CHAPTER 1

# Historical Time and Cohort Effects

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## 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, not only refers to the characteristics of place and culture, but also includes as a major parameter the historical time during which development occurs. Concerns about the influence of historical period, however, have emerged largely from the study of adults. Children, as emergent organisms, might reasonably be assumed to possess some characteristics that are constant throughout history because those characteristics are involved in the establishment of behavioral competencies essential for survival. But few, if any, of these 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. Therefore, I have in the past argued that scientific interest in age-related behavioral change recedes for those variables in which a behavioral asymptote is reached in young adulthood. Instead, close attention needs to be given to cohort and period effects (Schaie, 1973a, 1977).

In retrospect, it seems that much of the concern with methodologies designed to separate age, cohort, and period effects has stemmed from our preoccupation 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, developmentalists have often treated historical time and genera-

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tional effects as confounds to be controlled and explained away. Thus, it is not without a good deal of justification that Rosow (1978) could argue that the work on the 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. 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 sociologists have addressed the interface of life stages and cohorts theoretically as well as substantively (e.g., Carlsson & Karlsson, 1970; Elder, 1974; Ryder, 1965). In my own work I 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 not much has been done thus far to go beyond the description and identification of period and cohort effects, although attention has been called to the potential importance of these effects for fields as diverse as mental health, adult education, and the professional problems of engineers at midcareer (Schaie, 1978, 1981, 1982; Schaie & Willis, 1978).

The time has come then to remedy the lack of substantive attention given to the specific meaning of historical time and cohort. If this is to be done most constructively, it is not enough to appeal to sociologists and historians to provide definitions for what might be the most relevant societal changes and cohort boundaries for ordering developmental phenomena. It might be more constructive to begin by sketching out a framework that behavioral scientists can apply to the study of historical events that may be relevant to life-span development. 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 still highly speculative and provisional, it is possible that new insights may emerge 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), but fairly little formal attention had been given by developmental psychologists to the impact of generational or historical events. This lack of attention began to change when 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 7 years apart, the 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 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 (Schaie, 1983). It soon became obvious that to resolve these two alternatives it would be necessary to conduct an additional data collection, to permit construction of what we now call a longitudinal sequence (Schaie & Baltes, 1975). That is, data were needed that allow comparison of two or more cohorts followed over the same age range, a procedure that 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 will not surprise anyone that at the time of that study we lacked reasonable hypotheses with respect to the substantive meaning of either period or cohort effects (Schaie & Labouvie-Vief, 1974). The time period studied was an artifact of the timing of research funding; the cohort boundaries (and consequently the age ranges) were arbitrarily fixed to be equivalent to that time period. Because our initial interest was indeed the control of confounds for the age variable, this approach made sense. It simplified numerical analyses and permitted comparison of the magnitudes of variance components. In fact, this approach (perhaps inordinately directed toward attaining methodological sophistication) also gave rise to a number of methodological controversies (see Adam, 1978; Botwinick & Arenberg, 1976; Schaie & Hertzog, 1982), which may turn out to be of little substantive interest. For example, comparison of age and cohort effects, using equal

chronological time units, may be appropriate only if it is possible to show that there are phenomena that can actually be scaled in comparable units, underlying the index variables of age and time.

In the life of adults, 7 years may actually not be an unreasonable age interval to detect behavioral change. The convention of using 5- or 10-year intervals relates to our use of the decimal system rather than to any psychologically meaningful dimension. It seems equally appropriate to segment the full age range over which adults can be found in reasonable frequency into 10 segments of 7 years each, 6 of which occur during the normal work life, and 4 after the typical retirement age. The reader who finds the latter justification somewhat strained might agree that cohort intervals selected to conform to age intervals for reasons of computational convenience have even less credibility! Nevertheless, the issue of meaningful cohort and/or period boundaries might still be neglected except that our data forcefully call attention to the absurdity of our present classification schemes.

