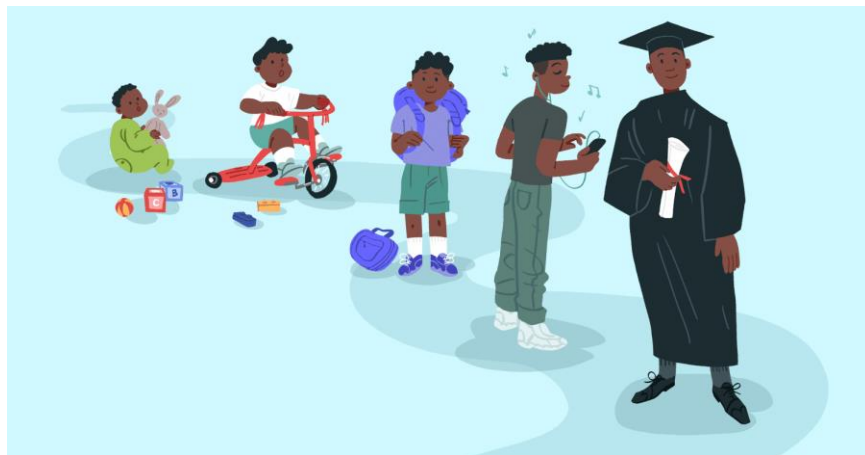


# **Child and Adolescent Development**

## **Participant Workbook**



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## Learning Objectives:



- Discuss the importance of human development to prevention
- Describe foundational development theories
- Illustrate patterns of life changes related to emotional, social, and moral development
- Explain how ATOD affects the adolescent brain differently than the adult brain.

# Abraham Maslow



One theorist who has a somewhat different slant is Abraham Maslow. Maslow introduced his theory of human development in the 1960's, conceiving of human needs in the form of a hierarchy, with lower needs taking priority over higher-level needs.

Maslow conceived of seven levels of human needs, from the most basic which appear at the base of the pyramid, to the higher needs

which appear toward the top. He divided these seven levels of needs into two major categories: deficiency needs and growth or being needs. The bottom four needs on Maslow's Hierarchy are termed deficiency needs while the top three are termed growth or being needs. He thought that people's behavior will be motivated by their more basic deficiency needs, such as physiological, safety, and belongingness, before they could be concerned with meeting their higher growth or being needs. So if a person is concerned about having adequate housing, having enough to eat, or having other basic life necessities, that person will be motivated to act in ways that will help fulfill these needs and may not be very interested in higher-level needs, such as improving their mind with new knowledge, developing new life skills, or appreciating the arts.

Deficiency needs are "deficits in the organism, empty holes, so to speak, which must be filled up for health's sake and furthermore must be filled from without by human beings other than the subject" (Maslow, 1968). Deficiency needs, such as physiological needs (hunger, thirst), safety needs and needs for belongingness and self-esteem motivate behavior designed to fulfill these needs.

Growth needs, or "being needs," involve a drive toward self-actualization. They do not strive for homeostasis or tension-reduction, as lower level needs do, Instead they may cause a person to seek tension, or disequilibrium as Maslow called it, in seeking to fulfill these higher-level needs. Baumrind and Moselle (1985) described adolescence as "a process characterized by alternating periods of relative disequilibrium and equilibrium"

Self-actualizers achieve a level of success in the world beyond the satisfaction of basic physiological or emotional needs. Because their deficiency needs are largely met, they are more motivated by being needs.

Maslow talked about "peak experiences" as mystical or transcendental experiences in which the individual feels valuable, good and worthwhile, and often involves a sense of wonder, awe and unity with the universe. These experiences appear unexpectedly and can be frequent small events of awareness as well as major occasions of enlightenment.

Maslow also referred to what he called a “plateau experience,” a low-key, less intense experience offering a more enduring sense of sacredness and unity. These experiences can be earned through work, discipline, study, and commitment to spiritual practice.

