

The Biology of Adolescence

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Introduction

Sadly, yet not surprisingly, some adults view the exuberant period of adolescence as a dubious stage of development. Seeing adolescence as a stage of development to be dreaded, rather than anticipated by adults, seems to be encouraged by the popular literature of today (e.g. Bell, 1987; Caissy, 1994). For both teens and adults the literature “warns” of what is to come. In spite of very little empirical support, the popular literature tells teens “you may feel full of energy or lie around and sleep a lot. Your moods may shift quickly, uncontrollably, surprising you” (see Bell, 1987, p. 5, cf. Buchanan, Eccles, & Becker, 1992). Another book, written for parents by Caissy (1994), suggests adolescents are moody and unpredictable and that negative

interactions between parents and their adolescents are inevitable. Caissy goes on to suggest that adults should just learn to accept the “self-centered”, “know-it-all”, “angry”, “critical” and “impulsive” behaviors of teens as “normal” behavior for this age group (Caissy, 1994, p. 53). This negative view of adolescence seems to be all pervasive and may even affect the thinking of some professionals interacting with today’s youth.

What is the source of this idea that adolescence is a stage of development to be dreaded? Sigmund Freud (Freud, 1905/1962) contended that humans were driven by their biology. Following in her father’s footsteps, Anna Freud (1969) suggested that adolescents need time to adjust to their new physiological drives. She

then proposed that an inability to understand these drives and feelings led adolescents to convert their drives and feelings to other feelings such as aggression or depression. Thus, biology becomes the source of conflict between adults and adolescents. Yet, conceptualizing the psychology of adolescence along with physiology does not necessarily mean we have to view adolescents as “driven” by these physiological changes. In fact, the current *zeitgeist* encourages an understanding of a more complex interaction of both physiological and psychological processes working in concert (Bronfenbrenner, 1979; Lerner, Lerner, & Tubman, 1989; Scarr & McCartney, 1983). This fresh and more

advanced approach suggests that hormones probably do play a role in psychological development, but not quite in the way envisioned by Sigmund and Anna Freud, nor in the way often portrayed in the popular literature.

Some empirical studies do show a slight rise of parent-adolescent conflict during puberty. The relationship between puberty and conflict is curvilinear with conflict temporarily increasing and closeness temporarily decreasing at the peak of pubertal maturation; however, this statistical effect is very small and has not been specifically linked to the hormonal changes of puberty (Blos, 1979; Buchanan, Eccles, & Becker, 1992; Molina & Chassin, 1996; Montemayor, 1986; Paikoff & Brooks-Gunn, 1991; Steinberg, 1989, 1990). This slight increase in conflict could just as easily be explained by shifts and changes within the family structure as children turn into adults (Smetana, 1988). The evidence is certainly clear that there are tremendous physical changes during adolescence which could possibly make this a challenging period of development (Petersen, Susman, & Beard, 1989), but are these changes psychologically and physiologically overwhelming for the adolescent? Should parents or adults be concerned or believe that adolescent behaviors, especially disparaging ones, stem from hormones? Do parents, or youth professionals need to adjust their comments or guidance to accommodate for adolescents supposedly overwhelmed by hormones? Absolutely not! None of the evidence available at this time suggests that the **hormonal physiology** of adolescence should lead to negative experiences. Thus, it might be more useful and encouraging for all adults, parents and youth professionals, to view the metamorphosis from child to adult as an exciting and fun time for all concerned. No

one should ever be led to expect this stage of development to be negative and conflictual, but should be encouraged to enjoy the blossoming of children into adults.

With this in mind, the goal of this paper is to encourage parents, youth professionals and other adults to cherish rather than just “survive” the period of adolescent development. Although there is still much to be learned about the biological underpinnings of this stage of development, this paper will first review the following areas of current research on adolescent development:

- **The hormonal changes of puberty and adolescents' moods**

- The tremendous physical growth and change during adolescence
- The timing of puberty
- The current adolescent experience on average
- Parent-adolescent conflict

Then, in conclusion, there will be offered a few suggestions on how to enjoy the biological changes of adolescence.

