Model characteristics of a life-span approach to the study of psychological aging are reviewed. Focusing on a selected set of model attributes related to the tasks of describing, explaining, and modifying intrapersonal and interindividual patterns of development and aging (continuity vs. discontinuity, antecedent-consequent relationships, concurrent vs. historical paradigms, time-lag relationships, treatment by history interactions, etc.), a number of questions prototypical of a life-span view of aging are derived. The primary conclusion is that a life-span view of aging redirects conventional thinking about psychological aging as a fixed decrement phenomenon toward a systematic analysis of the aging process in terms of dynamic and interactive man-environment systems and a more variable view of the aging process relative to its form and directionality. Furthermore, it facilitates the conceptualization of prevention efforts aimed at optimizing the aging process in a changing society.

Prototypical Paradigms and Questions in Life-Span Research on Development and Aging

Paul B. Baltes, PhD

The rising interest in a life-span view of human development and aging witnessed over the last decade is impressive and documented by the large body of theory and research contained, for example, in the three volumes that evolved out of the various West Virginia University Conferences on Life-Span Developmental Psychology (Baltes & Schaie, 1973; Goulet & Baltes, 1970; Nesselroade & Reese, 1973) and various chapters (e.g., Lowenthal & Chiriboga, 1973; Neugarten, 1973) contained in the APA Task Force on Aging Report edited by Eis dorfer and Lawton (1973). It seems fair to argue that this development brings to fruition what some prominent scholars and programs began some decades ago, though in a largely isolated manner (e.g., Bayley, 1963; Bloom, 1964; Bühler, 1933; Bühler & Massarik, 1968; Butler, 1968; Havighurst, 1948; Neugarten, 1969; Pressley & Kuhlen, 1957, etc.). Gerontology, which often conceives of aging as the endproduct of a long-term experiential and biological history, has been the primary arena for the crystallization of the life-span developmental approach.

Despite the fact, however, that the life-span approach seems to have lost its status as an "illegitimate child" and even may have acquired a certain faddish character, the theoretical and empirical rationale for a life-span view of development and aging is still vague, and perhaps even misunderstood. Thus far, the battle to establish firmly a life-span perspective seems to have centered on winning one primary objective: that development occurs at all ages (infancy, childhood, adolescence, adulthood, old age) and that, from a theory-construction perspective, it is not only shortsighted but sometimes even useless and damaging to construct age-specific developmental models that ignore interage networks and other aspects of long-term ontogenetic linkages.

For the most part, this aspect of the battle has been waged and most developmental researchers do accept the notion that developmental change is not restricted to any specific stage of the life-span and that, depending upon the function and the environmental context, behavior change can be pervasive and rapid at all ages. In fact, one finds the statement (e.g., Bayley, 1963) that it seems reasonable to assume that, generally speaking, the rate of change is greatest in infancy and old age. Obviously, the recognition of pervasive behavioral change at all stages of the life-span is basic to psychogerontology, and advancement of the life-span view has been primarily spearheaded by scholars of gerontology.

What is less clear to many developmentalists is whether the nature of life-span changes is...
such that they are inclined to apply the label "developmental change" throughout all phases of the human life-span. This issue, though significant in light of the history and the variety of world views associated with the concept of development (e.g., Harris, 1957; Overton & Reese, 1973; Reese & Overton, 1970), is less important in the present context. In line with earlier positions (Baltes & Goulet, 1970, 1971), it is argued here that the distinction between developmental change and aging change is largely a metatheoretical issue, discussion of which generates more heat than light, since it does not lend itself easily to empirical investigation.

Explication of Life-Span Ontogeny and Aging

Starting then from the conclusion that marked behavioral change does occur at all age levels, the central theme of scholarly efforts is to explicate the phenomenon of life-span change in terms of antecedent conditions and their associated mechanisms. Obviously, this process of explicating change is a tedious one. In general, the author is inclined to concur with Riegel's (1966) position that developmental psychology has not yet provided us with the type of theories that are apt to account for the "why" of development, though most researchers would maintain that impressive advancements have been made. This is particularly true for the ontogenetic change characteristics of the older person, i.e., aging, where most psychogerontologists still seem to rely on "counting and classifying the wrinkles of aged behavior" (Kastenbaum, 1968) and on expecting time per se to carry the onus of explanation.

