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Life-Span Developmental Psychology, Cognitive Functioning and Social Policy

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Introduction

The purpose of this chapter[1] is to present a life-span developmental perspective of the aging process in psychology. Recent expressions of a life-span orientation are combined in a growing number of publications such as the West Virginia Conferences on life-span developmental psychology (Baltes & Schaie, 1973; Goulet & Baltes, 1970; Datan & Ginsberg, 1976; Datan & Reese, 1977; Nesselroade & Reese, 1973) or the appearance of a new annual series entitled Life-Span Development and Behavior (Baltes, 1978).

A life-span developmental approach maintains that individuals continue to develop and change across the life course. Aging, then, is viewed as a life-long process which can only be properly studied as an outcome of life-long experiences. A life-span view of human development and aging has also contributed to the perspective that individual development occurs in the context of biocultural change. Thus, the process of aging must involve examination of the relationship between ontogenetic-individual development and social change across the entire lifetime. The biocultural context may be seen as involving both micro-level, individual life events and macro-level, ecological and social events. This particular approach

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involving a linkage between ontogenetic and social change has benefited much from similar developments in the sociological literature (e.g., Elder, 1975; Riley, 1976; Riley, Johnson & Foner, 1972).

In this paper, basic tenets of a life-span developmental approach will be discussed and contrasted with the orientation of traditional developmental psychology. Although a life-span approach is being applied to an increasing variety of aspects of development and aging, we will draw our research examples from the area of intellectual functioning. Primary attention will be given to the relationship between individual development and the biocultural context at descriptive and explanatory levels. Our basic position will be that the study of aging requires a life-span perspective extending from birth to death and that discussion of the sources of developmental aging must include examination of the biocultural (ecological) context as well as intraorganismic factors.

Finally, some generic implications of a life-span perspective for the development of social policy will be reviewed. The key assumption for the possibility of an interface between social policy and life-span developmental psychology is that social policy represents application of knowledge from a variety of disciplines, and developmental psychology is one of the behavioral specialities that can contribute to this task. Social policy, then, is seen to benefit from a human development orientation and an explicit concern with efforts at intervening into and optimizing the course of ontogenetic development (e.g., Baltes & Danish, 1978, in press). Since social policy is a multifaceted area, the field of education has been chosen as a sample case for the kind of perspectives which a life-span developmental view might contribute.

Perspectives of Life-Span Developmental Psychology

In our view, a life-span developmental psychology is less a theory than a perspective or an orientation which suggests, on a fairly abstract level, a unique set of theoretical and methodological paradigms. Developmental psychology, as a field in the behavioral sciences, is defined as dealing with the descriptive and explanatory study of individual development of behavior, i.e., ontogenetic psychological development. There are two themes in the history of developmental psychology which are helpful as background for discussing the distinguishing features in the emerging life-span developmental orientation in psychology.

Age-developmental Specialities versus Life-span Development

One historical theme deals with the paradox that developmental psychology has not evolved as a full-fledged life-span or life-course conception of individual development. Rather, except for the recent decade, developmental psychology evolved largely as a set of distinct, age-bracketed specialties: infant development, child development, adolescence, adulthood, aging. All of these age specialities of developmental psychology have managed to formulate their own bodies of knowledge with little cross-fertilization and ontogenetic linkage. This is particularly true for the two specialities which are probably the most advanced: child psychology and the psychology of aging (known in their multidisciplinary conceptions as child development and gerontology). An example of this age-segmented approach is reflected in the psychometric framework of intellectual assessment. Global intelligence measures such as the Wechsler and Stanford-Binet involve age-graded tests, each grade level of the test seeking to evaluate knowledge and skills deemed specific to that particular age segment, rather than assessing the individual's changing understanding of the same concept across different developmental periods. Moreover, the concept of intelligence has been largely one of childhood and early adulthood intelligence (Schaie, 1979, in press) with little attention paid to unique features of adult-developmental processes (see Riegel, 1973, and, Schaie, 1977, for notable exceptions).

It is amazing for the historical observer that such an age-fragmentation of the field of developmental psychology could occur, because there is neither an immediate historical nor any conceptual justification. On the one hand, it has recently been shown that the early 18th and 19th century origins of developmental psychology were primarily life-span and not child developmental conceptions (Baltes, 1979, in press; Reinert, 1976). On the other hand, despite the presumed conceptual focus of developmental psychology on behavior-change processes, it seems surprising that the major lines of age-specific implementation involved fairly atemporal, static, rather than processual, conceptions of development. Somehow, science-irrelevant factors, such as child-oriented features peculiar to most Western societies, and various contextual-political conditions such as funding mechanisms, must have prevented the earlier conceptual purity of a life-span approach from coming to fruition until recently.

The last decades, however, have seen a major re-orientation in this regard, following the lead of such programs as those at the University of Chicago in the United States (e.g., Committee on Human Development, 1965) and at the Uni-

versity of Bonn in Germany (e.g., Thomae, 1979, in press). Increasingly, it is being recognized that the study of behavioral development is either incomplete or seriously hampered unless it is seen in the context of the life-span or life-course (see also Lerner & Ryff, 1978). Thus, life-span developmental psychology has come to provide a conceptual umbrella under which separate age-developmental specialties can be located and integrated. A life-span model seeks to examine the interrelationship among developmental periods or developmental processes and to define patterns or sequences of developmental changes. Indeed, in contrast to an age-specific approach where the significance of chronological age is paramount, a life-span approach with its emphasis on developmental patterns across the life-course does not necessarily dictate a close association between all developmental sequences and chronological age. In fact, for certain psychological processes such as intellectual functioning in adulthood, chronological age may be a less than useful preliminary index of developmental change. For example, stability or even increase in verbal ability (an important measure of intellectual functioning) during most of the adult life span appears to be more related to the individual's educational background or to the intellectual stimulation available in the current environment than to age per se (Jarvik et al., 1973). Similarly, as is persuasively shown by Schaie (1979, in press), in the current cohorts of older people, there appears to be more variance in intellectual performance associated with birth-cohort than with chronological age.

