SOCIAL STRUCTURE and AGING: Psychological Processes

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Cohort Differences in Cognitive Aging: A Sample Case

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INTRODUCTION

For over two decades, the importance of studying adult intelligence within the context of sociocultural change has been recognized (Baltes, 1968; Riegel, 1976; Schaie, 1965). Empirical studies have focused primarily on the effect of cohort membership upon cognitive performance (Schaie, 1983). When individuals of different birth cohorts have been assessed at the same chronological age, the level of performance on a variety of psychometric ability measures has been shown to vary by birth cohort.

From the early studies on cohort differences in adult intellectual performance, empirical research and theoretical discussion have taken three directions. First, there is continuing empirical research on defining cohort differences in the *direction* and *rate* of cognitive development and decline (Schaie & Hertzog, 1983, 1986). Second, there has been discussion of the specific social structures and mechanisms that may be associated with cohort differences in cognitive performance. Of particular interest has been the relationship between change in certain structural indices (e.g., educational level, occupational status) and cohort differences in the level of intellectual performance (Abeles & Riley, 1987; Baltes, Cornelius, & Nesselroade, 1979; Kohn & Schooler, 1983). Third, new conceptualizations of the constructs of cohort and period have been recently proposed that extend definitions of cohort beyond that of birth cohort and define period in ways other than in linear time dimensions (Featherman & Peterson, 1986; Schaie, 1986a).

In this chapter, we consider issues related to the first two questions by using a sample case. We examine in detail the relationship between changes in educational level, as a social indicator, and cohort differences in inductive reasoning ability. In this sample case, a positive cohort trend is manifested for both the social indicator and the cognitive ability. Let me begin, however, with the big picture and briefly summarize some recent findings regarding cohort differences in the direction and rate of change in cognitive performance for a variety of abilities.

EXAMINATION OF COHORT PROGRESSIONS FOR THREE ABILITIES

There has been the tendency to summarize cohort effects in cognitive functioning as representing a uniformly positive cohort trend in which an increase in level of performance occurred from cohort to cohort, when these cohorts were compared at the same chronological age. However, as increasing numbers of birth cohorts have been examined for a variety of mental abilities, the early summaries describing a positive trend have been found to be much too simplistic (Schaie & Hertzog, 1983).

Cohort trends in intellectual performance are multidirectional, and the rate of change between successive cohorts varies widely (Schaie, 1986b). This can be illustrated by examination of the differences between successive cohorts for three of the Thurstone (1938) primary abilities: *inductive reasoning, spatial orientation, and number.*

Brief Description of the Data Base

The data to be discussed come from the Seattle Longitudinal Study (SLS; Schaie, 1983), a multiwave panel study that used as its population frame the membership of a metropolitan health maintenance organization. Participants were community-dwelling adults randomly selected from seven-year age intervals included in each panel (ages 25, 32, 39, 46, 53, 60, 67, 74, 81). Data were collected at 7-year intervals from 1956 to 1984.

Throughout the study, subjects have been assessed on five of Thurstone's primary mental abilities, and demographic information has been obtained at each data collection point. The data presented are based on an independent random sampling model in which each cohort at each age was assessed by means of a separate sample, thus controlling for possible effects of testing, reactivity, and experimental mortality. These analyses involved a sample of 768 subjects.

Inductive Reasoning

Cohort differences on inductive reasoning come closest to showing a positive, linear cohort progression. The top section of Fig. 3.1 presents cummulative mean differences in inductive reasoning performance for 10 birth cohorts (1889, 1896, 1903, 1910, 1917, 1924, 1931, 1938, 1945, 1952), when compared at the same chronological ages.[1] Although there is a clear linear trend, there are, however, significant differences in the *rate* of progression between successive cohorts. Relatively steep increments up to the 1931 birth cohort are shown, with slower decelerating increment thereafter. Cohort progressions vary by gender. On inductive reasoning,