This point is illustrated by 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 over 7-year intervals. The abscissa indicates their age at testing and the ordinate gives the mean performance in $T$-score points ($\bar{x} = 50$, $SD = 10$, based on a large sample at the first test occasion). The figure shows seven cohorts followed over a 14-year period, the youngest from mean age 25 to mean age 39 years, the oldest from mean age 67 to mean age 81 years. What becomes apparent immediately is that this figure does not portray seven *real* cohorts at all. Instead, considering the gaps between the arbitrary cohort boundaries, there appear to be three distinct cohort groupings. The three oldest cohorts seem quite distinct in level and slope from the next two, and those again are clearly

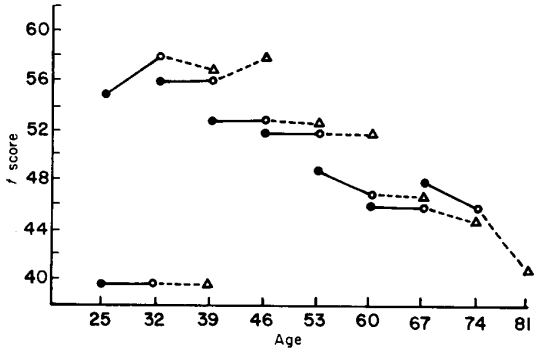


**Figure 1.** Longitudinal age gradients for spatial orientation measured in 1956 (darkened circles), 1963 (open circles), and 1970 (open triangles).

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, the more appropriate time boundaries for the real cohorts ought to be 21 years for the oldest and 14 years for each of the youngest, empirically determined sets.

The gaps between these three sets seem 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. Calling attention ot such gross historical concomitants, however, is the rankest ad hoc approach to the interpretation of cohort effects. In the remainder of this chapter, consideration is given to some of the issues that must be addressed before historical time and cohort effects can seriously be related 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 the concepts have been defined, the meanings of which are clarified here. Most recently I 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). Footnoted to that paper is the suggestion that the point of common entry for a cohort need not necessarily be birth, and reference is made to relevant discussions in the sociological literature (Rosow, 1978). It now seems timely to begin to broaden the concepts of both cohort and period in a more explicit and formal manner. Such broadening 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, 1983; Nydegger, 1981; or Sorokin & Merton, 1937).

### Cohort as a Selection Variable

Developmental psychologists have thus far utilized the cohort concept primarily as a mode of organizing individuals by birth year, but there are

**TABLE 1**

**Alternative Cohort Definers: Some Examples**

| | |
|---|---|
| Age-graded | History-graded |
| Biological: | Initial staff of new college or corporation |
| Menarche | "Class" entering ranks of unemployed |
| Menopause | Class of technical or proprietary school |
| Birth of first child | Conscripts called up in a general mobilization |
| Becoming a grandparent | Nonnormative |
| Death | Divorce |
| Societal: | Infectious disease |
| Entry into school system | Accidental onset of disabling condition |
| Voluntary enlistment in armed forces | Membership in social group |
| First marriage | Purchase of home in new neighborhood |
| Retirement | |

many other ways in which individuals can enter a common environment under study (see Table 1). Selection into such common environments may occur as the result of quite different influences. Baltes, Cornelius, and Nesselroade (1979) have classified such influences into three basic types: age-graded, history-graded, and nonnormative. The effects of the first of these influences will result in samples of subjects that 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 the 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.

There are other possible cohort definers that may be quite random with respect to age, at least over the broad range of middle adulthood. These include cohorts formed by influences that 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 cohort of persons entering the ranks of the unemployed during a depression and during periods of rapid technological change, the members of a given class of technical and proprietary schools.

Finally there are cohorts formed by the common experience of certain nonnormative 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. Nonnormative events, therefore, are those favorable events that are not required for the adequate development of all (or even most) individuals and those unfavorable events that may impact some persons' development but may be avoidable for many. Again, temporally close experience of such nonnormative events may be influential in the formation of cohort groupings. Examples of such cohort definers (which typically are uncorrelated or only 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 leaving this topic that only the biologically determined age-graded influences 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 the proposed broadening of the cohort concept or to restrict broadening to universally assignable attributes. It should be stressed, however, that assignment to cohorts defined by influences holding only for limited subpopulations may actually yield more powerful predictions in individual cases than is possible from knowledge of universally defined characteristics.

## Periods as Definers of Discrete Events

Thus far we have argued that there are many biological and societal influences that characterize entry into a common environment and that might consequently 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 subpopulations. By analogy, we must now examine to what extent the concept of period is linked to particular calendar dates.

The objective of this exercise is to see whether the status of period can be converted from that of an index variable to that of an explanatory concept. What is of interest then is not the particular calendar date, but rather the historical event or events for which that date is the temporal indicator. It follows that just as organizational principles were needed to characterize alternate conceptions for cohorts, classes of influences are now

wanted 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 cohorts can be defined by influences that 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.

A beginning can be made 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 that achieve virtually immediate and universal acceptance. Others are of a far more parochial nature. They may affect certain localities, but not others, or even in a single region may only impact specific subsets 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 data 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 indexes, 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 an index of the initial impact on the target person would be a similar index reflecting the calendar date on which the impact ended!