Attempts at explicating behavior change sequences are manifold, yet they are all based on the postulate that time per se is not a causative factor (see Baltes & Goulet, 1970, 1971; Riegel, 1972; Wohlwill, 1970, for reviews and discussions). Time, as chronological age, is a nonpsychological variable whose psychological meaning must always be deduced from further research aimed at the systematic explication of behavior changes in terms of the antecedents and processes that occur over time. Such a strategy reduces the time dimension to an enumeration of ordered events or event combinations. Baltes and Goulet (1971) have discussed some basic research paradigms that allow for such an analytic explication of developmental change phenomena, as have other researchers such as Baer (1970), Sutton-Smith (1970), and Wohlwill (1970). In the context of aging, it was Birren (1959, 1970) who presented this issue in great clarity when he said that aging may be used to refer to relationships involving chronological age with the implicit assumption that such relationships are inevitably in transition to being explained by other variables without recourse to the use of the term "age."

The quest for an explication of ontogenetic change in terms of antecedents or time-correlated processes leads to a specification of the paradigms that are unique to a developmental view of analytic behavioral research. Obviously, such a task is embedded in one's world view relative to methodology and theory construction in the behavioral sciences (see Overton & Reese, 1973; Reese & Overton, 1970 for discussions). However, a discussion, though metatheoretically biased, seems useful, if it clarifies and exemplifies the framework from which it is possible to deduce a theoretical rationale for a life-span view of psychological aging.

On Research Paradigms

A life-span view of development and psychological aging suggests that the behavior of an aged individual and interindividual differences in aged individuals are a product of ontogenetic history, that the past is a prologue to the present. What does such a proposition imply in terms of research paradigms and theoretical corollaries?

Previously, it was stated that delineation of research paradigms is always done within a metamodel and that such a task cannot be geared toward truth criteria. The acceptance of such a relativistic world view is important for the considerations to follow, since the research model used to illustrate the nature of a life-span view of aging is not necessarily the one other researchers may employ.

Within a deterministic and mechanistic metamodel, for example, it has been proposed to organize research paradigms in the behavioral sciences around the elements described in the upper part of Figure 1: response variables (R), stimulus variables (S), and organismic variables (O). Other classifications are possible (see Klinger, 1964; Spence, 1963, for discussions).

First, the metamodel contained in Figure 1 postulates that behavioral responses (R) constitute the dependent variable (explicandum) of psychological research. Second, it postulates that the explanation and prediction of behavior...
by reference to antecedent variables proceeds by relating the target, dependent variables (behavior, R) to either other response variables \( R = f(R) \), organismic variables \( R = f(O) \), or stimulus variables \( R = f(S) \). Substantive examples for these three paradigms are the attempts to explain and predict a given dependent variable, say, "anxiety" in terms of other response categories (e.g., aggression, guilt), organismic variables (e.g., blood pressure, heart rate), or stimulus variables (e.g., darkness, isolation).

Third, the metamodel contained in Figure 1 states that variable relationships can be concurrent \( (C) \) or historical \( (H) \). In other words, the attempt to account for a given target variable or consequent behavior can be based on antecedent variables that are concurrent to, or at least in an antecedent proximity to, the target variable; or the account can be based on antecedents that occurred earlier in the time sequence. The latter historical relationships, involving significant time differentials between the consequent and antecedent conditions, are sometimes called "distal" relationships. A substantive example of the distinction between a concurrent and historical relationship is the attempt to predict "anxiety" either by reference to exposure to a concurrent anxiety-provoking stimulus situation (e.g., threatening father) or to an anxiety-provoking stimulus situation that occurred at an earlier period, such as the experience of a threatening father in early childhood.

