

**HISTORICAL TIME AND COHORT EFFECTS**

**K. Warner Schaie**

**Department of Individual and Family Studies**

**The Pennsylvania State University**

**Paper Presented at the**

**West Virginia University Conference on**

**LIFE-SPAN DEVELOPMENTAL PSYCHOLOGY**

**Historical and Generational Effects in  
Life-Span Human Development**

**Morgantown, West Virginia, May 13-15, 1982**

## HISTORICAL TIME AND COHORT EFFECTS

K. Warner Schaie

The Pennsylvania State University

### INTRODUCTION

Historical accounts of the life-span psychology movement are likely to point out that one of its major contributions may have been to shift the focus of concern from the search for purely "developmental" patterns of a normative nature to the context within which development occurs. This context, of course, refers not only to the characteristics of place and culture, but as is highlighted by this conference, includes as a major parameter the historical time during which development occurs.

The fact that the concern about the influence of historical period emerged largely from the study of adults does not surprise. Children, as emergent organisms, might reasonably be assumed to possess at least some characteristics which ought to be constant across time because they are involved in the establishment of behavioral competencies essential for survival. But few, if any, such characteristics are important for development during much of adulthood, even though survival-relevant behaviors might again merit concern for the study of advanced old age. I have in the past argued, therefore, that for those variables where a behavioral asymptote is reached in young adulthood, age-related behavior change recedes in scientific interest. Instead, the developmental scientist is now faced with the need to be concerned with matters we have come to classify as cohort and period effects (see also Schaie, 1963a, 1977).

It seems to me in retrospect that much of our concern with methodologies designed to separate age, cohort and period effects has stemmed from our pre-occupation with the role of age as the independent variable of prime interest to developmentalists. Not unlike the early experimental psychologists who saw individual differences as a primary source of unwanted error variance, so have we often treated historical time and generational effects as confounds to be controlled and explained away. It is thus not without a good deal of justification that Rosow (1978) was able to argue that the work on sequential strategies (e.g. Baltes, 1968; Schaie, 1965) treated the effects other than age as

nuisances and that any information developed on them was at best incidental.

Such a position, of course, has never been true for all developmentalists. Klaus Riegel throughout the latter portion of his work vehemently argued for a dialectic interplay of historical events with life stage and cohort effects (1972, 1975, 1976). More recently, Sinott (1981) has considered implications of the theory of relativity for the study of development, which may provide considerable metatheoretical support for what we are about to consider. It should also be noted that several of our sociological colleagues have addressed the interface of life stages and cohorts theoretically as well as substantively (e.g. Carlsson & Karlsson, 1970; Elder, 1974; Ryder, 1965). And in our own work we have paid just as much attention to the estimation of period and cohort effects as to those of chronological age, perhaps at times even de-emphasizing the role of the age variable (e.g. Schaie, 1979, 1982b). But it remains quite true that we have done very little thus far to go beyond the description and identification of period and cohort effects as important components of individual differences variables although we have tried to call attention to the potential importance of these effects for fields as diverse as mental health, adult education and the professional problems of engineers at mid-career (Schaie, 1978, 1981, 1982a; Schaie & Willis, 1978).

Our task in this conference as I see it, is to continue to remediate the lack of substantive attention given to the specific meaning of historical time and cohort. If this is to be done most constructively we cannot simply appeal to our colleagues in sociology and contemporary history to define for us what might be the most relevant societal changes and cohort boundaries that we ought to use to order developmental phenomena by. Rather we must do some of our own homework. I would like to begin this endeavour by sketching out the framework that a behavioral scientist might apply to the study of historical events which might be relevant to issues of concern to a life-span developmental psychology. To do this effectively it may be necessary to broaden the concepts of cohort and period, to suggest methods for scaling the possible impact of historical events upon behavioral phenomena, and to suggest ways in which individual differences in position on space-time templates for diverse attributes might permit more creative uses of age as a dependent variable. In the course of this attempt, much of which is highly speculative and provisional at this juncture, it is possible that we might also be able to provide some new insights on how the

apparent stalemate in the estimation of age, cohort and period effects could perhaps be finessed. But before we get too ambitious let us begin far more humbly by recalling the kind of data that have persuaded at least some of us to leave the comforts of a static and ahistorical approach to the study of human development.

#### HISTORICAL TIME AND COHORT EFFECTS IN PSYCHOLOGICAL DATA

Some concern had been expressed earlier regarding the impact of social change upon behavioral variables (e.g. Kuhlen, 1940). However, it is probably fair to say, with all modesty, that little formal attention had been given by developmental psychologists to the impact of generational or historical events until my concern with the discrepancies between cross-sectional and longitudinal findings on changes in adult intelligence led to the publication of my paper on the general developmental model (Schaie, 1965). What I had noted, essentially, was the fact that when I compared data from two cross-sectional samples drawn from the same parent population seven years apart, that mean values on ability measures for the later sample exceeded those for the earlier sample with great regularity (Schaie & Strother, 1968). In addition, the overall mean for subjects at all ages also differed positively over time.

