wealth in the public sphere may render financial security in old age but may also hamper relationships and health, while women's caregiving roles may result in greater poverty but also greater support from informal networks.

Further research should show how gender intersects with other inequalities. Recent suggestions that men and women become more androgynous as they age – as well as research on this possibility – may well be based on models of femininity and masculinity more appropriate to younger ages. And some of what we know of the effects of gender roles and relations in younger years may not apply to old age. The burden of housework early in the life course weighs upon women in some ways but in later years may sustain their sense of femininity in ways that please them.

Social structures are not static; people resist and alter them as they live out their roles. Gender relations are dynamic; structural changes can be expected to influence experiences of gender and old age, just as the refashioning of gender identities will affect institutions such as families. Although women's greater labor force participation has not leveled the distribution of housework, men and women have changed their ideas about masculinity and femininity enough that men contribute more to child care. As a result, we can expect future cohorts to demonstrate somewhat divergent gender patterns in old age. At the same time, without substantial shifts in gender arrangements, inequalities between men and women will persist, although levels and expressions may change.

See also: Caregiving and Caring; Economics: Society; Life Course; Social Networks, Support, and Integration; Social Security.

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Generational Differences: Age-Period-Cohort

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Glossary

Cohort – Group of persons entering the environment at the same point or range in time.

Cross-Sectional Sequence – Groups of persons assessed once, where at least two age levels are sampled at a minimum of two different measurement occasions.

Longitudinal Sequence – At least two groups of persons assessed at least twice over the same age range.

Introduction

Generational differences are treated in this article from a psychological perspective, although attention

will be called to the historical context of the concept as it evolved in both sociology and psychology. Moreover, generations are differentiated from cohorts, and the article discusses the relevance of the literature on cohort differences to an understanding of generational differences. Methodological issues in the psychological study of generational differences and cohort differences will be considered, including an exposition of the age-cohort-period model. Examples of findings from the literature will draw largely on the Seattle Longitudinal Study, including findings on generational differences in cognitive performance, selected demographic characteristics, and perceptions of family environments.

Sociologists' and Psychologists' Views of Generations

The concept of generational differences received considerable play in the early twentieth century when the sociologist Karl Mannheim called attention to generational conflicts, particularly those between adolescents and young adults and their parents. Indeed, much of the sociological literature on generational differences deals with issues of generational conflicts and transmission of values. Similar early concerns in psychology appear in the work of Charlotte Buehler, centering on conflicts between adolescents and their parents. Among developmental psychologists, hints of concern about possible effects of generational differences can be found in the work of Raymond Kuhlen, who was the first in psychology to call attention to the fact that individuals age within the context of changing societies, implying the possibility that the timing of behavioral change might be important.

In the more recent literature, generational differences began to resurface in the mid-1960s almost simultaneously in both the sociological and developmental psychology literature. Ryder suggested that the notion of cohort progression was an essential concept for the sociological study of change. Riley, Johnson, and Foner further developed this theme in its implication for social gerontology in a seminal volume. At the same time, the author called attention to the fact that aging data obtained from cross-sectional and longitudinal data sets could not correspond, because cross-sectional age differences are confounded with cohort (generational) differences, while longitudinal age changes are confounded with time-of-measurement (period) differences. He specified a general developmental model that examined the formal nature of these relationships, placed them in the framework of quasi-experimental designs in psychology and education, and proposed strategies for collecting and analyzing data that might help obtain better estimates of the age factor.

Attempts to unconfound the age-period-cohort model have been controversial. However, given appropriate limiting assumptions, cohort studies have played an important role in behavioral research, not only in controlling for methodological artifacts that might result in the over- or underestimation of aging effects, but also in examining the contextual variables that affect levels of behavior and expression of personality traits over time. There is still a lack of good understanding of the relationship between macro-societal change and its effects upon age differences and age changes in behavior, but the study of generational differences in behavior has provided an initial attempt to identify those variables most prone to shifts across generations. Many geropsychologists who began prospective studies of aging in the 1960s have therefore included multiple cohort designs of one kind or another to deal with the issue of possible generational differences.

Generation and Cohort

The term generation often denotes successive groups in time in which the second group could (but need not necessarily be) the biological offspring of the first group. By contrast, the term cohort is an arbitrary definition of a point in time or range of time during which members of a group enter the environment (by birth or other temporal entry). Hence the temporal distance between two generations will generally represent a time frame from 20 to 30 years, while cohort differences may and often do cover much shorter periods of time.