## Jean Piaget

Swiss biologist and psychologist Jean Piaget is renowned for constructing a highly influential model of child development and learning. Piaget's theory is based on the idea that the developing child builds cognitive structures--in other words, mental "maps," schemes, or networked concepts for understanding and responding to physical experiences within his or her environment. Piaget further attested that a child's cognitive structure increases in sophistication with development, moving from a few innate reflexes such as crying and sucking to highly complex mental activities.

*Piaget's Four Stages of Cognitive Development*

Birth to 2 years of age	<b>Sensorimotor Stage:</b> The infant constructs an understanding of the world by coordinating sensory experiences with physical actions: progressing from reflexive, instinctual action at birth to the beginning of symbolic thought toward end of the stage.
2 to 7 years of age	<b>Preoperational Stage:</b> The child begins to represent the world with words and images. These words and images reflect increased symbolic thinking and go beyond the connection of sensory information and physical action.
7 to 11 years of age	<b>Concrete Operational Stage:</b> The child can now reason logically about concrete events and classify objects into different sets.
11-15 years of age through adulthood	<b>Formal Operational Stage</b> The adolescent reasons in more abstract idealistic and logical ways.

According to Piaget, two major principles guide intellectual growth and biological development: adaptation and incorporation. For individuals to survive in an environment, they must adapt to physical and mental stimuli. Assimilation and accommodation are both part of the adaptation process. Piaget believed that human beings possess mental structures that assimilate external events and convert them to fit their mental structures. However, mental structures also accommodate themselves to new, unusual, and constantly changing aspects of the external environment.

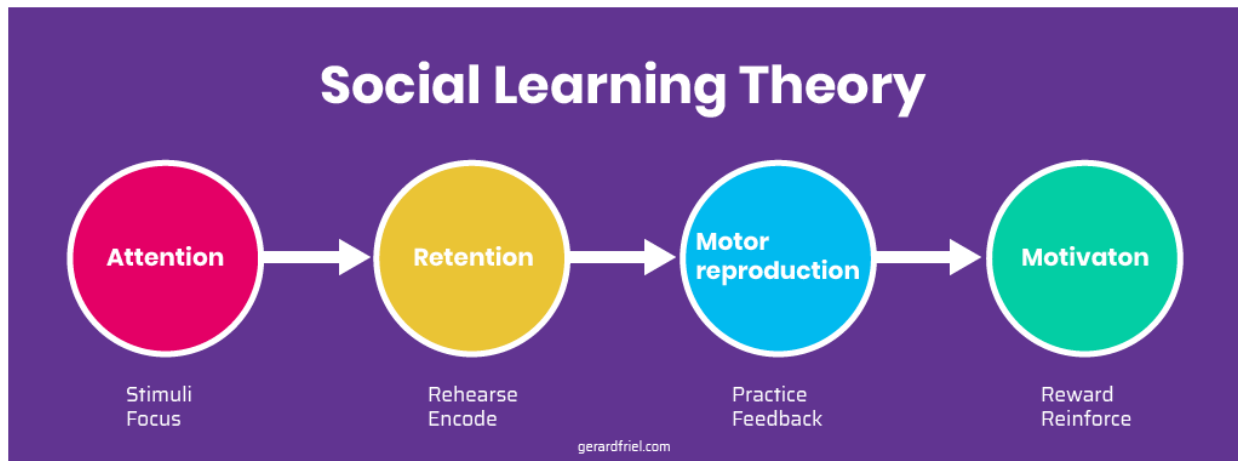
We function best when assimilation and accommodation are in equilibrium, meaning that we are able to draw on past experience and to respond to changed circumstances with new ways of thinking.

Piaget identified four major stages: sensorimotor, preoperational, concrete operational and formal operational. Piaget believed all children pass through these phases to advance to the next level of cognitive development. In each stage, children demonstrate new intellectual abilities and increasingly complex understanding of the world. Stages cannot be "skipped"; intellectual development always follows this sequence. The ages at which children progress through the stages are averages--they vary with the environment and background of individual children. At any given time a child may exhibit behaviors characteristic of more than one stage.