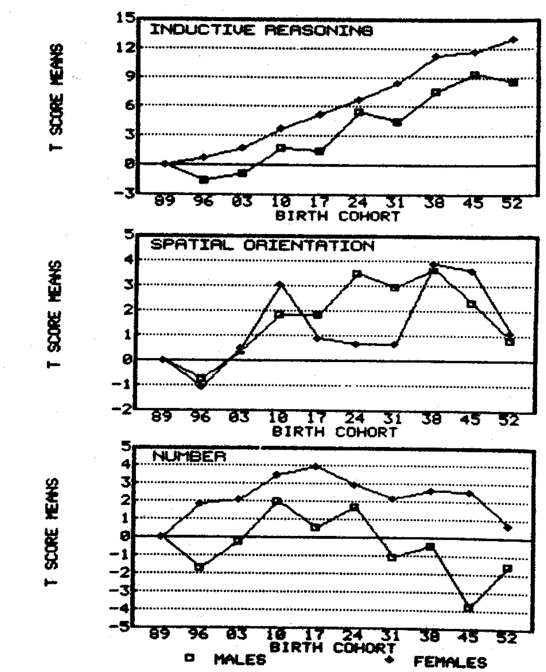

FIG. 3.1. Cumulative cohort differences for three of Thurstone's primary mental abilities: inductive reasoning, spatial orientation, number.

[1]We obtained cohort differences by taking the differences between means for each pair of cohorts at all common age levels. We then obtained cohort difference estimates by averaging across all estimates to avoid undue weighting in terms of differential sample sizes. We constructed cohort gradients by cumulating cohort difference estimates across cohorts.

women exhibited a quite regular, positive linear trend. The cohort pattern for men is positive but less regular.

Spatial Ability

The cohort progession for spatial orientation is much more irregular, with distinct gender differences in the overall pattern (middle section of Fig. 3.1). There was a generally positive trend for early cohorts of men, reaching an asymptote for the 1924 to 1938 birth cohorts. Women reached an initial peak for the 1910 cohort followed by a drop for the 1917 to 1931 cohorts. Both males and females exhibited a sharp drop for the 1945 and 1952 cohorts.

Number Ability

A very different pattern is shown for number ability, involving simple addition and subtraction computations (bottom section of Fig. 3.1). A peak was reached by the 1910 cohort and was maintained through the 1924 cohort, followed by a negative trend. Men reached an earlier asymptote by the 1910 cohort, and there followed a "stair-step" decrement until 1945 with some recovery for the 1952 cohort. Women exhibited a greater increment from base, reaching a peak with the 1917 cohort followed by a plateau then a decline for the 1952 cohort.

This brief overview of cohort progressions for three primary abilities illustrates that the direction of cohort effects varies across abilities, with some abilities showing positive, linear trends across the cohorts studied and other abilities exhibiting curvilinear or even negative cohort progressions. The rate of change between the successive cohorts studied varies widely also.

COHORT DIFFERENCES IN INDUCTIVE REASONING: A MORE DETAILED LOOK

We now begin a more intensive examination of cohort differences for one important primary ability—inductive reasoning—and consider possible social indicators associated with cohort effects for this ability.

Inductive reasoning has been defined as the ability to identify one or more logical rules or principles critical to the solution of a particular problem type, coupled with the ability to utilize these rules in future problem solutions (Thurstone, 1938). This ability is frequently assessed by Letter or Number Series tests in which the subject is shown a series of letters or numbers and asked to identify the next letter/number in the series.

This primary ability is represented in a number of psychometric models of intelligence (Cattell, 1971; Guilford, 1967; Thurstone, 1938) and more recently has been studied in computer simulations of problem solving (Simon & Kotovsky, 1963). Inductive reasoning has been of interest to gerontologists because it is one of the abilities exhibiting relatively early age-related decline. Previous analyses from the SLS on inductive reasoning ability indicated that significant age-related decline occurred in people in their mid-60s. However, analyses of the 1977 data suggest that for more recent cohorts, age-related decline may occur as early as the mid-50s (Schaie & Hertzog, 1983).

As you may recall from Fig. 3.1, there has been a positive, linear cohort progression for inductive reasoning, but the rate of increment has slowed down for recent successive cohorts. This linear cohort progression is evident in Fig. 3.2, which shows selected cohort comparisons at five ages (46, 53, 60, 67, 74 years). That is, Fig. 3.2 presents a time-lag comparison of five sets of two cohorts: birth cohorts (1924, 1917, 1910, 1903, 1896) assessed in 1970 at the ages of 46, 53, 60, 67, and 74 years compared with the birth cohorts (1938, 1931, 1924, 1917, 1910) assessed in 1984 at the same ages.

