them about their physical changes as a normal part of growing up. There would as well be an attempt to divert them away from risky behaviors that may have long-term implications for their development far beyond their adolescent years.

Furthermore, evidence for historical change in the pubertal process is intriguing. Findings of very early signs of pubertal maturation in girls in the Herman-Giddens et al. work illustrate how the standards of pubertal development in terms of timing may warrant revision. The implications of an early pubertal experience are even further underscored, as this research suggests that this is an experience that will be encountered by even more girls, and perhaps especially among African American girls.

Although an impressive body of research has been devoted to understanding both the biological and psychosocial aspects of the pubertal period, it is clear from the available research that new findings are illuminating our understanding of the pubertal process. For example, the research linking stress to pubertal development is intriguing, and represents a clear illustration of the interface between the adolescent's psychosocial and biological milieu. This research area is a relatively new pursuit, and further disentangling the processes involved remains. Similarly, the study of direct hormonal links to behavior and development during adolescence is relatively new, and as methodologies become more sophisticated, previous conclusions have been revised. What is clear is that hormonal links to behavior are complex, and biopsychosocial frameworks clearly provide the best representation of the process.

Bibliography

Alsaker, F. D. (1995). Timing of puberty and reactions to pubertal changes. In M. Rutter (Ed.), *Psychosocial disturbances in young people: Challenges for prevention* (pp. 37–81). New York: Cambridge University Press.

Belsky, J., Steinberg, L., & Draper, P. (1991). Childhood experience, interpersonal development, and reproductive strategy: An evolutionary theory of socialization. *Child Development, 62*, 647–670.

Brooks-Gunn, J., & Reiter, E. O. (1990). The role of pubertal processes in the early adolescent transition. In S. Feldman & G. Elliott (Eds.), *At the threshold: The developing adolescent* (pp. 16–53). Cambridge, MA: Harvard University Press.

Connolly, S. D., Paikoff, R. L., & Buchanan, C. M. (1996). Puberty: The interplay of biological and psychosocial processes in adolescence. In G. R. Adams, R. Montemayor, & T. P. Gullotta (Eds.), *Psychosocial development during adolescence* (pp. 259–299). Thousand Oaks, CA: Sage.

Eveleth, P. B., & Tanner, J. M. (1990). *Worldwide variation in human growth* (2nd ed.). New York: Cambridge University Press.

Graber, J. A., Lewinsohn, P. M., Seeley, J. R., & Brooks-Gunn, J. (1997). Is psychopathology associated with the timing of pubertal development? *Journal of the American Academy of Child and Adolescent Psychiatry, 36*, 1768–1776.

Graber, J. A., Petersen, A. C., & Brooks-Gunn, J. (1996). Pubertal processes: Methods, measures, and models. In J. A. Graber, J. Brooks-Gunn, & A. C. Petersen (Eds.), *Transitions through adolescence: Interpersonal domains and context* (pp. 23–53). Mahwah, NJ: Erlbaum.

Grumbach, M. M., & Styne, D. (1992). Puberty: Ontogeny, neuroendocrinology, physiology, and disorders. In J. D. Wilson & D. W. Foster (Eds.), *Williams textbook of endocrinology* (8th ed., pp. 1139–1221). Philadelphia: Saunders.

Halpern, C. T., Udry, J. R., & Suchindran, C. (1997). Testosterone predicts initiation of coitus in adolescent females. *Psychosomatic Medicine, 59*, 161–171.

Hayward, C., Killen, J. D., Wilson, D. M., Hammer, L. D., Litt, I. F., Kraemer, H. C., Haydel, F., Varady, A., & Taylor, C. B. (1997). Psychiatric risk associated with early puberty in adolescent girls. *Journal of the American Academy of Adolescent Psychiatry, 36*, 255–262.

Herman-Giddens, M. E., Slora, E. J., Wasserman, R. C., Bourdony, C. J., Bhapkar, M. V., Koch, G. G., & Hasemeier, C. M. (1997). Secondary sexual characteristics and menses in young girls seen in office practice: A study from the Pediatric Research in Office Settings Network. *Pediatrics, 99*, 505–512.

