

23

HISTORICAL PROCESSES AND PATTERNS OF COGNITIVE AGING

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In this chapter I comment on some of the historical influences that contribute to the marked cohort and generational differences in levels and trajectories of cognitive abilities that have been observed over the past century. I then use data from the Seattle Longitudinal Study (SLS; Schaie, 2005) to show how changes in educational attainment and occupational status have served as mediating variables for these changes.

Because I have investigated these processes primarily in a normal community-dwelling population sample, I need to begin by dealing with a number of definitional issues. First, I want to be specific in distinguishing between different forms of aging that can be found in the literature (cf. Schaie, 2006). I then try to embed normal age trends within a co-constructionist heuristic model of cognition (cf. Willis & Schaie, 2006).

Next, I describe some of the historical events that have bearing on differences in cognitive development across the cohorts for which I present relevant data. I discuss exemplars of events that seem to me to have mediating properties for

changes in cognitive trajectories across cohorts. Finally, I provide specific data for a crystallized and a fluid ability to show the impact of historical processes that appear to be most relevant. This last section also includes speculations about the future course of changes over time in level of rate of cognitive development in adulthood.

FORMS OF COGNITIVE AGING

Scrutiny of a variety of longitudinal studies of cognitive aging (cf. Schaie & Hofer, 2001) suggests most of the observed differences in cognitive trajectories can be described by four major patterns. Most individuals can be classified as (1) those who age normally, (2) the supernormals (those who are said to age successfully), (3) those who develop mild cognitive impairment, and (4) those who eventually become clinically diagnosed as suffering from dementia. I would like to suggest that historical processes are likely to have a differential impact on these patterns.

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Normal Aging. The most frequently observed pattern is what most researchers would describe as the *normal aging* of cognitive abilities. In this pattern most individuals reach an asymptote in their 30s or early 40s, maintain a plateau until the late 50s or early 60s, and then show modest decline on most abilities through the early 80s. For the survivors of this group, more marked decline occurs in the years prior to death (cf. Bosworth, Schaie, Willies, & Siegler, 1999). Among those whose cognitive aging can be described as normal, we can distinguish two subgroups. The first includes those individuals who reach a relatively high level of cognitive functioning, who even if they become physically frail can remain independent until close to their demise. Individuals in the second group, who reach only a modest asymptote in cognitive development, on the other hand, may in old age require greater support and be more likely to experience a period of institutional care. It is apparent from our own analyses and those of others (cf. Dickens & Flynn, 2001) that the first group has benefited from favorable societal advantages while the second represents those left behind because of more limited gains in environmental support.

Successful Aging. A small number of adults experience what is often described as *successful aging* (Fillit et al., 2002; Rowe & Kahn, 1987). Members of this group are usually genetically and socioeconomically advantaged; they tend to continue cognitive development later than most and typically do not reach their cognitive asymptotes until late midlife. This group also shows some very modest decline on highly speeded tasks, but they are likely to maintain their overall asymptotic level of cognitive functioning until shortly before their demise. This group contains those fortunate individuals for whom the mortality curve has been virtually squared and whose active life expectancy closely approaches their actual life expectancy. There is reason to believe that this is the group that has particularly benefited from the cumulative effects of historical changes in educational opportunities and occupational structures.

Mild Cognitive Impairment. A third pattern, *mild cognitive impairment* (MCI; Petersen et al., 1999), characterizes that group of individuals

who, typically in early old age, experience greater than normative cognitive declines. Different definitions, mostly statistical, have been proposed to assign individuals to membership in this group. Some have argued for a criterion of 1 standard deviation of performance compared with the young adult average, whereas others have proposed a rating of 0.5 on a clinical dementia rating scale, where 0 is normal and 1.0 is probable dementia. The identification of MCI originally required the presence of significant memory loss. More recently, the diagnosis has been extended to include decline in cognitive abilities other than memory. It is still an unresolved question whether individuals with the diagnosis of MCI inevitably progress to dementia or whether this group of individuals represents a unique entity, perhaps one that could be denoted as the *unsuccessful aging* (cf. Petersen, 2003). Definitions of membership in this group are too recent to determine to what extent historical processes may have impacted this group.

Dementia. All of the above patterns are clearly distinct from the fourth group, which includes those individuals who in early or advanced old age are diagnosed as suffering from *dementia*. Regardless of the specific cause of the dementia, these individuals have in common dramatic impairment in cognitive functioning. However, the pattern of cognitive change, particularly in those whose postmortem diagnosis turns out to be Alzheimer's disease, may be very different from that experienced by the normally aging. When followed longitudinally, at least some of these individuals show earlier decline, perhaps starting in midlife (cf. Willis & Schaie, 2005). Again, it is not clear at this point to what extent changes in the proportion of those who will eventually be diagnosed as suffering from clinically diagnosable dementia has increased over time, but one may speculate that the cumulative advantages of the normal and successful aging will serve to more clearly identify those at eventual risk for dementia at earlier ages than has been true in the past.

Although all of these forms of aging are likely to be impacted by historical processes, in this chapter I address primarily the historical influences that most clearly seem to affect adults who follow patterns of normative aging.

HISTORICAL EVENTS THAT MAY INFLUENCE CHANGES IN COGNITIVE TRAJECTORIES ACROSS COHORTS

Understanding the historical context of cohort differences requires the examination of the political, sociocultural, and educational events that occurred within a cohort's lifetime. In general, one would select events or processes that would be considered high watermarks in American history or major shifts in the prevailing practices (also see Schaie, Willis, & Pennak, 2005). Seven major life stages in a cohort's lifetime are considered in relation to these events and trends: Childhood (0–14 years), Adolescence (15–21 years), Young Adulthood (22–35 years), Early Middle Age (36–49 years), Late Middle Age (50–63 years), Young-Old Age (64–77 years), and Old Age (78+ years). The particular years used to frame these life stages were chosen specifically to match the cohorts used in the SLS (see Table 23.1; cf. Schaie, 2005).