Note in Fig. 3.2 that at all five ages the cohorts assessed in 1984 performed at a higher mean level than the same-age cohorts assessed in 1970, indicating a positive cohort trend. Age differences are also apparent in that earlier cohorts at both times of measurement performed at a lower mean level than more recent cohorts. Of particular interest to us in this chapter is the greater magnitude of differences shown for the cohorts com-

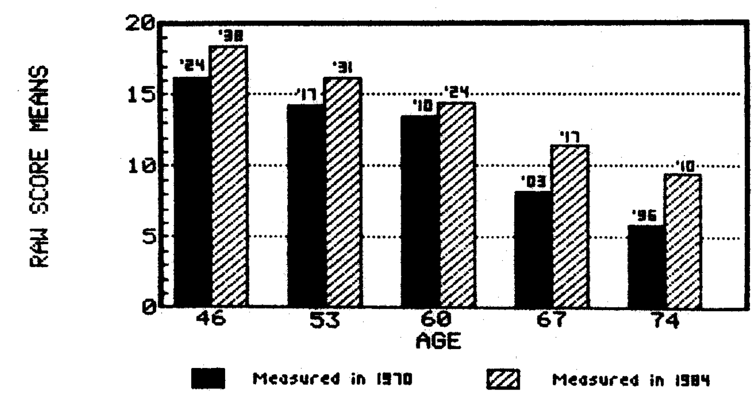

FIG. 3.2. Cohorts measured on inductive reasoning ability in 1970 compared with cohorts at the same age measured in 1984. Cohort comparisons are shown at five ages (46, 53, 60, 67, 74). Birth years are indicated for each cohort comparison.

pared at older ages (i.e., at ages 67 and 74; cohorts 1903 vs. 1917, 1896 vs. 1910). Differences for cohorts compared in middle age are much smaller (i.e., at ages 46, 53, and 60; cohorts 1924 vs. 1938, 1917 vs. 1931, 1910 vs. 1924). These reductions in the magnitude of cohort effects across age groups suggest a slowing down in the rate of the positive cohort progression observed for inductive reasoning.

Gender Differences

Figure 3.3 presents these cohort comparisons separately for males and females. Significant cohort differences were found for males only at age 74, with a trend toward a significant difference ($p < .09$) at age 67. There are no significant differences between male cohorts compared in middle age. In contrast, significant cohort effects were found for females within all age comparisons. Although the magnitude of cohort differences for women were somewhat greater for the comparisons made at the older ages, the differences were significant at all ages.

In summary, the data suggest a slowing down of the positive cohort progression for inductive reasoning, with smaller differences between cohorts compared in middle age than between cohorts compared in old age. This slowing of a positive cohort trend is most evident for males, with nonsignificant differences between cohorts compared in middle age. For women, there is evidence of a continued positive cohort progression, with significant cohort comparisons at all ages examined. At all ages, females assessed in 1984 performed at a higher level than cohorts of the same age assessed in 1970.

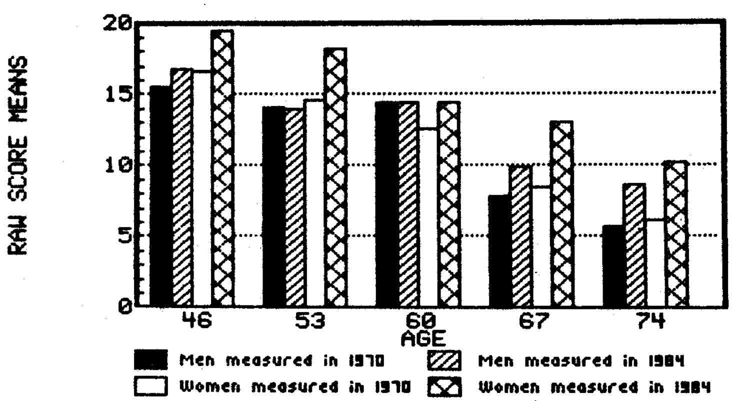

FIG. 3.3. Cohort comparisons of inductive reasoning ability by gender. Cohorts measured in 1970 compared with cohorts at the same age measured in 1984.