Malo, J., & Tremblay, R. E. (1997). The impact of paternal alcoholism and maternal social position on boys' school adjustment, pubertal maturation and sexual behavior: A test of two competing hypotheses. *Journal of Child Psychology and Psychiatry, 38*, 187–197.

Paikoff, R. L., & Brooks-Gunn (1991). Do parent-child relationships change during puberty? *Psychological Bulletin, 110*, 47–66.

Petersen, A. C., Sarigiani, P. A., & Kennedy, R. E. (1991). Adolescent depression: Why more girls? *Journal of Youth and Adolescence, 20*, 247–271.

Petersen, A. C., & Taylor, B. (1980). The biological approach to adolescence: Biological change and psychological adaptation. In J. Adelson (Ed.), *Handbook of adolescent psychology* (pp. 117–155). New York: Wiley.

Susman, E. J. (1997). Modeling developmental complexity in adolescence: Hormones and behavior in context. *Journal of Research on Adolescence, 7*, 283–306.

Trickett, P. K., & Putnam, F. W. (1993). Impact of child sexual abuse on females: Toward a developmental, psychobiological integration. *Psychological Science, 4*, 81–87.

Pamela A. Sarigiani and Anne C. Petersen

Social Patterns, Achievements, and Problems

Adolescence is a period of many changes ranging from the biological changes associated with puberty, to the social/educational changes associated with the transi-

tions from elementary to secondary school, and to the social and psychological changes associated with the emergence of sexuality. With such diverse and rapid change comes a heightened potential for both positive and negative outcomes. And, although most individuals pass through this developmental period without excessively high levels of "storm and stress," a substantial number of individuals do experience difficulty. For example, between 15 and 30% of students (depending on ethnic group) drop out of high school; further, adolescents have the highest arrest rate of any age group; and many consume alcohol and other drugs on a regular basis (Office of Educational Research and Improvement, 1988). In contrast, many adolescents do quite well during this period of life: they acquire the skills to move successfully into meaningful adult roles, they develop lasting friendships, and they form healthy, productive identities.

Biological Changes Associated with Puberty

As a result of the activation of hormones controlling physical development, most children undergo a growth spurt, develop primary and secondary sex characteristics, become fertile, and experience increased sexual libido during early adolescence (Buchanan, Eccles, & Becker, 1992). Because girls experience these pubertal changes approximately 18 months earlier than boys, girls and boys of the same chronological age are likely to be at quite different points in physical and social development during early adolescence. Although early maturation tends to be advantageous for boys, particularly with respect to their participation in sports activities and social standing in school, early maturation is often problematic for European American girls because the kinds of physical changes girls experience (such as weight gain) are not highly valued among many White American groups who value the slim, androgynous female body characteristic of European American fashion models (Simmons & Blyth, 1987). African American females do not evidence this same pattern perhaps because African American culture places higher value on the secondary sex characteristics associated with female maturation.

Stattin and Magnusson (1990) traced the long-term consequences of early maturation in females: Their early maturing girls obtained less education and married earlier than their later maturing peers despite the lack of any differences in achievement levels prior to the onset of puberty. These researchers attributed this difference to the fact that the early maturing females were more likely to join older peer groups and to begin dating older males; in turn, the early maturing girls in these peer groups were more likely to drop out of school and get married, perhaps because school achievement

was not valued by their peer social network while early entry into the job market and early marriage was.

Researchers have also studied how the hormonal changes associated with pubertal development relate to changes in children's behavior during the early adolescent years. There are direct effects of hormones on behaviors, such as aggression, sexuality, and mood swings. Hormones also affect behavior indirectly through their impact on secondary sex characteristics, which, in turn, influence social experiences and psychological well-being. For example, when breast development is associated with increases in girls' body image, it is also related to better psychological adjustment, more positive peer relations, and better school achievement (Brooks-Gunn & Warren, 1988).