In what ways do you think that cognitive development influences the type of prevention activities and services that should be delivered?

Applying Piaget's theory results in specific recommendations for a given stage of cognitive development. For example, with children in the sensorimotor stage, educators should try to provide a rich and stimulating environment with ample objects to play with. On the other hand, with children in the concrete operational stage, learning activities should involve problems of classification, ordering, location, conservation using concrete objects.

## Albert Bandura: Social Learning Theory



- Observation & Attention: This process surrounds the acquisition of the attention of the learner. Acquisition can be based on such factors as sensory capacity, arousal level, and past reinforcement.
- Retention: This process involves the learner accessing symbolic coding of the behavior that has caught their attention.
- Motor Reproduction: The physical reproduction of the activity through physical capability, observation and feedback
- Motivation through consequences: This process includes external, vicarious and/or self-reinforced motivation

Self-Efficacy – Belief in one’s capabilities to organize and execute courses of action required to produce given attainments. Regulates aspirations, behavior courses, effort and affective reaction.

Efficacy judgments are judgments of capability rather than judgments of worth.

It affects:  
How people think  
Feeling  
Motivation  
Behavior

People who doubt their capabilities:

- Shy away from difficult task
- Give up quickly
- Have low aspirations
- Dwell on deficiencies, formidableness of task
- Focus on adverse consequences of failure
- Thus they undermine their efforts by
  - Diverting attention from effective thinking
  - Being slow to recover from setbacks
  - Falling easy victim to stress and depression

People who have strong beliefs in capabilities:

- Approach difficult task as challenges to be mastered
- Foster interest
- Set challenging goals and maintain commitment to those goals
- Have high effort
- Thus they
  - Think strategically
  - Quickly recover after failure
  - Reduce stress

Efficacious people do not place their fate in the hands of others.

Principle sources of Self-Efficacy

- Mastery experiences
- Vicarious experiences
- Verbal persuasion and social influences
- Physiological and affective states

Self-efficacy is concerned with the orchestration of skills. “Self-Doubts” – Can easily overrule the best of skills.

## Urie Bronfenbrenner

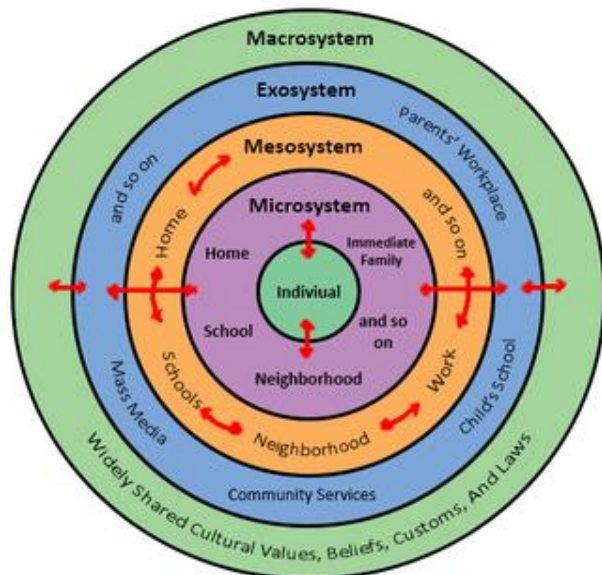
Urie Bronfenbrenner is one of the most well-known psychologists alive. Now in his eighties, he has had an extremely long and productive career. Bronfenbrenner is most famous for his views on **ecological psychology**. Very briefly, he suggests that:

interactions with others and the environment are key to development, we all experience more than one type of environment, including:

- **the microsystem** - such as a family, classroom, etc is the immediate environment in which a person is operating,
- **the mesosystem** - which is two microsystems interacting, such as the connection between a child's home and school,
- **the exosystem** - which is an environment in which an individual is not involved, which is external to his or her experience, but nonetheless affects him or her anyway. An example of an exosystem is the child's parent's workplace. Although a child may never have any role in the parent's workplace, or, in fact, never even go there, the events which occur at the child's place of employment do affect the child. For example, if the parent has a bad day at work, or is laid off, or promoted, or has to work overtime, all of these events impact the child, and finally,
- **the macrosystem** - or the larger cultural context.

