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## CME Review Article

**Editor's Note:** This is the first of four articles to be published in 2004 for which a total of up to 4 Category 1 CME credit hours can be earned. Instructions for how credit hours can be earned appear after the Table of Contents. Exam questions will appear after the article.

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# The First Three Years of Life and the Early Adolescent: Influences of Biology and Behavior - Implications for Child Rearing

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### Target Audience

*This CME activity is intended for physicians, medical students and nurse practitioners. Pediatric emergency department physicians, emergency physicians, pediatricians, and family practitioners will find this information especially useful.*

### Learning Objectives

*After completion of this article, the reader will be able to:*

1. Discuss influences of biology and behavior in the beginning of the first two decades of life: the first three years and the early adolescent years.
2. Summarize how the first 3 years of life impact early adolescent years and subsequently shape dynamic development throughout adult life.
3. Describe the applications for child rearing from infancy through adolescence.
4. Discuss that consistency is the factor that best characterizes effective parenting of children and adolescents.
5. State the period in which the increase in maturation of the central nervous system (CNS) and brain size occurs.

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### Abstract

Each person has a unique beginning, based on countless phenomena of biology and environment that have long perplexed scientists and society in general. This discussion focuses on selected comments regarding the influences of biology and behavior in the beginning of the first two decades of life: the first three years and the early adolescent years (10-14 years). These two important periods in human development have many parallels and differences; indeed, events that occur in the first 3 years of life impact the early adolescent years and subsequently shape dynamic development throughout adult life. The article concludes with applications for child rearing from infancy through adolescence. *Int Pediatr.* 2004;19(2):70-78.

**Key words:** adolescent, biology, behavior, influences, child rearing, human development, infancy

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*"The boundary between biology and behavior is arbitrary and changing. It has been imposed not by the natural contours of disciplines but by lack of knowledge."*<sup>1</sup>

### Introduction

Human life starts out as a marvelously complex, single cell that leads to the production of billions of cells and the formation of a human being. Despite the harshness of life, there are over 6 billion humans on our planet in 2004, paralleling the 6 billion or more humans who have preceded us. Each person has a unique beginning, based on countless phenomena of biology and environment that have long perplexed scientists and society in general. Though amazing progress has been made in the 20<sup>th</sup> century in understanding human development (indeed, even in the past decade!), we are far from understanding these

issues. This discussion focuses on selected comments regarding the influences of biology and behavior in the beginning of the first two decades of life: the first three years and the early adolescent years (10-14 years). These two important periods in human development have many parallels and differences; indeed, events that occur in the first 3 years of life impact the early adolescent years and subsequently shape dynamic development throughout adult life.

### **Growth**

The physical growth of young children and young adolescents is unparalleled in human development, with the exception of *in utero* growth. Newborns triple their birth weight by age 1 and achieve a weight 4 to 5 times their birth weight by age 3 years; they gain 50% of their birth length by age 1 year and nearly double it by age 3 years of age.<sup>2,3</sup> The young adolescent enters the process of puberty that results in gaining 25% of final adult height (up to 10 cm per year), gaining 50% of the ideal adult body weight, doubling of major organs, maturation of facial bones, decrease in lymphoid tissue, genital maturation and perhaps most remarkable of all, central nervous system (CNS) maturation.<sup>4,6</sup> In both early childhood and early adolescence, rapid growth combines with the refinement of old skills and attainment of new skills—all preparing for challenges of future life needs. Deficits in physical development (whether congenital or traumatic in nature) can have major emotional and psychosocial implications for later life. Children and adolescents are capable of profound progress or retardation in their social, emotional and moral development—depending on the positive and negative influences in their lives.

### **CNS Maturation**

It is the maturation of the central nervous system in both children and adolescents that has major impact on their behavior as children, adolescents and eventually, as adults. The young child experiences CNS maturation with increase in brain size while the young adolescent undergoes CNS maturation without increase in brain size. Clinicians, parents and society spend considerable time dealing with the effects of CNS maturation in children and also with the genital and CNS maturation in adolescents.