The implication of these findings suggested to me that there could either be the phenomenon of a unique period effect active across all cohorts studied, or that there was a long-term trend involving successively higher performance asymptotes in young adulthood (see Schaie, 1982b, for more detailed discussion). In fact, I soon decided that any attempt to resolve these two alternatives would require an additional data collection, so that it would be possible to construct what we now call a longitudinal sequence (Schaie & Baltes, 1975). That is, we needed data which would permit comparing two or more cohorts followed over the same age range, a procedure which requires a minimum of three measurement points. This is what we did, and we were then persuaded that we were not faced with a period trend unique to the original time span, but that we were actually faced with substantial cohort differences (Schaie & Labouvie-Vief, 1974).

It is without surprising anyone that I can now confess that we really did not have the slightest idea as to the substantive meaning of either period or cohort effects. The time period studied was an artifact of the timing of research funding, the cohort boundaries (and consequently the age ranges) were arbi-

trarily fixed to be equivalent to that time period. Since our initial interest was indeed the control of confounds for the age variable, this approach made eminent sense. It simplified numerical analyses, and permitted comparison of the magnitudes of variance components. In fact this approach, perhaps inordinately directed towards attaining methodological sophistication, also gave rise to a number of methodological controversies (cf. Adam, 1978; Botwinick & Arenberg, 1976; Schaie & Hertzog, 1982) which may substantively be quite besides the real point. That is, the comparison, for example, of age and cohort effects using equal chronological time units may be appropriate only if, substantively it is possible to show that there are actual phenomena underlying the index variables of age and time which can actually be scaled in comparable units.

In the life of adults, seven years may actually not be an unreasonable age interval to detect behavioral change. The convention of using 5 or 10 year intervals, obviously, relates to our use of the decimal system rather than any psychologically meaningful dimension. In my own life, I have found that changes of major significance, whether in professional or personal matters, have often taken longer than 5 years but less than a full decade to come about. And the full age range over which adults can be found in reasonable frequency can be conveniently divided into ten segments of seven years each, six of which currently occur during the normal work life, and four after the typical retirement age. Now if you find this justification at least somewhat strained, and it is, how much less will you give serious credibility to cohort intervals selected to conform to the age intervals for reasons of computational convenience? Nevertheless, we might still fail to attend to the issue of meaningful cohort and/or period boundaries, if it was not for the fact that our data will force the absurdities of our classification schemes to our attention whether we like it or not.

-----  
Insert Figure 1 about here  
-----

To illustrate this point let me call your attention to Figure 1, which presents data on the variable of Spatial Orientation from the Primary Abilities Test for a data set in which all 162 participants were examined three times in seven year intervals, their age at test being indicated on the abscissa, the ordinate giving mean performance in T score points (Mean = 50, S.D. = 10, based upon a large sample at first test). In other words, this

figure shows seven cohorts followed over a fourteen-year period, the youngest from mean age 25 to mean age 39, the oldest from mean age 67 to mean age 81. What becomes apparent immediately, of course, is the fact that the data suggest that there are not seven cohorts at all. Considering the gaps between the arbitrary cohort boundaries, there appear to be three distinct cohort groupings. The three oldest seem quite distinct in level and slope from the next two, and those again are clearly distinct from the youngest two. In this data set then, it appears empirically that there are three "real" cohorts. Given the constraints of our data set, their time boundaries should be 21 years for the oldest and 14 years for each of the youngest, empirically determined sets.

In some of my less formal presentations I have referred to the gaps between these three sets as being curiously close in temporal contiguity to World Wars I and II. That is the oldest group was educated prior to World War I, the second between the wars, and the youngest group during and after World War II. Now this kind of interpretation is the rankest ad hoc approach to the interpretation of cohort effects. I am certain we can do a lot better and in the remainder of my paper I will try to lay out some of the considerations that need to be addressed if behavioral scientists wish to make a serious effort to study historical time and cohort effects as they relate to human development.

#### THE CONCEPTS OF COHORT AND PERIOD REVISITED

Before we begin our attempt to delineate how behavioral scientists might go about measuring historical events, it might be prudent to give some attention to the manner in which we have chosen to define the concepts whose meaning we are now attempting to clarify. Most recently we have defined cohort as ". . . the total population of individuals entering the specified environment at the same point in time," and period (time of measurement) as ". . . the point in time at which the response of interest is actually recorded" (Schaie & Hertzog, 1982, p.92). In that paper, actually written two years ago, I already added footnote (p. 92), in which I suggested that the point of common entry for a cohort need not necessarily be birth and referred to relevant discussions in the sociological literature (Rosow, 1978). I would now like to begin to broaden the concepts of both cohort and period in a more explicit and formal manner. Such broadening, I believe may be useful in helping us reach a more genuine understanding of these concepts as they impact developmental phenomena. (For alternate but related conceptualizations of these issues see Nesselroade,

1981, and Nydegger, 1981).

