Topic #10

LONGITUDINAL AND CROSS-SECTIONAL DESIGNS

These designs are of particular interest in developmental and gerontological psychological research where age and long time lags are of interest or are important.

1. **Cross-sectional Designs**

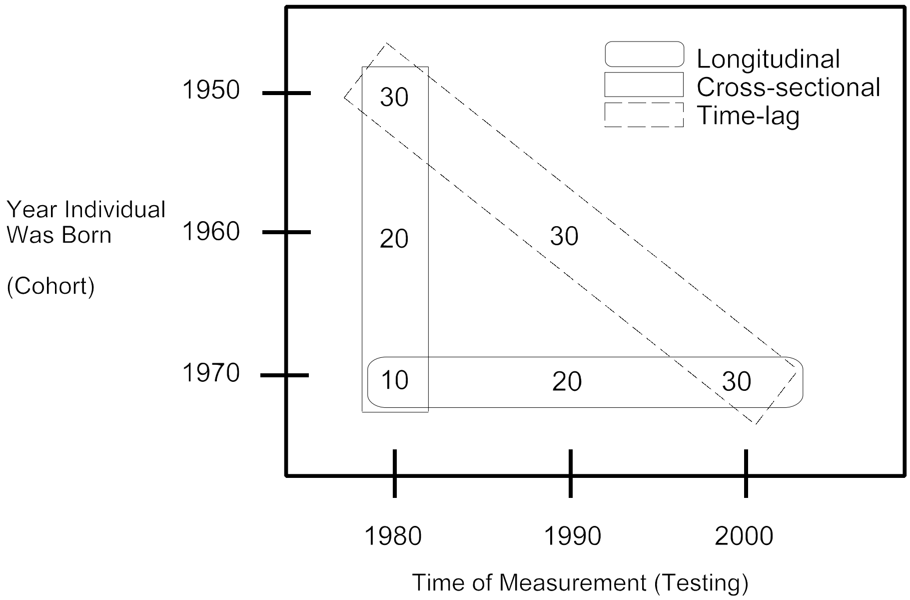
- These are research designs in which different cohorts or individuals are tested at a given point in time.
- Cross-sectional designs are between-subjects designs. The primary advantage of cross-sectional designs is that they are very economical.

2. **Longitudinal Designs**

- These are research designs in which a cohort is selected and studied over a relatively long period of time with repeated measurements. The same sample or group of individuals is studied over time.
- Longitudinal designs are typically within-subjects or repeated measurement designs.
- HOWEVER, they can also be between-subjects or independent groups designs. This would be the case if in studying a given cohort at each individual time of measurement, we selected a different sample from that same cohort. This is still a longitudinal design because we are studying the same cohort; and it is a between-subjects design because at each time of measurement we are selecting a *different* sample but from the same cohort.
- An advantage of longitudinal designs is their strength in allowing us to assess the change in variables or constructs over time. They are also generally stronger than cross-sectional designs because the temporal sequencing of the IV and DV is more clearly established.

3. **Time Lag Designs**

- These designs permit us to investigate changes across or differences between cohorts.
- They furnish us with cohort descriptive data because they are intended to map out changes across cohorts holding age constant.
- They use several cross-sectional designs over time.
- They still do not totally eliminate confounding.



Within-Cohort Age-Related Differences in Cognitive Functioning

Psychological Science
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Abstract

It is widely accepted that the level of cognitive functioning can be influenced by characteristics of the environment that change over time. Many developmental researchers have referred to these influences as cohort effects, and have used year of birth as the basis for determining cohort membership. Furthermore, age-related differences in cognitive functioning are sometimes assumed to be primarily attributable to cohort differences, which implies that differences between birth cohorts should be much larger than differences within birth cohorts. Comparisons of composite scores for five cognitive abilities in different people tested at different ages in different years revealed that within-cohort differences across ages were often as large as between-cohort differences across ages. These results lead to questions about the practice of relying on birth cohort to represent influences on cognitive functioning associated with temporal shifts in characteristics of the environment.

