the control of the individual worker rather than his or her employer. The decision to retire, in an otherwise healthy and active individual often depends upon having some objectives which will give meaning to

their life in retirement as well as the assurance that retirement will not mean loss of support systems and economic deprivation. As a consequence, pre-retirement planning has become part of most better personnel practices, often not so much as a fringe benefit for long-time employees, but as a useful approach to the reduction of anxieties about retirement which might otherwise delay the retirement decision (cf. Atchley, 1975; Glamser, 1976). Here are many opportunities for applied developmental psychologists to develop analytical modes of determining better ways of assisting persons to develop realistic retirement plans and schedules and to assist industrial organizations to develop retirement incentives that will facilitate institutional renewal where appropriate.

Development as an Adult Education Problem

Whatever topic of normal adult development we touch we must soon note that intervention activities in many if not most instances must involve formal or informal educational approaches. This may not be the place to bemoan the imbalance of the American educational system which has traditionally maintained its role as our society's prime socialization agent, but has largely ignored the fact that socialization continues past adolescence. Even further it has largely failed to recognize that in a rapidly changing technologically-oriented society, early formal education soon becomes obsolete, and adults must be given support to prevent undue symptoms of future shock (Toffler, 1970). While there are many efforts labeled adult education, they currently suffer from still being too much oriented towards self-discovery and leisure activities. Textbooks in educational psychology virtually ignore the adult learner, and consequently many adult education programs are seriously flawed, because they attempt to teach middle-aged and older adults with the techniques and materials appropriate for college students. These problems are slowly coming to the awareness of adult educators (cf. Chickering, 1981; Knox, 1977) but little has been done to apply what we know about adult development to curriculum or instruction. A most fertile field indeed for the applied developmental psychologist!

I would now like to suggest that as applied developmental psychologists we can help our colleagues in adult education in at least two major ways. We can suggest first some important new roles for adult education, and second we may be able to convince educational psychologists that concern for the older learner may be important for the survival of that field, and, that there is a knowledge base for an educational psychology of adulthood.

Among new roles for adult education, the applied developmental psychologist might suggest the need of adults to learn about their own aging. Even more specifically, that can

have much influence over their own aging by understanding some of the principles how health and behavior interrelate as we get older. I have already stressed the need to reduce cohort-related obsolescence in the industrial context. There is similar need with respect to many activities of everyday living and changing technology, call it consumer education if you will. And finally there is an important need for adult education to be instrumental in facilitating the transitions leading to second, third and fourth careers for many technologically displaced adults, as well as education in skills required for the many volunteer activities needed by our society, which with the vanishing non-working housewife will largely devolve upon those retired from the work force.

But what do we offer the adult educator as a knowledge base that would justify our recommendations? Here we can address at least two issues. The first relates to the question as to the degree to which educational aptitude is maintained at different adult ages. The second, of course, concerns educational technology, and involves much of what we have said about the implications of sensory and perceptual changes with age but also include some additional concerns coming from the literature on learning and memory in adults (cf. Arenberg & Robertson-Tchabo, 1977; Schaie & Willis, 1978).

EDUCATIONAL APTITUDE. Before we suggest that adult education may indeed be the interventional panacea of choice, we must consider the evidence, if any, for the continuing ability of adults to benefit from formal instruction. This question is probably best asked by comparing adults at various ages with a young adult comparison group. Such data are available from my longitudinal inquiry of psychometric abilities (Schaie, 1979; Schaie & Willis, 1978). Figure 5 shows an index of educational aptitude (a linear composite of recognition vocabulary and inductive reasoning scores from the Primary Mental Abilities test) computed for samples aged 32 to 81 years of age as a proportion of such aptitude for 25-year-olds. The solid bars represent estimates based on favorably attrited longitudinal samples carried over at least fourteen years, the broken bars come from independent random samples of the same cohorts; the former probably more characteristic for the typical participant in adult education activities, the latter for unselected populations. The last set of bars in that figure represent the lower boundary of the middle 50 per cent range for young adults. This figure suggests that for favorably selected populations, educational aptitude remains high into very advanced age, and even the more conservative estimates suggest that on average educational aptitude does not decline below the mid-range of young adults until the late sixties are reached.