#### Cohort as a Selection Variable

Although developmental psychologists have thus far utilized the cohort concept primarily as a mode of organizing individuals by birth year, there are many other ways in which individuals can enter a common environment under study (see Figure 2). Selection into such common environments may occur as the result of quite different influences. Baltes and his associates (1979) have classified these influences into three basic types: age-graded, history-graded and non-normative. The effects of the first of these influences will result in samples of subjects which are almost (but not entirely) as homogeneous by age as would be true for samples selected by birth year alone. Examples of age-graded cohort definers, other than year of birth (in declining order of correlation with age) are entry into the public school system, menarche, menopause, enlistment in the volunteer armed forces, first marriage, birth of first child, becoming a grandparent, retirement and death. Note that these cohort definers include both biologically and societally programmed events. They do have in common the attribute of being essentially normative in nature, and those among them that refer to societal norms, are still largely constrained by relevant biological characteristics ordered by age.

-----  
Insert Figure 2 about here  
-----

There are other possible cohort definers which at least over the broad range of middle adulthood may be quite random with respect to age. These include cohorts formed by influences which may be more or less history-graded in nature. For example, cohorts may be defined by events such as the staffing of a new corporation or college, the conscripts called up in a general mobilization, the "class" of persons entering the ranks of the unemployed during a depression, and during periods of rapid technological change, members of a given class of technical and proprietary schools.

Finally there are cohorts formed by the common experience of certain non-normative events. This may sound paradoxical, but the fact remains that for members of a common species it is simply unlikely that there be a large variety of totally unique experiences of developmental consequence. Non-normative events, therefore, are those favorable events which are not required for

the adequate development of all (or even most) persons, and those unfavorable events which may impact some persons' development but may be avoidable for many. Again temporally close experience of such non-normative events may be influential in the formation of cohort groupings. Examples of such cohort definers (which typically are uncorrelated, or at most moderately correlated with age) include divorce, experience of an infectious disease, onset of a disabling condition by disease or accident, membership in a particular social group, purchase of residence in a particular neighborhood, and so on.

Some of these examples lend themselves to equal interval cohort boundaries, but others definitely do not. Moreover, it is important to note before we leave this topic that it is only the biologically determined age-graded influences which permit assignment of all individuals to cohorts defined by a given influence. In all other instances cohort assignment is possible only for subtypes of the population displaying a particular biological, demographic or behavioral attribute. This restriction might persuade some investigators to be rather cautious in trying out my proposed broadening of the cohort concept or restrict such broadening to universally assignable attributes. Let me stress, however, that assignment to cohorts defined by influences holding only for limited sub-populations may actually yield more powerful predictions in individual cases than is possible from knowledge of universally defined characteristics.

#### **Periods as Definers of Discrete Events**

We discovered that there are many biological and societal influences which may characterize entry into a common environment, which consequently might be suitable as selection variables for the definition of cohort groupings. Some of these influences might substitute meaningfully for year of birth, but would still be largely age-graded. Others, however, would largely be uncoupled from chronological age, albeit they might only be applicable to selected sub-populations. By analogy, we must now examine to what extent the concept of period is linked to particular calendar dates.

If we insist, for the moment, that we wish to convert the status of period from that of an index variable to that of an explanatory concept, we would note that what is of interest is not the particular calendar date, but rather the historical event or events for which that date is the temporal indicator. It follows then that just as we needed some organizational principles to



characterize alternate conceptions for cohorts, so must we now begin to search for classes of influences that would mark a given period. Here we immediately discover a most important conceptual distinction between period and cohort effects. Cohort effects may be history-graded, and many are, but as we have seen cohorts can be defined by influences which may be quite ahistorical. By contrast, period effects are history-graded by definition! The Baltes et al. (1979) models then will not help in the reformulation of the period concept.

Perhaps we can begin by noting the range of impact of history-graded events. Some have universal impact, such as major wars, or the introduction of major technological changes which achieve virtually immediate and universal acceptance. Others are of a far more parochial nature. They may effect certain localities, but not others, or even in a single region may only impact specific sub-sets of the general population. Of immediate concern is the recognition that all such events, whether general or specific, may impact different regions or even different individuals at different points in time. What we need then is some approach that will permit us to designate a calendar date at which a particular historical event perceived to be a potential developmental influence has had the opportunity to reach a specified proportion of our target population. Alternatively we may argue that for the most intensive study of individual development it may be necessary to assign to each individual a series of period indices, one for each developmentally influential event under study, designating when such influence could have impacted our target person. Note immediately, that a corollary of such index of initial target person impact would be a similar index reflecting the calendar date on which the impact ended!

Before we can even begin consideration of how we would operationalize our new definition of period designators, we must come to grips with the question of how a behavioral scientist would recognize historical events which are useful for this purpose. It is unlikely that we are really interested in political history as such; we couldn't care less in this context who was President when, or who fought, lost or won what war. The kind of history we are concerned with instead, is the chronicling of societal changes in technology, customs and cultural stereotypes which might constrain behavior. In a quick and dirty perusal of modern American history, which I conducted in preparation for writing this chapter, I consequently eschewed the more formal treatments concerned with changes in our political fabric. What interested me most were the far more journalistic accounts of the

period which covered the life times of persons I have been privileged to study behaviorally, written so as to convey the dramatic changes which have characterized the life of these individuals, but with a view as well of identifying the calendar points at which particular events began to make broad impact (e.g. Allen, 1952).