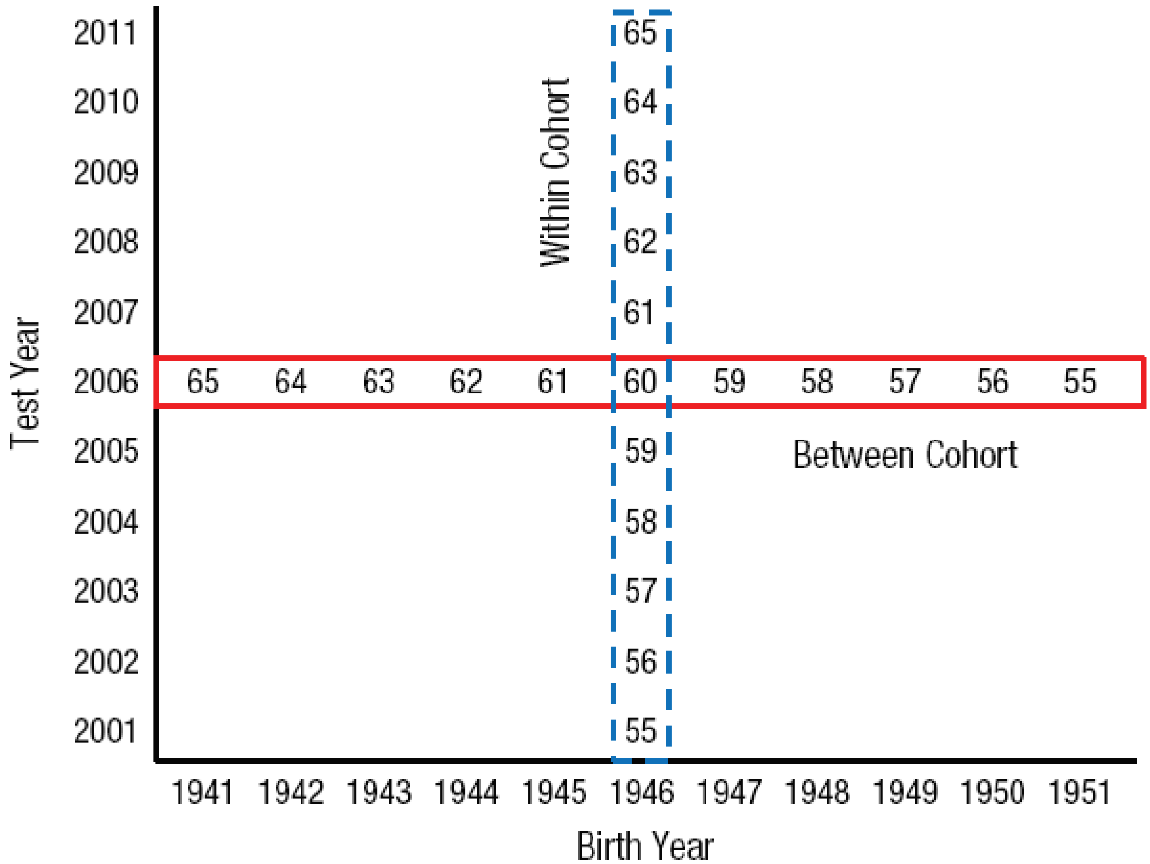

Fig. 1. Illustration of the structure of the data in the current project. Although the birth years ranged from 1907 to 1989, only a limited number of birth years are illustrated for the sake of clarity. Each cell in the matrix consists of data from different people. Thus, comparisons along a row are between cohort, because they involve people who were of different ages (and thus born in different years) but who were tested in the same year; comparisons along a column are within cohort, because they involve people who were of different ages (but born in the same year) and who were tested in different years. The numbers in the cells correspond to the ages of individuals from the indicated birth and test years.

Who Rises to the Top? Early Indicators

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Abstract

Youth identified before age 13 (*N* = 320) as having profound mathematical or verbal reasoning abilities (top 1 in 10,000) were tracked for nearly three decades. Their awards and creative accomplishments by age 38, in combination with specific details about their occupational responsibilities, illuminate the magnitude of their contribution and professional stature. Many have been entrusted with obligations and resources for making critical decisions about individual and organizational well-being. Their leadership positions in business, health care, law, the professoriate, and STEM (science, technology, engineering, and mathematics) suggest that many are outstanding creators of modern culture, constituting a precious human-capital resource. Identifying truly profound human potential, and forecasting differential development within such populations, requires assessing multiple cognitive abilities and using atypical measurement procedures. This study illustrates how *ultimate criteria* may be aggregated and longitudinally sequenced to validate such measures.

Why Are There Different Age Relations in Cross-Sectional and Longitudinal Comparisons of Cognitive Functioning?

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Abstract
A major challenge for researchers interested in investigating relations between aging and cognitive functioning is distinguishing influences of aging from other determinants of cognitive performance. For example, cross-sectional comparisons may be distorted because people of different ages were born and grew up in different time periods, and longitudinal comparisons may be distorted because performance on a second occasion is influenced by the experience of performing the tests on the first occasion. One way in which these different types of influences might be investigated is with research designs involving comparisons of people of different ages from the same birth cohorts who are all tested for the first time in different years. Results from several recent studies using these types of designs suggest that the age trends in some cognitive abilities more closely resemble those from cross-sectional comparisons than those from longitudinal comparisons. These findings imply that a major reason for different age trends in longitudinal and cross-sectional comparisons of cognitive functioning is that the experience with the tests on the first occasion inflates scores on the second occasion in longitudinal studies.