Calendar years were then applied to each cohort's life stage to yield a time frame for the historical context (see Table 23.1). For example, members of the oldest cohort in the SLS (cohort = 1) were young adults between 1911 and 1924, thus making the males eligible for World War I military duty. As adolescents between 1904 and 1910, many in this cohort did not have the opportunity to attend high school because American public education typically ended after the eighth grade prior to 1900 (Mondale & Patton, 2001).

Political Influences

Political events affecting the United States have had an overarching influence on education processes as well as sociocultural trends (see Table 23.1). American military involvements in particular appear to have had the most far-reaching impact. For example, intelligence

testing by the U.S. Army in World War I led to intelligence testing in American public schools. During World War II, women entered the workforce in unprecedented numbers, Black workers had new opportunities, and returning veterans found greater access to higher education (GI Bill; cf. Laub & Sampson, 2005; Sampson & Laub, 1996). The Cold War of the 1960s and America's obsession with beating the Soviets in space led to significant changes in public education, with a curriculum focus on sciences and technology.

Political events other than war also shaped health policies, education, and American culture. In the 1930s, the Great Depression had a direct impact on educational practices. President Lyndon Johnson's Great Society provided social interventions such as Medicare (1965) and Head Start (1964). In 1965, Johnson first used the term *affirmative action* regarding employment, but by the mid-1970s this policy had opened doors in education for minorities and women as well.

Educational Events

Perhaps one of the greatest environmental influences on cognitive abilities is the shift in the educational processes (see Table 23.3) by which one is taught to problem-solve and learn. Over the past century, these educational processes have undergone several trends—from the basics to "progressive" to "tracking" and back to basics time and again. In the late 1800s, education was a structured curriculum that included rigid recitations of the 3 R's—reading, writing, and arithmetic. High schools were not typical, and most children ended their education after 8 years. Kindergarten did not become the norm until the 1920s.

At the turn of the century, John Dewey at the University of Chicago, and the schools in Gary, Indiana, began to promote a "progressive," less rigid curriculum that was popularly termed "Learning by Doing." In addition to teaching the

Table 23.1 Mean Birth Years for the 7-Year Cohorts in the Seattle Longitudinal Study

Cohort	1	2	3	4	5	6	7	8	10	11	12	13
Mean birth year	1889	1896	1903	1910	1917	1924	1931	1938	1945	1952	1959	1966

Table 23.2 U.S. Political Events by Seattle Longitudinal Study Cohort and Life Stage

Childhood Adolescence Young Adult Early Middle Age

World War I led to public schools. entered the work- s, Black workers turning veterans education (GI Bill; ampson & Laub, 0s and America's ets in space led to duction, with a nd technology. war also shaped American culture. ssion had a direct ctices. President y provided social (1965) and Head first used the term employment, but by d opened doors in women as well.

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11	12	13
1952	1959	1966

Table 23.3. Cohort Events by Seattle Longitudinal Study Cohort and Life Stage

Event	Childhood 0-14	Adolescence 15-21	Young Adult 22-35	Early Midlife 36-49	Late Midlife 50-63	Young-Old 64-77	Old 78+
Labor violence (1892-1917)	1 2 3 4 (5)	1 2	1				
World War I (US: 1917-1918)	[3] (4)	[2] (3)	1 2				
Women's vote (1919)	4 5	3	1 2				
Prohibition (1920-1933)	4 5 6 (7)	3 4 (5)	1 2 3 (4)	1 (2)			
Great Depression (1929-1941)	5 6 7 (8)	4 5 (6)	[2] 3 4 (5)	1 2 (3)	1		
New Deal (1933-1938)	6 7 (8)	5 (6)	3 4 (5)	[1] 2 (3)	(1)		
Pearl Harbor/World War II (1941-1945)	7 8 (9)	6 (7)	4 5 (6)	[2] 3 (4)	1 (2)		
Korean War (1950-1953)	8 9 10	7 8	5 6 7	4 5	1 2 3	1	
JFK assassinated (1963)	10 11	9	7 8	5 6	3 4	1 2	
Civil Rights (1954-1971)	9 10 11 12	8 9 10	6 7 8 9	4 5 6 7	2 3 4 5	1 2 3	1
Great Society (1964-1969+)	10 11 12 (13)	9 10 (11)	7 8 9	5 6 7 (8)	3 4 5 (6)	1 2 3 5	1 (2)
Space race (1957-1969)	9 10 11 12	8 9 10	6 7 8 9	4 5 6 7	2 3 4 5	1 2 3	1
Vietnam War (1963-1973)	10 11 12 (13)	9 10 (11)	7 8 9 (10)	5 6 7 (8)	3 4 5 (6)	1 2 3 (4)	1 (2)
Cold War/nukes: Cuban Missile Crisis (1962)	10 11	9	7 8	5 6	3 4	1 2	
Watergate (1972-1974)	[11] 12 (13)	[10] (11)	[8] 9 (10)	[6] 7 (8)	[4] 5 (6)	[2] 3 (4)	1 (2)
Abortion rights: <i>Roe v. Wade</i> (1973)	[11] 12 (13)	[10] (11)	[8] 9 (10)	[6] 7 (8)	[4] 5 (6)	[2] 3 (4)	1 (2)
Dotcom economy 1992-2000		13	11 12 13	9 10 11	7 8 9	5 6 7	2 3 4 5

NOTE: () = leading edge of cohort; [] = trailing edge of cohort.