Finally, the developmental formulation shown in Figure 1 states that the major task of developmental research is the explication of intraindividual change and interindividual differences in intraindividual change (the consequent) by reference to time-related interactions between response, organismic, and stimulus variables. It is the product of such long-term interactions that defines the behavior of an individual and interindividual differences at a given point in time \( (T) \). Note in this context that \( T_1 \) and \( T_{1-1} \) parallel concurrent and historical relationships respectively; further, that the use of two indices \( (f, g) \) is intended to allow for differential functions at different points in time (see later discussions of continuity vs. discontinuity issue).

Obviously, this view of research paradigms is incomplete. On the one hand, it is apparent that for any given response category, there may be a multitude of concurrent and historical antecedents in operation which are not necessarily based on a fixed set of elements as is expressed in the multivariate format paradigm contained in Figure 1. On the other hand, we need to clarify precisely how historical conditions (the nature of \( f \) and \( g \)) are translated or transmitted into the present context. However, it is indeed this notion of a changing system of antecedent-consequent relationships operating over time to produce a given behavior product (e.g., aging) and a series of such products (Riegel, 1972) that is at the core of developmental theory construction.

Therefore, in the following an attempt is made to pinpoint which aspects of the described paradigms are fertile for developmental considerations and, at the same time, which aspects of these paradigms specify the unique aspects of a life-span approach to the study of aging.

Life-Span Developmental Paradigms and Aging

Thus far, it has been stated that a developmental, life-span view of psychological aging, if translated into empirical operations, must employ historical paradigms. Conversely, it may be said that if concurrent, contemporaneous paradigms are sufficient to account for aging phenomena, a life-span view is not particularly exciting. Moreover, it is maintained that a life-span (or a developmental orientation in general) view must focus on a cumulative process analysis of response-organismic-stimulus \( (\text{man-environment}) \) systems.

In order to examine the usefulness of such a historical, cumulative view of psychological aging, the following discussion proceeds in two steps. First, some general objectives of developmental theory building will be described in terms of the research paradigms presented. Second, a set of questions prototypical of life-span research on aging will be derived and briefly examined in light of empirical data (taken primarily from the area of research on intelligence). The reader may want to apply similar principles when digesting the content of the other symposium contributions.

General Objectives of Developmental Research

The frame of reference for the prototypical questions to be discussed is that, ideally, the
scope, precision, and deployment of theories should allow one to describe, explain, and modify a given phenomenon as described in Baltes and Goulet (1970). Moreover, it was asserted in that paper that, in terms of components of variance, developmental research is aimed at describing and predicting both intrapersonal change and interindividual differences in intrapersonal change. How can these objectives of developmental research be explicated by reference to the research paradigms described above? Note again that the following is intended to have primarily didactic and not philosophical value.

Description of development.—In this context, description is seen as involving the empirical, systematic report of psychological changes (with respect to both intrapersonal and interindividual aspects) as they occur during late adulthood. This aspect of the task of theory building involves the left part of the paradigms in Figure 1 and those components of the right part which deal with response systems. In other words, the question of description is one of (a) identifying the response categories (R 1, 2 . . . r) constituting the behavior system, and (b) of quantifying time-related changes in these response categories in terms of both quantitative and structural attributes and intra- vs. interindividual difference parameters (e.g., Baltes & Nesselroade, 1973; Van den Daele, 1969). Often, the initial attempt at description focuses on age-functional relationships. In principle, however, it is the ordered, time-related sequence of behavior events that lie at the core of developmental description (e.g., Baer, 1970; Siegel, 1972, Wohlwill, 1970).

As long as the time-related behavior sequences described are of the R-R type, even though they involve historical relationships, one may argue that such statements are primarily oriented towards predictive rather than explanatory description. However, this distinction is a matter of taste rather than logical necessity.

