Psychological Change in Adulthood

Longitudinal Studies of Adult Psychological Development. K. WARNER SCHAIE, Ed. Guilford, New York, 1983. xiv, 332 pp., illus. $32.50. Adult Development and Aging.

Students of individual and group differences in intellectual abilities are well aware of the depressing scenario for aging found in the early cross-sectional comparisons of different people in different stages of life. From 1920 to 1950 study after study reported intellectual declines beginning in early adulthood (the middle 20's) with still further declines following in each succeeding decade of life. Furthermore, formal education offered no protection. The declines were as steep for those with college degrees as they were for those with only grade school education.

These gloomy prospects were considerably improved as soon as the results of longitudinal studies in which the same individuals were tested on more than one occasion became known. Here the investigators found significant *increases* in adult abilities over the first 30 years of adulthood. This finding held for those whose education ended with high school as well as for those with college degrees. By 1965, Leona Tyler and others were concluding that early adulthood declines were not then occurring and probably never had. The higher scores for the younger adults in the early cross-sectional studies could be accounted for by the increasing opportunities through the 1920's, '30's, and '40's "for individuals to develop in stimulating surroundings." It is tempting to speculate about trends in the stimulating quality of our schools and homes for the '60's, '70's, and '80's. Do the recent declines in Scholastic Aptitude Test scores indicate a reversal of the pattern, so that now younger adults are the disadvantaged cohort?

The two chapters written by the editor of this book are the most informative ones in the volume because they provide the clearest impressions of the complexities lurking behind seemingly straightforward longitudinal designs that actually confound the effects of age, cohort, and time of measurement. Schaie has led the way in developing strategies (cohort-sequential, time-sequential, and cross-sequential) that can separate these influences and also minimize the threats to both internal and external validity in these longitudinal quasi experiments. The material he provides from his Seattle Longitudinal Study (nine birth cohorts, seven of them tested four times between 1956 and 1977) is well organized and presented in such a way as to reveal the "natural history" of the project. These data support the claim that adult abilities usually peak in the early 50's and do not show a significant decline thereafter until the mid-70's. The importance of correcting for cohort and time-of-testing differences is shown by the fact that the uncorrected data indicate that number ability declines first and most, whereas the corrected figures show later and less decline for number than for any other primary ability.

Although they are not a major focus in either of his chapters, Schaie does consider the practical implications of his findings. He thinks his data are relevant to a host of personnel decisions that are now somewhat controversial. The hiring and retirement of older workers are good examples. Another practical concern derives from the data showing that certain personality styles appear to delay intellectual decline. He is quite optimistic about the possibilities of developing educational and environmental interventions that could assist in the maintenance of intellectual functions beyond the period where "natural" decline sets in.

The six other studies in the book represent the efforts of independent groups of researchers to explore issues similar to those discussed by Schaie. What is missing is a comparison of the results from the different projects. It would have been very helpful to have in one place the answers from each study to the following four questions posed by Schaie: Does intelligence change uniformly or in different ability patterns? At what age is there a reliably detectable age decrement in ability and what is its magnitude? What are the patterns of generational differences and what is their magnitude? What accounts for individual differences in intraindividual change in intellectual function across adulthood?

It is with respect to the last of Schaie's questions that the projects vary most in approach. Jarvik and Bank examined aging in both identical and fraternal twins and found that chromosome loss related to ability declines in women but not men. Siegler reports that subjects from the Duke project showed significant (but complex) relationships between continued mental functioning and coronary heart disease and hypertension. Bray and Howard found that success as an AT&T manager was related not only to current intellectual standing but to intellectual and personality assessments made 20 years earlier. The personality tests used in this study were different from those employed by Schaie, and there is not enough information provided to permit the reader to determine the comparability of outcomes in the personality domain.

Another problem concerns the lack of good information in most of the studies about the bias introduced by the use of volunteer subjects. Longitudinal studies are particularly vulnerable to this difficulty because considerable testing is almost always involved. In some studies fewer than one-third of the eligible subjects actually participated. It is easy to imagine that many study volunteers are unusual in intellect, personality, and motivation.

But perhaps I am asking too much. The projects reported here are all important ones, and it is handy to have accounts of them in one volume. The average age of our population continues to increase, and these studies of aging will grow in influence and relevance for policy decisions.

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A Program for the Gifted

Academic Precocity. Aspects of Its Development. CAMILLA PERSSON BENBOW and JULIAN C. STANLEY, Eds. Johns Hopkins University Press, Baltimore, 1984. xiv, 217 pp. $22.50; paper, $7.50. Based on a symposium, Baltimore, Nov. 1980.

This volume assembles a series of papers originally presented at a conference marking the tenth anniversary of the "Search for Mathematically Precocious Youth" (SMPY) program. This program was established in 1971 at Johns Hopkins University by Julian Stanley and has since expanded to four other university sites around the country. Its purpose is to search for talented students in mathematics at about the junior high school age. The search is conducted through the administration of standard aptitude tests. The top 5 percent of the students are then provided a variety of acceleration activities in mathematics.

These opportunities include both content acceleration, the earlier introduction of subjects such as algebra and geometry in the students' programs, and student acceleration, the moving of the students into higher levels of the educational system. Occasionally, this means radical acceleration, moving outstanding junior high students five or six years ahead of their age group into university programs.