Generational and cohort differences are usually studied in the context of groups of people (birth cohorts) entering the environment at the same point (or range) of calendar time. It should nevertheless be stressed that the temporal boundaries for generations could also be characterized by non-calendar definitions. For example, the initial group of workers hired for a new factory or the first faculty of a new educational institution would represent a generation (regardless of the individuals' calendar age), as would the initial membership of a newly formed club, persons called to active duty in the armed forces at the same point in time, or the first-time purchasers of homes in a new residential subdivision.

Methodological Issues

Research Designs for the Study of Generational Differences: The Age-Cohort-Period Model

The age-cohort-period model specifies that any age-related or time-dependent behavior can be assigned

three temporal characteristics, such that

$$b = f(A + C + P),$$

where b (behavior) is observed at the chronological age A, for individuals over the calendar period P who entered the environment as members of cohort C. This relationship is similar to the relationship among the physical variables of volume, pressure, and temperature. Here, also, the third component can always be stated as a function of the other two components. Thus,

$$A = C + P$$
$$C = A + P,$$

and

$$P = A + C.$$

Each of these three components may be of primary interest for some scientific questions in the developmental sciences, and it is therefore useful to be able to estimate the specific contribution attributable to each component. In the behavioral sciences, in particular, we typically want to differentiate effects that change across age (intraindividual change) from those effects that differ across cohorts or generations (interindividual differences). On the other hand, educational researchers might be more interested in differentiating changing educational impact across different periods from the ages of those affected.

Data Collection Strategies

Empirical studies in the developmental sciences involve age and/or cohort comparisons either at one point in time or at successive time intervals. Traditional strategies used for this purpose are represented by cross-sectional, longitudinal, and time-lag designs.

Cross-sectional strategy investigates the hypothesis that there are differences in one or more characteristics for samples drawn from different cohorts but measured at the same point in time. This strategy is most appropriate for the study of interindividual differences. Age differences in behavior at a particular point in historical time may be relevant for policy decisions that lead to differential societal responses regardless of the antecedent conditions responsible for the age differences. Age differences detected in a cross-sectional data set, however, are inextricably confounded with cohort differences. Since cross-sectional subsamples are measured only once, no information is available on intraindividual change. Unless there is independent evidence to suggest that older cohorts performed at the same level as younger cohorts at equivalent ages, it would be most parsimonious to assume, at least in comparisons of adult samples, that cross-sectional age differences represent estimates of cohort differences that may be either inflated or reduced by maturational changes occurring over a specified age range.

Longitudinal strategy investigates whether age-related changes have occurred within the same population cohort measured on two or more occasions. This strategy is appropriate when the investigator wishes to predict age differentiation in behavior that occurs over time. But longitudinal data do not always provide unambiguous estimates of intraindividual change. A single-cohort longitudinal study confounds age-related (maturational) change with period effects that are specific to the particular historical period over which the behavior is monitored. The period effects could either mask or grossly inflate estimates of maturational changes.

Time-lag strategy compares two or more samples of individuals drawn from successive cohorts at successive points in time at the same chronological age. The hypothesis tested is whether there are differences in a given behavior for samples of equal age but drawn at different points in time. This strategy is of interest to social and educational psychologists. It is particularly appropriate when one wishes to study performance of individuals of similar age in successive cohorts (e.g., comparing baby boomers with the preceding generation). The simple time-lag design confounds cohort effect with period effects and may provide inflated or reduced cohort estimates depending on whether the temporal interval between the cohorts represents a period of favorable or adverse environmental influences.

Sequential Strategies

Generational differences were seen as serious confounds in studies of human aging. Consequently, several alternative sequential strategies were introduced that might differentiate effects of maturation characteristic for a particular developmental period from the attainment of different levels of functioning attributable to differences in socialization and/or other life experiences characteristic for successive generations by assessing the behavior of more than one cohort over a given age range.

The term 'sequential' implies that the sampling strategy used to study generational differences must include the acquisition of a sequence of samples taken across several measurement occasions. Perhaps the most widely used sequential strategy is the cross-sequential design, in which two or more cohorts are followed over an identical time period. This

approach permits the direct comparison of longitudinal and cross-sectional data (provided that the calendar time ranges are similar for age and cohort). The advantage of this approach is that only two points in time are needed, hence the early appearance in the literature of studies using this design. For purposes of studying generational differences, however, this approach represents a 'model misspecification' because it does not allow the comparison of each cohort over the same age range.

As indicated previously, geropsychologists and other developmental scientists often find the cohort-sequential design of greatest interest because it explicitly differentiates intraindividual age changes that occur within a generation from interindividual differences between generations. This design also permits a check of the consistency of age functions over successive generations, thereby offering greater external validity than would be provided by a single-cohort longitudinal design. A cohort-sequential study consists of two or more generations (however defined) being followed over two or more similar age levels. The minimum design for such a study involves three measurement points, allowing each of two cohorts to be followed over the same age range.