Explanation and prediction of development.—Explanation of developmental phenomena, in this context, refers to the explication or clarification of behavior products and changes (e.g., aging) and interindividual differences therein by showing their relationships to their concurrent and/or historical contexts. The central question is which antecedent conditions (S, O, R) or processes (learning, maturation, etc.) are sufficient and/or necessary to account for the occurrence of a developmental event. While in description the primary focus is on unbiased observation, the emphasis in explanatory or analytic analysis is on the evaluation of the explanatory value of variable relationships in accounting for intrapersonal change and interindividual differences in such change sequences. In this context, it does not seem worthwhile to dwell on the relative merits of other aspects of explanatory analysis such as whether the strategy chosen is "constructive" or "reductive."

As indicated earlier, the task of explanation centers about assigning the right-hand side of the paradigm depicted in Figure 1 the status of antecedent conditions. The task of explanation becomes predictive when a given variable relationship is used to project into the future as opposed to into the past. The approach toward explanation (and prediction) is developmental, if the nature of the variable relationships is such that distal (historical) events or processes are linked to each other in the attempt to account for individual differences that exist at a given point in time. For some researchers particularly of the "strong" developmental type (see Harris, 1957; Reese & Overton, 1970, for discussions), such an approach has particularly high explanatory power, if the antecedents utilized represent so-called "basic" processes (e.g., Piaget's processes of assimilation and accommodation) and if they account for universal, directional, and irreversible change sequences (e.g., stage models). The multivariate expansion of the developmental paradigm contained in Figure 1 points to another complicating feature of such a developmental analysis related to the issue of continuity-discontinuity models. The multivariate paradigm not only states that the structure of variable elements may change during ontogeny, but also that a given developmental phenomenon may result from a variety of antecedent combinations involving not only different sets and amounts but also differential, time-related delivery schedules. Note that such a perspective expands on the conventional definition of a continuity-discontinuity dichotomy (see also Reese, this symposium). Generally, this dichotomy is restricted to measurement aspects of the dependent variable continuum. The present view, in line with Kagan's (1969) position, implies that a developmental analysis of the continuity-discontinuity issue should include a focus on the degree of homology involved in the sequential linkage of antecedent-consequent relationships. Baltes and Nesselroade (1973) have discussed this aspect.

4. The terms continuity-discontinuity are not used in this context to specify a precise theoretical concept. They indicate multiple meanings (descriptive, explanatory, preventive continuity vs. discontinuity, etc.). In the case of discontinuity, the focus is always on interactive, nonhomologous antecedent-consequent relationships.
Theory building concentrates on the generation—In terms of the research paradigms developed and pointed out that the degree of interindividual and intraindividual homogeneity in the delivery of developmental matrices may indeed be smaller than generally assumed by nomothetic models of development.

Modification and optimization of development. — In terms of the research paradigms developed in Figure 1, the final major task of developmental theory building concentrates on the generation of a knowledge base that would allow for a priori (prevention and optimization) or a posteriori (alleviation) alteration or modification of developmental differences both on the level of intra- and interindividual difference dimensions. Obviously such attempts at modification assume a knowledge base about the description and explanation of development and aging, although it is not restricted to such "developmental" information.

In principle, such modification attempts can involve knowledge about concurrent and historical relationships relative to stimulus, response, and organismic variables and their interaction. However, knowledge of the "naturalistic" antecedent conditions (whether concurrent or historical) may not be sufficient to engage in successful intervention. For example, some of the antecedents (e.g., heredity, physical trauma), though powerful, may not be easily manipulable. Further, the developmental or aging product, particularly if it is the result of a long-term process and if the organism is beyond critical periods of sensitivity, may be irreversible and chronic. Moreover, it may be useful to apply treatment variables (e.g., drugs) that were not directly involved in the "developmental" generation of the matrix of developmental differences. Note also that any modification attempts may not focus on the sample organism used in collecting the developmental information, but concentrate on other organisms (in a preventive fashion) that are assumed to be part of the same parent population.