The developing brain consists of billions of cells comprised of *neurons* that do the brain's work and the *glia* that support neurons by supporting, nourishing and even cleaning them up.<sup>1</sup> Once the number of brain cells are in place (by late fetal life), the work of CNS pruning and differentiation takes place—work that is very intense in both the young child and the young adolescent.<sup>7,8</sup> Though 75% of brain growth (in weight) has developed by age 2, the processes of CNS maturation takes place for the rest of this child's life. After birth, the brain must develop extensive interconnections between its many neurons and these changes include the process of myelination of axons to greatly increase nerve conduction speed and efficiency. The young child and young adolescent undergo complex CNS changes to mature the brain circuitry and allow rapid development in cognitive/thinking processes and in general, allow adaptation to new environmental influences including that of parents. Neurologic insults in early childhood and early adolescence can have major adverse impact on later development.

The CNS is highly susceptible to infections and toxins (ie, alcohol, tobacco, cocaine, others) introduced during pregnancy that cause profound injury to the baby's development.<sup>9</sup> These toxin-induced changes can be seen in both the young child and the young adolescent who were exposed *in utero* and who need an intact CNS system to deal with the many changing processes in their lives. Malnutrition can cause enormous detrimental effects on the CNS of the young child and young adolescent. Malnutrition is often imposed on the young child by the environment that directly restricts food while malnutrition in the young adolescent can also be observed in the disorder of *anorexia nervosa*—in which the adolescent (usually female) accepts the environmental pressure from Western culture to be thin and fights the biological constraints of a normal, but non-thin physique. Advances in obstetrics and neonatology have reduced the threats of delivery on the newborn's brain development. However, threats from the environment remain to cause considerable brain injury from violence, malnutrition, poverty, war and others. The brain also remains susceptible to the adverse effects of chronic stress.

A poorly understood, yet important concept is the *plasticity* of brain tissue—that the brain cells have an astonishing capacity to adapt to changes and challenges

that occur throughout life.<sup>10</sup> The experience of the individual can influence these changes as well. The interconnectedness of brain cells or brain circuitry is improved by environmental stimulation throughout life, but especially in the young child. There are critical times when appropriate, timely stimulation must occur, as noted in the child's ability for binocular vision, language ability and even the development of affection bonds. Environmental stimulation is also important for the young adolescent who is undergoing profound CNS changes as well.

The number of brain cells that develop *in utero* is as many as 70% more than the number required for life as an adult.<sup>1</sup> This *initial redundancy* is reversed and the CNS undergoes a profound pruning or sculpting process that begins in late fetal life and continues in post-fetal life, with acceleration points in early childhood and early adolescence.<sup>11</sup> The excess number of CNS cells results in a process called *apoptosis* or *programmed cell death* in which factors needed for the survival of a cell are removed, leading to death of that cell. There is a massive removal of cortical synapses, with loss of up to 30,000 synapses per second during the early teen years. As puberty proceeds, half of cortical synaptic connections present before puberty are removed. The resultant neurobiological changes in childhood and adolescence are immense. For example, changes in the brain dealing with speech and language skills accelerate and peak in early adolescence; acquisition skills for a second language diminish after that.

Other important concepts of development include the influence of culture and also human relationships on human development in both children and adolescents. Though both age groups demonstrate much resilience, both are vulnerable to many insults and need considerable protection in growing up, starting with protection and nurturance from parents. It seems to be an oxymoron, but development in both age groups is both robust and highly vulnerable to many environmental threats. Development in both is influenced by sociocultural beliefs and practices. Also, both young children and young adolescents are naturally eager to explore and master their environments. Yet, they are capable of developing profound sadness and disorganization as a result of loss and personal rejection. The nurturance and guidance of parents is critical in this regard.

## Neurodevelopmental Approach

A neurodevelopmental approach that clinicians take in caring for children and adolescent seeks to keep these various factors in mind, recognizing that cognitive/motor development reflects a brain under construction. Neurodevelopmental domains of function are used to evaluate the CNS construction in children and adolescents. These domains are placed in various categories, such as *physical* or *somatic (growth)*, *neurological, motor (gross and fine)*, *visual, cognitive, auditory, language, kinesthetic, psychosocial, perceptual-motor, integrative* and *adaptive*.<sup>12,13</sup> During early stages of maturation, the baby changes to accept the demands of later childhood, while the young adolescent changes to prepare for life as an autonomous adult. The first three years of life prepare the newborn to survive life's first decade, while puberty allows survival in the second decade of life and beyond. A major difference between the two age groups is:

- 1) The 1 to 3 year old (and older) is in the skills acquisition state and does not have the cognitive, physical, motor, social, emotional or perceptual abilities of the adolescent. These young children are unable to recognize or avoid any forms of danger. Therefore, parents must take a very physically and verbally active ("hands on") approach to guiding and facilitating.
- 2) Even though the adolescent is also acquiring skills, it is with higher order skills in the functional domains. At this stage of development, adolescents can recognize overt forms of danger and can engage in basic cognitive and physical processes to avoid direct and clear forms of danger. Parents need to have a very active approach in verbally interacting to help their child engage in problem solving and using all of their cognitive skills. They remain there to protect but do not use a "hands on" approach needed for the younger child.