The hormonal changes of puberty and adolescents' moods

Adolescence is usually defined as the period of development from the onset of puberty to adulthood, with the onset of puberty marked by hormonal changes. The general outcome of puberty is an adult body capable of reproduction. Hormonal concentrations in blood are low before 8 or 9 years of age (Buchanan, Eccles, & Becker, 1992). Somewhere between 5 and 9 years, the hypothalamic-pituitary-adrenal (HPA) axis is activated, leading to an increase in numerous adrenal steroid hormones. The steroid hormones stem from a cholesterol base and are similar in boys and girls, though varying in quantity. For example, males have more testosterone and females less. Females have more estrogen, males less. Estrogen and testosterone are able to suppress other gonadotropic hormones such as LH (Luteinizing Hormone) and FSH (Follicle Stimulating Hormone) until puberty. Puberty is caused, in essence, by the inability of these hormones to continue to suppress the other gonadotropic hormones. Exactly why they are unable to continue suppressing these hormones is still

unknown (Buchanan, Eccles, & Becker, 1992; Cameron, 1990).

In girls, a significant increase in the hormone estradiol is seen at about age 9 or 10 years. The increase continues through 13 to 14 years. In boys, testosterone levels rise during sleep somewhere around 10 years of age, and about six months later, daytime concentrations of testosterone increase (Apter, Reinila, & Vihko, 1989). The normal range for the onset of puberty is usually around 9.5 years to 13.5 years for boys and 8 years to 13 years in girls (Nottelmann, et al; 1990). Aside from changes in concentration of hormones, there are also cyclic changes, for example the menstrual cycle in girls. Although for adolescents the entire system is transforming and stabilizing into an adult pattern (Buchanan, Eccles, & Becker, 1992), cyclic changes are true for adults as well (Henry, 1992). This period of stabilization of hormones is most likely the basis of the popular notion that adolescents, as well as their behavior and moods, are, in general, unstable and unpredictable.

There is still much we do not know about pubertal development, so the possibility exists that the onset and fluctuations of hormones during puberty can influence the moods of adolescence. For example, receptors for adrenal steroid hormones are found in the hypothalamus, amygdala and hippocampus, all areas of the brain associated with affective behaviors and moods (Buchanan, Eccles, & Becker, 1992; Henry, 1992; Nottelmann et al., 1990). However, even if hormones do affect these areas of the brain, there is still very little evidence that hormones affect moods or act differentially on adolescents as compared to adults. There is only one study (Larson, Csikszentmihalyi, & Graef, 1980) that might possibly support the view that hormones influence moods in adolescents. In this

study, adolescents were to record their moods intermittently during the day, when buzzed with pagers. Analysis of these records did indicate adolescents had mood swings during their day, but this data was not correlated with hormonal evidence. Nor has this type of research been done with adults. If we paged adults at various levels during their day, we might find that adults, on average, also have mood swings during the day. One other study, Diener, Sandvik and Larsen (1985, cf. Buchanan, Eccles, & Becker, 1992) did find a decline in intensity of mood from late adolescence to adulthood, but again we can only assume that intensity increases during puberty and is driven by hormones. In essence, there is very little *empirical* support for the popular belief that adolescents are “victims of raging hormones” (Brooks-Gunn, Warren, & Rosso, 1988, cf. Buchanan, Eccles, & Becker, 1992; Buchanan, 1991; Buchanan, Eccles, & Becker, 1992; Crockett & Petersen, 1987; Larson & Lampman-Petratis, 1989).

In fact, very few researchers believe hormones are the ultimate director of adolescent behavior (Lerner & Foch, 1987). Greene and Larson (1991) suggest the notion continues to persist because of adults’ perceptions of teens, as well as researchers’ limited knowledge about the interaction of biology in the adolescent stage of development. Buchanan and colleagues (1992) looked at energy level, restlessness and concentration, irritability and impulsiveness, and finding a range of individual differences, proposed that some individuals may be more susceptible to rises in concentration of hormones than others. The individual differences of some might then cause the assumption that all adolescents have similar problems. In other words, although hormones show no effects on the above behaviors on average, there

may be some adolescents who are more susceptible to hormones than the average adolescent.