Repeated Measures and Independent Samples

In a typical longitudinal study, repeated measures are taken of the same research participants at successive times. It is also possible, however, to use the same research design but with independent samples at each age level being measured. In this alternative design, one would draw a new (independent) sample from the same cohort initially tested. The independent sampling approach works well when a large sample is drawn from a large population, and when one is primarily interested in the estimation of population parameters. This approach controls for the effects of non-random dropout, regression to the mean because of fallible measurement instruments, and effects of practice or inadvertent changes in experimental protocols. If small samples are used, it is, of course, necessary to make sure that successive independent samples are matched on factors such as gender, income, and education to avoid possible differences due to selection biases.

Designs for Specific Issues in the Study of Generational Differences

If the primary interest of an investigator is the estimation of magnitudes of generational differences, then the independent samples approach described earlier will suffice. That is, one needs to obtain data from a minimum of two cohorts at the same age in order to estimate the magnitude of the cohort difference. However, it is probably quite problematic to estimate generational differences at only one age level, because of the possibility of age-by-cohort interactions. Hence, one would recommend for this purpose a cross-sectional sequence of sufficient temporal length that each pair of cohorts can be compared at multiple age levels, even though all cohort pairs cannot be compared at every age level of interest. When this is done, one can then set the performance of the earliest-born cohort as a base and cumulate successive cohort differences, in the same manner as life span psychologists estimate age gradients. This approach permits contrasting generational shifts in performance levels over time for distinct behavioral dimensions.

It should be noted that this approach would not suffice for the estimation of generational differences in rates of change. For this purpose it is necessary to follow the same individuals over time in the form of a longitudinal sequence that allows contrasting successive cohorts over the same age range. That approach is essential if one wishes to address the question of whether there have been any changes in the rate of aging for successive generations.

The study of differences in the behavior of successive generations of biologically related individuals requires contrasting parents with their adult offspring. Ideally, data should be available for parents and offspring at the same ages. Barring the availability of such ideal data, designs of studies involving differences within family units must pay attention to the age at which study participants are assessed, as well as to gender differences, when cross-gender parent–offspring pairs are studied. Adjustments for the confounding variables of age and gender must often be used to obtain realistic estimates of generational differences within biologically related family units.

Substantive Findings

The remainder of this article outlines what is currently known of generational differences in intellectual competence, selected demographic characteristics, and perceptions of family environments that may have implications for our understanding of behavioral aging; it relies heavily on findings from the Seattle Longitudinal Study.

Generational Differences in Cognitive Abilities

Generational differences were first studied by means of cohort-sequential designs as part of the analyses conducted for the third cycle of the Seattle Longitudinal Study (SLS). This study began in 1956