Piaget<sup>14,15</sup> wrote about 4 basic cognitive stages in childhood development:

- 1) Sensorimotor Stage (Birth to 2 years).
- 2) Preoperational Stage (Ages 3 to 6).

- 3) Concrete Operational Stage (7 to 11 years).
- 4) Formal Operational Stage (12-16 years and/or to adulthood).

In this system, complex sensory motor skills are acquired by age 2 while language acquisition, elementary logic and more complex reasoning skills are added in the 2 to 7 age group. Most young adolescents (ages 10-12) are in the *Concrete Operational Stage* in which more complicated skills are handled in the home and outside the home (as in school, for example). This young teen can better understand symmetrical relationships and how to appreciate concepts involving various serializations. They learn to enjoy learning and can take pride in increasingly complex educational accomplishments—especially if they are developing a healthy self-image and feel secure within a stable home environment. Some children develop cognitive skills at rates different from the average.

A major limitation of this stage is noted by the term *concrete*—the young adolescent has considerable difficulty with futuristic thinking. Their thinking skills are “concrete”, as if placed in a block of stone, and they deal with present issues only. Thus, it is often difficult to counsel a 12-year-old smoker not to use cigarettes because of lung cancer that may develop 20 to 40 years later. A 12-year-old female who is sexually active may not appreciate the newborn delivery that may be 9 months away or the lifetime consequences of a sexually transmitted disease (as genital herpes or HIV/AIDS).

At this stage of development, attempts to address these issues with counseling techniques are difficult. Counseling involves dealing with present consequences of one’s actions. Also complicating the counseling process is the tendency of many young adolescents for “magical thinking” in which they feel that nothing bad will happen to them, even if involved in dangerous activity—as reckless driving or sexual activity without contraception.

Contrast a problem in a 2 to 3 year old versus the same problem in a young adolescent. The problem may involve the 2 or 3 year old having a fight with a playmate.

The solution involves the intent to teach *appropriate* social skills—appropriate to the overall development of the 2 or 3 year old who speaks in simple language while demonstrating physically. You must understand

that the child is only able to engage in parallel play. Thus, the solution is to gently separate these two children and engage them in separate activities. However, by early adolescence, you can counsel the individual on how to act in such a situation. The counselor can speak in simple language and ask the adolescent to repeat, then explain what you meant by your words. The parent or counselor can offer a practice example and ask the adolescent to tell how one would solve the problem. Coach the youth through the process. If the adolescent experiences a similar situation, process with the adolescent afterwards and ask to evaluate the youth’s actions and brainstorm on how it will be handled in the future.

As we learn about the complex neurobiological and neurobehavioral changes occurring in childhood, we can observe the development of our children, understand what is happening and help the process along in a positive manner.<sup>16-18</sup> The CNS will allow adoption of behavior based in large part, on the environmental stimulation it receives over many years. Here are two examples of parental problem solving techniques and the evolution of parental interventions from infancy to adolescence.

### **Example One: Conflict Resolution with Love**

At age **3 months**, Rodrigo is screaming, his face is wrinkled up, his legs are flailing, and his eyes are tightly shut. You (the parent or other caretaker) pick him up and rock and sing to him. You feel his abdomen and it is soft. You feel his forehead and it is a normal body temperature. He continues to cry but the intensity level has decreased. You realize he is being soothed, so you add bouncing to the routine. He has been fed, so you know he is not hungry. The crying diminishes so that now he is sobbing. You guess that your efforts are working so you add walking to the bouncing, rocking, singing and holding routine. Rodrigo stops crying and falls asleep. Whew! You fixed the problem! The next time this happens you know what to do. Then another time the screaming starts but Rodrigo’s abdomen is hard and his forehead is hot. You know that you must do something different. You do that and he gets better, he is now just crying, the gas has gone and the forehead feels normal. You go back to your old tricks. Once again you fixed the problem.