Other researchers suggest hormonal effects stem from adolescents’ reactions to physical change, such as earlier breast development than their peers, rather than hormones per se (Rubin, 1990). Being earlier or later than the norm in the timing of puberty, in relation to the peer group, has been associated with negative effects (Brooks-Gunn & Graber, 1994; Petersen, Richmond, & Leffert, 1993; Udry, 1990). Furthermore, the pattern of negative effects is different for each sex. Reaching puberty early appears to have negative effects on girls whereas late maturity affects boys more negatively. For example, studies show early maturing girls are particularly sensitive to evidencing physical signs of maturation (e.g., breast development) prior to their peers, and this sensitivity in turn can lead to low self-esteem and a poor body image in these girls. In contrast, late maturing boys find themselves the last to lose their child-like appearance in their peer group. Being small and looking child-like alongside the more developed boys, at an age when girls and boys are becoming more interested in each other, often leads to low self-esteem and poor body image in late maturing boys (Graber & Brooks-Gunn, 1996). These effects are still being researched but suggest that the hormonal effects of puberty affect self-esteem and personality through social interactions and thus play a far more important role in the lives of adolescents than portrayed in the popular literature (Buchanan, Eccles, & Becker, 1992). The popular literature ignores these ramifications and instead focuses on the effects of hormones on adolescent moods.

Buchanan and colleagues (1992) suggest we focus on the real question, i.e., can we say

that moods and behaviors are different during adolescence as compared to other developmental times? As noted above, hormonal changes are gradually and cyclically changing during the pubertal process, yet even adults experience cyclic changes in hormonal concentrations. As very little research has examined the relationship directly (Buchanan, Eccles, & Becker, 1992; Graber & Brooks-Gunn, 1996; Petersen, Richmond, & Leffert, 1993), there are no definitive answers. This begs the question of why the popular literature and parents continue to accept the idea that adolescent moods and behaviors are a result of hormones. If we really want to know if moods and behaviors change at puberty, longitudinal studies following adolescents prior to puberty and through the pubertal process will need to be done (Buchanan, Eccles, & Becker, 1992). We are only now witnessing an explosion of new studies in adolescent development that are actively measuring hormone production in relation to behavioral patterns (Petersen, Richmond, & Leffert, 1993). Although we know little about hormonal changes, many studies have focused on the morphological changes that take place during the pubertal process. These changes are summarized below.

The tremendous physical growth and change during adolescence

Parents of adolescents typically comment on the vast amount of food this age group consumes and may even joke that their adolescents are “eating machines.” In truth, hormonal changes do lead to an increase in nutrient requirements because of the virtual doubling of body mass and rapid growth that takes place (Tanner, 1975; 1990). Adolescence is inevitably a time of tremendous physical growth and change as well as psychological change. The growth spurt, as it is often called, does not proceed

evenly. For both boys and girls, legs usually grow first, followed by the trunk. The old saying “never buy an adolescent boy a suit” attests to this uneven growth.

The average amount of height gained during a growth spurt is usually the same for all adolescents. Adult height depends on when the growth spurt actually started (Graber & Brooks-Gunn, 1996). Girls begin their growth spurt about two years earlier than boys, grow about six to seven inches and are usually taller than boys during this time period. Boys grow about 9 inches during the growth spurt and by age 14 most boys are taller than girls. Adult men in the United States on average, are about 4 inches taller than women (Tanner, 1990).