Social Indicators and Cohort Effects for Inductive Reasoning

We next ask whether contextual variables related to inductive reasoning performance can be identified, and do they exhibit the same pattern of cohort progression as that decribed for inductive reasoning? Educational level is a likely candidate given that it has been shown in numerous studies to be significantly related to a variety of cognitive abilities. Indeed, in the gerontological literature, educational level has been reported in several studies to account for a greater proportion of variance in cognitive performance than chronological age. Our regression analyses indicate that 20% of the variance in inductive reasoning scores for the cohorts studied can be accounted for by educational level alone.

Cohort Differences in Educational Level. The top section in Fig. 3.4 presents mean cohort differences in educational level at the five ages at which cohort comparisons were made (ages 46, 53, 60, 67, 74). Significant cohort differences were found at each of the five ages. In every case, the birth cohort assessed in 1984 exhibited a significantly higher mean educational level than the cohort assessed at the same age in 1970.

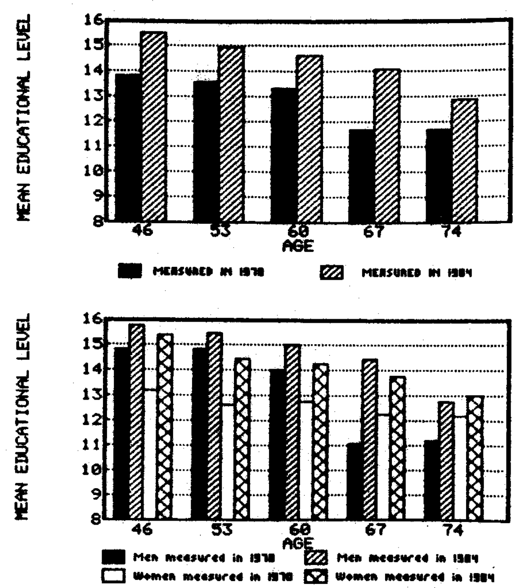

FIG. 3.4. Cohort comparisons of mean educational level for cohorts assessed in 1970 and for cohorts at the same age, assessed in 1984. Top section represents total group; bottom section, gender.

The bottom section in Fig. 3.4 shows cohort differences in educational level separately for males and females. There were significant cohort differences for women for all comparisons, except at the oldest age (74 years). In contrast, cohort differences are shown for males only at the two oldest ages (67, 74); the male birth cohorts compared at ages 46, 53, and 60 did not differ significantly in mean educational level, suggesting a slowing of a positive cohort progression for males similar to that shown for inductive reasoning.

Cohort Differences in Inductive Reasoning Residualized for Educational Level. Given the similarity in the cohort progressions for inductive reasoning ability and educational level for the cohorts studied, we examined changes in the magnitude of cohort differences in inductive reasoning when the effects of educational level were partialled out. Figure 3.5 (top section) presents the cohort comparisons in inductive reasoning performance with the effects of educational level partialled out. There were significant cohort differences only between the cohorts compared at the oldest age level (74). No other cohort comparison is statistically significant. The data in Fig. 3.2 (top section) indicates significant cohort effects at all ages; whereas, in Fig. 3.5, cohort differences are significant only for cohorts compared at age 74.

The bottom section of Fig. 3.5 presents the same data separately for

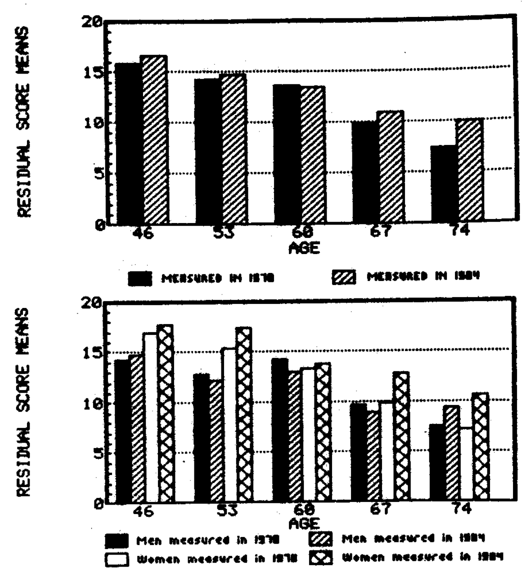

FIG. 3.5. Cohort comparisons of inductive reasoning ability with effects of educational level partialled out. Top section represents total group; bottom section, gender.

males and females. Whereas cohort comparisons for women had been significant at all ages (Fig. 3.2, lower section), significant effects remained only for cohorts compared at the two oldest ages when education was controlled (Fig. 3.5). Recall that differences for males were shown only for the cohorts compared at age 74, and these effects were also eliminated when variability associated with educational level was partialled out.