The research paradigms, then, illustrate that modification attempts, in principle, can incorporate developmental (historical) considerations; they can be based on concurrent (nonhistorical) variable relationships, and they may bear no similarity to the developmental history that produced the behavior outcome observed. Further, modification attempts can try to maximize the effectiveness of a given intervention procedure by considering the interaction between historical relationships and the concurrent treatment condition. This leads to the conclusion that a developmental orientation in modification efforts makes maximum usage of its potential, if it is oriented toward prevention and optimization. At the same time, however, this developmental view of modification requires maximum knowledge about the past and future history of the entire man-environment context.

To illustrate this view on modification, prevention, and optimization, consider an older person who shows decrements in auditory sensitivity (e.g., McFarland, 1968, for review). First, in line with a nondevelopmental modification strategy and without much consideration for the history of the auditory loss, one may decide to provide the elderly person with hearing aids (a concurrent, behavioral prosthetic à la Lindsay, 1964) to compensate for the deficiency. Second, with a focus on prevention, one may counsel the persons to avoid further exposure to high noise levels which presumably, in their cumulative operation, were among the major ingredients in the developmental production of the auditory sensitivity loss. Finally, with a focus on optimization of the ontogeny of future cohorts, one may decide to control exposure to noise throughout the life-span of individuals, to design noise-protective devices, and/or to develop educational programs (for example, through differential reinforcement) that raise the sensitivity of aging individuals to those frequencies that normally show marked sensitivity losses in advanced age, etc.

Prototypical Questions of Life-Span Research on Aging.

With a focus on the tasks of describing, explaining, and modifying human development, the following four questions appear critical for the usefulness of a life-span approach to the study of psychological aging. (Parenthetically, it may be mentioned that questions 2 and 3 are conceptually similar and may be combined into one.) For the most part, illustrating examples are taken from the domain of life-span research on intelligence. Specific references are typically not given in the text. However, the reader may consult Baltes and Labouvie (1973), Bayley (1970), Cattell (1971), Horn (1970), Jarvik and Cohen (1973), Schaie (1970), but especially Charles (this symposium), for overviews on this topic.

1. Concurrent vs. Historical Models of Description.

To what extent is the gerontological phenomenon under consideration (e.g., intelligence, memory, cognition, psychophysiology, etc.) more comprehensively and/or differentially describ-
able, if related to earlier parts of the life-span?

Consider intellectual performance as an example. First of all, it is apparent that the prevalent models of intelligence and cognition (e.g., Guilford vs. Cattell-Horn vs. Piaget vs. Gagne) allow for different degrees of ontogenetic change with Guilford's being the least developmental. At first glance, one might argue that those models that allow for historical approaches are most useful when description of intellectual aging is at stake. At the same time, however, such "developmental" views of intellectual aging embed the phenomenon in a larger context that modifies the nature of the description. As most persuasively argued by Sidney Pressey, it is equally important to assure that description is fair and adequate as the elderly's cognitive functioning is concerned.

Indeed, in the area of intelligence one may conclude that the life-span view has often misguided the descriptive task, since the emphasis has been too much on the use of instruments and procedures that have been developed for younger populations. Conversely, since the notion of a continuity life-span model prevailed (largely in the interest of R-R type prediction), the domain of gerontological intelligence may not have been properly mapped, etc. Another example for the questionable usefulness of a life-span, continuity view of behavior change in old age is the widespread use of a "decremental" regression model which tends to categorize gerontological changes in terms of dimensions and criteria that are developed within the context of other age segments. All these examples are given to counteract the widespread belief that continuity models are necessarily superior to discontinuity models (see also Woodruff, this symposium).

The necessary conclusion seems to be that any level of development (including aging) requires at least two biases when constructing models of description: A first kind—emphasizing retrospective and prospective continuity—which focuses on the long-term sequence of development, a second—emphasizing discontinuity—which attempts to describe the functioning at that particular age period without much concern for the past or the future.

Neugarten (1969) phrased a discontinuity position most clearly when she said: "We shall not understand ... adulthood by projecting forward the issues that are salient in childhood;" and, "what is most striking is the lack of predictability from childhood to adulthood with regard to life outcomes." With regard to the description of psychological aging, the author's belief is that a nonlife-span discontinuous posture seems useful at the present time in order to give the phenomena characteristic of old age a fair chance to be "detected" (see also Reese, this symposium).