Although brain development is complete before adolescence, the head does grow during this developmental period (Tanner, 1975; 1990). In fact, the face actually changes from child-like to adult-like as the skull solidifies. Body composition also changes. Girls begin to store fat on hips, breasts and upper arms, while boys tend to lose fat and develop muscle. Along with structural changes, there are changes in sensual experiences, for example the senses of smell and taste increase in intensity. There are sex differences in these changes and the intensity of sensual experiences is most likely related to reproductive needs of the sexes (Tanner, 1990). Changes in metabolic rate also occur and might affect activity levels though there is no direct evidence to support this relation (Buchanan, Eccles, & Becker, 1992). It is important to realize that hormonal pubertal processes are a process rather than an event (Petersen, 1987). That is, pubertal changes are occurring over a long time span. Thus, to return to our opening example, there is no sudden hormonal event that would lead adolescents to suddenly feel tired.

The timing of puberty

Due to the tremendous individual variation in timing of the onset of puberty, the terms “adolescent” and “teen” are not synonymous. Information on the timing of onset of puberty mostly stems from studies on girls’ menarche, i.e., the first indication of a menstrual cycle (Tanner, 1975). Although menarche can be used as a marker for the onset of puberty in girls, there is no similar marker in boys. Since the age of menarche (i.e., a girl’s first period) can be easily quantified, researchers tend to focus on this variable and assume the onset of boys’ pubertal patterns are similar. Using menarche as a marker, studies have shown a drop in the average age of puberty since the turn of the century (Marshall & Tanner, 1986). This variation in timing has been linked to several causes: heredity, improvements in nutrition, family environment and stressful life events (Belsky, Steinberg & Draper, 1991; Frisch, 1974; 1990; Graber, Brooks-Gunn & Warren, 1995; Steinberg, 1989; Surbey, 1990). According to Frisch (1974; 1990), the improved nutrition in industrialized countries, along with studies showing that low fat levels leads to cessation of the menstrual cycle strongly suggests that nutritional improvements have caused the trend toward earlier puberty. Alternatively, Steinberg (1989) has suggested the trend towards earlier puberty could just as easily be a result of stress factors related to industrialization. Marital conflict and/or father absence (Belsky, Steinberg & Draper, 1991; Surbey, 1990) have also been implicated as stressors affecting the onset of menarche. Studies have shown that girls raised without fathers and from divorced families do tend to mature earlier than girls raised in intact families (Surbey, 1990).

Although causal factors are still under investigation, the implications of this trend have generated much research. A century ago, it was common to marry in the late teen years with the onset of puberty occurring around 16 years of age (Lancaster & Hamburg, 1986). Therefore, marital age and the ability to reproduce were in harmony. Today, adults marry at a much later age while the average age of menarche in the United States has dropped to 12.8 years (Belsky, Steinberg, & Draper, 1991). Thus, adolescents are reproductively capable long before they are ready to marry and raise a family. Because of this, the trend towards an earlier onset of puberty has been implicated in the rise in school age pregnancies. There is a substantial amount of literature on the effects of earlier puberty on the rise in school-age pregnancies that will not be covered in this summation of general adolescent behaviors (e.g. Lancaster & Hamburg, 1986).

The current adolescent experience on average

According to the empirical literature, adolescent development is basically a positive as well as successful experience for most adolescents (Graber & Brooks-Gunn, 1996; Petersen, Richmond, & Leffert, 1993). Perhaps, many adults and parents view adolescence and puberty as having negative ramifications because of the attention placed on those adolescents who evidence problematic behaviors (Petersen, Richmond, & Leffert, 1993). Yet, the processes involved in the development of these socially problematic behaviors, as well as the groups of adolescents involved, are fundamentally different (Graber & Brooks-Gunn, 1996). In most adolescents, along with increasing size and reproductive maturity, come increasing cognitive abilities and knowledge which lead to a developing

understanding of self and others and an increased ability to relate with others (Petersen, Richmond, & Leffert, 1993). Although encompassing tremendous individual variation, most psychologists recognize adolescence as a positive time of transition (Graber & Brooks-Gunn, 1996; Rutter, 1994). In fact, Cornwell and colleagues (1996) suggest today's adolescents are really more advantaged than in the past. Declining fertility rates and poverty, along with increases in parental education have really led to positive changes within the family for the majority of today's youth (Cornwell, Eggebeen, & Meschke, 1996). In general, the current view is that the majority of adolescents have no problem coping with either the pubertal changes or the transition (Buchanan, Eccles, & Becker, 1992).