Before consideration can be given to how the new definition of period designators is to be operationalized, attention must be given to the question of how a behavioral scientist would recognize historical events that are useful for this purpose. It is unlikely that we are really interested in political history as such; it is of no interest in this context who the president was, who fought, lost, or won what war. Instead, the kind of history to be considered is the chronicling of societal changes in technology, customs, and cultural stereotypes that might constrain behavior. A brief perusal of modern American history, conducted in preparation for writing this chapter, consequently eschewed the more formal treatments concerned with changes in our political fabric. What was of greatest interest were the far more journalistic accounts of the period that covered the life times of the people who have participated in my behavioral studies. These accounts not only conveyed the dramatic changes that have characterized the life of these individuals, but also helped to identify the calendar points at which particular events began to make broad impact (e.g., Allen, 1952).

Because 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 Lord (1960). Lord is most instructive in pointing to the vast differences in manner of living and in customs facing our older adult subjects in their youth from those experienced by our current cohort. For example, in the year 1900, radio was nonexistent, telephones were viewed as business tools, and the major means of personal transportation were horses and buggies for short distances and trains for long distances. Similar writings by Allen (1931, 1940) cover the decades of the boom following World War I and the Great Depression; and a useful account of the period immediately following the Second World War is provided by Goldman (1956).

What becomes clear then is that effective use of a broadened period concept requires (1) the identification of historical events that have developmental impact over the period in which subjects under study were alive, and (2) the scaling of temporal position of greatest impact of such events, perhaps as watershed dates.

## How Do We Measure Historical Time?

It is now necessary to proceed from generalizations about the new directions that should be taken to specific prescriptions as to how the measurement of historical time can be operationalized. To begin with, a taxonomy of development-relevant events needs to be created 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, which they examined for the purpose of creating an exhaustive taxonomy of trait names. Professional judges can next be employed to classify the events as relevant to specific behavioral domains. Ratings of similarity may then serve to cluster events and to reduce to more manageable proportions the large number of events that could be studied.

Once events have been clustered along specified dimensions and a workable number of discrete events have been selected to mark each dimension, it is then necessary to do some further library research that will help obtain anchor points that can be used in assigning meaning to period analysis. The calendar dates need to be identified that bound those events that have been determined 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 conser-

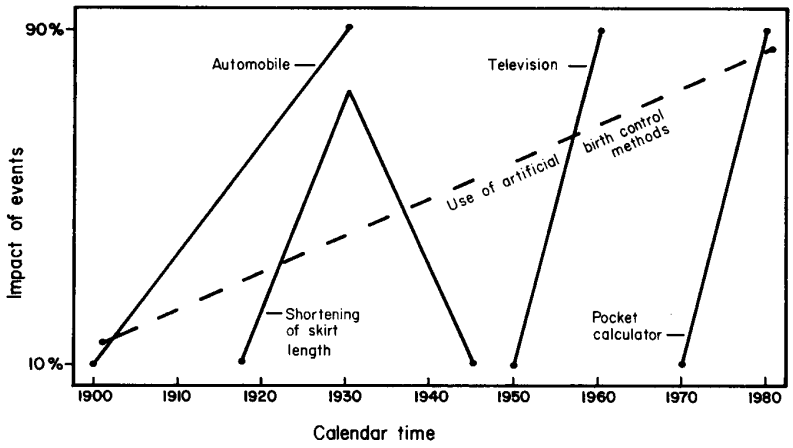


**Figure 2.** Period as event time, measured when 10–90% of the population adopted the change event.

vative boundaries, such as the year when 10% of the population had adopted a technological innovation (say the automobile, the telephone, or television) or accepted a changed custom or attitude (say minidresses, integration of schools, jogging) and the year when 90% of the population fully participated in the change event. For recursive phenomena by analogy, keeping in mind that event time is not necessarily unidirectional, an event would be deemed to have ceased when fewer than 10% of the target population remained impacted. Some examples of events showing various patterns of impact are depicted in Figure 2.

Another problem that requires solution is the manner in which relative impact values will be assigned to events that occur 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, it might then be feasible to determine the importance of the events by appropriate regression analyses. Lacking such data, it may not be unreasonable to rely once again upon expert scaling to obtain the needed parameters. Once this is done, calendar time can then be rescaled in terms of historical event impact density. Given a schema of multidimensional 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

**TABLE 2**

**Characteristics of Events Marking Historical Time**

| |
|---|
| Type of event |
| Technological |
| Attitudinal |
| Personal habits |
| Knowledge diffusing |
| Impact of event |
| Initial occurrence (impact on 10% of target population) |
| Universal recognition (impact on 90% of target population) |
| Dissipation (impact on less than 10% of target population) |
| Direction of the impact |
| Linear |
| Recursive |
| Event density |
| Population effects |
| Individual effects |
| Perception of event |
| Objectively defined by professional judges |
| Subjectively perceived by individual |

time requires attention to a number of different characteristics that have not hitherto been given a great deal of attention. These characteristics have been summarized in Table 2.