Ontogenetic Development: Personological vs Contextual Conceptions

The emphasis on ontogenetic-individual development traditionally employed by developmental psychologists deals with only one type of behavioral change, i.e., with that behavior-change process which can be discerned when following persons over extended periods of time. There are other types of behavior change which are often disregarded by developmental psychology. Of particular interest to other social scientists, but excluded from the territory of traditional developmental psychology, are those types of behavioral change which are related to species (evolutionary) development and to biocultural social change. This observation is most conspicuous if one attends to concerns of sociologists interested in aspects of human development and social change (Elder, 1975; Riley, 1976; Riley et al., 1972; Keniston, 1971).

Indeed, traditional developmental psychology's benign neglect of these other change phenomena may have seriously limited the psychological study of ontogenetic change. That

is, lack of concern for the biocultural context in which the individual develops may have resulted in an over-emphasis on age-segmented, normative, intraorganismic (personological) models of development (see also Bronfenbrenner, 1977; Riegel, 1976). Characteristics of such normative, personological developmental models will be briefly summarized to provide later contrast with the life-span approach and its contextual emphasis. Note for heuristic and didactic reasons, the following presentation is purposefully accentuated rather than balanced.

First, traditional models in developmental psychology (particularly in child development) have placed primary emphasis on intraorganismic sources or mechanisms of developmental change in contrast to external, contextual influences. In infancy and early childhood, neurophysiological and maturational variables have been considered the key developmental antecedents of most types of behavioral change. For example, the parallel between maturational factors and the child's physical development (Gesell, 1940) was assumed to hold also for the relationship between neurophysiological development and cognitive functioning. Such assumed linkage between intraorganismic, maturational variables and behavioral development is reflected in writings, such as Gesell and Ilg (1943), which describe the characteristic development of the child with little reference to external, environmental influences.

Secondly, emphasis has been place on normative, universal patterns of development (influenced largely by genetic, maturational factors) in contrast to individual differences in development. This normative developmental approach is illustrated in cross-cultural Piagetian research on cognitive functioning (Goodnow, 1962), where the concern has been for replication of universal stage sequences rather than for exploring how various cultures differentially affected the timing and behavioral manifestation of cognitive functioning. This predominant emphasis on intraorganismic, personological and normative factors is also found in the study of later adulthood. It has been widely held that the nature of intellectual decline in aging is rather universal (across abilities and persons). Moreover, until recently, potential decline in intellectual performance in old age has been primarily attributed to biological factors rather than to the possible negative cumulation of environmental life events and the effects of a deprived environment (Labouvie, Hoyer, Baltes, & Baltes, 1974).

Finally, personological models have characterized development as occurring in a static cultural context with little attention to macro-level cultural change. Even when persono-

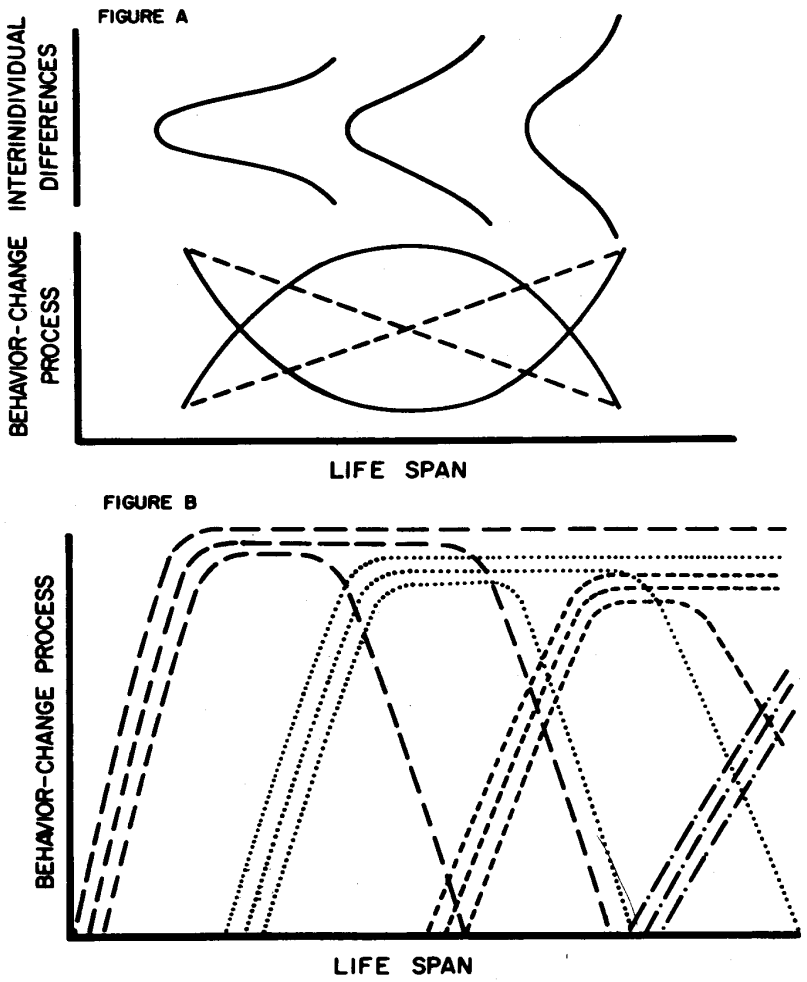

Figure 1. Selective examples of life-span developmental processes: Figure 1A illustrates multidimensionality, multidirectionality, and age-correlated increases in interindividual variability. Figure 1B summarizes notions of life-course grading and discontinuity. Developmental functions (behavior-change processes) differ in terms of onset, duration, and termination when charted in the framework of the life course; moreover, they involve both quantitative and qualitative aspects of change (from Baltes, Cornelius, & Nesselroade, 1979, in press ©Academic Press).

logical models of development have made explicit the role of environmental socialization factors, most developmental psychologists have behaved as if this context were fairly invariant with all individuals participating (throughout ontogeny) in a prescribed and fairly universal age-related sequence of socialization events. This normative socialization sequence was seen (often in conjunction with a convergent process of normative biological maturation) as producing regularities in ontogenetic development. Indeed, one of the outcomes for developmental psychologists of the 1960's war on poverty and the resulting compensatory education programs was the heightened awareness of the culturally different child and variability in behavioral development (Sigel & Brodzinsky, 1977).