2. Concurrent vs. Historical Models of Explanation.

To what extent is the gerontological phenomenon determined or accountable by reference to concurrent vs. historical antecedents?

Consider again intellectual performance in the elderly as a substantive example. Setting aside the dilemma that the accumulation of history must be transmitted to the present organismic state of the organism in order to be effective, the question is whether intellectual decline in the aged is due to concurrent or historical systems of antecedents (S, O, R). As Butler (1968) stated in another context: "Evidence ... supports the conclusion that the immediate ... situation influences the adaptation of the aged," and "The ... adaptation of people at any age depends ... upon the immediate situation and past history."

An empirical case for a concurrent model of explanation, for example, relates intellectual decrements and interindividual differences in such decrements in the elderly to aging-correlated changes in the psychophysiological state of the aged's organism, to the deprived educational context in which the elderly lives, or to his high degree of test anxiety or cautiousness when responding to intelligence tests.

In contrast, explanatory attempts, that are historical in nature, focus, for example, on the performance-inhibitory processes that result from long-term cumulative learning as is implicit in various types of interference conceptions. Similarly, the prevalent effect of life history-associated differences in educational and social contexts on intellectual performance in the elderly (see Charles, this symposium) can be used to account for the aged's difficulties in coping with cognitive tasks and in explaining interindividual differences in the aged's cognitive functioning. Further, the perspective that a given intellectual response is necessarily subsequent to a specific response (as implied in stage models) is the most simple case of a historical explanation, most simple since it is cast in the framework of R-R relationships alone.

3. Time-lag Explanations of Aging.

To what extent can the gerontological phenomenon be accounted for by reference to time-lag or distal variable relationships?
This prototypical question pushes the quest for historical, explanatory paradigms to its extreme involving lengthy time-lag explanations often of a discontinuous nature. Consider again the domain of intelligence. Examples of remarkable time-lag relationships are implicit in data on hereditary contributions to late adult functioning, data on the relationships between childhood socialization conditions and adult intelligence, and findings on the relationship between adult professional status and intellectual performance during old age. Similar arguments are made in the context of senile dementia. Kral (1972), for example, summarizes the gist of a literature review by stating that (when contrasted with the effects of physiological, cerebral aging) a genetic disposition (to senility) and stress endured in the remote or recent past may be of greater etiological importance.

The search for explanatory discontinuity in historical antecedent-consequent relationships, from a design perspective, is often formulated in terms of history by treatment interactions (Baltes & Goulet, 1971). To what degree, then, is the gerontological phenomenon determined by interactive effects involving the developmental history of the aged subject and his exposure to concurrent treatment conditions? Consider again the domain of intelligence. Are there data to suggest that aged persons respond differentially to a given set of treatments (organismic, environmental, etc.) characteristic of the elderly’s ecology depending upon the organisms developmental history?

Unfortunately, data are scarce in this respect. However, there is some tentative evidence to suggest the hypothesis that older cohorts benefit more from a retest experience if they had an average educational history rather than one that is superior in terms of length and quality. Similarly, there are suggestions and hypotheses to the effect that older subjects respond less well to various biological treatments aimed at increasing cognitive performance, if they had a medical history of biophysiological traumata. In sum, the proposition is that the effects of a given treatment are not nomothetic and continuous, but that effectiveness is "moderated" by subject-related historical variables.

4. History by Treatment (Intervention) Interactions and Aging.

To what extent, with a focus on corrective and preventive intervention, is the gerontological phenomenon more effectively manipulable if the strategy of intervention considers the nature of the history of the aging?

This question translates the treatment by history interaction model into practice. It has two aspects. One concerns the a posteriori treatment of developmental abnormalities; the other the prevention of such dysfunctions and optimization of the aging process. As stated before, it is particularly the prospective, preventive view which requires knowledge about the entire life-course matrix of developmental phenomena. Predicting the nature, timing, and delivery schedule of treatments for specified aging outcomes, of course, is the dream of any gerontologist, since this task interlocks the generation of a knowledge base with its application.