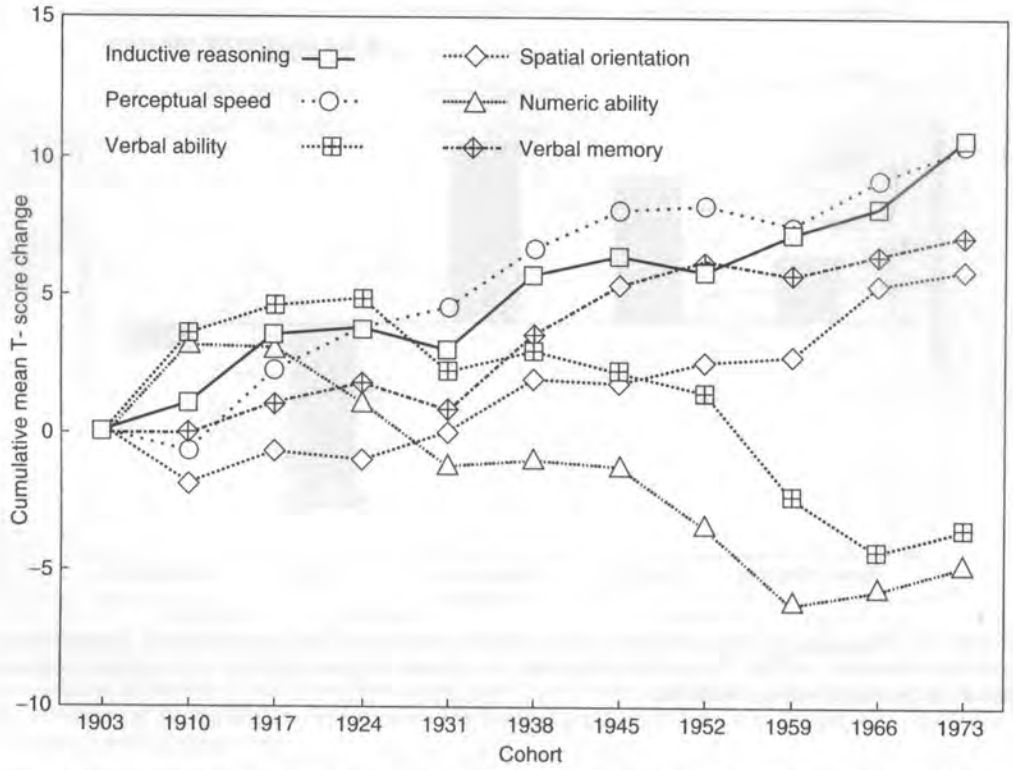

Figure 1 Cumulative generational differences of six mental abilities for birth cohorts in 7-year intervals from 1903 to 1973. From Schaie KW (2005) *Developmental Influences on Adult Cognitive Development: The Seattle Longitudinal Study.* © by Oxford University Press, Inc. Used by permission of Oxford University Press, Inc.

as a cross-sectional inquiry of Thurstone's primary mental abilities over the age range from the 20 s to the 70 s. Longitudinal follow-ups were conducted at six successive time points (7 years apart) in 1963, 1970, 1977, 1984, 1991, and 1998. All study participants were community-dwelling members of a health maintenance organization and represent the upper 75% of the socioeconomic spectrum. **Figure 1** shows cumulated generational differences for birth cohorts from 1903 to 1973 in 7-year intervals for six primary mental abilities: verbal ability (recognition of the meaning of words); inductive reasoning (the ability to abstract rules and principles from reoccurring single instances); spatial orientation (mental rotation of objects in two-dimensional space); numeric ability (skill in simple mathematical operations such as addition, subtraction, and multiplication); perceptual speed (rapid identification or matching of simple objects, or comparison of numbers); and verbal memory (immediate and delayed word recall). All abilities were measured by three or four different tests.

Substantial positive and linear generational differences were observed for inductive reasoning, perceptual speed, and verbal memory. The 70-year gain amounted to approximately 1 standard deviation (SD). This gain is likely to be associated with the substantial increase in educational exposure occurring over this time period. The positive gain across successive generations in inductive reasoning may also be related to changes in educational practice from rote learning to the encouragement of discovery methods. The virtual conquest of childhood diseases and the adoption of more favorable lifestyles in successive birth cohorts may also be implicated. A similar positive, although less steep, difference pattern occurred for spatial orientation. By contrast, verbal and numeric abilities seem to have peaked in the second decade of the twentieth century and have declined somewhat since then, but was stabilizing in the most recently born cohorts. The same changes in educational practices that have been favorable for inductive reasoning may have led to some loss in number manipulation skills as well. The decline in numeric ability across recent cohorts explains the fact that current cross-sectional studies suggest relatively little decline in numeric ability even though substantial decline has been found in longitudinal data. Generational differences of a magnitude similar to the inductive reasoning factor have also been observed for a measure of practical intelligence involving common everyday tasks.

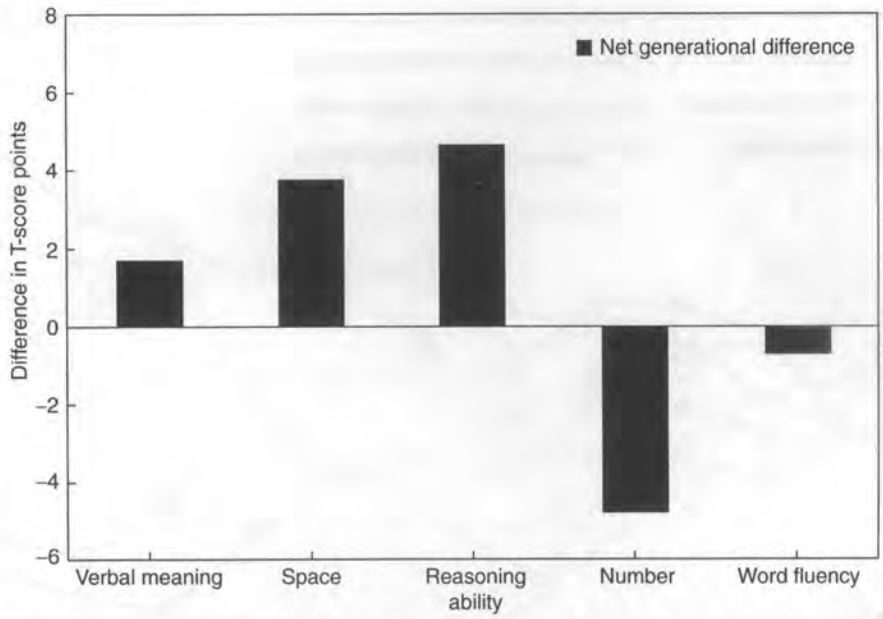

Figure 2 Generational differences in primary mental abilities between parents and their adult offspring. Adapted from Schaie KW (2005) *Developmental Influences on Adult Cognitive Development: The Seattle Longitudinal Study.* © by Oxford University Press, Inc. Used by permission of Oxford University Press, Inc.