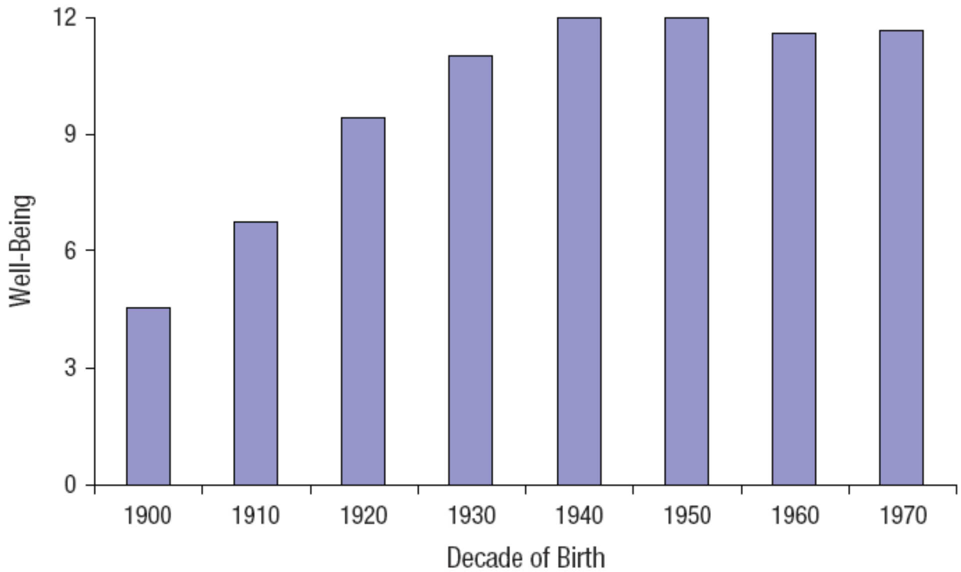
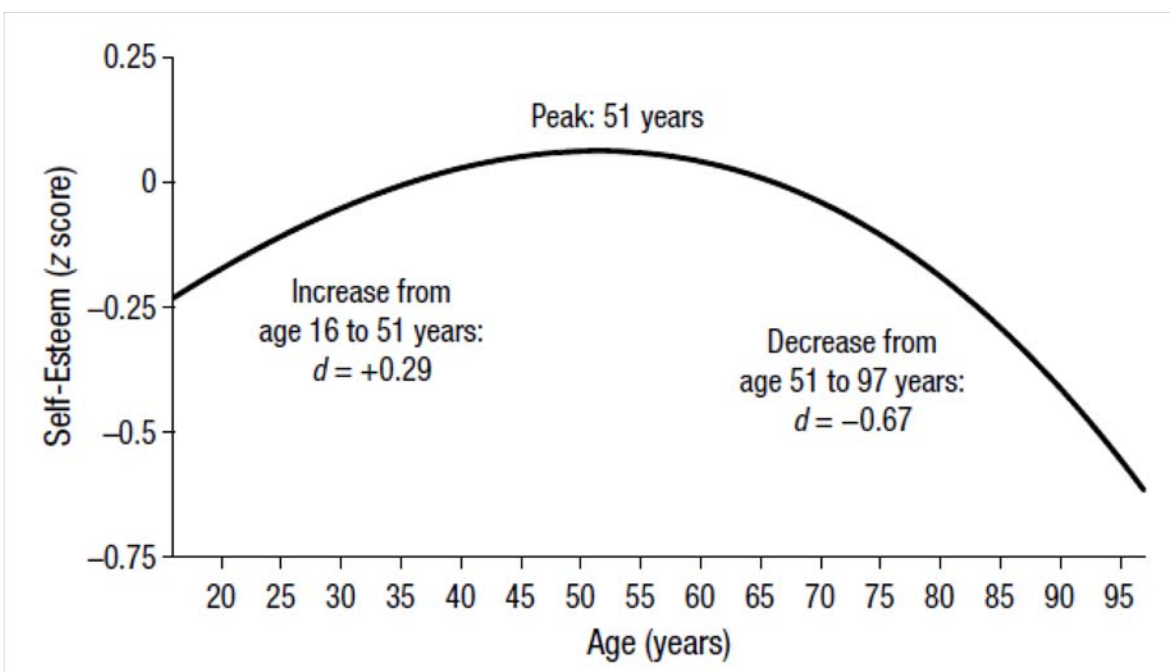


Fig. 2. Estimated marginal mean well-being in the Baltimore Longitudinal Study of Aging sample as a function of participants' decade of birth, controlling for age, age-squared, sex, ethnicity, and education.