Now the key **interventions** of the parent were physical actions, your physical closeness, the sound of your voice – you determine that your child just needs your attention. When Rodrigo was “sick” you used some home remedy interventions to relieve the crying and the gas and then your “attention” interventions. Now if none of this works and you realize your child is really in need of medical care, you seek out that care and then you follow your physician’s direction. Once again things get better and you add your “attention” interventions and things get better.

Now Rodrigo is **two-years-old**. He is not physically injured or medically ill. Rodrigo is screaming, his face is wrinkled up, his legs are flailing, and his eyes are tightly shut. You offer him his favorite toy, make the toy interact with him and talk, sing or walk with him. Rodrigo stops screaming. He continues to cry but the intensity level has decreased. You realize he is being soothed, so you add a little dance to your routine, laughing, and tickling him. The crying diminishes so that now he is sobbing. You guess that your efforts are working so you pick him up and dance with him and add walking to the bouncing, rocking, singing and holding routine. Rodrigo stops crying and begins to play. Whew! You fixed the problem! What a wonderful parent you are! Now the key **interventions** were physical actions, your physical closeness, the sound of your voice, and your efforts to distract your child – you determine that your child just needed your attention.

Now Rodrigo is **5-years-old** and the miracle of CNS maturation has continued. He is not physically injured or medically ill. Rodrigo is screaming, his face is wrinkled up, his legs are flailing, and his eyes are tightly shut. You ask Rodrigo what is wrong. He continues to scream. You touch him gently and ask “are you okay, sweetie?” He says no, and you ask “what can I do to help you?” (He can’t continue to scream while he is answering your questions). He is only crying now and says nothing. So you say, “Well, let’s walk over here and you can help me....” (a distraction technique). Or you offer him his favorite toy, make the toy interact with him and talk, sing or walk with him. He continues to cry but the intensity level has decreased. You realize he is being soothed, so you being to talk to him. Perhaps you can say, “you sound mad,” (or “frustrated” or “angry”) and begin to engage him in a dialogue to discuss his feeling. Once he says “I’m mad” or “no, I’m not mad. My brother,

Leandro, was being mean to me and he hit me and hurt my feelings” or something to that effect—you can then begin to discuss his feeling more and ask him what he would like you to do. You can begin to engage in gentle problem solving by asking him what he would like to do and if what he would like to do is socially inappropriate, you can gently suggest appropriate actions. At any rate, you guess that your efforts are working and so you continue to interact with him until he is ready to disengage. Whew! You fixed the problem! Now the key **interventions** were your physical closeness, the sound of your voice, and your efforts to distract your child – you determine that your child needs your attention, support and guidance. You were able to adapt your responses to appreciate his growth and development, yet apply needed concepts of parental nurturing.

Now we jump ahead in time and Rodrigo is **13-years-old**. He is healthy, not physically injured, or medically ill. Rodrigo is screaming, his face is wrinkled up, he is swinging his bat at tree limbs very aggressively, You call his name loudly, but not in a mean or angry voice. When he looks at you and says “what?”—you tell him to put the bat down so you can talk to him. Once this is done, you walk over to him and you ask Rodrigo what is wrong. He says “nothing.” You touch him gently and ask “are you okay?” He says no, and you ask “what can I do to help you?” He is still crying quietly but says nothing. So you say “Well, when I use to hit things or kick at things and scream, I was really mad about something.” “Are you mad?” He says “Yes, I am mad too.” You say, “so tell me, what you are mad about.” And then you can continue to ask open ended questions until he calms down and is ready to problem solve. If he will not talk, then you can distract him by saying “let’s go for a walk,” or “let’s go and do something” or “let’s run to get rid of the anger for now.” Once again, you guess that your efforts are working so you continue to interact with him until he is ready to disengage. Whew! You fixed the problem!

Now the key **interventions** were getting his attention, getting him to stop the dangerous behavior, getting rid of the dangerous object so you don’t get hurt, your physical closeness, the sound of your voice – you determine that your child needs your attention, support and guidance. You appreciate his CNS maturation. **Notice** that active or forceful physical intervention or action is not used any longer. These same techniques are useful at any age (absent physical

intervention or “hands on”). What you have done over the years is communicate to your child that you, the parent, are there, that you will pay attention, that you will help, and that when he is upset, that he can engage in activities to soothe himself and you will be soothing too. During adolescence the only physical contact should be hugs, hand shakes, pats on the back for something good. Another important intervention is that since birth you have used your physical closeness, your voice and verbal interaction as soothing tools. Therefore, talking with you will be a normal part of problem or conflict resolution for you and your child.