Comparisons from family studies of biologically related individuals involving parents and their adult offspring have yielded similar findings on generational differences in cognitive abilities. **Figure 2** shows findings on tests of five primary mental abilities for the difference between parents and their adult offspring. The bars show the net difference, adjusted for age, in a large data set of more than 600 families. If there were no differences between generations, the solid bar would be zero. As can be seen in the figure, there are significant differences that favor the younger (offspring) generation on inductive reasoning, spatial orientation, and verbal ability. On number ability, it is the older generation that is at an advantage, while there is little difference on word fluency.

These findings are supported in extensive analyses by Flynn, who studied differences across generations of young adults from 1932 to 1978 in the United States as well as in 14 different countries and who also reported massive gains in IQ over the past half century.

In addition to studying level of generational differences in cognition, we have also examined generational differences in rate of change over 7 years in parent–offspring dyads at comparable ages. **Figure 3** shows 7-year changes for six abilities from age 60 to age 67. Again, we see higher levels for the second generation for all variables except number. What is most noteworthy, however, is the fact that while the parent generation showed decline over this age range, the offspring over the same age range show stability or modest increment, except for word fluency and number skills, which continue to show relatively early declines.

Generational Differences in Selective Demographic Characteristics

Gerontologists have long been aware that some of the age difference findings reported in the literature are clouded by the non-comparability between the young and the old of a variety of demographic characteristics. Often these differences have been interpreted as inevitable products of the aging process, and investigators have failed to correct for them. Some studies have shown that a number of these demographic differences actually have little to do with the aging process, but rather must be attributed to generational differences. Examples of substantial generational differences in demographic characteristics include educational level, age at first marriage, and age at birth of first child.

Over the range of birth cohorts represented in the SLS (1889 to 1973) there has been a steady increase in years of education, amounting to a difference in education of about 5.5 years between the earliest and latest cohorts studied. As shown in **Figure 4**, the increase has been close to 1 year greater for men than for women. Age at first marriage, as shown in **Figure 5**, declined by approximately 4 years from the earliest cohort to those born in the 1930s (the lowest level for men was reached by those born in 1938 and

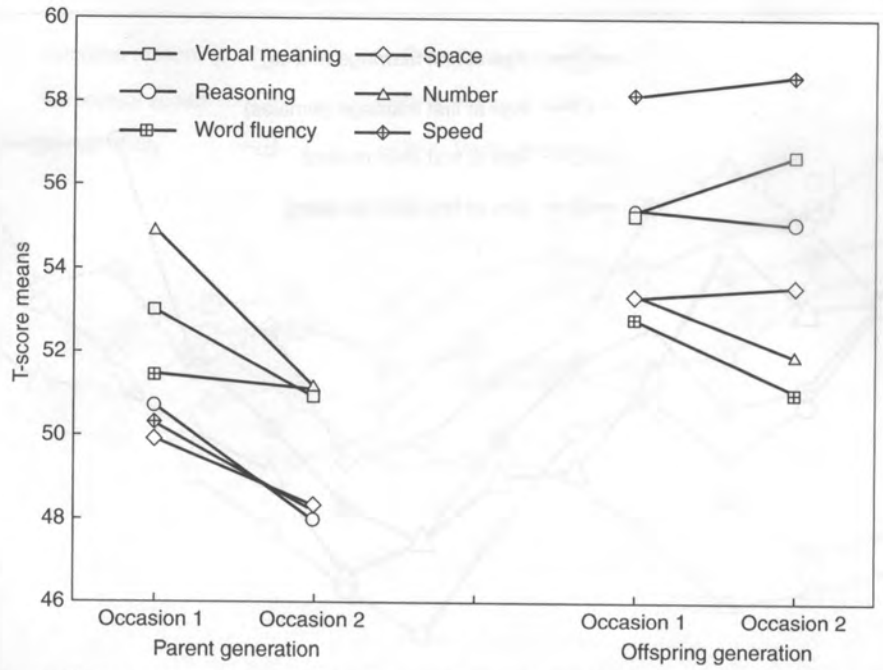

Figure 3 Generational differences in rate of cognitive aging over 7 years from age 60 to age 67. Adapted from Schaie KW (2005) *Developmental Influences on Adult Cognitive Development: The Seattle Longitudinal Study.* © by Oxford University Press, Inc. Used by permission of Oxford University Press, Inc.