THE NATURE OF COHORT DIFFERENCES IN INDUCTIVE REASONING

As I have examined the graphs showing cohort differences in intellectual functioning, I have often wondered as to the nature of the specific behavioral differences between cohorts reflected in these cohort progressions. Performance on psychometric measures of intelligence, such as the Thurstone Inductive Reasoning test, has traditionally been measured by the number of correct responses given by the subject. The question arises of whether the positive cohort progression for inductive reasoning reflects an increase in accuracy, an increase in speed of problem solving, or some combination. For example, recent cohorts may have attempted more test items, thereby increasing the number of items answered correctly (i.e., increasing their test score), although the level of accuracy may not have differed for the two cohorts. Accuracy, in this context, is defined as the proportion of items answered correctly out of the items attempted. Alternatively, the number of items attempted may not have increased across cohorts when compared at the same age; but more recent cohorts may have become more accurate, answering a greater proportion of attempted items correctly. Some combination of increased accuracy and problem-solving speed may also be reflected in these cohort effects.

These types of questions have been prompted by paradigmatic shifts in the study of cognition with greater emphasis given to information processing and componential analyses of cognitive behavior (Rybash, Hoyer, & Roodin, 1986; Salthouse, 1986; Sternberg & Berg, 1987). However, many long-term studies of adult cognition have been based on a psychometric approach to intelligence (Owens, 1953; Palmore, 1970; Schaie, 1983), yielding data in a form not readily amenable to address many issues of concern within an information-processing approach.

To examine alternative hypotheses regarding the nature of cohort effects, we compared cohort differences in accuracy (proportion of attempted items answered correctly), versus cohort differences in speed of problem solving.[2] Figure 3.6 (upper section) presents cohort differences

[2]The total cohort difference score can be partitioned into that part associated with differences in accuracy and the remaining part resulting from a difference in the number of items attempted (i.e., speed of problem solving). An accuracy difference score was computed to examine cohort differences in accuracy when adjusted for cohort differences in the number of items attempted. We derived the accuracy difference score by computing the expect-

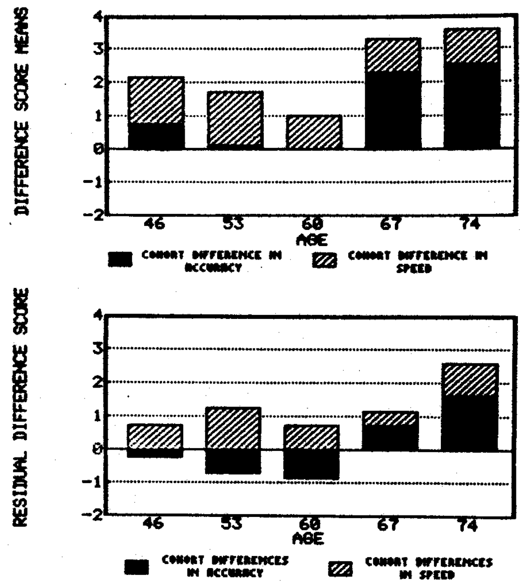

FIG. 3.6. Cohort differences in accuracy and speed dimensions of inductive reasoning performance. Upper section shows raw differences; lower section shows differences residualized for effects of educational level.

in accuracy and speed of problem solving at each of the five ages at which cohort comparisons were made. In agreement with Fig. 3.2, the magnitude of cohort differences was greater for cohorts compared at older ages. Of particular interest, however, are the qualitative differences in the nature of the effects for cohorts compared at different ages. For cohorts compared at ages 67 and 74, the cohort effects were due primarily to differences in level of accuracy; the more recent cohort at each age was more accurate than the earlier cohort at the same age. In contrast, for cohorts compared at ages 46, 53, and 60 years, cohort effects were due primarily to differences in speed of problem solving; the more recent cohort at each age attempted more test items than did the earlier cohort at the same age. For cohorts compared at age 46, we see some difference associated with increased accuracy, but it is small when contrasted with

ed score for the more recent cohort (assessed in 1984) in each comparison, if accuracy was the same for the two cohorts when compared at the same age. We computed the expected score by multiplying the number of items attempted by the more recent cohort times the accuracy rate for the earlier cohort (assessed in 1970). The cohort difference in accuracy equals the observed score for the more recent cohort minus the expected score for that cohort. We computed the cohort difference in problem-solving speed by subtracting the accuracy difference score from the total cohort difference score.

the cohort differences associated with increased accuracy for cohorts compared at ages 67 and 74.