Since most of my living research subjects were born no earlier than the turn of the century, I began by studying the immediate period preceding the first World War. For the behavioral scientist, a useful volume covering this period is provided by Walter Lord's *THE GOOD YEARS* (1960). It is most instructive in pointing to the vast differences in manner of living and customs facing our older adult subjects in their youth from those experienced by our current cohort. For example, in the year 1900, there was no radio, telephones were viewed as business tools, and the major means of personal transportation were the horse and buggy for short, and trains for long distances. I continued my journey by sampling some rather similar writings of Frederick Lewis Allen (1931, 1940) covering the decades of the boom following World War I and the great depression, and an account of the period immediately following the second World War (Goldman, 1956).

What becomes clear then is that effective use of a broadened period concept will require the identification of historical events presumed to have developmental impact covering the period during which subjects under study were alive and scaling the temporal position of greatest impact of such events, perhaps as watershed dates. In the following section of this presentation we shall next turn to the manner in which we might operationalize the new indicators required for our redefinition of the cohort and period concepts.

#### HOW DO WE MEASURE HISTORICAL TIME?

I shall now turn to what may be the most difficult part of my assignment, trying to proceed from generalizations about the new directions which I think we should take to more specific prescriptions on how we will get on our way. To begin with we need to create a taxonomy of development-relevant events, by careful analysis of modern history texts, perhaps similar in scope to the approach taken by Allport and Odbert (1936) in their pioneering analyses of dictionaries for the purpose of creating an exhaustive taxonomy of trait names. We can then proceed using professional judges to classify our events as relevant to specific behavioral

domains. Ratings of similarity may then be used to cluster events and reduce the large number that could be studied to more manageable proportions.

Once we have dimensionalized our events, and selected a workable number of discrete events to mark each dimension we must then do some further library research that will help us obtain anchor points which can be used in assigning meaning to period analysis. What I have in mind is that we must identify the calendar dates that bound those events which we have identified to be of most salient concern to developmentalists. For a number of temporally indexable social changes it may be possible to note their date of first impact as well as the date when the change had become universally accepted (within the limits of the target population under study). Perhaps it would be prudent to define somewhat more conservative boundaries, such as the year when 10 per cent of the population had adopted a technological innovation (say the automobile, the telephone or television) or accepted a changed custom or attitude (say mini-dresses, integration of schools, jogging), and that year when 90 per cent of the population were impacted by the change event. For recursive phenomena (keep in mind that event time is not likely to be uni-directional) we would by analogy consider the event as having ceased when less than 10 per cent of the target population remained impacted. Some examples of events showing various patterns of impact are shown in Figure 3.

-----  
Insert Figure 3 about here  
-----

Another problem that requires solution is to assign relative impact values to events occurring over the same or overlapping temporal periods. If data were available providing information on the individual timing (experience) of the historical events contiguous with behavioral measurements we might determine the importance of the events by appropriate regression analyses. Lacking such data it may not be unreasonable to once again rely upon expert scaling to obtain the needed parameters. Once this is done we can then re-scale calendar time in terms of historical event impact density. Given a schema of multi-dimensional event classification it might then be possible to develop a series of distinct time frames. For example, there might be one event-density based calendar for technological change, another for health-relevant interventions, a third for sexual mores, a fourth for information acquisition and yet another for events enhancing self-awareness.

The broadened concept of period as a set of events marking historical time requires attention then to a number of different characteristics which have not hitherto been given a great deal of attention. I have summarized these characteristics in Figure 4.

-----  
Insert Figure 4 about here  
-----

The important consequence of scaling, or rather re-scaling, historical time is that we would be able to assign psychological (or if you wish to call it that, existential) meaning to the construct of calendar time rather. Some might argue that moving from the prevalent enslavement to a purely physical time dimension might bridge some of the gaps between the hard-nosed experimental and more humanistic approaches to life-span development (e.g. Schaie, 1973b; Sparks, 1973). Note, however, that my endeavour is not to advocate a purely subjective calendar (although applying similar approaches to scaling the life history of an individual might be just that). What I am suggesting is that historical time ought to be defined in terms of event density. That is, periods of time which are filled with behavior-relevant events ought to count more than those which are relatively event-free. If we can implement such an approach we ought to find that the new time units will correspond much more closely with changes over age and time of interest to developmentalists. And as we will investigate next, reconceptualization of period as event time will permit us to take a new approach to resolving some of the that have plagued developmental researchers in recent years.