Table 23.3 Educational Trends in the United States by Cohort and Life Stage

Trend	Childhood 0-14	Adolescence 15-21	Young Adult 22-35	Early Midlife 36-49	Late Midlife 50-63	Young-Old 64-77	Old 78+
Grades 1-8: 3 R's, "Learning by doing," reciting (1890-1910)	1 2 (3)	1	(1)				
High schools (1910-1930)*	[2] 3 4 (5)	[1] 2 3 4	1 2 3	[1] (2)			
IQ testing to track students (1917-1930)*	[3] 4 5 6 (7)	[2] 3 4 (5)	1 2 3	1 (2)			
Junior highs and kindergarten (1920s)* Child labor laws; required	[3] 4 5 6 (7)	3 4 (5)	1 2 3	1 (2)			
School attendance (1930s)*	[5] 6 (7)	[4] 5 (6)	[2] 3 (4)	1 2 (3)	(1)		
Curriculum: college prep vs. voc tec (1940s)*	7 8 9 (10)	[5] 6 7 (8)	[3] 4 5 6	[1] 2 3 4	1 2	(1)	
SATs (1945)*	[7] 8 9	[6] (7)	[4] 5 (6)	2 3 (4)	1 (2)		
GI Bill (1945-1957)*	[7] 8 9 10 (11)	[6] 7 8	[4] 5 6 7	2 3 4 5	1 2 3	1 (2)	
Dick & Jane (1950-1965)	8 9 10 11	7 8 9 (10)	5 6 7	3 4 5 6 (7)	1 2 3 4 (5)	1 2 (3)	(1)
Cold War/space race curriculum (1958-1970s)	9 10 11 12 13	8 9 10 11	6 7 8 9 10	4 5 6 7 8	1 2 3 4 5	1 2 3 4	1 2
Desegregation acts (1964, 1965)	10 11 (12)	9 (10)	7 8 (9)	5 6 (7)	3 4 (5)	1 2 (3)	(1)
Head Start (1964)	10 11	9	7 8	5 6	3 4	1 2	
Equality acts: busing (1971), Title IX (1972), ESL (1974)	11 12 13	10 11	[8] 9 10	6 7 (8)	4 5 (6)	2 3 (4)	1 (2)
Alternative schools (1970s)*	11 12 13	10 11 (12)	8 9 10	6 7 8	4 5 6	2 3 4	1 2
Computers in school (1980s)	[12] 13	[11] 12 13	[9] 10 11 12	[7] 8 10	[5] 6 7 8	[3] 4 5 6	1 2 3 4

NOTES: Asterisks denote year(s) when shift began and/or trend became widespread. () = leading edge of cohort; [] = trailing edge of cohort; prep = preparatory; voc tech = vocational/technical training; ESL = English as a second language.

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NOTES: Asterisks denote year(s) when shift began and/or trend became widespread. () = leading edge of cohort; [] = trailing edge of cohort; prep = preparatory; voc tech = vocational/technical training; ESL = English as a second language.

basics, these curricula included field trips; nature studies; exercise; changing classrooms throughout the day; working with machinery; and lessons in health, manners, and cooking.

In the 1920s, intelligence testing began to be used more frequently to handle the increasing number of students and to more efficiently place students in an appropriate education "track" based on their aptitude. Administered in English, IQ testing was heavily biased against the thousands of immigrant children attending urban public schools. By the 1930s, when greater numbers of children attended school because of the Depression, IQ tests became more frequently used despite criticisms of their cultural bias.

Tracking continued through the 1940s, and the curriculum became even more split between college preparatory classes and industrial training. By the end of World War II, the Scholastic Aptitude Test (SAT) was beginning to replace the IQ tests for college admissions, and its use continues to this day. The Scholastic Aptitude Test was similarly biased against minorities and immigrant children who did not have the same level of language skills or experience the same culture as the White, middle-, and upper-middle class students. The Cold War caused another major shift in American public schools. Progressive curricula had evolved into "life adjustment" courses by the early 1950s. When the Soviets launched *Sputnik* in 1957, however, the reaction was a swift National Defense Education Act (1958) to ensure that American public education would be competitive with the Soviets in math and physics. Advanced students were now being tracked away from English and history to be trained in science and technology.

In the 1950s, the leading edge of the Baby Boomer population created an enormous impact on resources for teachers, classrooms, and the educational system. Although first-graders had been reading Dick and Jane textbooks since the Depression, vast numbers of Baby Boomers were now learning to read, making Dick and Jane the icons of the American Dream. Dick, Jane, Spot, and Sally reflected the perfect all-American family in the suburbs where Father worked and Mother stayed home.

Despite this portrayal of the American Dream, equal opportunities for education were becoming significant social issues, and civil

rights violence erupted in schools during the 1950s and early 1960s. The Civil Rights Act of 1964 and the Elementary and Secondary Education Act (1965) forced desegregation in American public schools, and in 1971 the Supreme Court ruled that busing was lawful. Title IX (1972) afforded equal opportunities for young women, and the Civil Rights Act was extended to children with disabilities in 1976.

In 1969, "Sesame Street" premiered on television. Although destined to become a cultural icon, its primary intent was, and still is, to educate while entertaining toddlers and preschoolers. Positive effects attributed to "Sesame Street" include increased letter and number literacy when children enter school (Rice, Huston, Truglio, & Wright, 1990), as well as increased social skills (Bankart & Anderson, 1979).

As the urban decay of the 1970s progressed and "white flight" from mandatory busing created better tax bases in the suburbs, public school districts in American cities fought back with alternative programs and magnet schools. By the 1980s, these schools not only managed to attract the best students but also enabled their students to gain admissions to good colleges. The 1980s also introduced computers and calculators into the classroom, creating new skills in technology but at the possible risk of losing basic arithmetic abilities, as shown in negative cohort differences for this ability in the SLS.

Sociocultural Events and Trends

American culture has been rich and diverse over the past 110 years that the SLS cohorts have lived (see Table 23.4). For the two oldest cohorts, the 1890s were a cultural decade of teddy bears, Frank Lloyd Wright architecture, Buffalo Bill Wild West shows, zippers, John Phillip Sousa band music, and Joplin ragtime. It was also a decade that witnessed Jim Crow laws, lynching of Blacks, and the Financial Panic of 1893.

