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Schaie K W. A general model for the study of developmental problems. *Psychol. Bull.* 64:92-107, 1965.
[West Virginia University, Morgantown, WV]

Conventional longitudinal and cross-sectional methods are shown to be a special case of a general model for research on behavioral change over time. The complete model requires consideration of the components of age, time, and cohort differences. New research strategies are proposed that involve optimal combinations of the cross-sectional and longitudinal methods into sequential designs. [The *Social Sciences Citation Index*® (*SSCI*®) indicates that this paper has been cited in over 320 publications since 1966.]

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"As an undergraduate student of R.D. Tuddenham at the University of California at Berkeley, in 1951, I had become interested in changes in the adult development of psychometric intelligence. This interest led to a dissertation at the University of Washington, under the direction of C.R. Strother, that involved a cross-sectional study of the primary mental abilities from early adulthood into old age.[1] I was fortunate enough to obtain access to one of the earliest Health Maintenance Organizations (Group Health Cooperative of Puget Sound), from the membership of which I obtained my dissertation sample. Some years later, while preparing to teach a seminar on adult development, I became alerted to research findings suggesting that the steep linear age decrement in intelligence reported in cross-sectional studies (including my own) seemed contradicted by findings of longitudinal studies following the same individuals over time.[2] I consequently decided to do a follow-up of my cross-sectional study to permit comparison of cross-sectional and longitudinal data in the same population, as well as drawing a new sample from the same population. This initial follow-up actually led to what is now one of the major longitudinal studies of adult psychological development, now in its 28th year.[3]

"Results of our initial follow-up replicated the steep cross-sectional age differences, while showing much less pronounced age changes within individuals, not reaching significance until the late 1960s. This discrepancy led to theoretical analyses that showed the longitudinal and cross-sectional approaches to be special cases of a more general model for the study of change over time. Specifically, it became clear that cross-sectional data confounded age and cohort differences, while longitudinal data confounded age and time-of-measurement (period) effects. Thus, data obtained via the two methods can only agree if cohort and period effects are of trivial magnitude. A third method was then identified and named *time-lag* that compares samples of individuals of the same age at different points in time (e.g., college classes). This method, however, also confounds cohort and time-of-measurement effects.

"The general model specifies the three components of age, cohort (year of birth), and time of measurement (period). It was shown that similar to the relation of temperature, volume, and pressure in physics, specification of any two components would determine the third. As in physics, one might, however, be interested in any of the three different combinations of two components. This led to the introduction of what are now called *sequential methods* of developmental data collection and data-analysis strategies, including the *cohort-sequential*, *time-sequential*, and *cross-sequential* paradigms.[4] I have recently begun to show that the remaining dependencies can be addressed by redefining the general developmental model in noncalendar terms."[5]

1. **Schaie K W.** Rigidity-flexibility and intelligence: a cross-sectional study of the adult life span from 20 to 70 years. (Whole issue.) *Psychol. Monogr.* 72(9), 1958. 26 p.
2. **Owens W A, Jr.** Age and mental abilities: a longitudinal study. *Genet. Psychol. Monogr.* 48:3-54, 1953.
3. **Schaie K W.** The Seattle Longitudinal Study: a twenty-one year exploration of psychometric intelligence in adulthood. (Schaie K W. ed.) *Longitudinal studies of adult psychological development.* New York: Guilford Press, 1983. p. 64-135.
4. ----------. Quasi-experimental designs in the psychology of aging. (Birren J E & Schaie K W. eds.) *Handbook of the psychology of aging.* New York: Van Nostrand Reinhold, 1977. p. 39-58.
5. ----------. Historical time and cohort effects. (McCloskey K A & Reese H W. eds.) *Life-span developmental psychology: historical and generational effects.* New York: Academic Press, 1984. p. 1-15.