Ten of the chapters in this volume report a variety of experiences with the SMPY talent search program, ranging from longitudinal evaluations to descriptions of special programs for rural talented students and a special program for gifted girls.

The intellectual rationale for this accelerative educational strategy is presented in the chapter by Robinson, to whom the volume is dedicated. He points out that there are three well-accepted principles of child development: learning is sequential and developmental, teaching requires assessment of the individual's status in that developmental sequence, and there is a wide range of differences in how rapidly students of the same age pass through that developmental sequence. Given these three principles, Robinson then raises a fundamental issue, "How can schools defend a rigid age-grade program insisting that all ten-year-olds must be in the fifth grade?"

Pollin's chapter reviews data on the socio-emotional status of students who have been in the SMPY program and concludes that there is little or no evidence available that would suggest that emotional disturbance was a consequence of acceleration of either content or student. This finding is supported by a longitudinal evaluation of SMPY's first class by Benbow, Perkins, and Stanley. The participants accelerated their education more than nonparticipants, expressed greater interest in mathematics and science, and felt good about their participation in the program. Lunny describes a mathematics acceleration program in a rural county where evening classes supplemented mathematics courses that the students attended during the day. This program appeared to be favorably received and represents an interesting and unique method for providing help to gifted students in rural areas.

Fox, Benbow, and Perkins report on a special accelerated mathematics program designed especially for girls. One of the earlier findings from the Talent Search program was that talented girls scored significantly less high in mathematics on the Scholastic Aptitude Test than boys. Consequently, special attention has been given to the stimulation of motivation and interest in mathematics in girls. This included a special program that enrolled only girls so they would feel no male competition or dominance that may have been inhibiting in the past. Unfortunately, the accelerated math program for girls reported here did not yield strikingly successful results. This outcome suggests that there remains a complex series of social and psychological factors that may be inhibiting girls from the full use of their mathematical talent and that are difficult to eradicate.

As is often the case in a volume that translates a conference into print, the contributions are uneven and often redundant. A chapter by Michael that purports to correlate creativity and mathematical talent is less than enlightening. Since the "creativity" measures used are suspect in both validity and reliability, the comparison reported has little meaning.

Nevertheless, it is useful to have a variety of results about a major talent search program such as the SMPY program in one volume. The overall results of these studies strongly suggest that there is room for the more rapid growth of mathematical understanding in identified talented youth without observable negative consequences. We can apparently live up to, without ill effects and with some tangible gains, the educational principle that each child, even mathematically talented children, should be given the education he or she needs, at his or her own developmental level.

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Newton on Optics

The Optical Papers of Isaac Newton. Vol. 1, The Optical Lectures, 1670–1672. ALAN E. SHAPIRO, Ed. Cambridge University Press, New York, 1984. xx, 627 pp., illus. $135.

The statutes governing the Lucasian chair of mathematics at Cambridge required its incumbent to lecture on "some part of Geometry, Astronomy, Geography, Optics, Statics, or some other mathematical discipline." Appointed to the chair late in 1669, Isaac Newton chose to follow the example of his predecessor, Isaac Barrow, by lecturing on optics. The choice of topic is not surprising, since during the previous few years Newton had read the major treatises on optics, carried out a number of original and revealing experiments, and begun to forge his own novel theory of light and colors. Stimulated by the need to prepare a series of lectures, Newton organized and expounded the fruits of his research on a broad canvas. Among the manuscripts at Cambridge are not one but two results of this effort, known collectively as the optical lectures; the first (known here as the *Lectiones opticae*) was begun shortly after Newton's appointment to the Lucasian chair, and the second (the *Optica*) is an altered and extended version that was mostly completed by early 1672. It was also early in 1672 that Newton presented his theory of light and colors to the Royal Society of London. However, his major treatise on the subject, the *Opticks*, was not published until 1704, and the *Optica* first appeared posthumously nearly a quarter of a century later. Although there have been published versions of both the optical lectures, these earlier editions fall far below the standard required by modern scholarship.

For some time scholarly editions have been needed not only of the optical lectures but of Newton's optical writings in general. Many important manuscripts remain unpublished, but perhaps the most serious omission is an adequate edition of the *Opticks*. To remedy this situation Cambridge University Press has planned a three-volume edition of Newton's optical papers. This first volume contains the optical lectures, and later volumes will encompass Newton's other optical writings, including the manuscripts for the *Opticks*.

In the present volume, capably edited by Alan E. Shapiro, the *Lectiones opticae* and *Optica* are transcribed with facing English translations. The texts are prefaced by a useful synopsis of their contents, indicating the major differences between the two texts. There is also an introductory essay in which the editor briefly explores the relationship between these two manuscripts and also the relation of the optical lectures both to Newton's other writings and to the optical treatises with which Newton was familiar. The text is elaborated by useful notes, which, likewise, are principally concerned with the relationship between Newton's texts. This emphasis reflects one of the prevailing preoccupations of the Newton industry, but it is slightly disappointing to find that other aspects of the text, such as Newton's use of language and the provenance of the key terms he employs, are not explored.

Although these optical lectures were