The turn of the 20th century and its first decade could best be described by a single term—*mass*. Mass transportation and mass media had increased the public's political awareness and decreased the geographic landscape. In 1907, the Wright Brothers flew at Kitty Hawk, and America's automobile culture

Table 23.4 Sociocultural Historic Events by Cohort and Life Stage

Event	Childhood 0-14	Adolescence 15-21	Young Adult 22-35	Early Midlife 36-49	Late Midlife 50-63	Young-Old 64-77	Old 78+
American frontier "closes" (1890s)	1 2						
Transportation: mass transit (1890s), flight (1907), automobile culture (1907)	1 2 3	1 (2)					
Segregation (1890-1920)	1 2 3 4 5	1 2 3	1 2				
Immigration peaks (1907)	2 3	1					
Roaring 20s: "speakeasies"	4 5 6	3 4	1 2 3				
Globalization of American culture: literature & film (1920-1940)	4 5 6 7 (8)	3 4 5 (6)	1 2 3 4 (5)	1 2 (3)	(1)		
Women in the workforce and military (1940s)	[6] 7 8 9	6 7	[3] 4 5 6	[1] 2 3 4	1 2		
Baby Boom* 1946-64	[7] 8 9 10 11 12	[6] 7 8 9	[4] 5 6 7 8	[2] 3 4 5 6	1 2 3 4	1 2	
Suburbia (1945-65)	[7] 8 9 10 11 12	[6] 7 8 9	[4] 5 6 7 8	[2] 3 4 5 6	1 2 3 4	1 2	
"All-American" ideals (1950s)	8 9 10 (11)	7 8 (9)	5 6 7 (8)	3 4 5 (6)	1 2 3 (4)	1 (2)	
TV: "The vast wasteland" (1961)	[9] 10 11	[8] 9	[6] 7 8	[4] 5 6	[2] 3 4	1 2	
Social Crisis 1965-1970s	10 11 12 13	9 10 11	[7] 8 9 10	[5] 6 7 8	[3] 4 5 6	1 2 3 4	1 2
Women's lib & gay rights (1963-1972)	10 11 (12)	9 10 (11)	7 8 9 (10)	5 6 7 (8)	3 4 5 (6)	1 2 3 (4)	1 (2)
"Me" generation (1980s)	[12] 13	[11] 12 (13)	[9] 10 11 12	[7] 8 9 (10)	[5] 6 7 (8)	[3] 4 5 (6)	1 2 3 (4)
PCs (1985-1990s)	13	12 13	10 11 12 13	8 9 10 11	6 7 8 9	4 5 6 7	[1] 2 3 4 5
Internet/www.com (1990s)		13	11 12 13	9 10 11	7 8 9	5 6 7	2 3 4 5

NOTES: Cohorts with Baby Boom birth years are in boldface type. () = leading edge of cohort; [] = trailing edge of cohort.

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was born when Ford began to mass-produce the Model T. Mass immigration peaked by 1907, and cities became public health disasters, with bubonic plague; massive numbers of deaths related to industrial accidents; and upper respiratory diseases such as pneumonia, tuberculosis, and influenza.

Although the Roaring Twenties with its "speakeasies," dance marathons, and mob activities would give way to the Great Depression, it was also the decade of innovations that would affect American culture for the rest of the century and beyond. Sound motion pictures became the norm, and the invention of frozen food (1925) and television (1926) would someday lead to the confluence of the frozen TV dinner as each evolved over the next three decades.

With the onset of World War II, women again found themselves in new cultural territory as they worked in factories, joined the military, and even formed a professional baseball league. Once their husbands returned from war, however, they retreated to their traditional roles that not only marked the beginning of the Baby Boom but also created the suburban streetscape and a new American social environment.

During the 1950s, the interstate highway system, constructed by the U.S. government for military logistics, increased America's love affair with the car while convenience foods and new household appliances made life at home less labor intensive. Pediatrician Dr. Spock, television, Cold War paranoia, and rock 'n' roll music influenced raising of the Baby Boomers in the 1950s.

American culture shifted dramatically in the 1960s with the assassinations of John F. Kennedy, Robert Kennedy, and Martin Luther King. The Civil Rights movement kept company with movements for women's liberation and gay rights. Continued escalation in the Vietnam War eventually created a cultural revolution in America with its anti-war protests. Although the Vietnam War ended in 1973, American culture was still influenced by political events. Television satirized politics and social mores with *Saturday Night Live* and *All in the Family's* Archie Bunker. The children's educational television show *Sesame Street* became a cultural icon while gas shortages and long lines at the pump created by OPEC's oil embargo created new attitudes about the environment and

reliance on fossil fuels. The microchip processor and technology advances in the 1970s would eventually lead to the personal computers of the 1980s and the Internet culture from the 1990s onward.

A CO-CONSTRUCTIONIST MODEL FOR THE IMPACT OF HISTORICAL PROCESSES ON COGNITIVE DEVELOPMENT IN ADULTHOOD

How are we to relate the historical processes described above to understand cohort trends in cognitive development across adulthood? I next describe a co-constructive model for adult development that has recently been explicated in more detail elsewhere (Willis & Schaie, 2006). This model is informed by two life span perspectives: (1) the dual-intelligence perspective proposed by Horn and Cattell (1966) and (2) the more recent co-constructionist perspective of Baltes and colleagues (Baltes, 1997; Li, 2003; Li & Freund, 2005).