Consider again the domain of intelligence. First of all, there is the posture that aging decrements, for example, are the result of long-term, cumulative processes such as practice and reinforcement deficits. Obviously, such data and conjectures are the first ingredients to a life-span model. For the most part these positions, however, imply a continuous, additive intervention paradigm. In addition, there are considerations about intervention which center about discontinuous conceptions. In line with a cognitive, phenomenological view of personality in late adulthood (e.g., Thomae, 1970), for instance, it could be suggested that a given educational intervention is differentially effective depending upon a given individual's prospective expectancy about the phenomenon of aging itself; an expectancy which is typically that of intellectual decrement. Aging subjects, however, differ in the degree of intensity of such expectations and, accordingly, one would predict subject-related history by intervention interactions.

Similar arguments could be put forward on the basis of strong cohort differences in intellectual aging (Nesselroade, Schaie, & Baltes, 1972). If the childhood educational system for today's elderly generation were significantly less satisfactory than for coming generations of aged individuals, one is tempted to predict that a given intervention strategy may be effective with today's aged population but not with the aged of the future. Furthermore, if early childhood experiences are critical for the emergence of intellectual achievement motivation, it is important to consider information about this period in the planning of corrective modification attempts in the elderly or the preventive, optimizing design of life-long educational programs.

Such a history by intervention interaction is also especially explicit, if a strong developmental theory of aging is accepted which implies that developmental theory and intervention must be
carefully matched (e.g., Kohlberg, 1968; Rohwer, 1970; Sigel, 1971). Assume for the moment that a given intellectual theory involves four structural and sequential stages (e.g., à la Piaget). Obviously, if subgroups of the aged had been functioning during adulthood at either the third or fourth level, a fourth-stage intervention package would have differential effects depending upon a given aged’s previous level of attainment. Again, from a design perspective, the outcome would be a history by intervention interaction. In sum, the proposition of this fourth paradigmatic question is that the effects of a given treatment are not nomothetic for all aged persons, but that their effectiveness is moderated by subject-related, historical variables. The longer such variables go back into the past ontogeny of the person, the stronger is the case for the usefulness of life-span developmental formulations.

Conclusions

The primary objective of this paper was to delineate the basic frame of reference for life-span research on psychological aging in terms of research paradigms and prototypical questions. This focus detracted from a careful review of the empirical support that such a research approach could muster. The reader who is interested in such an appraisal is encouraged to consult the symposium papers which follow and, regarding the domain of intelligence, the review papers cited. It is my evaluation that she/he will be struck by the range of opinions and data presented, both in support and refutation of a life-span approach to the study of development and aging.

As for the present writer, the attempt to formulate a conceptual framework and a set of prototypical questions resulted, in a way, in as many questions as answers. On the one hand, in an optimistic view, it is hoped that this paper further illustrates the narrow perspective age-specific theories of development display including those which neglect to see aging as a developmental product resulting from the accumulation of differential intraindividual change functions; further, that it is desirable for developmentalists engaged in researching earlier parts of the life-span to open their eyes to the prospects of adult development by including tasks and methods that are more typical of the elderly in their instrumentarium; moreover, that the relative strength of a life-span view is dependent upon the metamodel of development chosen, the area of research, the empirical support that can be mustered for the significance of historical relationships, history by treatment interactions, and the joint significance of continuity and discontinuity models in description, explanation, and modification; in addition, that the usefulness of a life-span view of aging is most explicit when preventive and optimizing gerontological intervention is at stake; further, and perhaps most importantly, that a life-span perspective is apt to redirect conventional thinking about aging (which employs concurrent paradigms and is fatalistic) by focusing on experimental, life-history antecedents and the modifiability of the aging process; and finally, that a life-span view of human development is conceptually not different from any more age-specific developmental approach, but only illustrates the conceptual base of the latter in more conspicuous clarity.