Figure 5 about here

TEACHING OLD DOGS NEW TRICKS. It goes without saying that all living organisms are capable of new learning. But it does not necessarily follow that the same technology will work as well. I will not here review the literature on adult learning (cf. Arenberg & Robertson-Tchabo, 1977; Botwinick, 1977; Knox, 1977), but rather would like to give an example, again from my own data on changes with age in the retrieval of what typical is well-learned (crystallized) information. I am talking about the observation that as we get older increasing retrieval difficulties impact free recall to much greater extent than they do adequately cued recognition.

Figure 6 about here

Figure 6 contrasts performance on vocabulary tests involving either recall or recognition (Schaie, 1980). Note that at age 25 men do equally well at both word recall and recognition, although women do slightly better on recognition than on recall. Word recall shows almost linear decline with age, while recognition improves or maintains at least until the late sixties. Note also that decline in recall is greatest for women, while decline in recognition is greatest for men. Obviously, these data have substantial implications for the adult educator, both with respect to memorization strategies and for the design of examinations; contrary to folk-wisdom older learners are likely to do better on multiple choice than on essay examinations!

SOME CONCLUDING THOUGHTS

I have presented you with some evidence regarding the existence of a knowledge base which encourages me to suggest that we are ready to speak seriously about an applied developmental psychology of adulthood. I have also examined some areas of application to which our present knowledge base speaks. Perhaps I should add a few words regarding the implications for the training of students who would wish to pursue the lines I have suggested and to indicate where there might be job roles for the kind of intervention activities suggested by my remarks.

Those wishing to apply adult development principles must obviously be well trained in the knowledge base and the methodologies (descriptive and experimental) required for their understanding and expansion. In addition I would expect that some hands-on practica would be needed in settings where well-functioning adults are to be found. Such settings could be personnel departments in industry, educational, vocational and other adult counseling centers, health planning agencies,

community centers or city planning commissions. The major requirement would be opportunities to observe adults at various ages and in different roles and to become familiar with relevant public policy issues. In addition to traditional models of research design and data analysis, training emphasis would need to be given to methods of evaluation research, needs analysis, systems analysis and techniques for the causal modeling of quantitative and qualitative data.

As traditional roles for developmental psychologists shrink at both child and adult levels, the kind of issues I have sketched are likely to open new employment opportunities. I see such opportunities arising in industry and adult education, within private consulting organizations, health and community planning agencies, and on the staff of government legislative as well as executive entities. Indeed the new roles for applied developmental psychologists are only limited by our imagination in applying our knowledge base to relevant social issues, our ingenuity in expanding the knowledge base in ways which are relevant to our society's pressing problems and needs, and the willingness of our society to move forward in the solution of the human problems characterizing a highly developed longevous society.