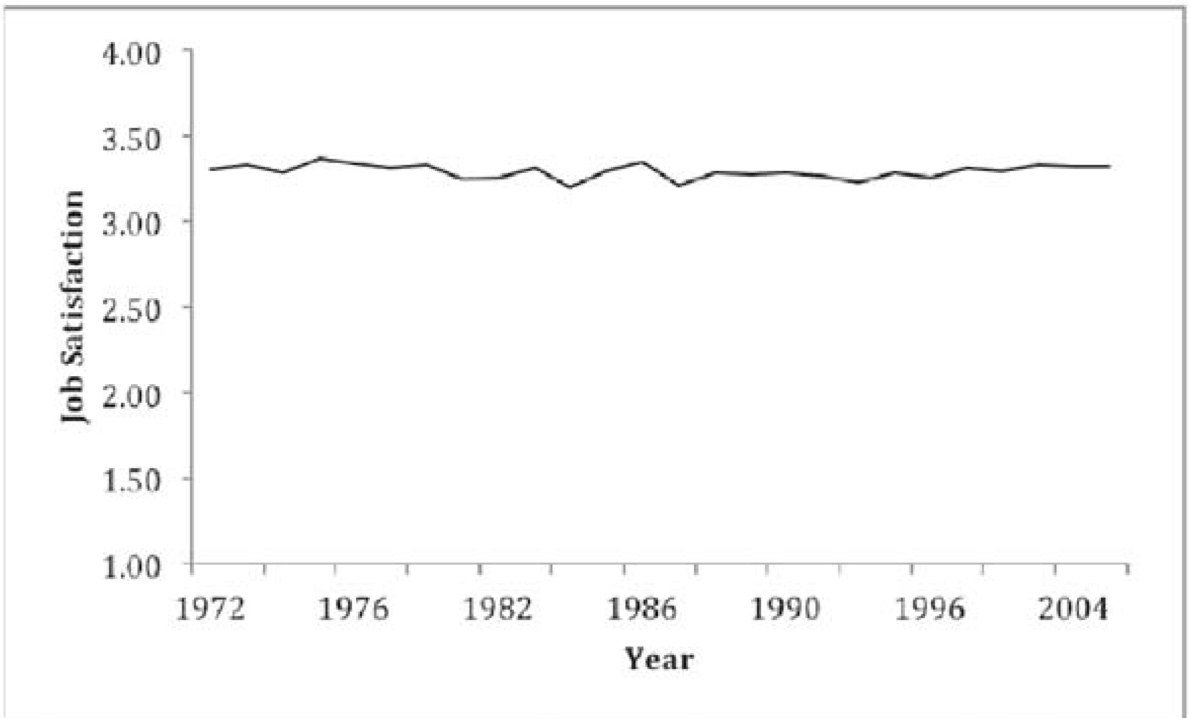


Figure 1. **Trend in Mean Levels of Job Satisfaction Based on the General Social Survey Between the Years of 1972 and 2006**
(1 = *very dissatisfied* and 4 = *very satisfied*)

Specific Threats to Internal Validity Faced by Longitudinal and Cross-Sectional Designs

1. **Selective survival**

   - This is intrinsic to both cross-sectional and longitudinal designs.
   - This threat is more critical with older adult samples.
   - This threat is associated with changes in the population composition across time because the weaker, less competent, and less adjusted individuals have typically died off.
   - This makes it difficult to make any retrospective or prospective inferences because the population is NOT the same (at different times).

2. **Selective dropout**

   - This applies to longitudinal research only. This is the situation in which participants drop out of the study sample. They might, for instance, move away, lose interest in the study, die, etc. So individuals who continue to participate may be inherently "different".

3. **Practice effects or retest effects**

   - This applies to repeated measures longitudinal designs where the same individual is tested and retested on the same psychological behavior and tested over a long period of time.
   - The problem is one of participants becoming task- or testwise. Also, if the particular task or test requires the use of particular skills, then with practice gained from repeated testing over a long period of time, participants become very skilled.
   - A vivid example of this is the Berkeley Growth Study. This was a longitudinal study on intelligence in the 1930's. Over less than 20 years participants were tested on the same or different versions of the same test more than 40 times. It seems highly likely that performance on these IQ tests may have been inflated by practice.

4. **History, cohort, or generation effects**

   - This is a threat associated with cross-sectional designs.
   - Cohort—is some group that has some characteristic(s) in common; usually thought of in terms of different age groups.
   - Cohort effect—the variable by which the cohort is grouped confounds the IV.
     - e.g., look at the effects of age on the ability to program a cell phone; age is confounded by one's generation or cohort such that the group that grew up in the (late?) 1990's to 2000's has grown up programming cell phones but our grandparents did not.