Each of these systems are characterized by roles, norms (expected behavior) and relationships. For example, an individual usually acts differently within his or her own family than within a classroom. The person may speak more often at home, be less goal-oriented, and, almost certainly, will not sit at a desk for hours on end. Other things being equal, according to Bronfenbrenner, when the relation between different microsystems is a compatible one, development progresses more smoothly. A common example of this is the relationship between home and school. When role expectations are similar in both settings, e.g., try your hardest, do your own work, be on time, etc., children will be

expected to perform better than if role expectations differ substantially from one setting to the next. The above is just a very brief, simplified introduction to Bronfenbrenner's theory. It is one of the most interesting theories in psychology and one that includes the largest percentage of truly important concepts (e.g., your relationship with your mother, cultural expectations for women in your society, the national economy, your socioeconomic status and much more). Obviously, it is also a very complex theory that has only been touched upon in this discussion.



## Lev Vygotsky's Socio-cultural Theory

The work of Lev Vygotsky (1934) has become the foundation of much research and theory in cognitive development over the past several decades, particularly of what has become known as Social Development Theory.

Vygotsky's theories stress the fundamental role of social interaction in the development of cognition (Vygotsky, 1978), as he believed strongly that community plays a central role in the process of "making meaning."

Unlike Piaget's notion that children's development must necessarily precede their learning, Vygotsky argued, "learning is a necessary and universal aspect of the process of developing culturally organized, specifically human psychological function". In other words, social learning tends to precede (i.e., come before) development.

Vygotsky has developed a sociocultural approach to cognitive development. He developed his theories at around the same time as Jean Piaget was starting to develop his ideas (1920's and 30's), but he died at the age of 38, and so his theories are incomplete - although some of his writings are still being translated from Russian.

No single principle (such as Piaget's equilibration) can account for development. Individual development cannot be understood without reference to the social and cultural context within which it is embedded. Higher mental processes in the individual have their origin in social processes.

McCloud, S. (2018). *Lev Vygotsky*. Retrieved from:  
<https://www.simplypsychology.org/vygotsky.html>

## John Bowlby's Attachment Theory

Bowlby's evolutionary theory of attachment suggests that children come into the world biologically pre-programmed to form attachments with others, because this will help them to survive.

Bowlby suggested that a child would initially form only one attachment and that the attachment figure acted as a secure base for exploring the world.

The attachment relationship acts as a prototype for all future social relationships so disrupting it can have severe consequences. The main points of Bowlby's theory are:

1. A child has an innate (i.e., inborn) need to attach to one main attachment figure (i.e., monotropy).
2. A child should receive the continuous care of this single most important attachment figure for approximately the first two years of life.
3. The long-term consequences of maternal deprivation might include the following: delinquency, reduced intelligence, increased aggression, depression, affectionless psychopathy
4. Robertson and Bowlby (1952) believe that short-term separation from an attachment figure leads to distress (i.e., the PDD model).



5. The child's attachment relationship with their primary caregiver leads to the development of an internal working model (Bowlby, 1969).