On the other hand, the present considerations point also to a host of questions dealing with the issue of empirical substantiation and operationalization of the prototypical paradigms discussed. Whereas it is theoretically possible to view the search for empirical data on life-span (historical) relationships as being only a matter of time, especially in light of the rising interest in the field, there are numerous immediate questions dealing with adequate methodology. We face the obvious need for data-analysis models that allow for the examination of continuity vs. discontinuity issues and the sequentiality of behavioral events, the joint analysis of behavior-biology-environment systems that are much more complex and dynamic than currently conceived of, the utilization of retrospective and prospective methods of data collection, and, last not least, for strategies that permit the assessment of altering behavior-biology-environment systems in a rapidly changing world, where the import of phylogenetic rather than ontogenetic change processes may be continuously growing.

A life-span view of psychological aging, then, perhaps similar to cross-cultural perspectives, points not only to the dramatic complexity of the multiplicity of ontogenetic conditions that may have produced a given aging phenomenon, to its variability, but also to its contextual, epochal, and phylogenetic specificity. In this vein, further clarification and discussion of the paradigms underlying a life-span approach to the study of aging cannot but help in focusing our research efforts and enriching our theoretical and methodological arsenal in the field of gerontology.
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It is asserted that the life-span approach has both facilitated and impeded advances in the psychophysiology of aging. Circumstances in which the life-span perspective is more or less useful in psychophysiological approaches to aging are identified and discussed. Alternatives to the life-span approach are also considered. While description has been the main thrust of most life-span psychophysiological research in the past, attempts at explanation, modification, and prevention should mark more future attempts to understand physiology-behavior relationships in the aged. Since life-span information can be useful in explanation and modification, and since such information is essential in prevention, the life-span approach will continue to be a viable perspective in the psychophysiology of aging.

The Usefulness of the Life-Span Approach for the Psychophysiology of Aging

Diana S. Woodruff, PhD

The life-span perspective has been both useful and misleading in psychophysiological approaches to aging, and it is the aim of this paper to delineate the strengths and weaknesses of the life-span model in psychophysiological research. Psychophysiology involves the attempt to determine relationships between psychological and physiological variables. Psychophysical research on aging has typically consisted of the description and explanation of age changes in behavior over the life-span in terms of age changes in physiology. Indeed, the biological decremental model of aging has pervaded geropsychological research, and consequently the psychophysiological approach has received considerable emphasis in the psychology of aging.

On the one hand, the life-span approach in psychophysiology has been useful inasmuch as a large body of evidence has accumulated indicating that physiological decline is related to age changes in behavior (e.g., Birren, Butler, Greenhouse, Sokoloff, & Yarrow, 1963; Gaitz, 1972; Jarvik, Eisdorfer, & Blum, 1972; Thompson, 1973; Welford & Birren, 1965). On the other hand, the approach has perhaps misdirected psychologists to accept irreversible physiological and behavioral decline as characteristic of aging thus precluding exploration of means to decelerate or reverse behavioral aging as well as precluding exploration of non-physiological and concurrent environmental determinants. The pervasiveness of the life-span psychophysiological approach in aging research attests to the usefulness of this approach, but the very pervasiveness of the biological decremental model represents a weakness in terms of a narrowness of perspective in contemporary geropsychological research.

Psychophysiology of the Aged: Past a Prologue for the Future?

In evaluating the usefulness of the life-span perspective for understanding behavior in the aged, one is essentially evaluating the usefulness of information about the early and middle years of life in understanding and predicting behavior in later years. In this regard the question, "Past a prologue for the future?" involves the degree to which historical events in the life-span are antecedents for behavior in the future (see Baltes, this symposium). Another sense of this question can also be discerned: Are the past means of studying the psychophysiology of aging necessarily the most useful prologue for future approaches in this area? Perceived at this level, the question involves methodology. The resolution of the second issue in part rests on the resolution of the first—the extent to which past history is useful in understanding behavior in the aged.