### **Example Two: Safety and Autonomy**

Gabriella is **two-days-old**. You bring her home from the hospital. You prepare a bed that meets all the safety guidelines. You follow your pediatrician’s recommendations about how to place her in her crib for sleeping. You place a baby monitor in her room so you can hear her should you be able to stop gazing at her beauty. You purchase fire retardant clothing and blankets. You don’t allow anyone to smoke around her. You do everything in your power to keep her safe. She doesn’t need autonomy yet!

Whenever Gabriella orients to you or looks at you, you coo softly, you laugh and you tell her how beautiful she is and how much you love her. As she grows and looks at you or smiles, or coos— you engage in the responses above. As she grows and reaches for you, or does anything appropriate or within developmental expectations you reward that behavior with smiles, gentle touching, laughter, coos, and expressions of affection. You cuddle her and engage in the same responses. Whenever you touch her you do the same. You are teaching her that your closeness, and her behavior make you happy and all she has to do is be herself.

Gabriella is now **7-months-old** and is crawling and she is very curious. She is exploring her world! You now must broaden the safety net. Now you survey the floors to make sure there are no small objects. You put gates across doorways and stair ways to prevent falls. You make sure there are no objects hanging within her reach that she could pull down and hurt herself. You put safety locks on all doors and furniture that can be opened and reveal dangerous objects or close to pinch little fingers. You de-claw the cat and never

leave Gabriella alone with the dog. You make sure all of her clothes have no hanging cords and that she can’t sit on the blind side of doors that can be opened and hurt her. You keep her in eyesight and under supervision at all times when she is awake. You still use the baby monitor when she is in her crib that has been lowered to the lowest level so she can not pull up and possibly come out of the crib. If you see her move towards danger, you say “no, no” in a firm voice and remove her physically from the danger. You engage in all the loving and rewarding responses to her appropriate behavior as described above.

Gabriella is now **three-years-old**. She is running, climbing, crawling and talking and has learned to get you to come when she wants and how to entice you to get her what she wants. Keeping her safe continues to take the same effort (if not more!) as her central nervous system maturation continues. The gates are still necessary and now it is essential to make sure doors to the outside are locked. Gates to fences are child proof. Her world is larger but you still keep her in your eyesight. You still have the baby monitor but now she is in a bed with side rails so she won’t fall out. She is not in the crib because you found her climbing out and when you screamed she fell on the floor. Luckily she wasn’t bruised or seriously hurt. You went out and bought a bed. When she moves towards danger, you say “no, no” and physically remove her from danger. Because you are watching her, you often can prevent problems because you see the gleam in her eye when she spots a forbidden object and moves toward it or begins to engage in an unwanted behavior. She is exploring her world with a never-ending curiosity!

Now Gabriella has excellent CNS maturation and she was toilet trained at 19 months. So at three years old, she is such a smart girl, that she is into more and more exploration. Guess what? One day you came in and she had found daddy’s razor and was shaving. Luckily she only received a minor cut before you intervened. You learned not to actually leave an area where she is, but simply stand where she could not hear you. Whenever Gabriella uses the toilet, wipes herself (you always check to make sure she is dry), and flushes the toilet, you praise her efforts. You engage in all the loving and rewarding responses to her appropriate behavior as described above but you add words like “big girl,” “good job,” “that makes me happy,” “I like that kind of behavior, great,” etc.

**Interventions Used.** Constant supervision and physical intervention are essential. Notice no spanking or hitting or yelling interventions were offered as interventions. Gabriella lives in a structured but enriched environment where she learns how to make her parents happy. When she is doing something that places her in danger, she learns that her parents are not happy but they will protect her. She learns to comply when told “no, no” so that she removes herself from the danger before you actually reach her. So when you do reach her, you gently shake her hand, pat her back, or kiss her on the cheek or forehead and accompany her to safety.

Gabriella is now **13-years-old** and wants to go to the mall with her friends. She has been a very compliant child for the most part. When she engages in inappropriate behavior, you can usually talk with her and she can tell you how she will keep herself from engaging in that behavior in the future. And she usually can be counted on to do what she said—you trust her. She is really proud of herself when she makes you happy. And she knows what makes you happy – her safety. Now you have talked to Gabriella about how engaging in smoking, drinking, and sexual activity will keep her from being safe. You have discussed your values and morals with her. She clearly knows that stealing is wrong. Another important thing, when Gabriella was four and five years old and told you a lie, you patiently helped her feel safe enough to tell the truth. She learned that she could tell you the truth and you would be happy with her behavior. She learned that if she lied, you would be unhappy with her behavior. She also learned that when someone made fun of her, they had a problem because her parents thought she was special and told her so. She thought her parents were beautiful and she looked just like them; therefore, she, too, was beautiful. She believed that her parents were happy with her; so if someone else was not, it hurt her feelings but she was able to talk to her parents about it.