Parent-adolescent conflict

Research has certainly documented some conflict in the parent-child relationship during puberty (Steinberg, 1981; 1989) though not necessarily as negatively conflictual as portrayed in the popular literature. Generally, most adolescents feel parents' rules are fair (Achenbach & Edelbrock, 1981; Smetana, 1989). Students in my large freshman university class on family issues were asked whether they felt going through puberty was a rough time in their lives, if they felt their parents were unfair or if there was increasing conflict during this time period. Most responses were negative. Students shared that they were happy that parents gave them clear boundaries as adolescents. They all stated they would apply the same rules when raising their own children.

Montemayor (1986) and Smetana (1988, 1989) also believe that most conflicts are minor and result from the family

reorganization that occurs as children turn into adults. Smetana (1988, 1989) and Molina and Chassin (1996) have both hypothesized that as adolescents mature, they may demand more autonomy, temporarily causing a redefinition of family expectations and regulations. If this is true, and if adolescents from divorced families have more autonomy (as suggested by Hetherington, 1989), then there should be more parent-adolescent conflict in intact families than in divorced families. Smetana (1991) did find that there was less conflict in mother-custody families as compared to intact families. In both types of families, parent-adolescent conflict was related to the same issues, usually the everyday details of family life: interpersonal relationships, regulating activities, homework and several others. However, as Smetana (1991) points out, lack of conflict can also mean lack of communication. So, the autonomy hypothesis is still unresolved. Molina and Chassin (1996) have recently found less conflict in Hispanic families as boys reached puberty and suggest that puberty leads to closer relationships within Hispanic families, at least for boys. But since the sample consisted of alcoholic families, it could be lack of communication that again leads to what appears to be nonconflictual relationships. Again, all these effects would still point to interpersonal relationships within social contexts during puberty and not solely hormones or puberty (see Greene & Larson, 1991).

Enjoying the biological changes of adolescence

Perhaps the secret to enjoying the biological changes of adolescence is to ignore some of the popular literature on raising teens, especially when it is telling you to accept "self-centered, know-it-all, angry, critical and impulsive behaviors" as normal for

teenagers. Hormones should not be seen as a cause or an excuse for unacceptable behaviors, and parents and/or youth professionals wishing to enjoy their adolescents should not excuse any unacceptable behaviors as inevitable. Overall, parents as well as youth professionals do need to allow increasing amounts of autonomy during this adjustment period (Smetana, 1991). Yet, Smetana and Asquith (1994) did find that both adolescents and parents agreed that parents should retain authority in the household. Shifts in authority need to be in areas of personal jurisdiction. The problem is that adults and adolescents define personal jurisdiction differently. For example, parents see "personal" as pertaining to areas that have only consequences to the adolescent. For parents, areas that have to do with social or moral rules are no longer personal and are subject to parental authority. Adolescents believe decisions in some of these areas are personal. Shifting and setting these new boundaries within the family are part of the process of adolescent development. Each family will differ on determining how and when to shift these boundaries. One example would be the adolescent who prefers being with friends rather than attending the family picnic. Another example might be an adolescent who feels her parents cross the personal boundary in attempting to choose her friends. Professionals working with youth will find adolescents often attempting to delineate these same boundaries. For example, although an adolescent might feel their choice of friends is their own personal business, most adults would feel obligated to intervene when the friends of adolescents use alcohol or drugs. Although most adolescents think parents have no right to comment on personal issues such as style of clothes, most adolescents also regard parental directives on moral issues and

behaviors as reasonable (Smetana, 1994). This indicates youth who hold an adult in high esteem would regard information on moral issues and behaviors as reasonable input. There are no simple answers or resolutions as adolescents turn into adults and learn to make these decisions.