Scaling, or rather rescaling, historical time would permit the assignment of psychological (or as some would term it, existential) rather than physical meaning to the construct of calendar time. Some might argue that moving away from the prevailing enslavement to the calendar (a purely physical time dimension) might bridge the gap between the hard-nosed experimental and the more humanistic approaches to life-span development (e.g., Schaie, 1973b; Sparks, 1973). This position does not specifically advocate a purely subjective calendar, although applying similar approaches to scaling the life history of a single individual would yield that result. What is advocated, however, is that historical time ought to be defined in terms of *event density*. That is, periods of time that are filled with behavior-relevant events ought to count more than those that are relatively event-free. If such an approach can be implemented, it seems likely that the new time units ought to correspond much more closely with those changes over age and time that are of interest to developmentalists. Moreover, reconceptualization of *period* as *event time* results in an important fringe benefit. As discussed next, it permits a new approach to resolving some of the methodological dilemmas that have plagued developmental researchers in recent years.

## Implications for the Estimation of Age, Cohort, and Period Effects

Broadening the concepts of cohort and period effects illuminate an important difference between them that may be fundamental to understanding them. 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 intraindividual change variables, whether calendar or event time, whether short or long; one cannot have the experience of an event commencing and terminating simultaneously. Although events are temporally bounded, it is nevertheless 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 I introduced the concept of event time.

The distinction just made sheds further light on the relation between cross-sectional and longitudinal data because chronological age has the status of an interindividual difference variable in the former, but of an intraindividual 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 meaning does that leave for the concept of age? Most likely, it may be prudent to return to a fairly limited maturational view. Pure age effects, freed from cohort and period confounds, should reflect aggraded phenomena that are biological or ethological in nature because 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, in which membership is not necessarily a function of chronological age, and having defined period effects as event time (which is no longer synonymous with calendar time), it now follows that the indeterminancies suggested by the general developmental model (Schaie, 1965) may no longer be inevitable. At least for extensive life stages, it is now possible to imagine research designs that permit specification of distinct age, period, and cohort dimensions. More often than not, these dimensions will fail to be orthogonal to each other, but it is possible to envision many circumstances (such as some of the examples given in this chapter for both cohort and event-time definers) in which, correlations will be quite low.

It would be beyond the scope of this chapter to indicate specific implications of these matters for technical aspects of sequential analysis. However, it appears to me that the earlier analysis of variance approaches (Schaie, 1977) will remain useful particularly in those instances in which cohort groupings are defined in such ways that the natural cohort boundaries are discrete or nonlinear in nature. Alternate approaches such as those suggested by Mason, Mason, Winsborough, and Poole (1973) and by Horn and McArdle (1980) would be preferred when all three dimensions are defined as continous variables, or when multiple definers of cohort and period are used.

In all of these instances it would seem to be most sensible to enter chronological age as the last variable because it alone retains the status of a pure index variable, unless it can be operationalized by physiological or other directly measurable age-related parameters. This leads to a cautious final comment that perhaps the time has indeed come to give more serious attention to Wohlwill's (1973) suggestion that chronological age might best be used as a dependent variable. That is the only approach that will ever provide the knowledge as to how chronological age manages to 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 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 the dimensions of cohort and historical period (time of measurement) were discovered, but were viewed at first primarily as unwanted confounds for the understanding of age changes. It was soon recognized, however, that rather than being merely inconvenient, these concepts may also be of great intrinsic interest to developmentalists.

In spite of the preoccupation with methods for separating cohort and period from chronological age, there have been few attempts to assign specific meaning to these concepts. In this chapter it is argued that before meaning can be assigned to the concept of cohort, it is necessary to broaden our view of how cohorts are selected; some organizing principles have been suggested for this purpose. Likewise, it is found to be desirable to transform the concept of period into one of event time. Once this is done, it then

becomes 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, it is suggested that some of the methodological problems of age, time, and cohort estimation might be finessed by the redefinition of cohort and period, as their dependency upon chronological age can at least in some instances be partially broken by the new definitions.

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