## John R. Nesselroade, The Pennsylvania State University

First, I wish to thank my fellow symposiasts for a set of interesting and timely papers dealing with selected aspects of longitudinal methodology. Primarily, I intend to restrict myself to making some general comments rather than sharply focussing on specific points made in the papers although, in a few cases, I plan to address relatively specific issues.

It is somehow reassuring to learn that interest in longitudinal data collection and analysis schemes is still with us although, for my part, I should like to help dispel, if possible, some of the mystique which continues to surround longitudinal studies. Threats to the validity of simple longitudinal studies are well-known and Dr. Frey has reminded us how important it is that proper controls be included in the design for spurious changes. Effects due to dropout or experimental mortality, retesting, selective sampling, etc., must be dealt with in longitudinal studies.

Controls in longitudinal studies Paul Baltes and I (Nesselroade & Baltes, 1974) recently finished a longitudinal study of adolescent personality and ability development, some results from which will help to illustrate the pervasiveness of retest and dropout effects. In that study six measures of primary mental abilities were administered to a large sample of adolescents three times over a two year period. With the use of appropriate controls we ascertained that highly significant and substantial retest effects were found for all six ability measures. The apparent gains made over the two years were, for some measures, wholly attributable to retesting with the same instrument. In addition, on five of the six ability measures, highly significant and sizeable differences were found between the mean scores of the core longitudinal sample at occasion 1 and the mean scores at occasion 1 of the people who were initially assigned to the longitudinal sample but subsequently dropped out of the study for one reason or another prior to the second occasion of measurement. Outcomes such as those just mentioned constitute an overwhelming reason for carefully designing in proper controls when planning and conducting longitudinal studies. The measurement of change

In this brief set of papers we have been exposed to a number of methods for defining change, such as the algebraic difference score which received its usual castigation but which still may have some usefulness, the residual change score which seems to remain ever popular as a change measurement device, the ratio as a measure of change introduced by Fox and Clemmer and a pattern notion for representing change described by George. Each of these may have particularly useful properties for specific contexts but requires the exercise of some caution in application as well. For example, even though the ratio measure of change makes intuitive sense the properties of a ratio of two variables seem not to be as well understood as are the properties of some linear combination of variables such as differences or residual change scores. The proposal by George also looks promising. One problem which one notices immediately, however, is that as the number of measurement occasions increases either some arbitrary decisions about which occasions are attended to must be made or the number of classifications increases dramatically with possible subsample size problems resulting.

It does seem to be the case that a particular kind of change score must be identified for a particular purpose. There is no one best way to define and measure change and even raw difference scores yet may have some uses. No substitute has been found for having some guiding theory in making the decision concerning how to represent change information.

It is noteworthy that in each application discussed, by one means or another, change has been reduced to a single score. For example, the ratio of incomes employed by Fox and Clemmer reduces information from two points in time to a single score. The residual change score similarly reduces two data points to one and the change pattern notion follows this same general procedure of collapsing information from two or more occasions of measurement to a single value. While reductions of this kind may be necessary starting places one can not help but believe that some of the richness of change processes may be lost by these techniques and that we need some newer, more complex ways of structuring and representing change.

Regarding future research a couple of points bear making. First, data on older adults from a variety of studies suggest that influences such as cohort effects are quite substantial on some variables. The research programs represented in both the Fox and Clemmer and the George presentations at some point may benefit from analyses set up to describe the magnitude of effects associated with such alternative classifications. Second, the suggestion is offered that researchers continue to look very carefully at derived indicators of change, e.g., ratio scores, regarding their fruitfulness as dependent variables. Alternative representations may be as meaningful and somewhat more predictable in terms of their characteristics over the long run. Novel change indices may well be needed but they must be carefully evaluated before longitudinal data can be fully exploited.

Reference

Nesselroade, J. R., & Baltes, P. B. Adolescent personality development and historical change: 1970-1972. <u>Monographs of the Society for</u> <u>Research in Human Development</u>, 39 (1, Serial No. 154).