Well, Gabriella wanted to go to the mall with her friends. You were not very comfortable but you did trust Gabriella. Well, the girls went to the mall. Two of her friends left with some boys. Gabriella refused to go and called you to come get her. Good news! You were in the parking lot of the mall and when your cell phone rang you were able to be there to pick her up within a couple of minutes. You told Gabriella how

proud you were of her for keeping herself safe. You also did something that made Gabriella very mad but you explained why. You drove around the mall and found the girls walking to the car with the boys. You stopped, and said, “Hi... I came to get Gabriella and wondered if you would like a ride too.” The girls were so embarrassed, that they got in the car. You then asked the girls if they would like to go back to the mall and you would be happy to wait for them. They quickly agreed. You saved Gabriella and her friends from great embarrassment and kept them safe.

**Interventions.** At this stage of development, you can not always give total visual supervisions, but you can always be close by. Your children will not like it but your main job is to keep them safe. You can wait in the parking lot of the mall, shop in a different section of the mall but you always need to be available. Their CNS has matured to a wonderful degree, but their safety needs are still present.

Gabriella has grown into a beautiful young woman. At age 16½ years, she has her driver’s license, works part time at the local store, baby sits for the neighbors occasionally, saves her money, has good grades and wants to go to college. Gabriella has had her driver’s license for 3 months. She has not received any tickets. The rules you established were that within the first six months of driving, she could not have any friends in the car with her, she could not drive after 9 p.m. and she had to always wear a seat belt. She said that you were being too strict again but agreed to obey your rules. One Monday, you forgot a paper you needed for work at home. It was lunch time, so you decided to go home and retrieve the paper. On your way, you see Gabriella with four friends in the car. She was laughing and talking and enjoying her friends. She did not see you. You are very upset but decide not to embarrass her but to address the issue later when you arrived home.

That evening when Gabriella came home from her job, you told her that there was a problem and the two of you needed to talk. Rather than asking her what she did for lunch and potentially having her lie and escalate the problem, you take the direct approach: You say, “Gabriella, I came home for lunch today, and on the way I saw you and several of your friends in the car. You were driving down the local highway. I am

very disappointed with your behavior and your disobedience.”

Gabriella is angry at first and says, “Why were you spying on me! I hate you for invading my privacy!” You ignore this comment because you know it is meant to distract you and divert the conversation away from her driving behavior. Instead you say, “Gabriella, do you understand why I am upset?” After a few minutes of silence and crying, Gabriella says, “Yes, I broke the rule of keeping myself safe. You told me that many teens have accidents the first six months they drive. And by having other people in the car, I put them at risk too.” You say, “I am very proud that you have such good thinking skills most of the time.” Now, for violating our family rule, you must give me your keys. You can not drive for the rest of the week, and I want you to write me a 5 page paper about the ways you are expected to keep yourself safe.” Gabriella is again angry but accepts the punishment. She says, “How am I going to get to work and school until I can drive again?” You answer, “You have parents, either one of us will transport you until then. It will be fun for us because we will get to see you more and get you all to ourselves”

**Interventions.** There are at least four key factors that were at work here: First, you did not try to trap your child. You did not set her up to lie when she was in a tough situation because you know that most people lie for three reasons: a) to keep from losing something valuable (freedom, the car, or a valued object); b) to prevent experiencing pain (corporal punishment, verbal abuse, rejection); c) to gain access or possession of something or someone of value. So you did not put your child in that position. Second, you made the punishment fit the crime or made it reasonable so that it supported the lesson or value you wanted learned. Third, you made sure your child knew you were punishing the behavior, but you still liked and respected her by your last comment that made it clear that her parents loved being with her. You could have made her feel bad by letting her know that taking her to school every day for the rest of the week would be an imposition. **Finally**, because you have built on the safety issues, family values, trust, and your love of being with her throughout her life, it is easier to engage in this kind of interaction. Indeed, with all the complexities of biology at work in your child’s growth and development, you, the knowledgeable parent, can

provide positive influences in the maturation of your child.