Changes in Cognition

Cognitive changes during this developmental period involve increases in adolescents' ability to think abstractly, consider the hypothetical as well as the real, engage in more sophisticated and elaborate information processing strategies, consider multiple dimensions of a problem at once, and reflect on oneself and on complicated problems. Such cognitive changes are the hallmark of Piaget's formal operations stage, which he assumed began during adolescence (e.g., Piaget & Inhelder, 1973). Although there is still considerable debate about exactly when these kinds of cognitive processes emerge and whether their emergence reflects global stagelike changes in cognitive skills, as described by Piaget, most theorists agree that these kinds of thought processes are more characteristic of adolescents' cognition than that of younger children.

Cognitive theorists have also investigated more specific information processing skills, cognitive learning strategies, and metacognitive skills (Keating, 1992). They find a steady increase during adolescence in information processing skills and learning strategies, in knowledge of a variety of different topics and subject areas, in ability to apply knowledge to new learning situations, and in awareness of one's strengths and weaknesses as learners. However, in order for these new skills to allow adolescents to become more efficient, sophisticated learners, ready to cope with relatively advanced topics in many different subject areas, they need lots of opportunities to practice using them.

These kinds of cognitive changes can affect individuals' self-concepts, thoughts about their future, and understanding of others. Theorists from Erikson (1963) to Harter (1998) have suggested that the adolescent years are a time of change in children's self-concepts, as they try both to figure out what possibilities are available to them and to develop a deeper understanding of themselves. Such self-reflection requires higher-order cogni-

tive processes. During adolescence, individuals also become much more interested in understanding others' internal psychological characteristics, and friendships become based more on perceived similarity in these characteristics. Again, these types of changes reflect the broader changes in cognition that occur at this time.

Friendships and Peer Groups

Probably the most often discussed changes during adolescence are the increases in peer focus and involvement in peer-related social, sports, and other extracurricular activities. Many adolescents attach great importance to these types of activities—substantially more importance than they attach to academic activities (Wigfield, Eccles, MacIver, Reuman, & Midgley, 1991). Indeed, often to the chagrin of parents and teachers, activities with peers, peer acceptance, and appearance can take precedence over school activities, particularly during early adolescence. Further, European American adolescents' confidence in their physical appearance and social acceptance is often a more important predictor of self-esteem than confidence in their cognitive/academic competence (Harter, 1998). The extent to which this is true in other ethnic groups has yet to be adequately assessed.

In part because of the importance of social acceptance during adolescence, friendship networks during this period often are organized into relatively rigid cliques that differ in social status within the school setting (Brown, 1990). The existence of these cliques seems to reflect adolescents' need to establish a sense of identity; belonging to a group is one way to solve the problem of "who am I."

Also, in part because of the importance of social acceptance, children's conformity to their peers peaks during early adolescence. Most policy concern has focused on how this peer conformity can create problems for adolescents, and about how "good" children can be corrupted by the negative influences of peers, particularly by adolescent gangs—and indeed gangs do pose serious social problems in many cities. However, although pressure from peers to engage in misconduct does increase during adolescence, most researchers do not accept the simplistic view that peer groups are mostly a bad influence during this period. More often than not, adolescents agree more with their parents' views on "major" issues such as morality, the importance of education, politics, and religion. Peers have more influence on things such as dress and clothing styles, music, and activity choice. In addition, adolescents usually seek out peers whose interests are compatible with their own; this means that those who are involved in sports will have other athletes as friends; those who are serious about school will seek friends who are similarly inclined. Finally, adolescents usually

select peers who share their parents' fundamental values. In most cases, the peer group acts more to reinforce existing strengths and weakness than to change adolescents' characteristics.

Finally, the quality of children's friendships undergoes some important changes during adolescence (Berndt & Perry, 1990). As suggested by Sullivan (1953), adolescents' friendships are more focused on fulfilling intimacy needs than younger children's friendships. This is particularly true for girls.