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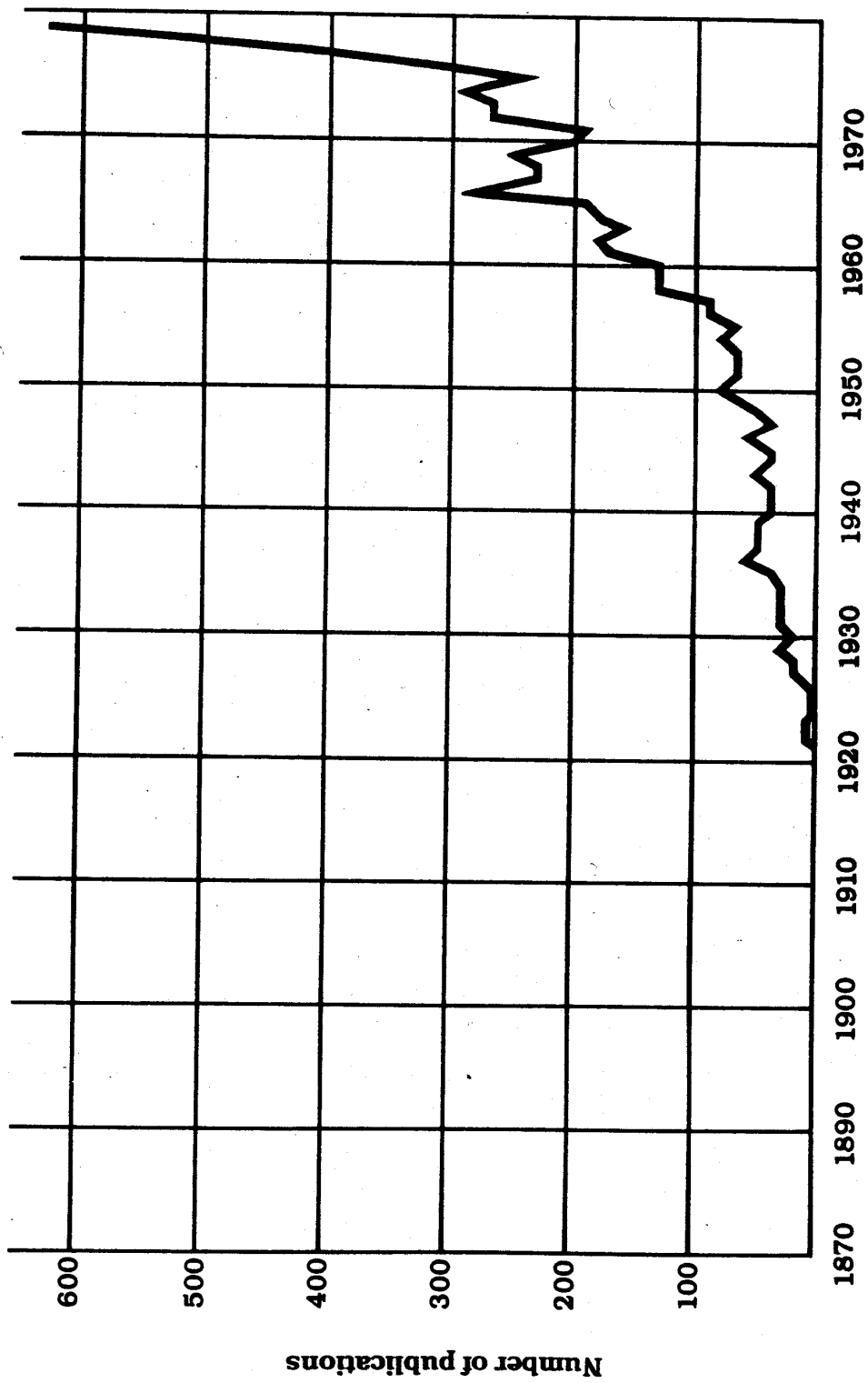
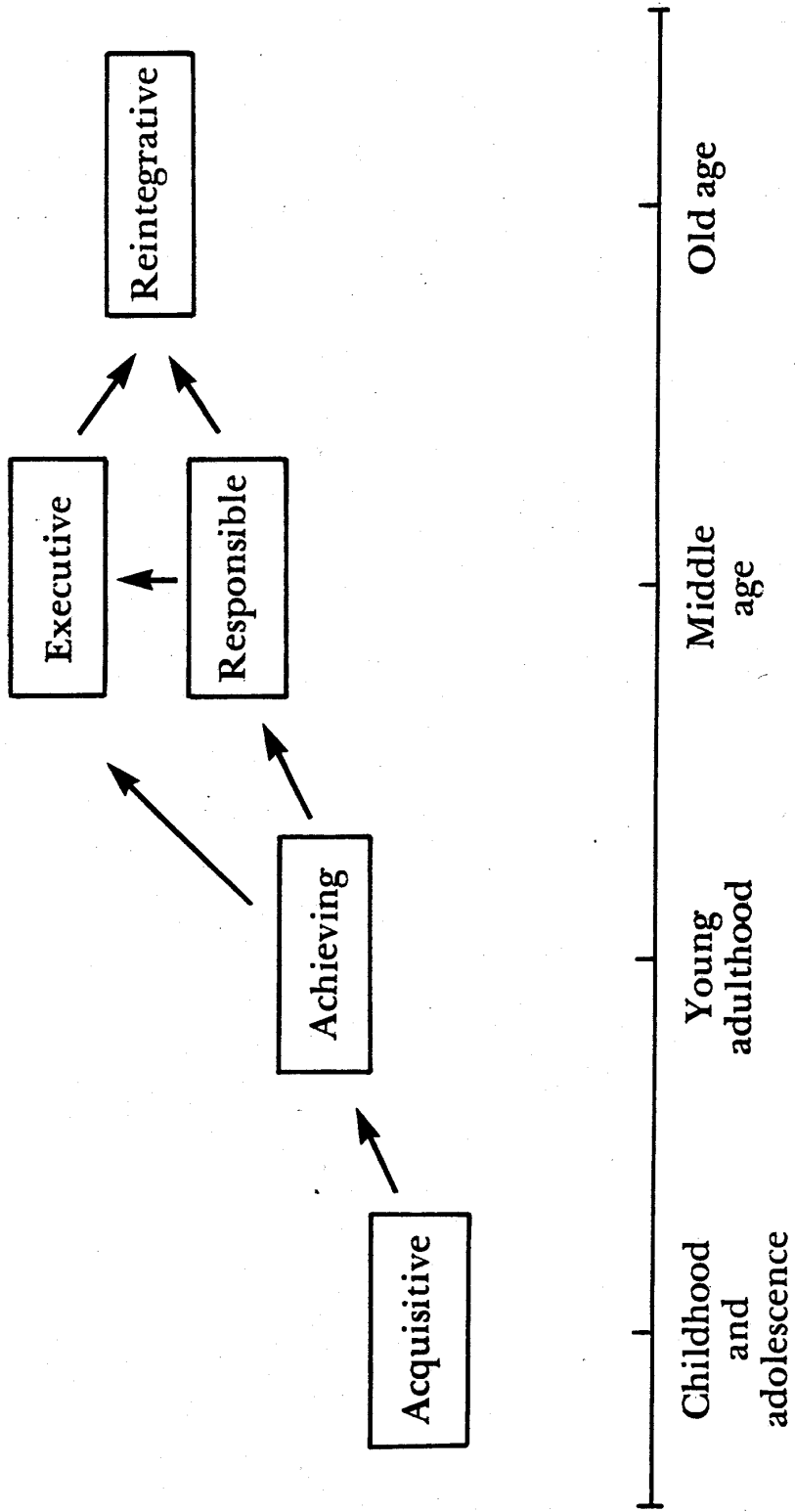