## Erik Erikson

### Erik Erikson's Stages In Detail

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Stage (age)	Psychosocial crisis	Significant relations	Psychosocial modalities	Maladaptations & malignancies
I (0-1) -- infant	<i>trust vs mistrust</i>	mother	to get, to give in return	sensory distortion -- withdrawal
II (2-3) -- toddler	<i>autonomy vs shame and doubt</i>	parents	to hold on, to let go	impulsivity -- compulsion
III (3-6) -- preschooler	<i>initiative vs guilt</i>	family	to go after, to play	ruthlessness -- inhibition
IV (7-12 or so) -- school-age child	<i>industry vs inferiority</i>	neighborhood and school	to complete, to make things together	narrow virtuosity -- inertia
V (12-18 or so) -- adolescence	<i>ego-identity vs role-confusion</i>	peer groups, role models	to be oneself, to share oneself	fanaticism -- repudiation
VI (the 20's) -- young adult	<i>intimacy vs isolation</i>	partners, friends	to lose and find oneself in a another	promiscuity -- exclusivity
VII (late 20's to 50's) -- middle adult	<i>Generativity vs stagnation (self-absorption)</i>	household, workmates	to make be, to take care of	overextension -- reactivity
VIII (50's and beyond) -- old adult	<i>integrity vs despair</i>	mankind or "my kind"	to be, through having been, to face not being	presumption -- despair

Chart adapted from Erikson's 1959 *Identity and the Life Cycle* (**Psychological Issues** vol 1, #1)

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# Changes Activity # 1

Identify one change you've gone through in each of the following categories and write down how old you were when the change occurred.

1. Physical change:

How old were you? \_\_\_\_\_

How did you feel when this happened? \_\_\_\_\_

2. Family change:

How old were you? \_\_\_\_\_

How did you feel when this happened? \_\_\_\_\_

3. Intellectual change:

How old were you? \_\_\_\_\_

How did you feel when this happened? \_\_\_\_\_

4. Emotional change:

How old were you? \_\_\_\_\_

How did you feel when this happened? \_\_\_\_\_

5. Social change:

How old were you? \_\_\_\_\_

How did you feel when this happened? \_\_\_\_\_

6. Moral change:

How old were you? \_\_\_\_\_

How did you feel when this happened? \_\_\_\_\_

7. Financial change:

How old were you? \_\_\_\_\_

How did you feel when this happened? \_\_\_\_\_

8. Career change:

How old were you? \_\_\_\_\_

How did you feel when this happened? \_\_\_\_\_

9. Philosophical change:

How old were you? \_\_\_\_\_

How did you feel when this happened? \_\_\_\_\_

10. Political change:

How old were you? \_\_\_\_\_

How did you feel when this happened? \_\_\_\_\_

Source: SAPST Module 6 Participant Manual

## Emotional Development Table

<b>Newborn to Age 1</b>	<b>1 to 2 Years of Age</b>	<b>3 to 6 Years of Age</b>	<b>7 to 9 Years of Age</b>	<b>10 to 14 Years of Age</b>	<b>15 to 18 Years of Age</b>
<p>Infants need a warm, responsible caregiver.</p> <p>Infants develop self-worth and security.</p> <p>Emotional security regulation improves.</p> <p>Infants identify caregivers and emotions.</p> <p>Infants begin to learn about cause and effect.</p>	<p>Emotions take on rollercoaster quality.</p> <p>Children become extremely demanding and persistent.</p> <p>Temper tantrums are common.</p> <p>Children become possessive of caregivers.</p> <p>Empathy begins to appear.</p>	<p>Children move from physical emotional expressions to verbal expressions.</p> <p>They develop a good sense of humor.</p> <p>They comply with rules and display positive emotion as they do so.</p> <p>They are sensitive to others' feelings.</p> <p>Emotional elements of play become true to real-life situations.</p>	<p>Children desire to perform well and do things correctly.</p> <p>They view issues as right or wrong, with very little middle ground.</p> <p>Criticism and failure are difficult to handle.</p> <p>Emotional conformity to rules improves.</p> <p>They become better able to understand others' emotions.</p> <p>They seek emotional security.</p>	<p>Frequent changes in mood result from hormonal changes.</p> <p>Children carefully regulate their emotions.</p> <p>They may experience a drop in self-assurance after transition to middle school.</p> <p>They are preoccupied with appearance.</p> <p>Serious emotional problems such as depression may appear.</p> <p>They internalize or externalize stresses.</p>	<p>Decrease in self-consciousness becomes evident in early adolescence.</p> <p>Young people wrestle emotionally with identity issues. (Who am I?)</p> <p>They may accept some parental ideologies and professional goals.</p> <p>They search and explore to develop their own identity.</p> <p>Maturity may bring about appropriate emotional behaviors</p>