#### IMPLICATIONS FOR THE ESTIMATION OF AGE, COHORT AND PERIOD EFFECTS

Let me first of all reiterate another difference between cohort and period effects that, I believe, has been illuminated somewhat by our broadening of the two concepts. This difference refers to the fact that cohort as a selection variable clearly must be and can only be an individual difference characteristic. One cannot belong to two cohort levels on the same selection variable, albeit under our broadened definition one can simultaneously be a member of two or more cohort classifications. Period effects, by contrast, must be intra-individual change variables, whether calendar or event time, short or long; one cannot have the experience of two events occurring over time simultaneously. Nevertheless, it is possible for two individuals to experience the same events on a different time scale, or to experience different

events at the same point in time. That is why we introduced the concept of event time.

The distinction just made sheds further light on the relation between cross-sectional and longitudinal data, since chronological age has the status of an inter-individual difference variable in the former but of an intra-individual change variable for the latter. What is held in common by the two age indicators, therefore, must be other than cohort membership (now defined as a multiple selection variable) or experience of historical events (now considered as event time). What does that leave us with for the concept of age? Most likely, we must return to a fairly limited maturational view. Pure age effects, freed from cohort and period confound should reflect age-graded phenomena which are biological or ethological in nature, since all other variance would be accounted for by group membership and experience of history-graded events. I am thus quite unabashedly returning to a position I took some time ago when I suggested that sequential methods might offer some contributions to the analysis of nature/nurture issues (Schaie, 1975).

Having allowed for cohort groupings, membership in which is not necessarily a function of chronological age, and having defined period effects as event time which is no longer synonymous with calendar time, we have essentially succeeded in breaking the inevitability of the indeterminacies suggested by the general developmental model (Schaie, 1965). That is, at least for extensive life stages, it is now possible to imagine research designs which permit specification of distinct age, period and cohort dimensions. More often than not, these dimensions will not be orthogonal to each other, but it is possible to envision many circumstances (see some of the examples given for both cohort and even time definers), where correlations will be quite low.

It would be beyond the scope of this paper to indicate specific implications of these matters for technical aspects of sequential analysis. To be quite frank, I have not yet progressed far in addressing that issue. It appears to me though that the ANOVA approaches previously outlined will remain useful particularly in those instances where cohort groupings are defined in such ways that the natural cohort boundaries are not continuous or linear in nature. Alternate approaches such as those suggested by Mason et al. (1973) and by Horn and McArdle (1980), would be preferred were all three dimensions are defined as continuous variables, and in particular where multiple definers of cohort and period are used.

In all of these instances it would make most sense to me to enter chronological age as the last variable, since it alone retains the status of a pure index variable, unless it is by physiological or other directly measurable age-related parameters. Which brings me to a cautious final comment that perhaps the time has indeed come when we should take more seriously Wohlwill's (1973) suggestion that chronological age might best be utilized as a dependent variable. Only in that manner will we ever know how chronological age does serve as a convenient index of the actual factors influencing human development.

#### SUMMARY AND CONCLUSIONS

Developmental psychologists and other developmental scientists in recent years have been spending a good deal of effort upon developing methodologies for a more valid description of developmental phenomena occurring over time. In that process they have recognized that chronological age as such has little explanatory power and is a rather empty indicator of the phenomena of interest. In the course of dealing with this problem we have discovered the dimensions of cohort and historical period (time of measurement), which at first were viewed primarily as unwanted confounds for our understanding of age changes. We soon recognized, however, that rather than being merely inconvenient, these concepts may of great interest to developmentalists.

In spite of our preoccupation with the methods for separating cohort and period from chronological age, there have been few attempts to assign specific meaning to these concepts; the work of some of those present at this conference, of course, being an exception. In this paper I have proceeded to argue that before we can assign meaning to cohort, we must broaden our view of how cohorts are selected, and have suggested some organizing principles for this purpose. Likewise, I found it necessary to transform the concept of period into one of event time. Once this was done, it then became possible and necessary to suggest an approach to the scaling of historical time to permit derivation of units of analysis useful for behavioral work. Finally, I suggested that some of the methodological problems of age, time and cohort estimation might be finessed by my redefinition of cohort and period, as their dependency upon chronological age can at least in some instances be partially broken by the new definitions.

Whether or not my specific suggestions for the study of historical time and cohort effects presented here will find wide

nce is not important. What is important is the fact that  
ference can not fail but encourage developmental psychol-  
to move beyond the mere note that time and place are sig-  
influences upon development. Our work here then is to  
e others to design and implement studies which explicitly  
explain the impact of history upon human development. If  
ed in this endeavour I am convinced that we will have  
ed a new era in the history of the developmental  
s.