FIGURE 1

Number of psychological aging publications per year from 1880 to 1979.

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Figure 2. Stages of Adult Cognitive Development



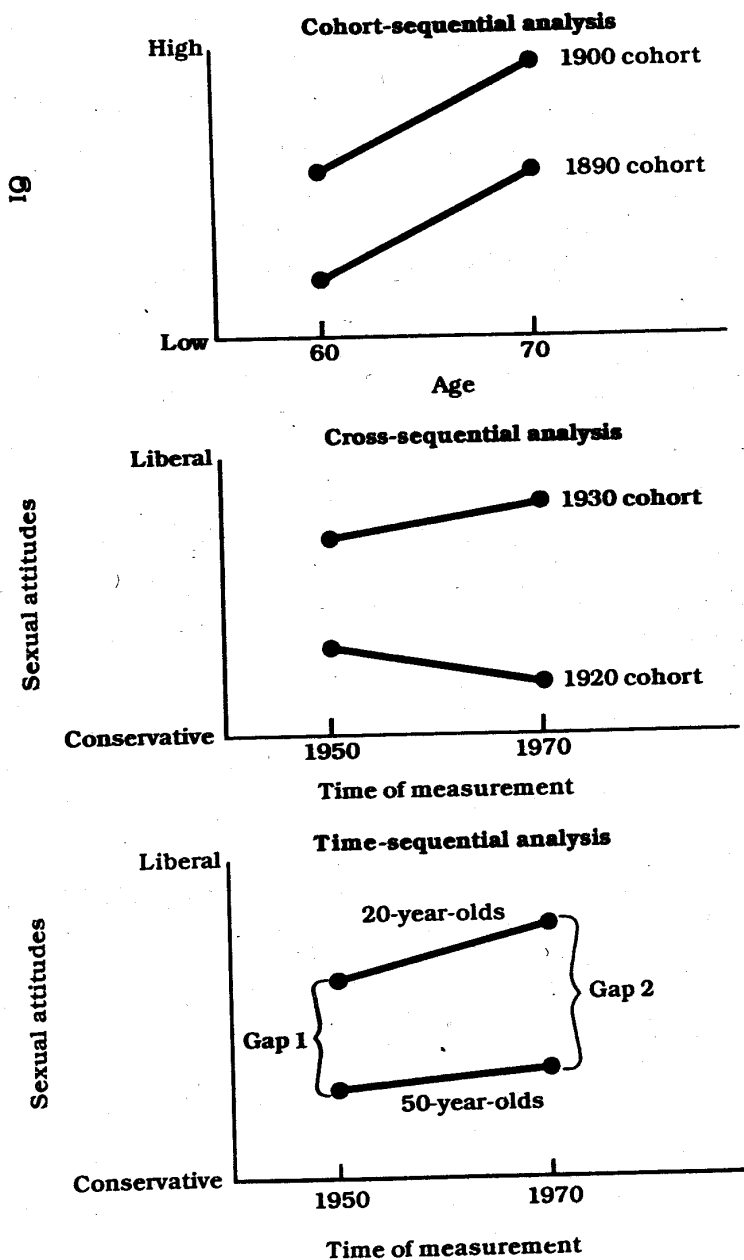


FIGURE 3
 Analyses of cross-sectional and longitudinal sequences can compare two or more cohorts at two or more ages (cohort-sequential), two or more cohorts at two or more times of measurement (cross-sequential), or two or more ages at two or more times of measurement (time-sequential). The data in time-sequential analyses must be from independent samples, but data in the other analyses can be repeated measures or generated from independent samples of the same cohorts.

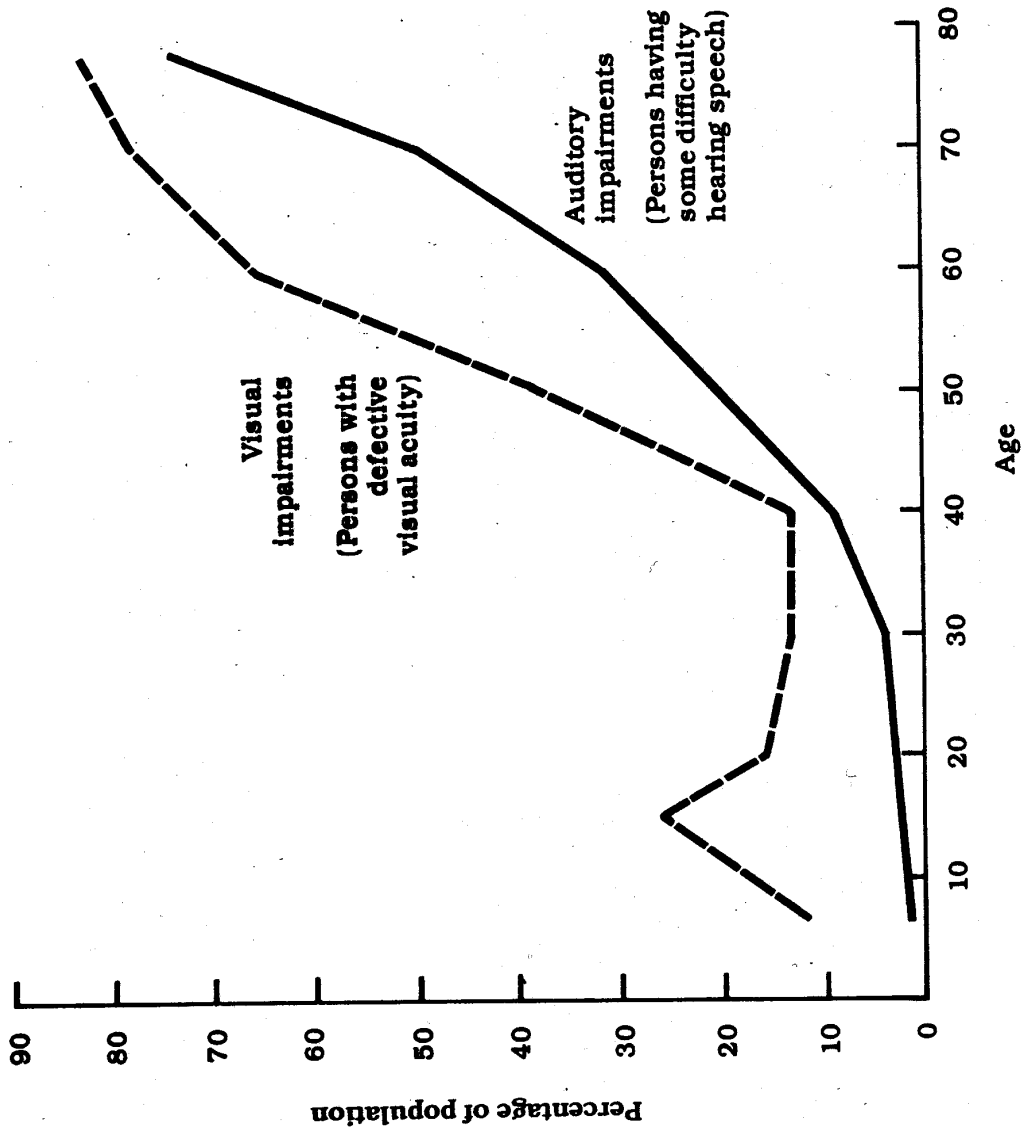


FIGURE 4
 Percentage of persons in U.S. with visual and auditory impairments, age 6-79 years, 1960-70.
 Source: National Center for Health Statistics. Health United States 1975, using Health Examination Survey.