Although there is no such thing as a typical adolescent or typical family, in general, parents are expected to impose authority the first six years of a child's life (Baumrind, 1996). Somewhere around school age, children begin to understand that individuals are allowed to have different perspectives but at this age children still actively solicit adult approval. As children approach adolescence they need to form their own identity and become autonomous. Parents who have provided explanations, and reasoned with their children as they developed, have caused their children to internalize parental values. By adolescence, these children are usually capable of reason and able to consider the opinions of others. If parents have been firm about values and rules in early childhood, less rules are needed and parents as well as other adults should be able to relax and enjoy watching children emerge into adults. This is not quite the same as the implication of popular literature (e.g. Caissy, 1994) which suggests that adults should be willing to accommodate to adolescents' moods and needs.

Many years ago, Winnicott (1960) came up with the concept of "good enough mothering" that Sandra Scarr (1992) has recently renewed as "good enough parenting." Believing there are no typical families or parents, Scarr has suggested that chances are pretty good that unless the family or parents are considerably outside the "norm", they will not ruin their children with their parenting style. Although some

may not accept Scarr's conclusions and consider them controversial, this advice appears to make sense since it allows parents

to trust their judgement with their expectations for what they deem reasonable and acceptable behavior for adolescents. Most adolescents are not victims of their hormones. Adolescents are in fact changing into adults and trying to learn to accept the responsibilities of adulthood. They look to adults and parents to treat them with respect for their emerging capacities but they also need guidance. This guidance could be especially critical in relation to ramifications of the trend towards earlier pubertal maturation which is experienced by the current generation of adolescents.

Baumrind (1996) recently offered suggestions on how to effectively parent which can be related to all adults working with today's youth. Baumrind states adults should focus on the optimal outcome expected for youth today. Three general goals usually strived for are character, competence, and communion. Adolescents with character would be responsible, persistent and able to delay gratification. To be competent, adolescents should be effective at human functioning, e.g., able to support and take care of themselves. Adolescents should also be able to relate with others i.e., communion. Adults who choose these goals for adolescents would probably not accept self-centered, egocentric, angry, critical or impulsive behaviors from adolescents as a "normal" result of puberty and hormonal maturation, and rightly so.

References

Apter, D., Reinila, M., & Vihko, R. (1989). Some endocrine characteristics of early menarche, a risk factor for breast cancer, are preserved into adulthood. *International Journal of Cancer*, 44(5), 783-787.

Baumrind, D. (1996). Parenting: The discipline controversy revisited. *Family Relations*, 45, 405-414.

Bell, R. (1987). *Changing Bodies, Changing Lives: A Book for Teens on Sex and Relationships*. New York: Vintage Books.

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

Blos, P. (1979). *The Adolescent Passage*. New York: International Universities Press.

Bronfenbrenner, U. (1979). *The ecology of human development*. Cambridge, MA: Harvard University Press.

Brooks-Gunn, J. & Graber, J. A. (1994). Puberty as a biological and social event: Implications for research on pharmacology. *Journal of Adolescent Health*, 15, 663-671.

Brooks-Gunn, J., Warren, M. P., & Rosso, J. T. (1988). *The impact of pubertal and social events upon girls' problem behavior*. Unpublished manuscript, Educational Testing Service, Princeton, N. J.

Buchanan, C. M. (1991). Pubertal status in early-adolescent girls: Relations to moods, energy and restlessness. *Journal of Early Adolescence, 11*, 185-200.

Buchanan, C. M., Eccles, J. S., & Becker, J. B. (1992). Are adolescents the victims of raging hormones on moods and behavior at adolescence? *Psychological Bulletin*, *111*, 62-107.

Caissy, G. A. (1994). *Early Adolescence: Understanding the 10-15 Year Old*. New York: Plenum Press.

Cameron, J. L. (1990). Factors controlling the onset of puberty in primates. In J. Bancroft & J. M. Reinisch (Eds.) *Adolescence and Puberty* (pp. 9-28). New York: Oxford University Press.