The Co-Constructive Perspective. Coevolutionary theorists have long maintained that both biological and cultural evolution has occurred and that recent, cohort-related advances in human development in domains such as intelligence can be attributed largely to cumulative cultural evolution (Cavalli-Sforza & Feldman, 1981; Dunham, 1991; Tomasello, 1999). Cultural activities impact the environment, thereby allowing humans to codirect their own evolution (Cavalli-Sforza & Feldman, 1981; Dunham, 1991). The co-constructionist approach advocated by Baltes and his colleagues further imposes a life span developmental perspective on coevolutionary theory. It provides principles for the timing of the varying contributions of neurobiology and culture at different developmental periods and across different domains of functioning. Of particular importance for understanding the impact of historical processes is the principle that continuing advances in human development depend on ever-increasing cultural resources. Increases in cultural resources have occurred through cumulative cultural evolution and have resulted in humans reaching higher levels of functioning. At the individual level, this implies that increasing cultural resources will be required at older ages to prevent

NOTES: Cohorts with Baby Boom birth years are in boldface type. () = leading edge of cohort; [] = trailing edge of cohort.

age-related losses or to make possible further development.

The Dual-Intelligence Perspective. The co-construction perspective described above can be applied to the dual-component model of intelligence. Horn and Cattell (1966) described a hierarchical model of psychometric intelligence organizing mental abilities into the supraordinate domains of fluid and crystallized intelligence. Neurobiological influences impact particularly fluid intelligence, and experience and culture-based knowledge influence crystallized intelligence. Fluid intelligence is thought to develop and decline earlier in the life span, whereas the more culture-based crystallized abilities are maintained well into old age. Psychometric abilities, such as inductive reasoning, spatial orientation, and memory processes, were considered more fluid like, whereas verbal, numerical, and social knowledge skills were thought to be crystallized. Note, however, that the Horn-Cattell model is concerned primarily with intraindividual change and does not offer any specific hypotheses with respect to secular trends in intelligence.

Implications for Adult Cognitive Development. The effects of historical processes described above determine changes in both neurobiological and sociocultural influences. The mechanisms through which cognition is affected

include the accumulation of societal resources in knowledge, values, and material artifacts that are transmitted to future generations; these resources continue to develop and change through cumulative cultural evolution (Tomasello, 1999). With respect to cognition, these accumulated cultural resources are represented specifically by structural variables such as educational level, occupational status, and ability level. Thus, advances in cognition as represented by cohort and generational effects may be seen as being primarily due to an accumulation of cultural resources and knowledge across time (cf. Willis & Schaie, 2006, for further details).

Sociocultural and neurobiological influences vary in the timing of their impact in the early and later half of adulthood. Sociocultural resources such as educational level, occupational status, and ability level are acquired and accumulated primarily during the first half of adulthood. Social processes impact current activities, habits, and beliefs of the individual, represented by activities in domains such as health behaviors, cognitive engagement, and the complexity of one's work tasks. Neurobiological influences such as chronic diseases and biomarkers impact cognitive change primarily in later adulthood. A schematic of the model is provided in Figure 23.1. The solid lines indicate strong directional relationships, and the dashed lines indicate weaker relationships.

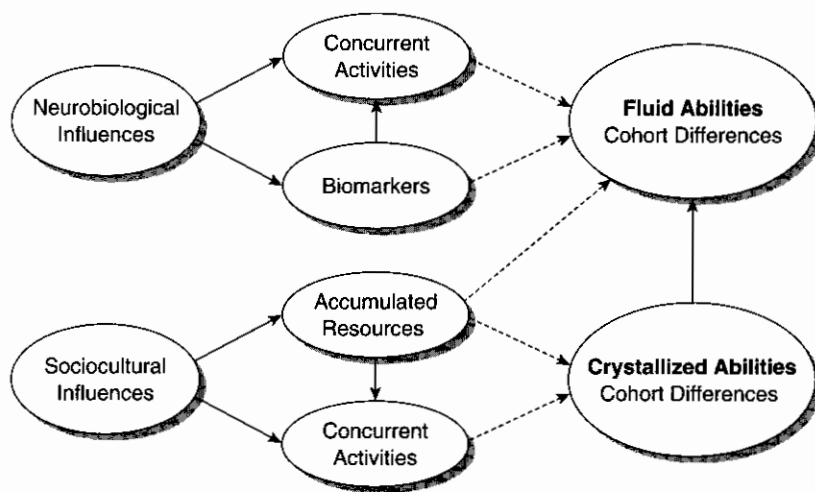


Figure 23.1 The Co-Constructionist Model Applied to Cohort Differences in Fluid and Crystallized Abilities

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The model proposes that cohort differences in fluid abilities are mediated also, in a time-lagged manner, by cohort differences in crystallized abilities; that is, the acquisition of higher levels of sociocultural knowledge and skills will increase the likelihood of the adoption of lifestyles that provide the infrastructure for cohort-related increase in fluid abilities.

GENERATIONAL DIFFERENCES IN COGNITION

The co-constructionist model suggests that historical processes that allow the positive accumulation of resources and the increased mastery of deleterious neurobiological influences should lead to increased levels of cognitive functions across generations, but I would also predict positive changes in the shape of cognitive trajectories. These should prevail for both fluid and crystallized intelligence in the first half of adulthood due to the cumulative impact of accumulated cultural resources (e.g., cohort-related increases in educational level). With regard to later adulthood, a cohort-related increase in prevalence of positive trajectories is predicted to occur for crystallized but not for fluid intelligence. Sociocultural influences are expected to have the greater

impact on positive crystallized trajectories in the second half of adulthood. The increasingly positive crystallized trajectories may be impacted primarily by current cultural activities (e.g., cognitive engagement), which should become more frequent across cohorts because of gains in accumulated resources that have occurred for more recent cohorts early in adulthood. The deleterious effects of neurobiological influences will limit the impact of cultural advances in relation to fluid intelligence in old age. However, given the delayed onset of chronic disease in more recent cohorts and the increased use of prophylactic medications (e.g., anti-hypertensives), the impact of neurobiological influences such as chronic disease should decrease in more recent cohorts as they reach advanced ages.

I now focus on the impact of sociocultural influences in particular, using examples from the SLS for the crystallized ability of verbal meaning and the fluid ability of inductive reasoning. The two sociocultural influences to be addressed for this purpose will be (1) years of educational attainment and (2) occupational status.