For someone outside the mainstream of developmental psychology, the relative neglect of cultural factors and of the importance of biocultural change in traditional developmental psychology might be surprising. In our view, however, this characterization of the field is an accurate representation of its dominant themes, some vigorous exceptions (e.g., Committee on Human Development, 1965; LeVine, 1970) notwithstanding.

Search for New Conceptions of Development

The emergence of a life-span developmental perspective, then, is beginning to contribute to an expansion and reformulation of existing conceptions of behavioral development. On a general level, this applies to both the descriptive and to the explanatory-analytic efforts in developmental work. Figures 1 and 2 are illustrative of this search for new conceptions of development. In a later section, the area of intellectual behavior will be examined to provide a concrete research example.

1. Multidimensionality, Multidirectionality, and Life-course Grading. On the level of identifying ontogenetic change, Figure 1 (A & B) summarizes evolving conceptions of development which stem largely from a life-span approach. In fact, the first American textbook on life-span developmental psychology (Hollingworth, 1927) already contains the foundations for the perspective represented in Figure 1.

In the past (e.g., Harris, 1957), the central approach to defining development in the context of child psychology was to view it as a fairly unitary process. Following the guidelines provided by philosophers and especially biologists, development was defined as a behavior-change process with specific progression-related characteristics. The salient features of such a "developmental" behavior-change process were that the change was unidirectional, sequential, qualitative, irreversi-

ble, fairly normative (across persons and behaviors), and oriented towards an endstate (e.g., maturity). Such a concept of development is closely related to the biologist's concept of growth. A large number of features had to be met for a behavior-change process to be called developmental. This is why this biology-oriented concept of development is occasionally labelled a "strong" concept of development. More recently, articles by Wohlwill (1970) and McCall (1977) continue in that tradition, though largely in the context of child development. Similarly, chapters by Reese and Overton (Reese & Overton, 1970; Overton & Reese, 1973) are helpful in articulating the unique metatheoretical features which different concepts of development display. These chapters distinguish between organismic and mechanistic concepts of development. Organismic conceptions, both on the level of the description and explanation, are part of the class of concepts of development which we have labelled "strong."

Life-span researchers have begun to view this particular conception of development as being unduly restrictive and as only one type of case among a larger array of possibilities. Figure 1 represents some alternatives. The central themes depicted in Figure 1 are that, in a life-span developmental framework, developmental functions can display multiple directions, diverse trajectories, and much interindividual variability and intraindividual plasticity.

Specifically, Figure 1A focuses on increasing interindividual variability in behavior as the life-course evolves (upper part) and, on multidimensionality and multidirectionality (lower part of figure). These features add up to a concern with differential processes of development. Differential development is used here to indicate that the forms of developmental change are not unitary. Rather, such change displays much diversity on the intraindividual level (across situations and behaviors) as well as on the level of interindividual differences (both within and between cohorts).

Figure 1B supplements the general approach outlined in Figure 1A. It adds to the notions of multidimensionality, multidirectionality, and plasticity (or intra- and interindividual variability) conceptions of life-course grading and discontinuity. Following Neugarten's (1969, see also Neugarten & Hagestad, 1976) earlier suggestions, discontinuity and life-course grading point to two salient features of life-span development. First, the terms suggest that behavior-change processes do not necessarily represent change as a simple cumulation along an invariant continuum of measurement. Second, not all behavior-change processes extend across the entire life span. They do not all originate at birth and terminate

at death. The central notion expressed in Figure 1B is that the life-course of individuals evidences patterns of multiple behavior-change processes which differ not only in directionality but also in ages of onset, duration, and termination.

Thus, life-span developmental psychologists, while acknowledging the usefulness of a biologically-oriented growth concept as one type of developmental change, are much impressed with the substantial magnitude of diversity and discontinuity which ontogenetic development seems to display (e.g., Huston-Stein & Baltes, 1976; Hollingworth, 1927; Neugarten, 1969). It is as yet open to question how far such a pluralistic view can be pushed without risking loss of the unique strength of a developmental approach. However, it is evident that simple, unitary, and cumulative conceptions of development are insufficient when it comes to the task of charting processes of life-span development.

2. Multiple and Interacting Sources of Development. The previous section and Figure 1 dealt with description of developmental change. Figure 2 focuses on explanatory factors and principles to account for the complexity of the life-span changes summarized in the previous section. This figure combines Riley's (Riley et al., 1972; Riley, 1976) sociological model of aging and cohort flow with perspectives provided by life-span developmental psychology (Baltes, 1976; 1979, in press; Baltes, Cornelius, & Nesselroade, 1979, in press).

The scheme represented in Figure 2 attempts to delineate major antecedent systems influencing individual development, and to summarize general principles of theory building. The center upper part of the figure identifies three major systems of influences on development. They are: ontogenetic age-graded, evolutionary history-graded, and non-normative. These influence systems interact in the production of developmental behavior-change processes. However, it must be recognized at the outset that the definition of these age-graded, history-graded, and non-normative influences is not simple, nor do these influences necessarily fall into three distinct unrelated classes. Moreover, it is likely that their definition varies among researchers, particularly if oriented to different disciplines. Thus, the present effort is prototheoretical and heuristic only.