## REFERENCES

- Adam, J. Sequential strategies and the separation of age, cohort, and time-of-measurement contributions to developmental data. *PSYCHOLOGICAL BULLETIN*, 1978, 85, 1309-1316.
- Allen, F.L. *ONLY YESTERDAY: AN INFORMAL HISTORY OF THE NINETEEN-TWENTIES*. New York: Harper, 1931.
- Allen, F.L. *SINCE YESTERDAY: THE NINETEEN-THIRTIES IN AMERICA*. New York: Harper, 1940.
- Allen, F.L. *THE BIG CHANGE: AMERICA TRANSFORMS ITSELF 1900-1950*. New York: Harper, 1952.
- Baltes, P.B. Longitudinal and cross-sectional sequences in the study of age and generation effects. *HUMAN DEVELOPMENT*, 1968, 11, 145-171.
- Baltes, P.B., Cornelius, S.W., & Nesselroade, J.R. Cohort effects in developmental psychology. In J.R. Nesselroade & P.B. Baltes (Eds.), *LONGITUDINAL RESEARCH IN THE STUDY OF BEHAVIOR AND DEVELOPMENT*. New York: Academic Press, 1979.
- Botwinick, J., & Arenberg, D. Disparate time-spans in sequential studies of aging. *EXPERIMENTAL AGING RESEARCH*, 1976, 2, 55-66.
- Carlsson, C., & Karlsson, K. Age, cohorts and the generation of generations. *AMERICAN SOCIOLOGICAL REVIEW*, 1970, 35, 710-718.
- Elder, G. *CHILDREN OF THE GREAT DEPRESSION*. Chicago: University of Chicago Press, 1974.
- Goldman, E.F. *THE CRUCIAL DECADE: AMERICA, 1945-1955*. New York: Knopf, 1956.
- Horn, J.L., & McArdle, J.J. Perspectives on mathematical/statistical model building (MASMOB) in research on aging. In L.F. Poon (Ed.), *AGING IN THE 1980S*. Washington: American Psychological Association, 1980.
- Kuhlen, R.G. Social change: A neglected factor in psychological studies of the life span. *SCHOOL AND SOCIETY*, 1940, 52, 14-16.



- Lord, W. THE GOOD YEARS: FROM 1900 TO THE FIRST WORLD WAR. New York: Harper, 1960.
- Mason, K.O., Mason, W.M., Winsborough, H.H., & Poole, W.K. Some methodological problems in cohort analyses of archival data. AMERICAN SOCIOLOGICAL REVIEW, 1973, 38, 242-258.
- Nesselroade, J.R. Temporal selection and factor invariance in the study of development and change. Unpublished manuscript. Max Planck Institut fuer Entwicklungs und Erziehungswissenschaft, Berlin, Germany, 1981.
- Nydegger, C.N. On being caught up in time. HUMAN DEVELOPMENT, 1981, 24, 1-12.
- Riegel, K.F. Time and change in the development of the individual and society. In H.W. Reese (Ed.), ADVANCES IN CHILD DEVELOPMENT AND BEHAVIOR. Vol. 7. New York: Academic Press, 1972.
- Riegel, K.F. Adult life crises: towards a dialectic theory of development. In N. Datan & L. Ginsberg (Eds.), LIFE-SPAN DEVELOPMENTAL PSYCHOLOGY: NORMATIVE LIFE CRISES. New York: Academic Press, 1975.
- Riegel, K.F. PSYCHOLOGY OF DEVELOPMENT AND HISTORY. New York: Plenum, 1976.
- Rosow, I. What is a cohort and why. HUMAN DEVELOPMENT, 1978, 21, 65-75.
- Ryder, N. The cohort as a concept in the study of social change. AMERICAN SOCIOLOGICAL REVIEW, 1965, 30, 843-861.
- Schaie, K.W. A general model for the study of developmental problems. PSYCHOLOGICAL BULLETIN, 1965, 64, 91-107.
- Schaie, K.W. Methodological problems in descriptive developmental research on adulthood and aging. In J.R. Nesselroade & H.W. Reese (Eds.), LIFE-SPAN DEVELOPMENTAL PSYCHOLOGY: Methodological issues. New York: Academic Press, 1973. (a)
- Schaie, K.W. Reflections on papers by Looft, Peterson and Sparks: Intervention towards an ageless society? GERONTOLOGIST, 1973, 13, 31-35. (b)