Oesterreich, L. (1995). Ages and stages. In L. Oesterreich, B. Holt, & S. Karas, *Iowa family child care handbook* [Pm 1541] (pp. 196–197). Ames, IA: Iowa State University Extension.

## Social Development Table

Newborn to 2 Years of Age	3 to 6 Years of Age	7 to 9 Years of Age	10 to 14 Years of Age	15 to 18 Years of Age
<p>Children watch, observe, and imitate adults.</p> <p>They develop self-recognition.</p> <p>They categorize people according to characteristics.</p> <p>They are self-centered.</p> <p>They develop a greater sense of independence</p>	<p>Children begin to remember life history.</p> <p>They express beliefs through desires.</p> <p>Their self-efficacy is typically high.</p> <p>Attributions are related to achievement. <b>[Ed. Note: This is unclear. Reword somehow?]</b></p> <p>They act with intention.</p> <p>They are critical of others.</p> <p>They seek attention and approval of adults.</p> <p>Friendship is based on play and exchange of material goods.</p> <p>They acquire social problem-solving strategies.</p>	<p>Self-concept is based on academic, physical, and social dimensions.</p> <p>Achievement is based on ability, effort, and on external factors such as praise.</p> <p>Children develop perception of others based on personality traits and comparisons.</p> <p>They develop race and social class attitudes.</p> <p>Their perspective expands.</p> <p>Friendship becomes increasingly important.</p>	<p>Children show interest in others' mental states and feelings.</p> <p>They take others' perspectives into consideration.</p> <p>They show some tendency to think of social rules and conventions as standards that should be followed.</p> <p>They want to please others. They store information about social events in long-term memory.</p> <p>Secret codes and shared word meanings strengthen the bonds of friendship.</p>	<p>Young people recognize that people have different thoughts and feelings from their own.</p> <p>They show an understanding that social rules and conventions help society run more smoothly.</p> <p>Self-concept is based on personality traits, friendships, romantic appeal, and job confidence.</p> <p>Character sketches formulate perceptions.</p> <p>They define friendship as mutual understanding and intimacy rather than shared activities.</p>

Oesterreich, L. (1995). Ages and stages. In L. Oesterreich, B. Holt, & S. Karas, *Iowa family child care handbook* [Pm 1541] (pp. 196–197). Ames, IA: Iowa State University Extension.

## Moral Development Table

<b>Newborn to 2 Years of Age</b>	<b>3 to 6 Years of Age</b>	<b>7 to 9 Years of Age</b>	<b>10 to 14 Years of Age</b>	<b>15 to 18 Years of Age</b>
<p>Children think of morality in concrete terms and are motivated selfishly.</p> <p>They learn to comply with rules and to accept delay of gratification.</p>	<p>Children accept moral perspectives of caregivers as their own.</p> <p>They understand standards for right and wrong.</p> <p>They form opinions about caregivers' authority.</p> <p>Their notion of justice is based on equality.</p> <p>Ability to accept delay of gratification improves.</p> <p>They need adults to provide self-control strategies.</p>	<p>“Good” is whatever conforms to existing laws, customs, and authority.</p> <p>Rewards and punishment provide the focus for what is right and wrong.</p> <p>Their sense of justice is based on fairness.</p> <p>“Good” is also what brings approval from friends.</p> <p>They expand their self-control strategies.</p>	<p>Children develop better understanding of fairness and guilt.</p> <p>They recognize others' needs.</p> <p>They are concerned about maintaining interpersonal relationships.</p> <p>They consider other people's perspectives when making decisions.</p> <p>They satisfy others' needs if their own needs are also met.</p> <p>Decisions are intended to please others.</p>	<p>Young people look to society as a whole for guidelines about right and wrong.</p> <p>“Good” is whatever conforms to existing procedures.</p> <p>“Good” is consistent with moral principles.</p> <p>Moral dilemmas involve relationships with others and societal norms.</p> <p>Moral reasoning focuses on understanding others' feelings.</p> <p>Self-regulation is based on what is considered right and wrong.</p>