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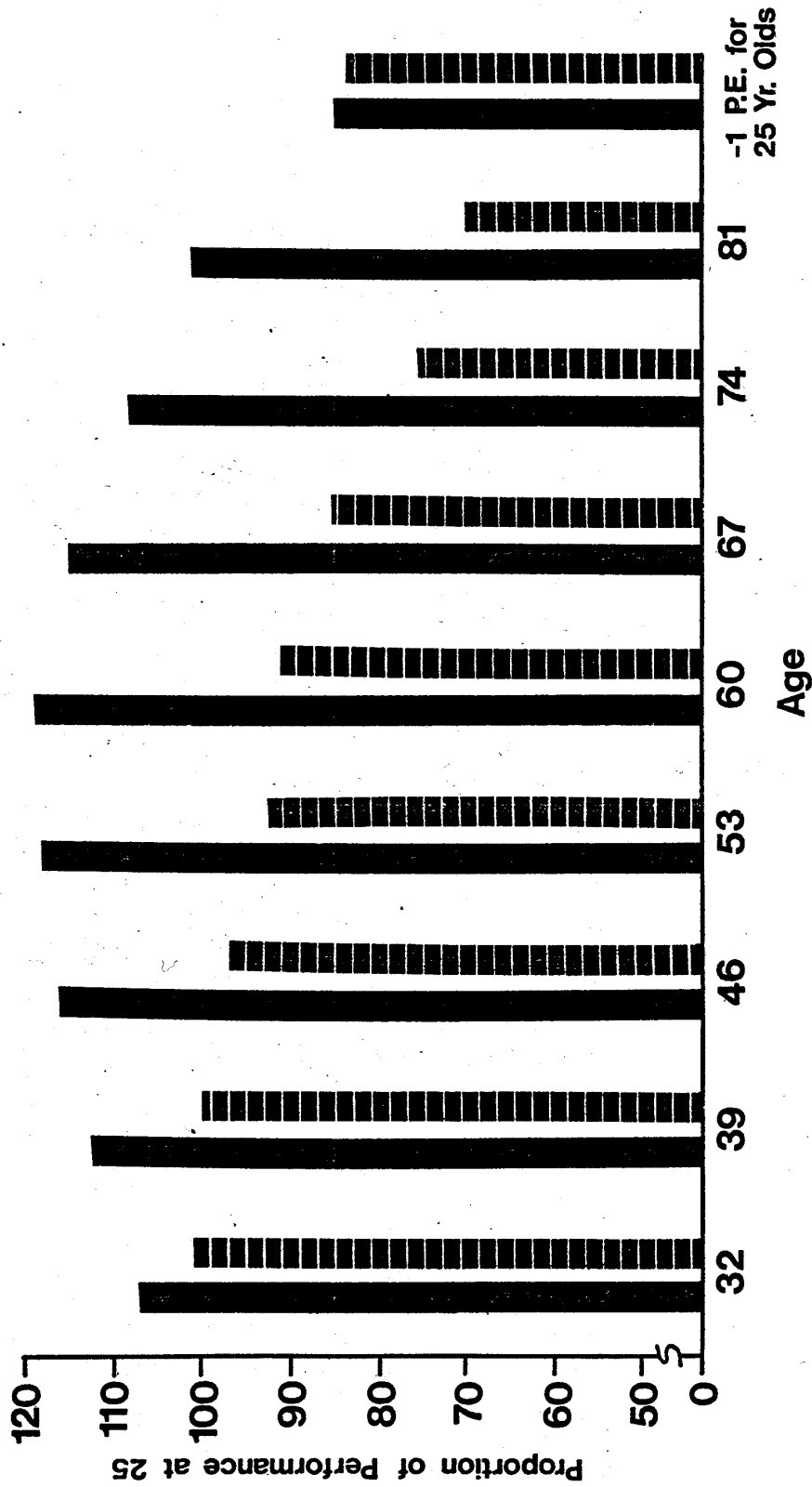