## Conclusion

In conclusion, there are many similarities and differences between the needs of children in the first three years of life and early adolescence. One might ask: “Is nature more important than nurture in a child’s development?” The answer is No! Both are intertwined in a complex cascade of neurobiological and neurodevelopmental events that take the child from a single cell into an autonomous adult who may make positive contributions to society long after you are gone. Because of the genital maturation occurring in adolescence, they can have her own children and, using the lessons learned from you, can produce their own wonderful offspring.

*La dulce vida! La dolce vita! Life is beautiful!*

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First Three Years of Life & the Early Adolescent

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**Quarterly CME Program**  
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**CME EXAMS AVAILABLE IN THIS ISSUE**

Available in print and online:

**The First Three Years of Life and the Early Adolescent: Influences of Biology and Behavior -  
Implications for Child Rearing**

Available online at: [www.int-pediatrics.org](http://www.int-pediatrics.org)

**Program Pricing**

All responses must be prepaid: \$15 per exam.

**Objectives**

After evaluating a specific article published in the *International Pediatrics*, participants in the *International Pediatrics* Quarterly CME Program should be able to demonstrate an increase in, or affirmation of, their knowledge of clinical medicine. Participants should be able to evaluate the appropriateness of the clinical information as it applies to the provision of patient care.

**Participants**

This program is designed for physicians who are involved in providing patient care and who wish to advance their current knowledge of clinical medicine.

**Credits**

Miami Children's Hospital designates each *International Pediatrics* Quarterly CME program a maximum of hour of category 1 credit toward the AMA Physician's Recognition Award. Each physician should claim only the hours of credit that he or she actually spent on the educational activity.

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Please view CME questions on the following page.

**CONTINUING MEDICAL EDUCATION**

June 2004

**EXAM POSTMARKED DEADLINE: DECEMBER 31, 2004**

**The First Three Years of Life and the Early Adolescent: Influences of Biology and Behavior - Implications for Child Rearing** Greydanus DE, Pratt, HD, Patel, DR. *Int Pediatr* 2004;19(2)70-78.

**QUESTIONS**

1. **The pubertal growth spurt results in what percentage of adult height:**
  - a. 5%
  - b. 10%
  - c. 25%
  - d. 35%
  
2. **What percentage of brain growth (weight) occurs by 1 year of age:**
  - a. 25%
  - b. 50%
  - c. 75%
  - d. 90%
  
3. **The concept that the brain cells have a tremendous capacity to adapt to changes and challenges is called:**
  - a. Apoptosis
  - b. Interconnectedness
  - c. Differentiation
  - d. Plasticity
  
4. **An increase in central nervous system (CNS) maturation with an increase in CNS brain size occurs in which period:**
  - a. Young child
  - b. Young Adolescent
  - c. Older Adolescent
  - d. Young Adult
  
5. **The factor in parents that best characterizes effective parenting of children and adolescents is:**
  - a. Authority
  - b. Consistency
  - c. Education
  - d. Kindness

**PAYMENT INFORMATION**

**Program Pricing**

**All responses must be prepaid: \$15 per exam.** Credit card payment must accompany exam. No checks accepted.

**Credit Card Information**

- American Express
- MasterCard
- Visa

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CREDIT CARD NUMBER

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EXPIRATION DATE

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SIGNATURE

Each participant will receive a confidential report of his or her results along with an explanation of the correct answer to each question. A certificate of credit will be sent to those who successfully complete the examination.

**CUSTOMER INFORMATION**

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NAME

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E-MAIL ADDRESS

\_\_\_\_\_  
MEDICAL SPECIALTY

**PROGRAM/EXAMINATION EVALUATION**

1. Were the stated program objectives successfully met?

A. Yes

B. No

C. Partially (please explain) \_\_\_\_\_

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2. Were the selected article and related questions relevant to your practice?

A. Yes

B. No (please explain) \_\_\_\_\_

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3. Do you anticipate that participation in this program will result in any behavioral change in your delivery of patient care?

A. Yes (please indicate the behavioral change that you anticipate) \_\_\_\_\_

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B. No

**Please fax the completed forms to (305) 663-8446 or mail it to International Pediatrics Quarterly CME Program, Miami Children's Hospital, 3100 SW 62<sup>nd</sup> Avenue, Miami, FL 33155 (USA). All responses must be prepaid.**