Figure 23.2 shows the observed longitudinal age gradients for the crystallized verbal meaning ability (comprehension of word meaning) for 12 successive cohorts with average birth years from 1889 to 1966, over the age range from 25 to

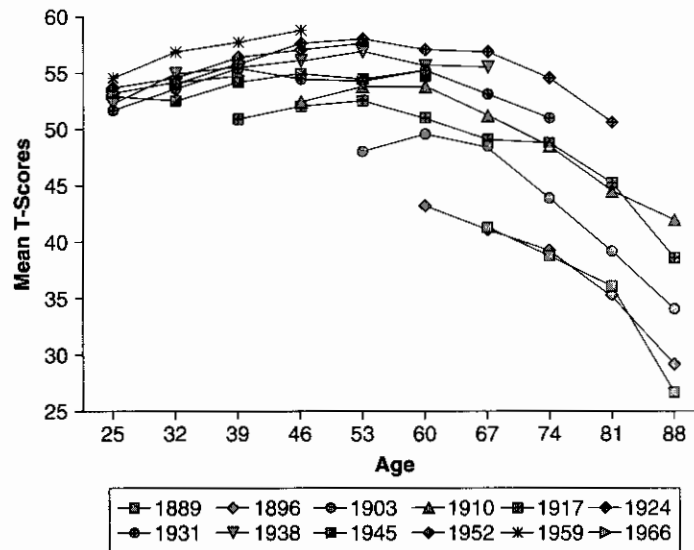


Figure 23.2 Intracohort Trajectories for the Crystallized Ability of Verbal Meaning for 12 Successive Cohorts Born From 1889 to 1966

allized Abilities

88 years, for those ages when the specific cohorts were in the study from 1956 to 2005. These data are based on longitudinal changes within each cohort for individuals available over each 7-year interval, anchored on the mean values when cohorts first entered the study.

Substantial increases were observed across successive cohorts at all ages. The available cohort comparisons at the same ages are most noteworthy in late middle and early old age (approximately 2 SD). They still amount to 0.7 SD over the most recent cohorts in young adulthood and to about 1.5 SD even in advanced old age. Similar findings for the fluid ability of inductive reasoning are shown in Figure 23.3. It should be noted also that the slopes of the intracohort trajectories, particularly in early old age, have become shallower (a decrease in rate of aging) for the crystallized ability but not for the fluid ability examined here.

**COHORT DIFFERENCES
 IN SOCIOCULTURAL INFLUENCES**

We must ask, then, what historical influences may be implicated in these dramatic changes in level and slope (for verbal meaning). Direct data for the samples for which cognitive data are

shown can be examined for the two demographic indicators of (1) education and (2) occupational attainment.

Educational Attainment

As discussed above, there have been substantial changes in both duration of average educational experiences as well as shifts from rote learning to discovery learning and other participatory educational strategies. We have no direct data on qualitative differences in our study participants' education, but we do have data on the level of education attained. Figure 23.4 indicates the distribution of educational attainment across cohorts in the SLS by proportion of persons whose education was limited to grade school and high school or who attended college and graduate school. Although our data come from a geographical area with unusually high educational attainment, the shift across cohorts appears to be quite representative of the general U.S. pattern of cohort shift.

The increasing proportion of the population with high educational attainment also has significant implications for level and slope of cognitive trajectories across the adult life span. To show these consequences, I next present data in Figures 23.5 and 23.6 on longitudinal changes

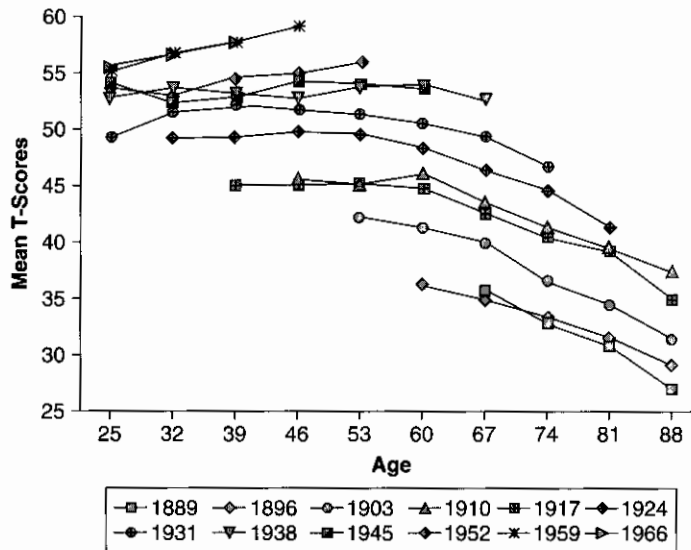


Figure 23.3 Intracohort Trajectories for the Fluid Ability of Inductive Reasoning for 12 Successive Cohorts Born From 1889 to 1966

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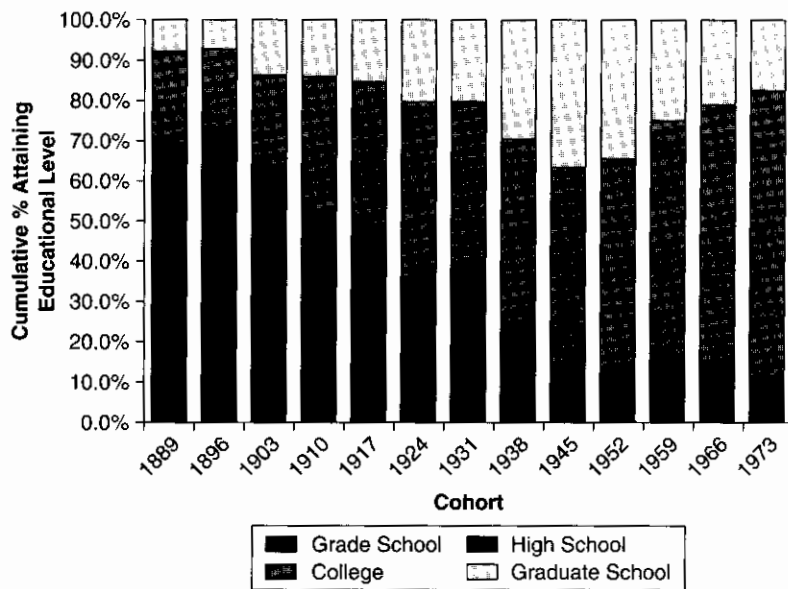