Changes in Family Relations

Although the extent of actual disruption in parent-adolescent relations is still debated, there is no doubt that parent-child relations change during adolescence (e.g., Collins, 1990). As adolescents become physically mature they often seek more independence and autonomy, and may begin to question family rules and roles, leading to conflicts, particularly around issues like dress and appearance, chores, and dating. However, despite these conflicts over day-to-day issues, parents and adolescents agree more than they disagree regarding core values linked to education, politics, and spirituality.

Parents and adolescents also have fewer interactions and do fewer things together outside the home than they did at an earlier period—as illustrated by the horror many adolescents express at seeing their parents at places like shopping malls. Both Collins (1990) and Steinberg (1990) argued that this "distancing" in the relations between adolescents and parents is a natural part of pubertal development that has great functional value for adolescents precisely because it fosters their individuation from their parents, allows them to try more things on their own, and develops their own competencies and efficacy. When parents respond to this distancing in a developmentally supportive fashion, while at the same time providing ample guidance and control, their adolescent children exercise their increasing autonomy in a mature, responsible fashion and maintain positive relationships with their parents.

School and Adolescent Development

For some children, the early adolescent years mark the beginning of a downward spiral leading to academic failure and school dropout.

The Junior High/Middle School Transition. Simmons and Blyth (1987) found a marked decline in some early adolescents' school grades as they moved into junior high school, a decline that was predictive of subsequent school failure and dropout. Similar declines have been documented for such motivational constructs as interest in school, intrinsic motivation, self-concepts/self-perceptions, and confidence in one's intellectual abilities, especially following failure. Finally, there are also increases during early adolescence in such negative motivational and behavioral character-

istics as test anxiety, learned helpless responses to failure, focus on self-evaluation rather than task mastery, and both truancy and school dropout (see Eccles & Midgley, 1989). Although these changes are not extreme for most adolescents, there is sufficient evidence of gradual decline in various indicators of academic motivation, behavior, and self-perception over the early adolescent years to make one wonder what is happening. And although few studies have gathered information on ethnic or social class differences in these declines, we know that academic failure and dropping out is especially problematic among some ethnic groups and among youth from low socioeconomic communities and families; thus, it is likely that these groups are particularly likely to show these declines in academic motivation and self-perception as they move into, and through, the secondary school years.

A variety of explanations have been offered to explain these "negative" changes: Some have suggested that declines such as these result from the intraspsychic upheaval assumed to be associated with early adolescent development. Others have suggested that these declines are due to coincidental timing of multiple life changes (e.g., Simmons & Blyth, 1987). Still others have suggested that it is the nature of the junior high school environment itself that is important. Drawing upon person-environment fit theory, Eccles and Midgley (1989) proposed that the negative motivational and behavioral changes associated with early adolescence could result from the fact that traditional junior high schools are not providing appropriate educational environments for early adolescents. According to person-environment theory, behavior, motivation, and mental health are influenced by the fit between the characteristics individuals bring to their social environments and the characteristics of these social environments. Individuals are not likely to do very well, or be very motivated, if they are in social environments that do not fit their psychological needs. If the school social environments in the typical middle grades do not fit well with the psychological needs of adolescents, then person-environment fit theory predicts a decline in the adolescents' motivation, interest, performance, and behavior as they move into this environment. There is some evidence for each of these perspectives.

The Relation of Changes in School Environments to Motivational Changes During Early Adolescence. Work in a variety of areas has documented the impact of classroom and school environmental characteristics on motivation. For example, the big school/small school literature has demonstrated the motivational advantages of small secondary schools especially for marginal students (Barker & Gump, 1964). Similarly, the teacher efficacy literature has documented the positive student motivational consequences of high teacher efficacy (Ashton, 1985). Finally, orga-

nizational psychology has demonstrated the importance of participatory work structures on worker motivation (Lawler, 1976). The list of such influences could, of course, go on. The point is that there may be systematic differences between the academic environments in typical elementary schools and those in typical junior high and middle schools; if so, these differences could account for some of the motivational changes seen among early adolescents as they make the transition into junior high school or middle school.