Age-graded influences refer to biological and environmental determinants which exhibit a high degree of correlation with chronological age. They follow from the traditional focus on biological maturation and, as to socialization, from viewing the life-course as consisting of a series of normative age-graded (Neugarten & Hagestad, 1976) tasks and socializa-

tion influences. History-graded influences are those fairly normative-universal event patterns which occur in connection with biosocial change as evidenced, for example, in cohort effects. They exhibit a high correlation with historical time and apply to most individuals of a given cultural unit. Non-normative influences, finally, are those which are significant in their effect on development but are not normative in the sense that they do not occur for everyone or not necessarily in easily discernible and invariant sequences or patterns through the life-course of individuals.

As to non-normative influences, Dohrenwend and Dohrenwend's (1974) concept of critical life events (see also Hultsch & Plemons, 1979, in press) is a good example. There appear to be two major subclasses of non-normative influences. The first is related to historical time and deals with event patterns at the macrolevel such as wars, economic depression, or health epidemics which are not universal but specific to historical moments, regions, and clusters of people. The second subclass parallels age-graded influences and involves significant life events (illness, loss of employment, divorce, death of significant others) at the individual level. The assumption is that unique combinations and sequences of such non-normative influences represent a substantial part of the influences operating in the production of life-span changes in behavior.

Figure 2 suggests also that some of these distinct influence systems can be seen as having primary origins in one of the dominant models within developmental psychology: maturational, dialectical, and learning-socialization. However, it would be superficial to link them to any of these models in a unitary fashion. This is particularly true because all influence systems, in principle, involve both environmental and biological determinants and mechanisms (see also Lerner, 1976). Dotted lines connecting the three influence systems (other connections could be added) suggest that they interact with each other, and arrows to the right along the time continuum indicate that the influence systems accumulate in their effects and change with time. Note also that the distinction of the influences provided by the three influence systems is not always convergent, neither in timing nor in strength. Thus, as Riegel (1977) discussed in the context of ontogeny, it is necessary to examine carefully the extent of synchronicity and colinearity which age-graded, history-graded, and non-normative influences display as the life-course of a given cohort unfolds.

The lower part of Figure 2 is designed to illustrate how successive cohorts of individuals develop at different epochs

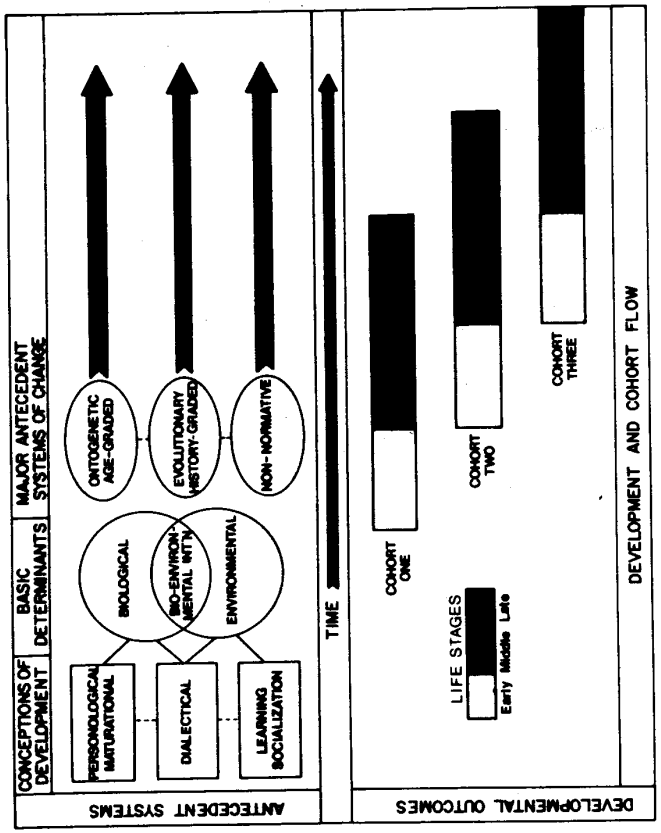

Figure 2. Illustration of relationship among life-span development, cohorts, and three major influence systems: ontogentic (age-graded), evolutionary (history-graded), and non-normative (non-developmental). The figure is taken from Baltes, Cornelius, and Nesselroade (1979 © Academic Press). The lower part of the figure is an adaptation of the model of aging and cohort flow present by Riley (e.g., Riley et al., 1972).

and in the context of different cohort combinations. Therefore, in their life-course, successive cohorts may respond to and interact with different patterns of factors associated with the three classes of influence systems outlined in the upper part of the figure. This part of the figure is taken from the work of Riley and her colleagues (Riley et al., 1972) in sociology.

A final observation on the relationship between Figures 1 and 2: Figure 1 emphasized the need for multidimensionality, multidirectionality, and plasticity in representing the complexity of life-span development on the descriptive level. Figure 2 emphasizes the existence of distinct explanatory sets of influences (age-graded, history-graded, non-normative) which are themselves changing with time. It is important to recognize that there is a high degree of conceptual convergence between descriptive efforts (Figure 1) and explanatory (Figure 2) efforts. This is so because diversity in influences (nature, patterning, sequencing, duration, etc.) is a prerequisite for diversity in developmental outcomes. In this sense, both figures supplement each other in the search for comprehensive views of development as suggested by a life-span developmental psychology.

Psychometric Intelligence and Life-Span Development

This next section will illustrate in the area of psychometric intelligence, why a life-span approach has generated the types of theoretical perspectives summarized in Figure 1 and 2. This presentation is necessarily selective and largely a condensation of ideas contained in recent writings by Baltes, Labouvie-Vief, Schaie, and their colleagues (e.g., Baltes & Labouvie, 1973; Baltes & Schaie, 1976; Labouvie-Vief & Chandler, 1978; Riegel, 1973; Schaie, 1977, 1979, in press; Schaie & Baltes, 1977). It should also be acknowledged that not all researchers necessarily agree with all of the themes presented here (as in writings by Horn, 1978; Horn & Donaldson, 1976; and Botwinick, 1977).