Figure 23.4 Cumulative Proportions of Educational Attainment for 13 Successive Cohorts Born From 1889 to 1973

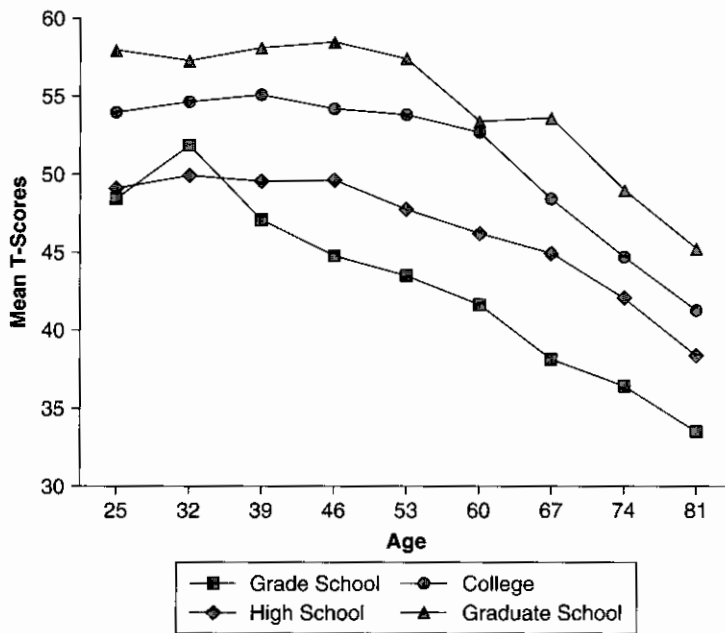


Figure 23.5 Longitudinal Trajectories for the Crystallized Ability of Verbal Meaning by Level of Educational Attainment

SOURCE: From Schaie, K. W. (2006). Societal influences on cognition in historical context. In K. W. Schaie & L. L. Carstensen (Eds.), *Social structures, aging and self-regulation in the elderly* (p. 19). New York: Springer Publishing Co. Reproduced by permission.

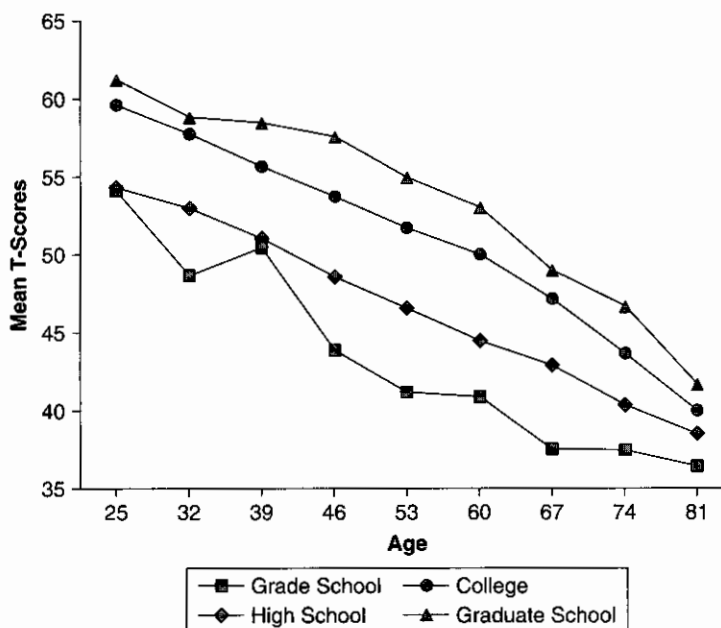


Figure 23.6 Longitudinal Trajectories for the Fluid Ability of Inductive Reasoning by Level of Educational Attainment

SOURCE: From Schaie, K. W. (2006). Societal influences on cognition in historical context. In K. W. Schaie & L. L. Carstensen (Eds.), *Social structures, aging and self-regulation in the elderly* (p. 19). New York: Springer Publishing Co. Reproduced by permission.

in cognitive trajectories for the two abilities I am using as exemplars in this chapter. For the crystallized ability of verbal meaning there are substantial differences in level and slope that are largest in early old age. These differences may indicate that more recent cohorts may be able to work longer in occupations involving primarily verbal skills (see "Occupational Status" section). For the fluid ability of inductive reasoning we find primarily differences in level, converging somewhat at very old ages. Here too, more recent cohorts would be at an advantage by virtue of their higher educational attainment.

Occupational Status

Another historical process that provides an important influence on cohort differences in cognitive abilities is the changing occupational structure in our working population. To examine these changes in our longitudinal samples, I have examined the cumulative proportion of individuals who were retired, or employed in unskilled, skilled, and professional occupations

at age 60, for seven successive cohorts. As shown in Figure 23.7, there were virtually no retirees at age 60 prior to the cohorts born in 1910; from then, their proportion has increased, although there is recent trend for some to remain longer in the workforce. More important is that there has been a significant decrease in the proportion of persons in unskilled occupations from the earlier cohorts and a steady move toward a greater proportion in professional occupations.