Eccles and her colleagues have called this kind of phenomenon "Stage-Environment Fit." At the most basic level, this perspective suggests the importance of looking at the fit between the needs of early adolescents and the opportunities afforded them in their middle school environment. A poor fit would help explain the declines in motivation associated with the transition to either junior high or middle school. More specifically, these researchers suggested that different types of educational environments may be needed for different age groups in order to meet the individual's developmental needs and to foster continued developmental growth. Exposure to the developmentally appropriate environment would facilitate both motivation and continued growth; in contrast, exposure to a developmentally inappropriate environment, especially a developmentally regressive environment would create a particularly poor person-environment fit, which, in turn, would lead to declines in motivation as well as in the attachment to the goals of the institution.

Eccles and Midgley (1989) further argued that many early adolescents experience developmentally inappropriate changes in a cluster of classroom organizational, instructional, and climate variables, including task structure, task complexity, grouping practices, evaluation techniques, motivational strategies, locus of responsibility for learning, and quality of teacher-student and student-student relationships as they move into either middle school or junior high school. They argued, in turn, that these experiences contribute to the negative change in students' motivation and achievement-related beliefs assumed to coincide with the transition into junior high school. Recent research supports these suggestions. For example, Simmons and Blyth (1987) point out that most junior high schools are substantially larger than elementary schools and instruction is also more likely to be organized and taught departmentally. As a result of both of these differences, junior high school teachers typically teach several different groups of students each day and are unlikely to teach any particular student for more than one year. In addition, students typically have several teachers each day with little opportunity to interact with any one teacher on any dimension except the academic content of what is being taught and disciplinary issues. Thus, the opportunity for forming close

relationships between students and teachers is effectively eliminated at precisely the point in the students' development when they have a great need for guidance and support from nonfamilial adults (Carnegie Council on Adolescent Development, 1989). Such changes in student-teacher relationships, in turn, are likely to undermine the sense of community and trust between students and teachers. This in turn leads to a lowered sense of efficacy and an increased reliance on authoritarian control practices by teachers, and an increased sense of alienation among students. Such changes are also likely to decrease the probability that any particular student's difficulties will be noticed early enough to get the student necessary help. This in turn increases the likelihood that students on the edge will be allowed to slip onto negative trajectories leading to increased school failure and dropout.

There is also consistent evidence of counterproductive changes in the authority relations between students and teaches. For example, despite the increasing maturity of students, junior high school classrooms, compared to elementary school classrooms, are characterized by a greater emphasis on teacher control and discipline, and fewer opportunities for student decision making, choice, and self-management. Such a mismatch between young adolescents' desires for autonomy and control and their perception of the opportunities in their environments should result in a decline in the adolescents' intrinsic motivation and interest in school; and this is exactly what happens (Eccles et al., 1993).

Finally, junior high school teachers appear to use a higher standard in judging students' competence and in grading their performance than do elementary school teachers. There is no stronger predictor of students' self-confidence and efficacy than the grades they receive. If grades change, then we would expect to see a concomitant shift in the adolescents' self-perceptions and academic motivation. There is evidence that junior high school teachers use stricter and more social comparison–based standards than elementary school teachers to assess student competency and to evaluate student performance, leading to a drop in grades for many early adolescents as they make the junior high school transition (e.g., Simmons & Blyth, 1987).