Multidimensionality, Multidirectionality, and Variability

Descriptive evidence on multidimensionality and multidirectionality of psychometric intelligence is widely accepted. Following Cattell's (1971) lead, Horn's (1970, 1978) reviews are perhaps most comprehensive and consistent in their conclusion that psychometric intelligence is not a unitary dimension but a multidimensional construct involving distinct classes of intellectual behavior. In addition to the Horn-Cattell theory of fluid-crystallized intelligence, Thurstone's

or Guilford's structure-of-intellect models, each involving a multitude of dimensions, are widely known examples.

Horn and Cattell have also been most explicit (though sometimes without adequate empirical support) in adding to the notion of multidimensionality that of multidirectionality. In other words, the intellectual behavior of a multitude of people in a diverse set of contexts not only exhibits a multidimensional pattern of intellectual abilities (factors, dimensions). In addition, when one considers the course of life-span development, these multiple abilities can each exhibit distinct developmental curves or functions. For example, as most persuasively argued by Horn (1970, 1978), fluid intelligence tends to exhibit an inverted U-shaped function through the life-span, with maximum performance for most people around the completion of the third decade of life. Crystallized intelligence, by contrast, is assumed to display a developmental function exhibiting progression or maintenance of performance up until late adulthood.

Thus, the Horn-Cattell theory of psychometric intelligence is not in line with some of the traditional features of development conceived as a unitary progression, but focuses on multidimensionality and multidirectionality. In terms of empirical data base, Schaie's cohort-sequential work (Schaie, 1970, 1978) is clearly the most persuasive on these points. Using Thurstone's model of primary mental abilities, Schaie and his colleagues have been able to show dramatic differences in the level and direction of adult-developmental changes. This was true both for classes of intellectual behavior (e.g., psychomotor speed vs. vocabulary) and for distinct age-cohorts. As a consequence, in the area of life-span psychometric intelligence, the case for a multidimensional and multidirectional conception has been set forth.

The case seems also to have been made on the issue of interindividual variability and intraindividual plasticity. While Horn (1970, 1978) and Botwinick (1977) continue to focus on normative change functions (across persons and cohorts), there is mounting evidence of much variability and plasticity associated with distinct historical contexts and life-course experiences. This evidence comes from two lines of research, the first involving comparative work with criterion groups, the second involving the consequences of direct intervention work. Illustrative examples for the first line of research are work on cohort effects (see Baltes, Cornelius, & Nesselroade, 1978 for review), which suggests variability among birth-cohorts in the course of intellectual development; research on the impact of professional career environments on adult intelligence (e.g., Kohn & Schooler, 1977, and their

chapter in this volume); evidence on the impact of educational differences on the nature of intellectual functioning in advanced adulthood (e.g., Gardner & Monge, 1978); or findings on large interindividual differences at given age levels in the latter part of the life course (e.g., Schaie & Parham, 1977).

The second line of research on variability is aimed directly at studying the conditions under which the same individuals, as they age, exhibit different levels and forms of intellectual behavior. This research is manipulative-interventive and focuses on intraindividual functioning.

A central example of this approach has been the use of practice (training) and other performance-related support systems (e.g., motivation, cautiousness) for exploring the range of intraindividual variability (plasticity) in intellectual performance in older adults. Such intervention research has produced rather dramatic increases and decreases in old people's intellectual performance (see Baltes & Baltes, 1977; Labouvie-Vief, 1976 for reviews). For example, Plemons, Willis, & Baltes (1977) were recently able to show in older persons (age range 59-85) that eight one-hour training sessions dealing with one component of fluid intelligence ("figural relations") resulted in marked improvement and also in some generalization to other intellectual tests used to assess transfer of training to other domains of intelligence. This transfer of training effect was maintained at a follow-up evaluation obtained six months after training. Furthermore, older persons have consistently evidenced marked retest gains of the general performance kind when they were asked to participate repeatedly in the taking of intelligence tests. Even such behavior of older persons as response speed (often related to a decline in neurophysiological functioning) has been demonstrated to be somewhat modifiable in older persons by means of practice and reinforcement contingencies (e.g., Hoyer, Labouvie & Baltes, 1973). As a consequence, it seems fair to conclude that there is much plasticity in intellectual behavior of the aged. Thus, it is reasonable to infer that the course of intellectual aging is highly modifiable, dependent to a large degree on the nature of the support (or deficit of support) in the old person's concurrent and past environments.

It is not yet clear how far the question of ontogenetic transformation and plasticity in intelligence can be pushed. In fact, it is important to understand that we cannot postulate a complete absence of normative developmental trends if we are to maintain a developmental approach as a useful theoretical and methodological perspective (McCall, 1977; Wohlwill,

1973). Thus, while it is demonstrated that there is multidimensionality, multidirectionality, interindividual variability, and intraindividual plasticity in ontogeny on the level of quantitative analysis (how much? what direction?), it is not clear whether there are counterpart qualitative differences in structure and processing. The question of qualitative differences relates to the notions of discontinuity and life-course grading illustrated in the preceeding Figure 1B. On the one hand, there is much evidence for the early life-span that there is little predictability from early to adult life in psychometric intelligence (Horn, 1978). On the other hand, Schaie's data on adult and gerontological intelligence for the life-course show a picture of much higher stability in interindividual differences and, therefore, much higher predictability than is true for childhood. The major problem is that, for the most part, we have not yet addressed the question of suitable or unique tasks for measuring "gerontological" or late-life cognition. Notable exceptions include preliminary work by Clayton (1980, in press) on wisdom, by Gardner and Monge (1977) on adult-relevant tests, by Riegel (1973) on a fifth stage of Piagetian operations, and by Schaie (1977) who offers prototheoretical suggestions on adult cognitive stages.

In sum, the evidence accumulated thus far is sufficiently strong to mandate a search for alternative conceptions of adult psychometric intelligence (see also, Labouvie-Vief, 1977). And, the evidence is in convergence with the general theoretical perspectives expressed in Figure 1 above, which expands the traditional concept of development beyond that of a normative and unidirectional process to include behavior-change processes having features of multidimensionality, multidirectionality, and large inter- as well as intraindividual variability (plasticity).