- Schaie, K.W. Research strategy in developmental human behavior genetics. In K.W.Schaie, E.V Anderson, G.E. McClearn & J. Money, (Eds.), DEVELOPMENTAL HUMAN BEHAVIOR GENETICS. Lexington, Mass.: D.C. Heath, 1975.
- Schaie, K.W. Quasi-experimental designs in the psychology of aging. In J.E. Birren & K.W. Schaie (Eds.), HANDBOOK OF THE PSYCHOLOGY OF AGING. New York: Van Nostrand Reinhold, 1977.
- Schaie, K.W. Impact of aging on the individual: Cognitive, intellectual and performance factors. In M. Hamburger & J. Arleo (Eds.), THE ENGINEER AT MID-CAREER: DISCRIMINATION OR UTILIZATION. New York: Institute of Electrical and Electronic Engineers, 1978.
- Schaie, K.W. The Primary Mental Abilities in adulthood: An exploration in the development of psychometric intelligence. In P.B. Baltes & D.G. Brim, Jr. (Eds.), LIFE-SPAN DEVELOPMENT AND BEHAVIOR, Vol. 2. New York: Academic Press, 1979.
- Schaie, K.W. Psychological changes from midlife to early old age: Implications for the maintenance of mental health. AMERICAN JOURNAL OF ORTHOPSYCHIATRY, 1981, 51, 199-219.
- Schaie, K.W. New directions for an applied developmental psychology of adulthood. Invited lecture presented at the Annual Meeting of the Eastern Psychological Association, Baltimore, 1982. (a)
- Schaie, K.W. The Seattle Longitudinal Study: A twenty-one year exploration of psychometric intelligence in adulthood. In K.W. Schaie (Ed.), LONGITUDINAL STUDIES OF ADULT PSYCHOLOGICAL DEVELOPMENT. New York: Guilford Press, 1982. (b)
- Schaie, K.W., & Baltes P.B. On sequential strategies in developmental research: Description or explanation? HUMAN DEVELOPMENT, 1975, 18, 384-390.
- Schaie, K.W., & Hertzog, C.K. Longitudinal methods. In B.B. Wolman (Ed.), HANDBOOK OF DEVELOPMENTAL PSYCHOLOGY. Englewood Cliffs, N.J.: Prentice-Hall, 1982.
- Schaie, K.W., & Labouvie-Vief, G. Generational versus ontogenetic components of change in adult cognitive behavior: A fourteen-year cross-sequential study. DEVELOPMENTAL PSYCHOLOGY, 1974, 10, 303-320.

Schaie, K.W., & Strother, C.R. The effect of time and cohort differences on the interpretation of age changes in cognitive behavior. MULTIVARIATE BEHAVIORAL RESEARCH, 1968, 3, 259-293.

Schaie, K.W., & Willis, S.L. Life-span development: Implications for education. REVIEW OF RESEARCH IN EDUCATION, 1978, 6, 120-156.

Sinott, J.D. The theory of relativity: a metatheory for development? HUMAN DEVELOPMENT, 1981, 24, 293-311.

Sparks, P.M. Behavioral versus experiential aging: Implications for intervention. GERONTOLOGIST, 1973, 13, 15-18.

Wohlwill, J.F. THE STUDY OF BEHAVIORAL DEVELOPMENT. New York: Academic Press, 1973.