Finally, we examine the nature of cohort differences when the effects of educational level are partialled out. The lower section of Fig. 3.6 presents cohort differences in accuracy and problem-solving speed under these conditions. As would be expected given the proportion of variance accounted for by educational level, the magnitude of the cohort differences was much reduced and, in most cases, was no longer statistically significant. With regard to the nature of cohort differences, we see that effects for cohorts compared at ages 67 and 74 were still primarily associated with positive cohort increments in level of accuracy. However, for cohorts compared at ages 46, 53, and 60, the positive cohort trends were totally associated with increases in speed of problem solving, and there was a slight negative trend in accuracy level for cohorts compared at those ages.

DIFFERENTIAL COHORT PROGRESSIONS: SOME IMPLICATIONS

The research on cohort effects on cognitive functioning indicate that cohort progressions differ across mental abilities in direction and rate. Cohort progressions are multidirectional. For some abilities, such as inductive reasoning, a positive linear cohort trend has been manifested in the past, whereas curvilinear or negative trends have been shown for other abilities. Furthermore, there is considerable variability in the rate of change across cohorts. For example, there appears to be a slowing of the positive cohort trend for inductive reasoning ability.

To the extent that abilities, such as inductive reasoning, are important in the daily functioning of individuals, this slowing of positive cohort progressions has important societal implications. Current cohorts entering old age are significantly advantaged cognitively compared with previous cohorts at the same age. This advantage in cognitive competence should facilitate their dealing with many complexities and demands of later adulthood. The relative advantagement of those currently entering old age bodes well for society, given the rapid increase in the number of elderly living into old, old age.

If we consider also the slowing of the positive cohort progression for inductive reasoning, there is the implication that current older adults will be at less disadvantage when compared with middle-aged adults than were prior cohorts in old age. Indeed, with the slowing of the positive cohort progression, the magnitude of cohort differences are of the size that may be reduced or eliminated via cognitive training and educational interventions (Willis, 1985; Willis & Schaie, 1986). The potential of educational interventions for diminishing cohort differences is further supported by our analyses indicating that cohort effects could be significantly reduced by partialling out cohort differences in educational level.

This discussion needs to be tempered by the recognition that the study of cohort effects in old age reflects not only cohort differences in the *level* of ability performance achieved but also possibly cohort differences in the *rate* of age-related change. That is, the cohorts assessed at ages 67 and 74 in 1970 may have experienced somewhat greater age-related change by those ages than did the cohorts assessed at the same ages in 1984, given demographic trends in average life expectancy, medical treatment of chronic diseases, and so on.

The implications of the slowing of positive cohort progressions are somewhat less rosy when we consider future generations of older adults. As the magnitude of cohort differences decreases, there is the implication that future generations of older adults will enter old age with little cognitive advantage over their predecessors. Yet, there is little doubt that the complexities and demands of daily living will continue to increase in the next few years. There is the implication, then, that the cohorts of adults entering old age in the next two decades may be in comparatively greater need of societal supports or educational interventions to assist them in dealing with the increasing complexities of daily demands.

The data examined in this chapter indicate further that the rate of change in cohort progressions may vary by gender. The slowing of the positive cohort progression for inductive reasoning ability was more pronounced for men than for women. The importance of examining cohort progressions separately by gender and by other individual difference variables suggests other societal implications. The data indicate that the relative cohort advantagement of current and future generations entering old age may vary by gender. Given the data suggesting that the positive cohort trend for inductive reasoning ability appears to have slowed more for males than for females, it follows that current middle-age females will be relatively more advantaged entering old age, compared to previous cohorts, than will males of the same age/cohort. This bodes particularly well for these individuals as well as for society, given that women are more likely than men to experience old age widowed, alone, and with fewer financial resources.