Multiple Sources of Influences

As we turn now to the effect of explanatory determinants and the role of multiple systems of influences (represented in Figure 2 above) the data base is so far less rich, but nonetheless consistent.

1. Age-graded Influences. The effect of age-graded influences on life-span intelligence is perhaps best reflected in research on childhood and adolescent intelligence. For the most part, such research has emphasized a conjoint unfolding operation of maturational and socialization processes. A very clear-cut expression of such an age-graded approach is inherent in the formal educational system. In a more general context, Parelius (1975) discusses numerous ex-

amples of how current educational scheduling leads to various forms of age-stratification throughout life.

What is most relevant for the present context is that it is less clear which age-related life course variables operate on psychometric intelligence in any consistent manner following early adulthood. While educational and maturational schedules correlate highly with chronological age up to adolescence, subsequent age-correlated schedules are less conspicuous. This is likely also the primary reason why chronological age appears to lose much of its power as an organizing search variable as one moves into adulthood and old age, at least in the area of psychometric intelligence. If one follows Schaie's (Schaie & Parham, 1977) recent reanalysis of his cohort-sequential data, it is not until the late seventh and eighth decade of human life that age-correlated determinants recapture a dominant position in the explanation of intellectual variance and the course of intellectual aging.

What then are the primary guiding factors in adult development of psychometric intelligence? In our view, these are increasingly related to the operation of history-graded and non-normative influences as described in Figure 2. To begin with, it is reasonable to assume that early life, age-correlated factors such as education will continue to have a long-term effect, particularly as they mediate subsequent professional career trajectories (e.g., Kohn & Schooler, 1977). Indeed, educational level accounts for a large share of inter-individual differences in the intellectual performance of older adults (Schaie & Willis, 1978). Furthermore, as mentioned above, it is quite possible that, following a life-course grading model, there are unique cognitive tasks in late life. These might either stimulate the acquisition of new cognitive skills, or result in the extinction or transformation of skills which are losing their adaptiveness in old age.

2. History-graded Influences. The impact of history-graded influences is best illustrated by research on cohort differences in adult development, most notably the work of Schaie. Schaie's (1970, 1979, in press) cohort-sequential project on adult intelligence (as noted above) involved the longitudinal study of a large number of subjects from the adult age range (24 to 80 years old). He observed each of a number of age samples stemming from different cohorts three times over a 14-year period (in 1956, 1963, and 1970). Dependent measures were intelligence tests from the Primary Mental Abilities (Thurstone) and Schaie's Test of Behavioral Rigidity. The design permitted the plotting of 14-year change data, for each of 7 separate age/cohorts: for example, from age 24 to 38, 31 to 45, 38 to 52, 45 to 59, 52 to 66, 59 to 73, and 66 to 80.

The key findings shatter any theory of adult intelligence which is based on universal and normative developmental trends such as aging decline. Instead, the outcome showed a picture of very strong cohort differences associated with social-change effects. In fact, the magnitude of cohort differences was, in general, larger than age changes within cohorts, at least up to the seventh decade of life. For example, different cohorts aged very differently in intelligence; thus persons of the same age (e.g., 60-year-olds, in 1956 vs. 1963 vs. 1970), but from different birth cohorts, exhibited rather discrepant quantitative change patterns ranging from increments to stability to decrements. Moreover, Schaie's data produced very little evidence of any universal decline in intelligence (across persons and distinct dimensions of intellectual performance). Some cohorts on some dimensions of intelligence (e.g., crystallized) showed increments, let's say from age 45 to 52, while the same cohorts evidenced decline on others (e.g., fluid intelligence). To put the same findings a different way, the different historical periods (1956 to 1963 vs. 1963 to 1970, etc.) produced quite discrepant outcomes in the nature of quantitative intellectual aging for identical age groups drawn from different birth-cohorts.

While Schaie's research is the most comprehensive on the impact of historical change on life-span development of psychometric intelligence, there are many corroborative findings in related domains of behavior and for other segments of the life span (see Baltes et al., 1978, for review). Zajonc (1976), for example, has attempted to formulate a family constellation-based model in an effort to account for the well known cohort-related declines in adolescent performance on the Scholastic Aptitude Test.

Another example comes from research on neonatal behavior. There is a hotly debated issue in that field on the question of whether or not neonates can be classically conditioned. The last 20 years have seen many conflicting data and confusing arguments. In 1976, Porges examined these data from a social change or cohort perspective, looking at historical changes in the life space of infants, as in procedures of pre-, co-, and postnatal medical practices surrounding birth. Porges reached the conclusion that the last 20 to 30 years have seen major changes in such practices dealing, for example, with medication and maternal nutrition during pregnancy, birth, and the postpartum period. Having demonstrated this, Porges (1976) proceeded to argue that such historical changes in the medical conditions surrounding pregnancy and birth have presented researchers with

quite different types of infant organisms at distinct historical periods, different at least for the first 1 to 4 days of life. Depending on the medical practices affecting particular cohorts, the infants' activity levels are different, as are their capabilities to attend. Accordingly, Porges argues that the questions of whether neonates can or cannot be classically conditioned cannot be answered with a strict personological and history-free approach. One needs to consider the biocultural context in which infants "transact"; so the question of conditionability becomes one of contingencies. Moreover, Porges argued that such a contextual-interactive position suggests that any developmental finding collected at a particular historical point is likely to be but a sample from a larger population of possible findings.

Finally, a study by Nesselroade and Baltes (1974) can serve to illustrate further the role of history-graded influences. They examined via a cohort-sequential, longitudinal design approximately 2,000 West Virginia adolescents (age range 13 to 17) in 1970, 1971, and 1972. Using both personality and ability measures as dependent variables, they found that, in the case of personality, the historical moment (1970 vs. 1971 vs. 1972) rather than chronological age (from 13 to 14 to 15 to 16) was the more powerful factor in accounting for the course of adolescent personality development. Specifically, regardless of their age, over the two-year period from 1970 to 1972, adolescents developed in the direction of less super-ego strength, less achievement orientation, and more independence and autonomy.