Cornwell, G. T., Eggebeen, D. J., & Meschke, L. L. (1996). The changing family context of early adolescence. *Journal of Early Adolescence*, *16* (2), 141-156.

Crockett, L. J. & Petersen, A. C. (1987). Pubertal status and psychosocial development: Findings from the early adolescent study. In R. M. Lerner & T. T. Foch (Eds.) *Biological-Psychosocial Interactions in Early Adolescence* (pp. 137-188). New Jersey: Lawrence Erlbaum Associates.

Freud, S. (1905). *Three essays on the theory of sexuality*. Translated and

newly edited by James Strachey (1962). London: Hogarth Press.

Freud, A. (1969). Adolescence as a developmental disturbance. In G. Kaplan & S. LeBovici (Eds.) *Adolescence: Psychosocial Perspectives* (pp.5-10). New York: Basic Books.

Frisch, R. E. (1974). A method of prediction of age of menarche from height and weight at ages 9-13 years. *Pediatrics*, *53*, 384-390.

Frisch, R. E. (1990). The right weight: body fat, menarche and ovulation. *Baillere's Clinical Obstetrics and Gynecology*, *4*(3), 419-439.

Graber, J. A., Brooks-Gunn, J., & Warren, M. P. (1995). The antecedents of menarcheal age: heredity, family environment, and stressful life events. *Child Development*, *66*(2), 346-359.

Graber, J. A., & Brooks-Gunn, J. (1996). Transitions and turning points: Navigating the passage from childhood through adolescence. *Developmental psychology*, *32* (4), 768-776.

Greene, A. L., & Larson, R. W. (1991). Variation in

stress reactivity during adolescence. In E. Mark Cummings, A. L. Greene & K. H. Karraker (Eds.) *Lifespan Developmental Psychology: Perspectives on Stress and Coping*. New Jersey: Lawrence Erlbaum Associates.

Henry, J. P. (1992). Biological basis of the stress response. *Integrative Physiological and Behavioural Science*, 27 (1), 66-83.

Hetherington, E. M. (1989). Coping with family transitions: Winners, losers, and survivors. *Child Development*, 60 (1), 1-14.

- Lancaster, J. B., & Hamburg, B. A. (1986). *School Age Pregnancy and Parenthood. Biosocial dimensions.* New York: Aldine De Gruyter.
- Larson, R., Csikszentmihalyi, M., & Graef, R. (1980). Mood variability and the psychosocial adjustment of adolescents. *Journal of Youth and Adolescence, 9*, 469-490.
- Larson, R., & Lampman-Petratis, C. (1989). Daily emotional states as reported by children and adolescents. *Child Development, 60*, 1250-1260.
- Lerner, R. M., & Foch, T. T. (1987). An overview. In R. M. Lerner & T. T. Foch (Eds.) *Biological-Psychosocial Interactions in Early Adolescence* (pp.1-8). New Jersey: Lawrence Erlbaum Associates.
- Lerner, R. M., Lerner, J. V., & Tubman, J. (1989). Organismic and contextual bases of development in adolescence: A developmental contextual view. In G. R. Adams, R. Montemayor & T. P. Gullotta (Eds.) *Biology of Adolescent Behavior and Development* (11-37). London: Sage Publications.
- Marshall, W. A., & Tanner, J. M. (1986). Puberty. In F. Flakner & J. M. Tanner (Eds.) *Human Growth. A Comprehensive Treatise. Volume 2* (171-209). New York: Plenum Press.
- Molina, B. S. G., & Chassin, L. (1996). The parent-adolescent relationship at puberty: Hispanic ethnicity and parent alcoholism as moderators. *Developmental Psychology, 32* (4), 675-686.
- Montemayor, R. (1986). Family variation in parent-adolescent storm and stress. *Journal of Adolescent Research, 1*, 15-31.
- Nottelmann, E. D., Inoff-Germain, G., Susman, E. J., & Chrousos, G. P. (1990). Hormones and behavior at puberty. In J. Bancroft & J. M. Reinisch (Eds.) *Adolescence and Puberty* (pp. 88-121). New York: Oxford Press.
- Paikoff, R. L., & Brooks-Gunn, J. (1991). Do parent-child relationships change during puberty? *Psychological Bulletin, 110*, 47-66.
- Petersen, A. C. (1987). The nature of biological-psychosocial interactions: The sample case of early adolescence. In R. M. Lerner & T. T. Foch (Eds.) *Biological-Psychosocial Interactions in Early Adolescence* (pp.35-61). New Jersey: Lawrence Erlbaum Associates.