We have also attempted to examine in more detail the specific behaviors related to cohort differences in cognitive performance. Our analyses suggest that cohort progressions may reflect qualitative as well as quantitative shifts. Cohorts may differ not only in their level of cognitive performance but also qualitatively in the nature of their behaviors underlying these cohort differences. These qualitative shifts from accuracy to speed in the nature of cohort differences in reasoning ability may be

related to slowing cohort progressions in social indicators, such as educational level; this trend is most notable for the cohort comparisons made at the ages of 46, 53, and 60. Note that when the effects of education are partialled out of the reasoning ability scores, the remaining positive cohort effects solely reflect increases in the speed of problem solving rather than increases in accuracy. The implication is that secular trends in social indicators may be related not only to quantitative cohort differences in cognitive functioning but also to qualitative shifts in the nature of the cohort differences.

THE ROLE OF SOCIAL INDICATORS IN THE ACQUISITION AND MAINTENANCE OF COGNITIVE ABILITY

Our colleagues in sociology have differentiated between macro- and microlevels of social structure as they impact psychological functioning. Macrolevel structure involves large social units and includes society as a whole, whereas microlevel structure involves the immediate social environment of the individual. We suggest that within a life-span perspective, we need to differentiate between macro- and microlevel social structures that impact the *acquisition* of intellectual skills and abilities in young adulthood, as against social structures that influence the *maintenance* of intellectual functioning in middle and later adulthood. A major developmental task of childhood and young adulthood is the acquisition of a certain level of proficiency in basic cognitive skills, such as written and oral language, computation, and abstract reasoning. However, in adulthood and old age, the primary intellectual demands focus on the application, maintenance/restoration, and compensation of these cognitive skills and abilities (Baltes & Kliegl, 1986; Schaie, 1977–1978). In work and family life, the adult is called on to apply the cognitive knowledge base and skills acquired in early schooling. In middle age, the individual must expend increasing effort in maintaining and restoring cognitive skills. Although the average middle-aged individual has not experienced significant age-related decline in cognitive ability, rapid technological and societal change may render previously acquired skills and knowledge base obsolete or in need of updating and restoration. Finally, in old age, the individual is faced with the increasing possibility of physical and contextual losses and, thus, must selectively determine in what cognitive domains to compensate for these losses.

Middle age is characterized by considerable stability in basic mental abilities (e.g., inductive reasoning) and increased expertise in specific knowledge bases relevant to the individual's career or life tasks. The research of Glaser (see his discussion following this chapter) and others has indicated that individual differences in basic mental processes may not be particularly relevant once an expert knowledge system is in place. However, given rapid technological change and the current knowledge explosion, the middle-aged adult is increasingly faced with the threat of technical obsolescence in those areas of expertise acquired in young adulthood. We believe that the basic mental abilities, such as inductive reasoning, may again become important in middle age when the individual is faced with the radical reorganization of previous knowledge bases or with the acquisition of new knowledge structures. For example, Garfein (1986) has recently trained middle-aged adults with little or no prior computer literacy to use spread sheet software. He found fluid abilities to be significant predictors of the middle-age adult's ability to master this technology.

The mechanisms by which social structures impact acquisition of intellectual functioning may be quite distinct from the way in which social structures impact maintenance and compensation of cognitive ability. In the acquisition of cognitive abilities, social structures may be influential in determining the *level* of intellectual performance achieved by a particular cohort. By contrast, in middle and later adulthood, social structures may influence primarily the *rate of change* in intellectual performance as the individual copes first with technological and societal challenges then with age-related change in old age.

Level of performance on many ability tests has been shown to be highly related to level of educational attainment. Featherman (Featherman & Peterson, 1986) has noted the cohort trends toward increasing age-gradedness in the transitions into adulthood. As age-gradedness increases, the timing and duration of transition events into adulthood become more uniform across cohorts. For example, laws governing compulsory schooling have contributed to the age-gradedness in education of the young. The timing and duration of basic schooling is, consequently, being experienced more uniformly by successive cohorts. Likewise, increase in the number of years of compulsory schooling has contributed to a decrease in cohort differences in median educational attainment.

The continuing positive cohort trend in female's postsecondary educational attainment is important, also, given gender differences in the relationship between educational attainment and career development in midlife. Educational attainment is important for both men and women in acquiring their first jobs in young adulthood. For men, later job experience and training become increasingly important in determining the career moves and advancements achieved in midlife. However, for women, occupational achievements in midlife are more consistently related to their first jobs and, thus, to educational attainment.