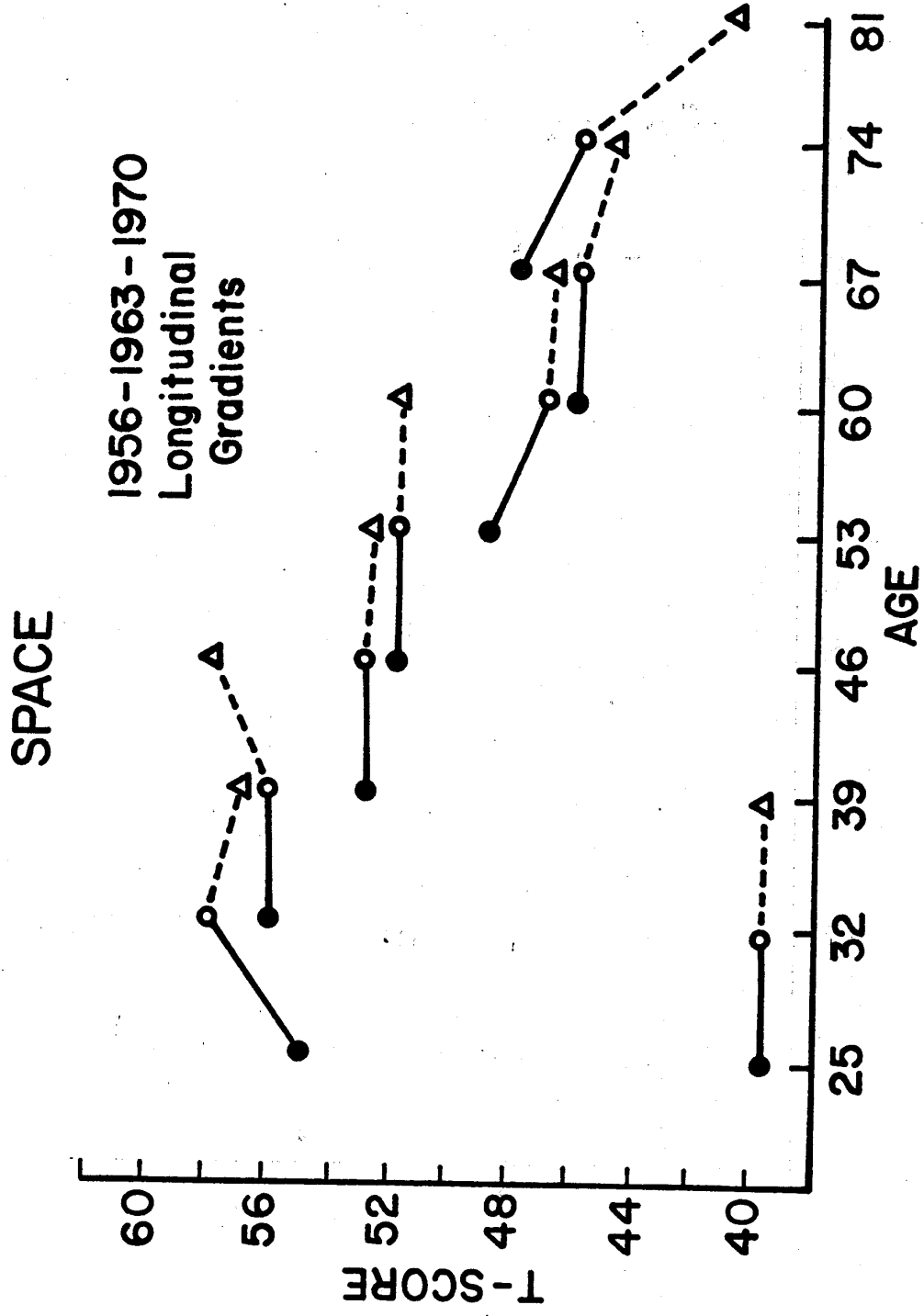


Figure 1. Longitudinal age gradients for Space.

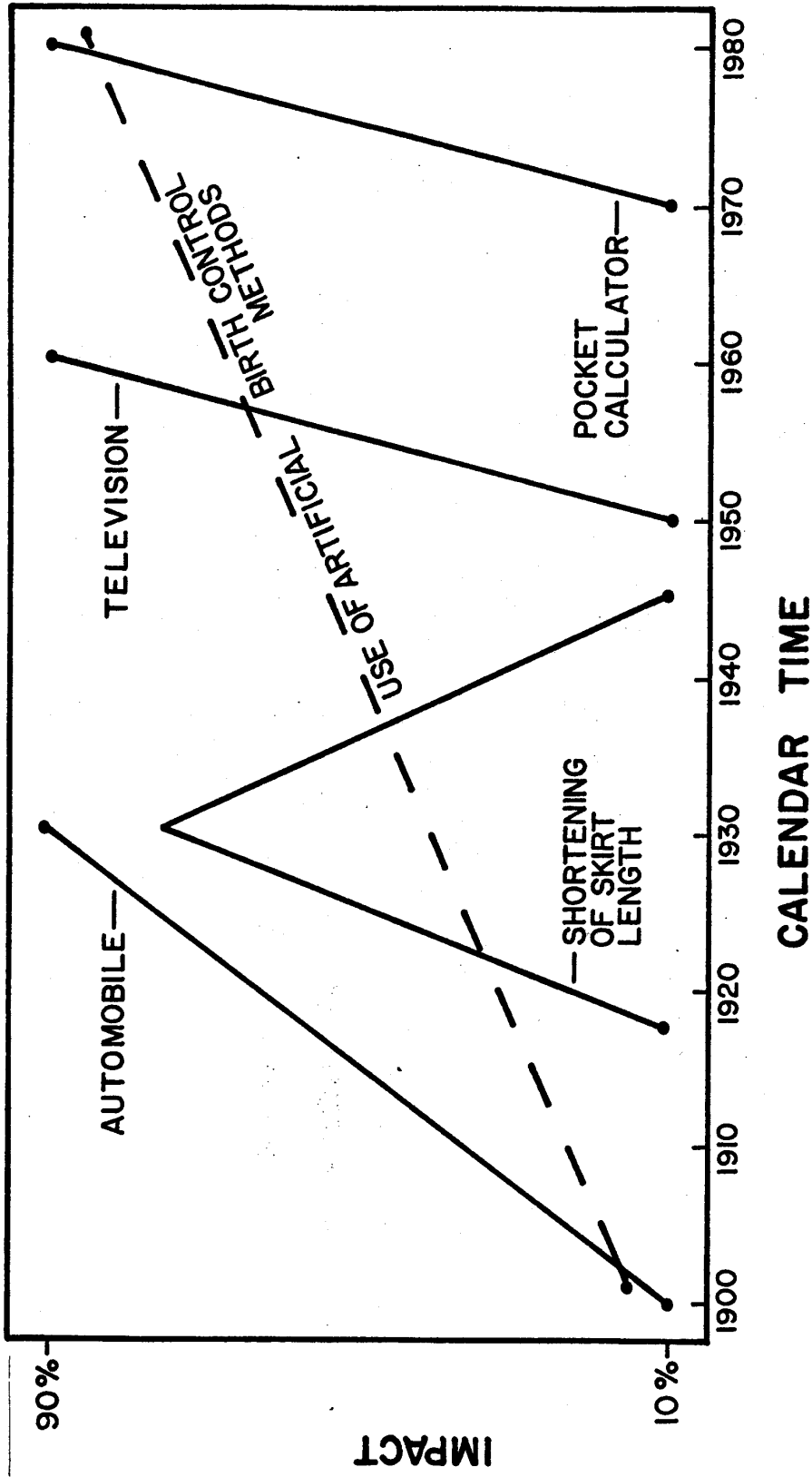


FIGURE 3. PERIOD AS EVENT TIME