3. Non-normative Life Events. As mentioned in describing Figure 2, the three postulated influence systems are not necessarily mutually exclusive and, in addition, their delineation is preliminary and might differ depending upon one's conceptual orientation. The difficulties of distinct definition are particularly conspicuous in the case of non-normative life events. In principle, since time is necessarily involved when determinants operate in concrete situations, non-normative events will always exhibit a degree of correlation with age- and history-graded processes. The major characteristic of these non-normative events is that they show little consistent normalization in onset, duration, or sequencing for different persons and different domains of behavior.

In the area of psychometric intelligence, there is only beginning evidence for the operation of non-normative events; at least, the existing evidence has not yet been brought together in any systematic manner. Father absence, for example, has been linked to lowered scholastic achievement, particularly for boys. Santrock (1972) found that effects of father

absence (because of divorce, separation, or desertion) during early childhood were more devastating to scholastic performance of lower class 3rd and 6th grade children than to performance of older children. Shelton (1969) also has reported that father-absent boys compared with father-present boys in junior high school made lower grades in both academic and non-academic subjects. In the gerontological literature, an example for non-normative factors is Botwinick's (1967) conception of modifiers of intellectual performance, such as the role of illness, occupation, or leisure life. As another example, specific illness-related physical disabilities may also be linked to intellectual functioning. Thus, in both young populations (Hine, 1970) and older populations (Granick, Kleban, & Weiss, 1976) hearing loss has been found to be related to reductions in cognitive functioning.

Many such non-normative factors of associated processes might be important in determining the course of life-span intelligence. Their occurence, however, is not universal nor, if they do occur, do they exhibit universal patterns of onset, duration, constellation, or sequencing. Yet, despite the paucity of relevant empirical data, we believe that the systematic examination of such non-normative life events will provide a powerful avenue towards the understanding of adult intelligence, especially in terms of quantitative changes and the large interindividual variability and variations in trajectory.

4. Interactions. Examination of the interactions among the three sources of influences listed is the least advanced area of research, in part because appropriate methodological strategies are only recently being formulated.

Thus in the area of life-span intelligence, the current scene is primarily one of conceptual model building. However, as illustrated in the lower part of Figure 2 and in Riley's models of the interplay between aging and social change (see her chapters in this book), a conceptual case can easily be made for the likelihood of interactive formulations involving age-graded, history-graded, and non-normative life events. In the psychological literature, Riegel's (1976, 1977) discussion of dialectical conceptions of aging is rich in such suggestions. Similarly, Uhlenberg's chapter in this book shows the changing nature of old age in the United States from a sociological point of view as resulting from interactions between distinct ontogenetic and historical sets of influences. Furthermore, forecasting the future of aging patterns as conducted by futurists (see Gordon's chapter in this book) also involves consideration of differential ontogenetic-historical interaction patterns across time.

Life-Span Development and Social Policy

Social policy affords one form of intervention into the course of life-span development and aging. Social policy and intervention both imply a plan for arranging conditions under which particular behavioral and societal outcomes are prevented, achieved, or maintained. Of course, knowledge about the course and conditions of psychological human development represents only one important facet to be considered in formulating social policy.

What are some of the implications of a life-span developmental approach for the formulation of social policy, using the area of education as an example? The new catch words suggested by a life-span orientation are: multidirectionality, multidimensionality, large interindividual differences, and modifiability or plasticity, all conceptualized in an interactive contextual framework. This view results in a conception of behavior development which is a "differential developmental psychology."

In fact, some researchers argue that what we observe when studying "naturally occurring" psychological development is but a small segment of what psychological development could be like if the social, environmental, and biological support context were engineered to be different. Such a difference- and plasticity-oriented view is particularly appropriate for the second part of the human life-span.

Life-Span Social Policy

Since we suggest a direct linkage between the basic tenets of a life-span approach and conceptions of social policy, the following generic principles should hold.

First, it follows that social policy should involve a life-span perspective as well. An age-segmented approach to social policy involves many of the same limitations as found in age-specific psychological models of development. Social intervention into one age period must be preceded by an examination of possible side effects for other age periods and by designing a policy which considers interage linkages.

Second, a life-span social policy needs to focus on preventative optimization and not only on alleviation. In the case of aging, this suggestion implies that the focus for intervention is not necessarily the aged. On the contrary, in line with the assumption that aging is a life-long process, much of social policy needs to deal with younger age groups.

Such a preventative orientation toward the future might detract from the current needs of the aged. At the same time, it appears reasonable to argue that (particularly when age-graded influences are involved) a life-span distribution of social policy efforts is the only strategy which, in the long run, is capable of using resources in an optimal manner by dealing with problems before they occur or even by preventing their occurrence.

Third, because of the pervasiveness of differential development, social policy needs to be differential social policy. Life-span changes involve increasing variability, with chronological age becoming less and less relevant as we move towards adulthood and old age. This is largely true because there is less age-graded socialization in the second part of life(see also Rosow, 1971) and because history-graded and non-normative events gain in prominence. Accordingly, social policy for the second part of life cannot be normative; it needs to be flexible and differential. Such a call for a differential social policy is also supported by the notion of intraindividual plasticity. Aging individuals need to be able to continue to maximize their human potential in a context which is supportive of independent and often idiosyncratic functioning and the view that important developmental tasks continue to unfold.

Fourth, a life-span developmental orientation suggests a cultural-change conscious social policy. Different combinations of age-graded, history-graded and non-normative influences operate to produce distinct developmental outcomes for different cohorts. The implication for social policy is that such developmental change would require new and different social policies, always formulated, however, in an overarching framework of cohort-sequential life-course trajectories. Publications by Neugarten and Havighurst (1976, 1977) are illustrative of such a cultural-change conscious approach to social policy and social ethics as it applies to current and future aging cohorts.