Eccles and Midgley argued that these types of school environmental changes are particularly harmful at early adolescence given what is known about psychological development during this stage of life. Early adolescent development is characterized by increases in desire for autonomy, peer orientation, self-focus and self-consciousness, salience of identity issues, concern over heterosexual relationships, and capacity for abstract cognitive activity (Simmons & Blyth, 1987). Simmons and Blyth argued that adolescents need a reasonably safe, as well as an intellectu-ally challenging, environment to adapt to these shifts—an environment that provides a "zone of comfort" as well as challenging new opportunities for growth. In light of these needs, the environmental changes often associated with transition to middle grade schools are likely to be particularly harmful in that they emphasize competition, social comparison, and ability self-assessment at a time of heightened self-focus; they decrease decision making and choice at a time when the desire for control is growing; they emphasize lower-level cognitive strategies at a time when the ability to use higher-level strategies is increasing; and they disrupt social networks at a time when adolescents are especially concerned with peer relationships and may be in special need of close adult relationships outside of the home. The nature of these environmental changes, coupled with the normal course of individual development, is likely to result in a developmental mismatch so that the "fit" between the early adolescent and the classroom environment is particularly poor, increasing the risk of negative motivational outcomes, especially for adolescents who are having difficulty succeeding in school academically.

The High School Transition. Although there is less work on the transition to high school, the existing work is suggestive of similar problems. For example, high schools are typically even larger and more bureaucratic than junior high schools and middle schools. Bryk, Lee, and Holland (1994) provide numerous examples of how the sense of community among teachers and students is undermined by the size and bureaucratic structure of most high schools. There is little opportunity for students and teachers to get to know each other and, as a consequence, there is likely to be distrust between them and little attachment to a common set of goals and values. There is also little opportunity for the students to form mentorlike relationships with a nonfamilial adult and little effort is made to make instruction relevant to the students. Such environments are likely to further undermine the motivation and involvement of many students, especially those not doing particularly well academically, those not enrolled in the favored classes, and those who are alienated from the values of the adults in the high school. These hypotheses need to be tested.

Most large public high schools also organize instruction around curricular tracks that sort students into different groups (Lee & Bryk, 1989). As a result, there is even greater diversity in the educational experiences of high school students than of middle grade students; unfortunately, this diversity is often associated more with the students' social class and ethnic group than with differences in the students' talents and interests. As a result, curricular tracking has served to reinforce social stratification rather than foster optimal education for all students, particularly in large schools. Evidence

comparing Catholic high schools with public high schools suggests that average school achievement levels are increased when all students are required to take the same challenging curriculum. This conclusion is true even after one has controlled for student selectivity factors. A more thorough examination is needed of how the organization and structure of our high schools influences cognitive, motivational, and achievement outcomes.

On the More Positive Side. Difficulties with secondary school transitions, however, are by no means universal. Hirsch and Rapkin (1987), for example, found no change in self-esteem in students making the transition from sixth grade into a junior high school. These authors did report, however, an increase in depressive symptomatology in girls making the transition as compared to boys. Although some of these differences across studies undoubtedly reflect variations across studies in populations, school environments, and varying methodological techniques, it is likely that individual differences in young adolescents' responses to school transitions also play a role. In support of this hypothesis, several studies have found negative changes for some youth and not for others. For example, Simmons and Blyth (1987) found that girls already involved in dating and showing the most advanced pubertal development were most at risk for negative changes in their self-esteem in conjunction with the transition to junior high school. Similarly, Midgley, Feldlaufer, and Eccles (1989) found more extreme negative effects of the junior high school transition on low achieving students. Finally, Lord, Eccles, and McCarthy (1994) found that adolescents who did well in school during their elementary school years and who have confidence in their academic and social abilities adapt quite well to the junior high school transition.

Bibliography

Ashton, P. (1985). Motivation and the teacher's sense of efficacy. In C. Ames & R. Ames (Eds.), *Research on motivation in education* (Vol. 2, pp. 141–171). Orlando, FL: Academic Press.

Barker, R., & Gump, P. (1964). *Big school, small school: High school size and student behavior.* Stanford, CA: Stanford University Press.

Berndt, T. J., & Perry, T. B. (1990). Distinctive features of early adolescent friendships. In R. Montemayor, G. R. Adams, & T. P. Gullotta (Eds.), *From childhood to adolescence: A transitional period?* (pp. 269–287). Newbury Park, CA: Sage.

Brooks-Gunn, J., & Warren, M. P. (1988). The psychological significance of secondary sexual characteristics in 9- to 11-year-old girls. *Child Development, 59,* 161–169.