Oesterreich, L. (1995). Ages and stages. In L. Oesterreich, B. Holt, & S. Karas, *Iowa family child care handbook* [Pm 1541] (pp. 196–197). Ames, IA: Iowa State University Extension.

## Activity # 2

### Creating a Human Development Soundtrack

Your assigned age group \_\_\_\_\_

Using the Emotional/Social/Moral Development Tables above, come up with a song that describes the development of your assigned age group. (May be a common song with the words changed)

Song Title \_\_\_\_\_

Be prepared to share your song and the logic behind it.

## Activity # 3

Brad has been partying and drinking heavily. He loses his balance and stumbles. What part of his brain is being affected? The brain stem, cerebral cortex, or cerebellum?

Answer:

Collin has also been drinking heavily at the party. He decides to drive home even though his sober friends have offered to drive him home. What part of his brain is being affected? The brain stem, cerebral cortex, or cerebellum?

Answer:

## Adolescence

Rapid changes made teens vulnerable to stress and drug-taking.

Early trauma can delay brain development, cortical development and skills.

Behaviors such as mood-swings, risk-taking, and failure to follow instructions are seen.

Short term memory increases, acquisition of new knowledge and skills.

However, decision-making, developing priorities, and understanding consequences lag .

Female brain –

- more gray matter, can process information, stronger verbal skills, multi-tasking
- hippocampus grows faster resulting in strong social skills, being emotionally supportive

Male brain –

- more white matter, spatial skills, navigation and math skills
- Amygdala and hypothalamus grows faster resulting in flight or flight response, enjoying contact sports, assertive behaviors

### Managing emotions

- Because adolescent brain cortexes are not fully developed, adolescents use their more primitive limbic system
- Can misinterpret others' emotions, confusing anger with sadness
- Teen brain is more vulnerable to stress
- Lack of sleep affects adolescents brain development and ability to manage emotions – need 9 ½ hours of sleep a night.
- Risk-taking
- Lack of mature frontal cortex to mediate the “just do it” impulse
- Levels of dopamine, the pleasure neurotransmitter, decline between childhood and adulthood, leaving the adolescent to seek the dopamine high.
- Levels of serotonin, which helps control impulses, fluctuates during teen years.
- When other teens are present, teens will take dramatic risks.

### **The brain continues to develop into adulthood and undergoes dramatic changes during adolescence.**

One of the brain areas still maturing during adolescence is the prefrontal cortex—the part of the brain that enables us to assess situations, make sound decisions, and keep our emotions and desires under control. The fact that this critical part of an adolescent's brain is still a work-in-progress puts them at increased risk for poor decisions (such as trying drugs or continued abuse). Also, introducing drugs while the brain is still developing may have profound and long-lasting consequences.

The maturation of brain structures generally occurs from the back of the brain to the front. There are four primary brain structures from the back to the front of the brain – cerebellum, nucleus accumbens, amygdala and prefrontal cortex – that are noteworthy in terms of how their differential maturation may impact adolescent behavior.

A major brain structure at the back of the brain is the cerebellum. This structure controls physical or motor coordination and is a region that is involved in the playing of sports.

