Sequential Studies

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Sequential studies combine aspects of longitudinal and cross-sectional studies in order to overcome some of inherent problems in both designs. Longitudinal studies can provide rich information about phenomena change, but have two major disadvantages: (a) they can require substantial resources, and (b) they can confound effects of age, cohort (i.e., influences due to shared historical experiences), and time-of-data-collection effects (i.e., events that co-occur with the data collection occasions). Cross-sectional studies require fewer resources, but only provide limited information about developmental change.

There are three major types of sequential studies: cross-sequential, cohort-sequential, and time-sequential. They are summarized in Table 1.

Cross-sequential designs start with a cross-sectional design and then follow all the participants over a period of time. They allow for studying longer periods of development in shorter time periods. An example is shown in Figure 1(a) for a study designed to assess development during school-age years (5–18 years). A typical longitudinal study would require at least 13 years, but the cross-sequential design in Figure 1(a) reduces it to 4 years. A drawback of this design is that it is not able to provide information on specific age effects unless time-of-measurement effects are negligible. In Figure 1(a), the true rate of growth between 16–18 years might differ across cohorts because older cohorts (i.e., Generation X) provide estimates that occurred before influential time-of-measurement effects, whereas younger cohorts (i.e., Millennials) provide estimates after the time-of-measurement effects. For example, if the phenomenon of interest is knowledge acquisition, mass Internet availability could make the rate of change between 16–18 years of age in older cohorts different from that in younger cohorts.

Cohort-sequential designs involve simultaneously conducting several short-term longitudinal studies covering the same age range. It starts with a single cohort, and then an additional cohort in added each year. Each cohort stays in the study until they reach the maximum age. These designs are useful for investigating the effects of age on the target phenomena as well as consistently of age effects across cohorts. An example is given in Figure 1(b) for study designed to assess development between 11–14 years of age. It could be used to estimate the rate of growth between 11- and 14-year-olds as well as see if that rate differs between older and younger generations. A drawback for this design is that it assumes there are no time-of-measurement effects. So, if something happens in the middle of the study, its effect on the target phenomena will differ for older and younger cohorts. For example, in Figure 1(b) the effect of mass Internet availability would only show up for older ages of the Generation X cohorts but for both younger and older ages of the Millennial cohorts.

In *time-sequential designs* the age range of participants is kept the same for each wave of data collection. Thus, at each wave data are collected for only a portion of the cohorts. This design is useful for examining if age group differences change over time. An example is given in Figure 1(c) for a study examining if the difference between 11- and 15-year-olds is the same for Generation X and Millennial generations. The drawback of the design is that it does not capture cohort effects. Thus, mass Internet availability could confound any generational differences.

Further Reading

Little, T. D. (2013). *Longitudinal structural equation modeling*. New York, NY: Guilford.

Schaie, K. W., & Caskie, G. L. L. (2005). Methodological issues in aging research. In D. M. Teti (Ed.), *Handbook of research methods in developmental science* (pp. 21–39). Malden, MA: Blackwell.

Schaie, K. W., & Hertzog, C. (1982). Longitudinal methods. In B. B. Wolman (Ed.), *Handbook of developmental psychology* (pp. 91–115). Englewood Cliffs, NJ: Prentice-Hall.

Table 1. Summary of Features for Three Types of Sequential Study Designs.

Design	Minimum Requirements			Effects	No Information
	Ages	Cohorts	Waves		
Cross	3	2	2	Wave, Cohort	Age
Cohort	2	2	3	Age, Cohort	Wave
Time	2	4	2	Age, Wave	Cohort

		Year Data Collected			
	Year Born/Cohort	1993	1994	1995	1996
Generation X	1978	15	16	17	18
	1979	14	15	16	17
	1980	13	14	15	16
	1981	12	13	14	15
	1982	11	12	13	14
	1983	10	11	12	13
	1984	9	10	11	12
	1985	8	9	10	11
	1986	7	8	9	10
	1987	6	7	8	9
Millennials	1988	5	6	7	8

(a)

		Year Data Collected										
	Year Born/Cohort	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Generation X	1980	11	12	13	14							
	1981		11	12	13	14						
	1982			11	12	13	14					
	1983				11	12	13	14				
	1984					11	12	13	14			
	1985						11	12	13	14		
	1986							11	12	13	14	
Millennials	1987								11	12	13	14

(b)

		Year Data Collected						
	Year Born/Cohort	1993	1994	1995	1996	1997	1998	1999
Generation X	1978	15						
	1979	14	15					
	1980	13	14	15				
	1981	12	13	14	15			
	1982	11	12	13	14	15		
	1983		11	12	13	14	15	
	1984			11	12	13	14	15
	1985				11	12	13	14
	1986					11	12	13
	1987						11	12
Millennials	1988							11

(c)

Figure 1. Examples of cross-sequential (a), cohort-sequential (b), and time-sequential studies (c).