Of particular interest to those of us studying adult development are the macro- and microsocial structures that impact the *maintenance* of cognitive functioning in middle and old age. Three lines of recent research suggest that certain dimensions of the workplace environment are associated with intellectual viability in middle and later adulthood. First, there is the salient work of Kohn and Schooler (1983) examining reciprocal relationships between work complexity and intellectual flexibility. Second, Featherman (this volume) has proposed some provocative ideas that suggest how an individual's knowledge and skills acquired in the workplace may impact his or her adaptation to old age. Third, our own work (Willis & Tosti-Vasey, 1986) describes the personal characteristics and work environment dimensions that foster professional updating and productivity in midcareer faculty. These three lines of research suggest that there may be "spillover" or transfer from skills and abilities acquired in the workplace to more general dimensions of cognitive functioning, and that these effects are likely to persist on a long-term basis.

Specific dimensions of the work environment have been identified as being related to maintenance and enhancement of intellectual functioning. Kohn and Schooler (1983) have reported that more complex work environments, entailing a variety of challenging job demands in which people and ideas are involved and the worker has considerable autonomy in determining work priorities, are related to enhanced intellectual flexibility. In our own research with midcareer faculty, we have found that continued scientific productivity is related to having breadth and diversity in job demands. Work that either underutilizes the professional's skills or, conversely, results in overspecialization is particularly disadvantageous. Enhancement of a college faculty's intellectual skills, for example, is hampered by repetitive teaching of a limited number of courses. Overspecialization is dangerous in midcareer, because it not only limits diversity in job assignments but also renders professionals in some technical fields more vulnerable to obsolescence from sudden shifts in the direction of their professional discipline.

In the Kohn and Schooler research (1983), work with people was found to be more complex than work with things. We have found that the role of colleagues is particularly important in professional productivity and competence in midlife. Peers are the most widely used source of technical information. Our choice of information channels is influenced by ease of accessibility, and our colleagues are often the most accessible resource. In addition, peers influence one's perception of the work environment, including norms or standards of work effort and achievement.

SUMMARY

In this chapter, we have discussed issues related to the direction and rate of cohort progressions for cognitive abilities using inductive reasoning ability as a sample case. Cohort progressions for mental abilities are multidirectional and dynamic. We have observed that the positive, linear progression for induction appears to be slowing for cohorts currently in middle age. The direction and rate of cohort progressions vary by gender. For inductive reasoning, cohorts of males compared in middle age exhibited less of a cohort effect than did females from the same cohorts.

Our analyses have suggested that cohort effects in cognitive performance reflect qualitative as well as quantitative differences. There is suggestive evidence that the slowing in some positive cohort trends may also involve qualitative shifts in the nature of cohort effects. Comparisons of cohorts at middle age indicated that these effects were primarily associated with differences in speed of problem solving rather than with differences in level of accuracy.

We have demonstrated that social indicators, such as educational level, can account for considerable variability associated with cohort effects. After residualizing for educational effects, we found no significant differences in ability level for cohorts compared in middle age. However, significant cohort effects remained for cohorts compared at older ages.

We have suggested that in further explorations of the relationship between social indices and cognitive functioning across the life span, it will become increasingly important to differentiate between social indicators that primarily impact acquisition of cognitive ability as oppose to indicators that impact maintenance of cognitive competence in middle and old age. Indicators related to acquisition are more likely to influence peak level of ability performance, whereas indices associated with maintenance of cognitive competence impact cohort differences in the rate of cognitive change in later life.

Although the classroom is the environment most commonly associated with acquisition of cognitive skills, several lines of research indicate that the workplace is an important environment for the maintenance and enhancement of cognitive competence in midlife. Diverse, challenging work assignments, autonomy in decision making, and stimulation and information provided by colleagues have been implicated as important dimensions of the work environment that foster enhancement and maintenance of intellectual competence in midlife. It has been suggested that abilities and skills honed in the workplace are important in coping with challenges of later life. Executive planning and problem-solving skills developed on the job may be particularly useful in decision making in old age. However, the contextual variables and cognitive processes that facilitate the transfer of previously acquired knowledge and skills to dealing successfully with the problems of old age remain to be identified and examined. Adult development and social change represent a dialectical process. The impact of social indicators and psychological development upon each other will, therefore, continue to change and must be studied as a dynamic system.

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