The nucleus accumbens, which is responsible for motivation, and the amygdala, which identifies and controls emotion, are brain regions located more in the middle of the brain. The nucleus accumbens is responsible for how much effort the organism will expend in order to seek rewards. A developing nucleus accumbens is believed to contribute to the often-observed tendency that teenagers prefer activities that require low effort yet produce high excitement. Real-world observations may bear this out: many teenagers favor playing videogames, for example. The amygdala is responsible for integrating how to emotionally react to pleasurable and aversive experiences. It is hypothesized that a developing amygdala contributes to two behavioral effects: the tendency for adolescents to react to situations with “hot” emotions rather than more controlled and “cool” emotions, and the propensity for youth to mis-read neutral or inquisitive facial expressions from other individuals as a sign of anger.

And one of the last brain regions to complete maturation is the structure named the prefrontal cortex, located just behind the forehead. Sometimes referred to as “the seat of sober second thought,” it is the area of the brain responsible for the complex processing of information, ranging from making judgments, to controlling impulses, foreseeing the consequences of ones’ actions, and setting goals and plans. A developing prefrontal cortex may contribute to poor judgment and risk taking.

## Susceptibility to Alcohol

- Direct evidence cannot be obtained from human adolescents for ethical reasons.
- Much of what is known about alcohol susceptibility is from adolescent rat studies.
- Comparing adolescent and adult rats, both having no prior exposure to alcohol and matched on temperament, adolescent rats are less sensitive to the sedative and motor impairment effects of intoxication. (Spear, 2002)

These rat studies have identified two phenomena that suggest adolescents are more vulnerable to the effects of alcohol compared to adults.

One set of studies conducted by Professor Linda Spear at SUNY at Binghamton in New York indicates that adolescent rats are less sensitive to the effects of intoxication than adult rats. Adolescent rats typically consume two to three times as much alcohol for their body weight as adults. Adolescent humans also show this diminished sensitivity to intoxication; their higher metabolic rates allow them to consume higher amounts of alcohol.



A lower sensitivity to alcohol's effects would be consistent with the observation that young people are capable of drinking large amounts of alcohol before feeling intoxicated.

## Social Disinhibition

- Adolescent rats are more sensitive to the social disinhibition effects of alcohol compared to adults.
- These studies suggest that adolescent rats derive greater “social comfort” from intoxication than adult rats. (Spear, 2002)

In another series of studies by Dr. Spear and colleagues, adolescent rats demonstrate a greater sensitivity to the social disinhibition that occurs while drinking. That is, compared to adult rats, adolescent rats show behavior consistent with the notion that they experience “greater social benefit” from the effects of intoxication. For example, intoxicated adolescent rats are more inclined to congregate with other rats compared to intoxicated adult rats that show less of this social behavior.

## Cognitive Disruptions

### Animal Data:

When exposed to alcohol, adolescent rats, compared to adult rats, reveal more...

- Disruption in memory
- Impairment of neurotransmission in hippocampus and cortex

The work from Professor Spear's laboratory suggests that the memory region of the brain – the hippocampus - is particularly sensitive to alcohol, especially during adolescence. Adolescent rats exposed to various amounts of alcohol have significantly more brain damage in their frontal cortex than their adult counterparts. They also show greater damage to their working memory. With long-term use, adolescent rats have shown massive neuronal loss in other regions of the brain - the cerebellum, basal forebrain, and neocortex.

### Human Data:

- The hippocampus encodes new information into memory.
- Adolescents with a history of alcohol use disorder have a smaller hippocampus volume (on average, by about 10%).

There are some human data that have confirmed the findings from the animal literature. Professor Susan Tapert and her colleagues studied 14 adolescents (ages 15-17) with a history of an alcohol use disorder and 17 healthy comparison teenagers. Those with the histories of health drinking had a smaller left hippocampus volume.

If adolescents are more susceptible to the effects of alcohol, it would be expected that adolescents reveal early susceptibility to developing an alcohol use disorder, and also would show higher rates of alcohol use compared to adults. There are data to support these trends.

Source: Ken Winters, Ph.D., Scientific Advisor, Mentor Foundation, Copyright © 2008 The Mentor Foundation

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