Brown, B. B. (1990). Peer groups and peer cultures. In S. S. Feldman & G. R. Elliott (Eds.), *At the threshold: The developing adolescent* (pp. 171–196). Cambridge, MA: Harvard University Press.

Bryk, A. S., Lee, V. E., & Holland, P. B. (1993). *Catholic schools and the common good.* Cambridge, MA: Harvard University Press.

Buchanan, C. M., Eccles, J. S., & Becker, J. B. (1992). Are adolescents the victims of raging hormones? *Psychological Bulletin, 111,* 62–107.

Carnegie Council on Adolescent Development (1989). *Turning points: Preparing American youth for the 21st century.* New York: Carnegie Corporation.

Collins, W. A. (1990). Parent-child relationships in the transition to adolescence: Continuity and change in interaction, affect, and cognition. In R. Montemayor, G. R. Adams, & T. P. Gullotta (Eds.), *From childhood to adolescence: A transitional period?* (pp. 85–106). Beverly Hills, CA: Sage.

Eccles, J. S., & Midgley, C. (1989). Stage-environment fit: Developmentally appropriate classrooms for young adolescents. In C. Ames & R. Ames (Eds.), *Research on motivation in education* (Vol. 3, pp. 139–186). New York: Academic Press.

Eccles, J. S., Midgley, C., Buchanan, C. M., Wigfield, A., Reuman, D., & MacIver, D. (1993). Development during adolescence: The impact of stage/environment fit. *American Psychologist, 48,* 90–101.

Eccles, J. S., Wigfield, A., & Schiefele, U. (1998). Motivation. In N. Eisenberg (Ed.), *Handbook of child psychology* (Vol. 3, 5th ed., pp. 1017–1095). New York: Wiley.

Erikson, E. H. (1963). *Childhood and society.* New York: Norton.

Harter, S. (1998). The development of self-representations. In W. Damon & N. Eisenberg (Eds.), *Handbook of child psychology,* (Vol. 3, 5th ed., pp. 553–618). New York: Wiley.

Hirsch, B., & Rapkin, B. (1987). The transition to junior high school: A longitudinal study of self-esteem, psychological symptomatology, school life, and social support. *Child Development, 58,* 1235–1243.

Keating, D. P. (1990). Adolescent thinking. In S. S. Feldman & G. R. Elliott (Eds.) *At the threshold: The developing adolescent* (pp. 54–89). Cambridge, MA: Harvard University Press.

Lawler, E. E. (1976). Control systems in organizations. In M. D. Dunnette (Ed.), *Handbook of industrial and organizational psychology.* Chicago: Rand-McNally.

Lee, V. E., & Bryk, A. S. (1989). A multilevel model of the social distribution of high school achievement. *Sociology of Education, 62,* 172–192.

Lord, S., Eccles, J. S., & McCarthy, K. (1994). Risk and protective factors in the transition to junior high school. *Journal of Early Adolescence, 14,* 162–199.

Midgley, C. M., Feldlaufer, H., & Eccles, J. S. (1989). Changes in teacher efficacy and student self- and task-related beliefs during the transition to junior high school. *Journal of Educational Psychology, 81,* 247–258.

Office of Educational Research and Improvement (1988). *Youth indicators 1988.* Washington, DC: U.S. Government Printing Office.

Piaget, J., & Inhelder, B. (1973). *Memory and intelligence.* London: Routledge & Kegan Paul.

Rosenholtz, S. J., & Simpson, C. (1984). The formation of ability conceptions: Developmental trend or social construction? *Review of Educational Research, 54,* 301–325.

Simmons, R. G., & Blyth, D. A. (1987). *Moving into adolescence: The impact of pubertal change and school context.* Hawthorne, NY: Aldine de Gruyter.

Stattin, H., & Magnusson, D. (1990). *Pubertal maturation in female development.* Hillsdale, NJ: Erlbaum.