Life-Span Education

The general themes of a life-span, preventative-optimization, differential, and cultural change-consciousness approach to social policy are easily applied to the area of education. Currently, educational services are heavily concentrated in the periods of early life (childhood, adolescence). Thus, the primary guidelines for the format of current education are developed within a frame of reference that owes much to the kind of child-development conception presented earlier with little concern for life-span development (Dave, 1976; Dave &

Lengrand, 1974; Montada & Filipp, 1976).

For example, the posture of life-long differential development and the view of plasticity would suggest a strong case for redistributing education across the life-span (see also Birren & Woodruff, 1973; Riley, Johnson, & Foner, 1972; Schaie & Willis, 1978). The implied assumption is that education, concentrated in early life, cannot prepare the individual for a life-time of ontogenetic changes resulting from novel combinations of age-graded, history-graded, and non-normative influences. In this vein, Montada and Filipp (1976) have argued that the content of childhood education efforts cannot be guided only by childhood and status quo orientations; it must include the teaching of preventative life-skill techniques which facilitate adjustment in late life and in a changing society. Similarly, Dubin (1974), in a review article on occupational obsolescence and life-long learning, asserted that a major portion of the educational system should be devoted to preventative updating in light of a changing cultural context, rather than massed education in early life for the rest of life. Such a demand for life-long education is not only supported by the conclusion that the second part of life contains novel tasks to be mastered by the individual (Schaie & Quayhagen, 1978; Havighurst, 1972), but also by requirements of teaching technology. Learning principles suggest that a contextual subject matter-specific component is important in designing for optimal learning (Gagne, 1968; Wroczynski, 1974). The child or young adult, however, has not yet had many of the relevant life experiences which provide a useful context for facilitating the learning of certain subject matter or life skills (Brim & Wheeler, 1966; Cropley, 1976; Houle, 1974; Riley, Foner, Hess, & Toby, 1969) requisite for effective adaptation in advanced stages of the life course.

The general demand for life-long education is, of course, not new (Yeaxlee, 1929). Adult education and continuing education endeavors have frequently used the term "life span" to suggest expansion of traditional education into the adult period. However, what is unique to the current life-span approach is the formulation of a set of generic developmental principles. The salient general propositions are, as was true for social policy, life-span education, differential education, preventative-optimizing education, and cultural change-conscious education.

As to life-span education, the recommendation is to distribute educational resources throughout the life course. The assumption is that since there is ontogenetic-developmental change across the entire life span, educational intervention must also be life long in nature in order to optimize and facilitate development. However, it is important to view life-span education not simply as a continuous cumulation and extension of childhood-education and higher education models, neither in technology, format, nor subject matter (Schaie & Willis, 1978). A life-span approach suggests both continuity and discontinuity in development. Therefore, it is important to consider both continuous and discontinuous developmental tasks and conditions associated with the life course as summarized in Figures 1 and 2. Unique developmental tasks at each stage in the life span must be incorporated into educational intervention. At the same time, consideration of the prior developmental and educational history of the individual is useful in designing concurrent intervention endeavors.

The concept of differential education is important because life-span development becomes less normative and less homogeneous with increasing age. Thus, as life-span development is highly differential, educational systems will need to show a counterpart high level of differentiation both in terms of the substance of education and timing. Such differentiation will allow for multiple and discontinuous educational pathways for different individuals and subgroups of persons. Furthermore, the concept of what constitutes education (substance, format, etc.) will need to be either re-evaluated, expanded, or subsumed under a more general concept such as human development intervention. Moreover, because not all educational needs can be predicted with sufficient accuracy (e.g., those due to non-normative events), the concept of differential education also implies that educational entry and exit opportunities need to be made as flexible as possible (Dave, 1976).

With regard to the principle of preventative optimization in educational policies, the task is one of arranging for educational systems which not only anticipate the course of human development, but also contain conditions facilitative of progressive mastery of subsequent components of the developmental course. In fact, it is knowledge about the course and mechanisms of life-span development which provides the strength of a developmental approach to intervention including education (Baltes & Danish, 1978; Birren & Woodruff, 1973; Cropley, 1976; Urban, 1976). The life-span conceptions outlined in Figures 1 and 2, however, make it also clear why it is unlikely that all aspects of life-span development can be adequately addressed with a preventative-optimizing strategy. Those processes and problems which are primarily related to history-graded and non-normative influences cannot be fully predicted. In spite of such non-normative developmental influences, it may be possible to maintain some form of preven-

tion-optimization strategies nevertheless. For example, mechanisms for ad hoc educational planning need to be made available, if the need should arise. Similarly, to the end of dealing with non-normative life events, the Hamburgs, Danish, and their colleagues (e.g., Coelho, Hamburg, & Adams, 1974; Danish, 1977) have begun to develop educational intervention models which are aimed at enhancing general life or coping skills. These skills are assumed to be relevant in a large array of potential life tasks or crises and, therefore, assumed to exhibit preventative-optimizing potential even for non-normative situations.

The principle of cultural change consciousness in educational policies is perhaps the least articulated. Concepts such as educational obsolescence and continuing education (Dave, 1976; Hiemstra, 1976) have been introduced to acknowledge the possibility of maintaining educational efforts throughout life. Their rationale has been developed, however, largely in the context of occupational careers (Dubin, 1972, 1974). Comparatively little attention has been paid to multifaceted requirements and educational targets as implied, for example, in Toffler's (1970) Future Shock. Thus, it is our impression that this feature of life-span educational policy, while evident on the conceptual level, is the one deserving most vigorous thought at this moment in time. The rate of cultural change appears to be so high that education for the status quo is only a part of what is necessary for individuals to be able to master and contribute to the future as their life development progresses.

The prototheoretical notions of differential development and intellectual plasticity inherent in current life-span thinking, however, provide useful generic principles when considering cultural change issues. This foundation is apt to generate optimism about what could be accomplished if we accept the challenge of a cultural change-conscious approach to life-span education. Such an orientation suggests the need for dynamic educational policies which are not only reactive to cultural change, but also assertively involved in determining the direction of some aspects of its future course.

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