- Petersen, A. C. (1988). Adolescent development. *Annual Review of Psychology*, 39, 583-607.
- Petersen, A. C., Richmond, J. B., & Leffert, N. (1993). Social changes among youth: The United States experience. *Journal of Adolescent Health*, 14, 632-637.
- Petersen, A. C., Susman, E. J., & Beard, J. L. (1989). The development of coping responses during adolescence. In D. S. Palermo (Ed.) *Coping with Uncertainty: Behavioral and Developmental Perspectives*. Hillsdale, N. J.: Lawrence Erlbaum Associates.
- Rubin, R. T. (1990). Mood changes during adolescence. In J. Bancroft & J. M. Reinisch (Eds.) *Adolescence and Puberty* (146-153). New York: Oxford University Press.
- Rutter, M. (1994). Continuities, transitions and turning points in development. In M. Rutter & D. F. Hay (Eds.) *Development through life: A handbook for clinicians* (pp.1-25). London: Blackwell Scientific.
- Scarr, S. (1992). Developmental theories for the 1990's: Development and individual differences. *Child Development*, 63, 1-19.
- Scarr, S., & McCartney, K. (1983). How people make their own environments: A theory of genotype--->environment effects. *Child Development*, 63, 1-19.
- Smetana, J. G. (1988). Adolescents' and parents' conceptions of parental authority. *Child Development*, 59 (2), 321-335.
- Smetana, J. G. (1989). Adolescents' and parents' reasoning about actual family conflict. *Child Development*, 60 (5), 1052-1067.
- Smetana, J. G., & Asquith, P. (1994). Adolescents' and parents' conception of parental authority and personal autonomy. *Child Development*, 65, 1147-1162.
- Steinberg, L. (1981). Transformations in family relations at puberty. *Developmental Psychology*, 14, 683-684.
- Steinberg, L. (1989). Pubertal maturation and parent-adolescent distance: an evolutionary perspective. In G. R. Adams, R. Montemayor & T. P. Gullotta (Eds.) *Biology of Adolescent Behavior and Adolescent Development* (pp. 71-97). London: Sage Publications.
- Steinberg, L. (1990). Autonomy, conflict and harmony in the family relationship. In S. S.

Feldman & G. R. Elliott (Eds.) *At the threshold: The developing adolescent* (pp.255-276). Cambridge, MA: Harvard University Press.

Surbey, M. K. (1990). Family composition, stress and the timing of human menarche. In T. E. Ziegler & F. B. Bercovitch (Eds.) *Socioendocrinology of Primate Reproduction* (pp. 11-32). New York: Wiley-Liss Inc.

Tanner, J. M. (1975). Growth and endocrinology of the adolescent. In L. I. Gardner (Ed.) *Endocrine and genetic diseases of childhood and adolescence* (2nd edition, pp. 14-64) Philadelphia: W. B. Saunders.

Tanner, J. M. (1990). *Fetus into Man. Revised and*

Enlarged. Cambridge: Harvard University Press.

Udry, J. R. (1990). Hormonal and social determinants of adolescent sexual initiation. In J. Bancroft & J. M. Reisch (Eds.) *Adolescence and Puberty* (pp. 70-87). New York: Oxford University Press.

Winnicott, D. W. (1960). Ego distortion in terms of true and false self. In *The maturational process and the facilitating environment*. New York: International Universities Press.

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