Steinberg, L. (1990). Autonomy, conflict, and harmony in the family relationship. In S. Feldman & G. Elliott (Eds.), *At the threshold: The developing adolescent* (pp. 255–276). Cambridge, MA: Harvard University Press.

Sullivan, H. S. (1953). *The interpersonal theory of psychiatry.* New York: Norton.

Wigfield, A., Eccles, J., Mac Iver, D., Reuman, D., & Midgley, C. (1991). Transitions at early adolescence: Changes in children's domain-specific self-perceptions and general self-esteem across the transition to junior high school. *Developmental Psychology, 27,* 552–565.

Jacquelynne S. Eccles and Allan Wigfield

Adolescent Thought Processes

Our adolescents today are exposed to a constantly changing expanse of information from a multitude of sources. Some, like cruising the Internet, were unknown to earlier generations. To stay "in the know" vis-à-vis their peers, adolescents need continuing access to the latest word their culture has to offer. They also must sort through a rapid-fire and often conflicting barrage of input from peers, parents, teachers, and media, to decide what to believe, what to ignore, and what warrants their sustained interest. Moreover, the information processing and judgment demands that today's teens face are central to their survival. Decisions about drug use, sexual activity, and social-group membership can have life-or-death implications.

To meet these challenges, we might ask whether adolescents are equipped with cognitive skills that surpass those they possessed as children. The question of the cognitive competencies of adolescents, relative to those of either the children they so recently were or the adults they are soon to become, is one of particular interest to developmental psychologists. To paraphrase the title of an influential article by Carey (1985), we can ask, "Are adolescents fundamentally different kinds of thinkers and learners from children?"

Is Adolescence Marked by a New Stage of Cognitive Development?

Even casual conversations with adolescents confirm that they know more about a wider variety of topics than do school-age children. But is this knowledge base organized any differently from the less extensive knowledge base of the child, or does it include principles or entities that the child's does not? One long-standing assumption is that with adolescence comes the ability to understand abstract concepts, such as justice or democracy. Of greatest interest to psychologists, however, has been the possibility that adolescents are capable of particular cognitive strategies that were not available to them earlier, enabling them to succeed in new kinds of intellectual tasks.

For several decades the dominant influence in this respect has been Piaget's theory of formal operations. Indeed, his remains the only comprehensive theory specifying a transformation in thinking capacities with the transition from childhood to adolescence. Formal operations, according to Piaget, constitute the final stage in a developmental sequence of major reorganizations of cognitive structure that take place during infancy and childhood. With the attainment of this stage, thought becomes able to take itself as its own object—adolescents are able to think about their own thinking. Formal operations in fact are defined as "operations on operations," that is, mental operations on the elementary operations of classification and relation that define the preceding stage of concrete operations. The adolescent becomes able, for example, not only to categorize animals according to physical characteristics and habitats but also to operate on these categorizations—to put them into categories and on this basis to draw inferences regarding relations that hold among animals' physical characteristics and habitats. The adolescent thus reasons at the level of *propositions* that specify relations between one category (or relation) and another. Associated with this second-order operatory structure, according to the theory, are several other important cognitive strategies—analogy (constructing relations between relations, e.g., subjects: monarchy::citizens:democracy), systematic combination (e.g., of all possible pizza types creatable with four kinds of toppings), conditional reasoning (about if-then statements), and the "scientific method" of controlled experiments in which one factor is varied systematically to assess its effect while all others are held constant to remove their influence.

Much subsequent research has upheld Inhelder and Piaget's (1958) findings that adolescents on average perform better than children in tasks designed to assess these cognitive strategies. Piaget, however, regarded these various acquisitions as tightly linked manifestations of the formal operational thought structure hypothesized to emerge at adolescence. In this respect, subsequent research has been less supportive, yielding little evidence for a singular or abrupt transition from the childhood stage of concrete operations to the adolescent stage of formal operations (Moshman, 1998). Instead, substantial variability has been observed, both within and across individuals, in the age of attainment of the cognitive strategies associated with formal operations, with attainment in some cases still absent at adulthood. Furthermore, modest practice can improve