Similar to the influence of increasing levels of educational attainment, the increasing proportion of the population with higher occupational status has significant implications for level and slope of cognitive trajectories across the adult life span. The consequences of these trends are presented in Figures 23.8 and 23.9. For the crystallized ability of verbal meaning there are substantial differences in both level and slope. Note the substantial difference in favor of those with professional occupations. For the fluid ability of inductive reasoning, there are also significant differences in level and a flatter slope for those with professional occupations; at least until age

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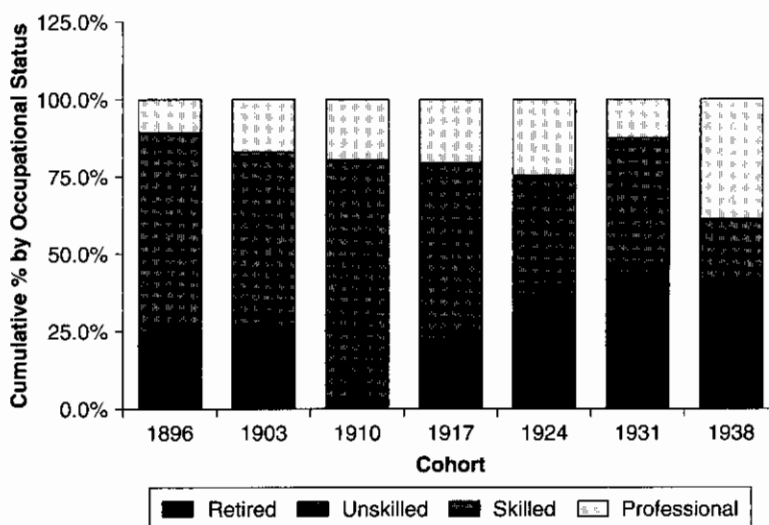


Figure 23.7 Cumulative Proportions of Educational Attainment for Seven Successive Cohorts at Age 60 Born From 1896 to 1938

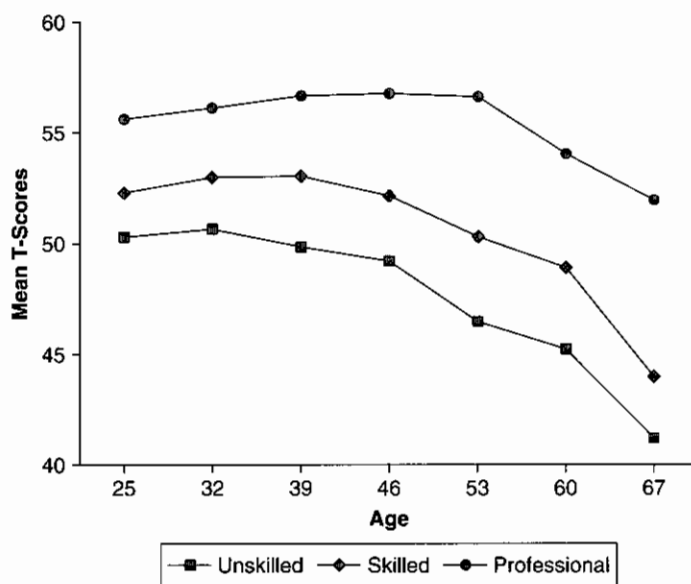


Figure 23.8 Longitudinal Trajectories for the Crystallized Ability of Verbal Meaning by Level of Occupational Status

SOURCE: From Schaie, K. W. (2006). Societal influences on cognition in historical context. In K. W. Schaie & L. L. Carstensen (Eds.), *Social structures, aging and self-regulation in the elderly* (p. 19). New York. Springer Publishing Co. Reproduced by permission.

60 is reached. Again, the cohort trend reveals the cumulative advantage obtained by successive cohorts via an increase of the population

proportion employed in occupational pursuits that seem to mediate maintenance of cognitive functions into old age.

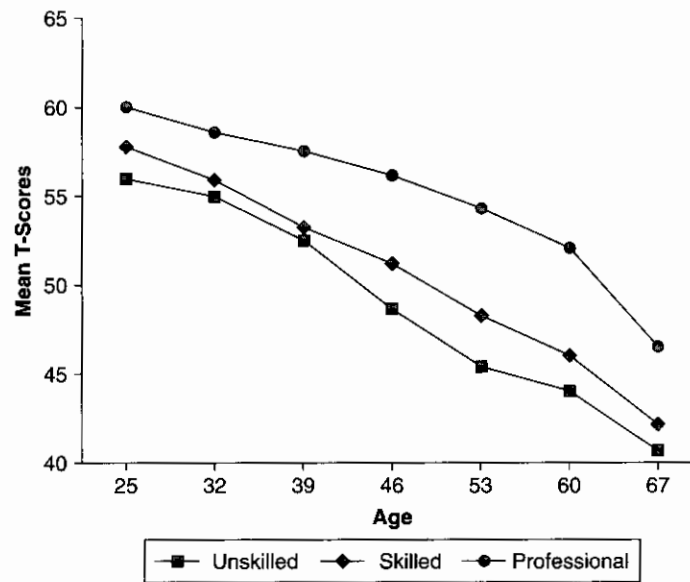


Figure 23.9 Longitudinal Trajectories for the Fluid Ability of Inductive Reasoning by Level of Occupational Status

SOURCE: From Schaie, K. W. (2006). Societal influences on cognition in historical context. In K. W. Schaie & L. L. Carstensen (Eds.), *Social structures, aging and self-regulation in the elderly* (p. 20). New York: Springer Publishing Co. Reproduced by permission.

CONCLUSION

In this chapter, I have described generational differences in cognitive trajectories and have reviewed some of the influences of historical change that affect level and slope of cognitive trajectories through adulthood. I also suggested the relevance of the co-constructive model in understanding the impact of neurobiological and sociocultural influences on adult cognitive development. I then provided data from the SLS to document cohort trends in both cognitive abilities and sociocultural influences that affect them. From these data, I conclude that future generations are likely to display more positive cognitive trajectories than their parents and grandparents. One of the major reasons for this trend is that sociocultural influences are at work to ensure that advances in educational attainment in shifts in the occupational structure will result in protective factors, sometimes called *cognitive reserve*, will compensate for many cognitive risks associated with neurobiological losses associated with increasing longevity.

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