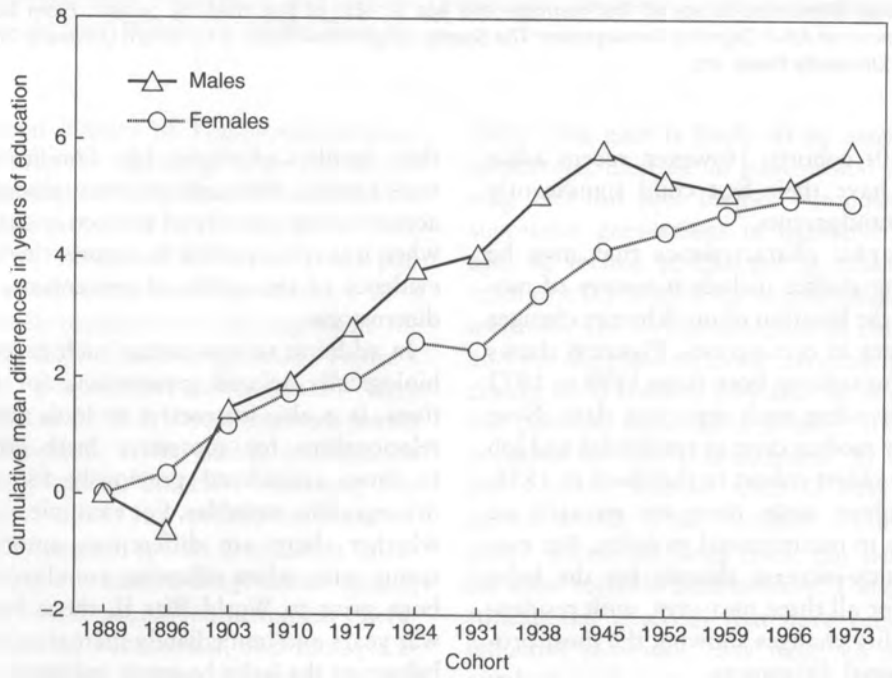

Figure 4 Generational differences in years of education by gender. From Schaie KW (2005) *Developmental Influences on Adult Cognitive Development: The Seattle Longitudinal Study.* © by Oxford University Press, Inc. Used by permission of Oxford University Press, Inc.

for women by those born in 1931). From then on there has been a steady rise, which is most pronounced for women. As for the age of individuals when their first child was born, for women there has been a steady increment that leveled off at those born in 1959, but it has continued to rise for men. On average, parental age at birth of the first child is approximately 5 years older for the most recently born