FIGURE 5

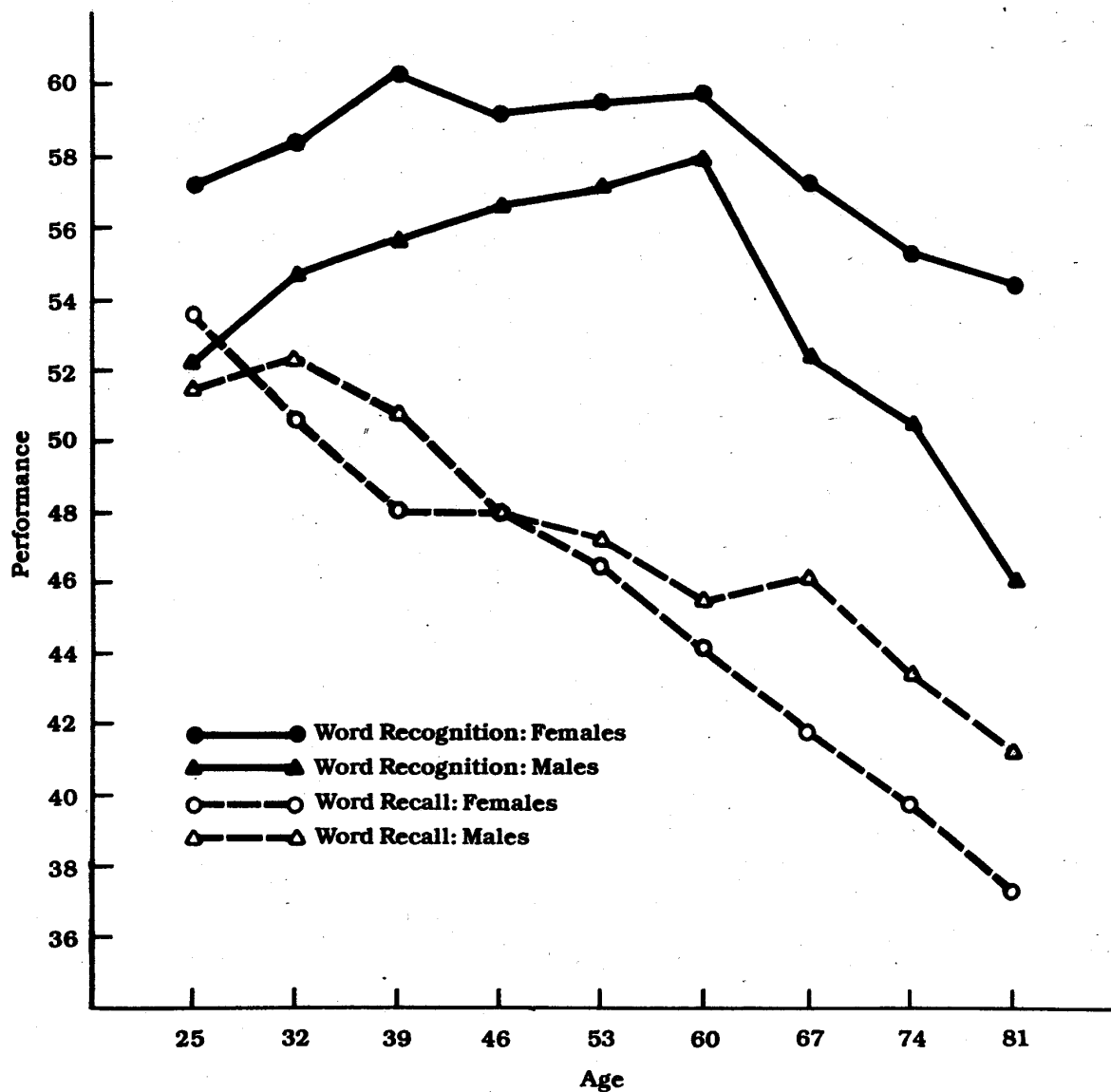


FIGURE 6

Cumulative age changes by sex from twenty-one-year longitudinal study of word recognition and recall.

Source: Reprinted by permission of the publisher, from K. W. Schaie. Cognitive development in aging. In *Language and communication in the elderly*, edited by Loraine K. Obler and Martin L. Albert (Lexington, Mass.: Lexington Books, D. C. Heath and Company). Copyright 1980, D. C. Heath and Company.