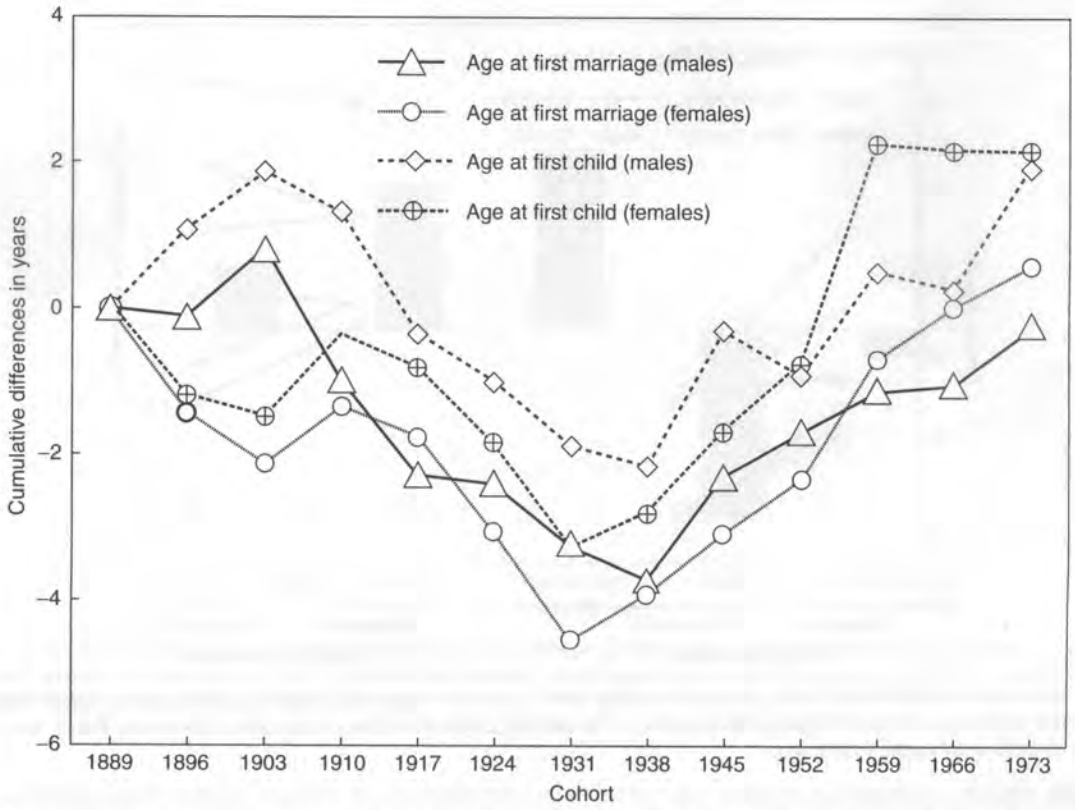

Figure 5 Generational differences in age at first marriage and age at birth of first child, by gender. From Schaie KW (2005) *Developmental Influences on Adult Cognitive Development: The Seattle Longitudinal Study.* © by Oxford University Press, Inc. Used by permission of Oxford University Press, Inc.

than for the 1930s cohorts. However, recent adult cohorts did not have their first child significantly later than their grandparents.

Other demographic characteristics that may be important in aging studies include measures of mobility (changes in the location of one's home, changes of job, and changes in occupation). **Figure 6** shows average changes for cohorts born from 1889 to 1973 in the 5 years preceding each reporting date. Note that there is a very modest drop in residential and job mobility from the oldest cohort to that born in 1938; over the same cohort range there are virtually no cohort differences in occupational mobility. But mobility characteristics increase sharply for the baby boomer cohorts for all three measures, with residential and job mobility changes showing the most pronounced generational differences.

Generational Differences in Perceptions of Family Environments

A final set of findings of generational differences in geropsychology comes from the assessment of perceptions of family environments by older parents and their adult children within their current families and their families of origins (the families in which they were raised). Although one must always be careful in accepting the veracity of subjective data, particularly when it is retrospective in nature, there is substantial evidence of the utility of perceptions of behavioral dimensions.

In addition to comparing such perceptions across biologically related generations for large populations, it is also instructive to look at shifts in these relationships for successive birth cohorts, similar to those considered previously for cognitive and demographic variables. For example, it may be asked whether there are differences among parent–offspring pairs when offspring are classified into those born prior to World War II, those born during the war years and immediately thereafter, and those who belong to the baby boomers cohorts.

The relevant data inform us that there is a clear differentiation for parents and offspring in the perceived level of all family dimensions between their family of origin and their current families. Obviously the retrospective distance in time is greater for the parents than for the adult offspring. Nevertheless, shifts in the quality of family environments are reported consistently over persons' own life course. The

current families are seen as more cohesive and expressive but also characterized by more conflict than was reported for the families of origin. There seems to be a shift toward greater openness and engagement in family interactions. More intensive family interactions are also reflected by intellectual-cultural and active-recreational orientation from the family of origin to the current family. Along with these shifts there is the

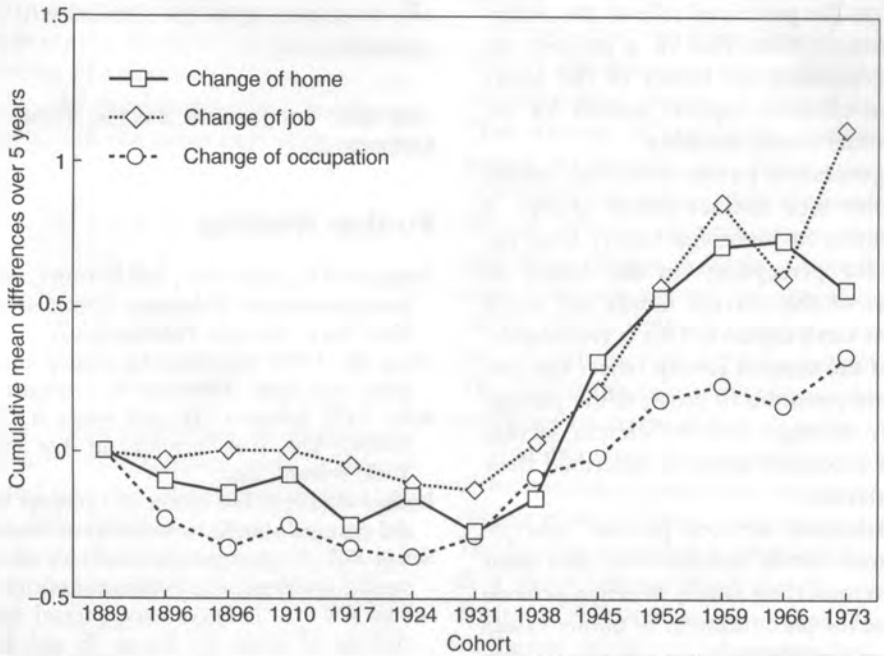

Figure 6 Generational differences in frequency of change of job, occupation, and place of residence. From Schaie KW (2005) *Developmental Influences on Adult Cognitive Development: The Seattle Longitudinal Study*. © by Oxford University Press, Inc. Used by permission of Oxford University Press, Inc.

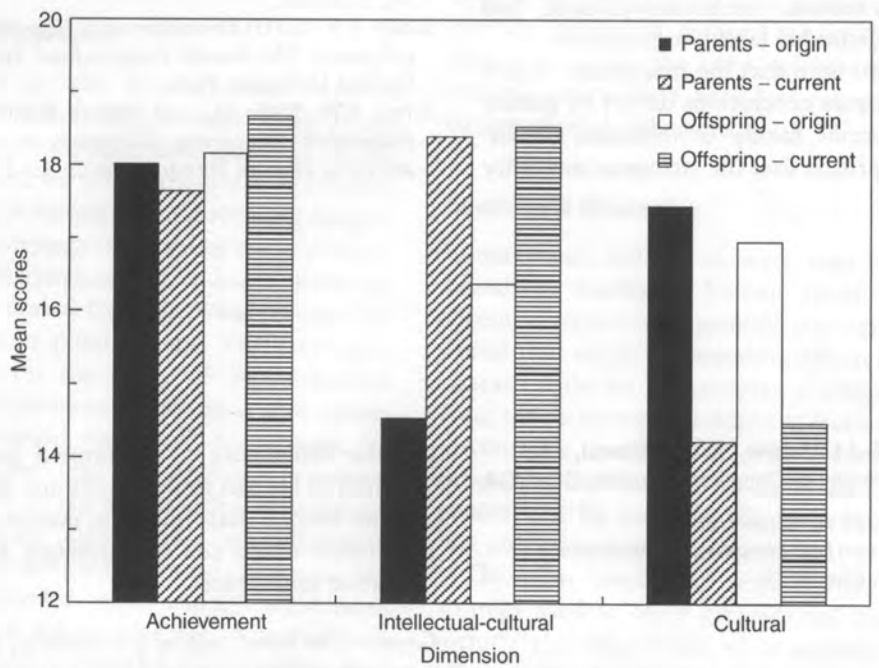

Figure 7 Interaction of perceived family environment by generation and life stage. Reproduced with permission from Schaie KW and Willis SL (1995) Perceived family environments across generations. In: Bengtson VL, Schaie KW, and Burton L (eds.) *Adult Intergenerational Relations: Effects of Societal Change*. New York: Springer Publishing Company, Inc., New York 10036.

overall perception of lower levels of perceived control, family organization, and achievement orientation (see Figure 7). Perhaps these judgments are another way of describing the increasing complexity of modern American families. Combined with continuing reports of ever-lower reported levels of social responsibility, this may well mean that the perceived role of the American family is changing from that of a primary socialization agent (operating on behalf of the larger society) to a more effective support system for the needs of the individual family member.

When the two-generation parent–offspring sample is broken down into four distinct cohort groups, it appears that the shifts in perceived family level occurred primarily for perceptions of the family of origin. Perceptions of the current family are much more similar across birth cohorts. This is reasonable, since judgments of the current family reflect the current societal climate common to most, while perceptions of the family of origin reflect different secular periods for which successive cohorts described their early family experiences.

Substantial correlations between parents' description of their current family environment and their offspring's description of their family of origin provide supporting evidence for the continuity of family values and behaviors. Even though there is a substantial time gap in the period rated, these two ratings do refer to the same parental family unit. This similarity of perceptions across generations was particularly strong for three dimensions most closely reflective of value orientations (achievement, intellectual-cultural, and active-recreational) and for family organization.

It is interesting to note that the magnitude of perceived similarity across generations differs by gender pairing and by specific family environment dimensions. It is not surprising that the strongest similarity of family environment perceptions occurs within mother–daughter pairings, even though frequency of contact between adult mothers and daughters is only slightly greater than that for other relationship combinations. In fact, the intensity (frequency) of contact between parents and offspring seems to have virtually no impact upon the similarity of reported family environments.

See also: Longitudinal Studies; Research Design and Methods.

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Genetics

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Glossary

Allele – One of many particular forms of a gene.

Cellular Senescence – The limited proliferative potential of human somatic cells and of cells of many other species that limits the number of replicative divisions that a cell can undergo; also called replicative senescence.

Gene – The basic unit of inheritance; typically refers to the coding sequence and control regions for a single protein or to a DNA region controlling synthesis of a particular gene product.