TIP SHEET
Youth Brain Development

INTRODUCTION

This tip sheet was developed to provide WiSTEM^{2}D volunteers with a basic overview and key concepts related to brain development. Understanding adolescent brain development provides important information for supporting young people as they navigate this period of development.[1]

KEY DEFINITIONS[2]

- **Amygdala:** area of the brain responsible for immediate reactions; associated with emotions, impulses, aggression, and instinctive behavior
- **Frontal cortex:** area of the brain that controls reasoning and helps us think before we act
- **Grey matter:** the darker tissue of the brain and spinal cord containing most of the brain's neuronal cell bodies that are involved with muscle control, sensory perception, speech, and self-contral
- **Limbic system:** an area deep in the cerebrum responsible for reward seeking, expression of emotion and motivation, survival and pleasure; stimulated by social and emotional factors
- **Myelin:** insulation layer developed by nerve cells that helps cells communicate
- **Prefrontal cortex:** area of the brain associated with planning, complex cognitive behavior, decision making, and moderating social behavior

OVERALL BRAIN DEVELOPMENT[3,4]

The brain undergoes tremendous growth and continuous reconstruction before it can function as a mature, adult brain.

Extensive research in neuroscience shows that the first five years of a child's life are a critical period of development. This is the time when the brain builds the pathways that provide the foundation for future learning.

While the brain is about 90 to 95 percent of its adult size by age six, a second surge of brain growth occurs shortly after puberty (sometime between ages 10 and 14). Throughout adolescence, the brain is in an active state of intensive remodeling and "rewiring." This process is not complete until approximately 25 years of age.

The **amygdala**—the area of brain responsible for immediate reactions, emotions, impulses, aggression, and instinctive behavior—develops first, followed by the frontal cortex and the limbic system.

The **frontal cortex**, which controls reasoning and critical thinking, continues to mature well into adulthood. The **limbic system**, which is responsible for reward seeking and is stimulated by social and emotional factors, develops faster than the frontal cortex.

The **prefrontal cortex** develops last, affecting self-monitoring, problem solving, and decision making.

ADOLESCENT BRAIN DEVELOPMENT[5,6]

Adolescence—the transitional period between childhood and adulthood (ages 10 to 24)—is a time of amazing physical, emotional, and cognitive growth that is unmatched in the life cycle, with the possible exception of infancy. During this period, the brain's **gray matter** is consolidating and strengthening to be more efficient. Connections in the thinking and processing part of the brain are pruned and new pathways are forged.

The limbic system develops faster than the frontal and prefrontal cortexes, creating a temporary imbalance between the two systems. Until development of the cortex catches up with that of the limbic system, emotions, social pressures, and desires for rewards can override logical thinking and reasoning in the adolescent brain. As a result:

ADOLESCENTS ARE MORE LIKELY TO:

- Act on impulse
- Misread or misinterpret social and emotional cues
- Engage in risk-taking behaviors

ADOLESCENTS ARE LESS LIKELY TO:

- Use good decision-making strategies
- Think before they act
- Link actions with consequences
- Change dangerous or inappropriate behaviors
- Plan for the future

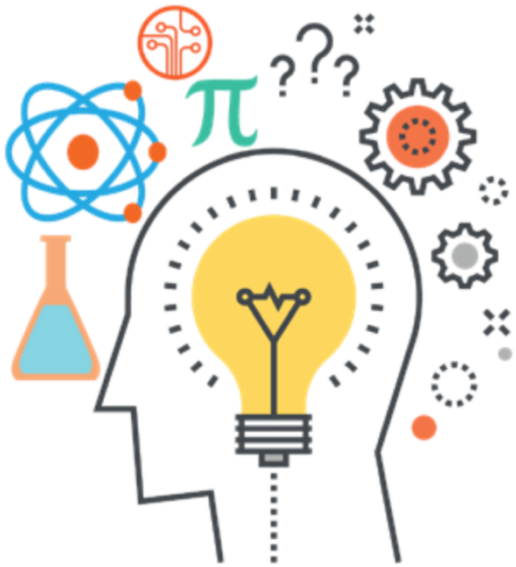
The immature limbic system, however, does not mean that young people cannot make good decisions or determine right from wrong. In fact, adolescents and adults have similar capacities to distinguish between risky and safe choices, but adolescents are just less able to make the right choice "in the moment."

INFLUENCES ON DEVELOPMENT[7]

While adolescents generally develop in roughly the same way and along the same timeline, brain development is influenced by many factors, including:

- Adult role models
- Drug use/abuse (nicotine, alcohol, caffeine, other substance)
- Environment
- Genetics
- Hormones
- Medications
- Nutrition
- Prenatal/postnatal exposure
- Puberty
- Sleep
- Stress
- Surgery

While hormones affect every tissue of the body (including the brain), the effect is not as potent as most people believe. It does not make adolescents inherently "difficult." Adult expectations and behaviors toward young people affect them as much as, if not more than, biology.



BUILDING A HEALTHY BRAIN[8]

Young people may adopt habits and patterns in adolescence that have effects on them and their health later in life (e.g., smoking, overeating, and not getting enough exercise or sleep). Poor mental health can also increase during adolescence; this may be related to the greater vulnerability of the developing brain to stress. It is important that young people have periodic well-visits with a health care provider to observe and monitor their health and mental health.

ADULTS CAN HELP BY:

- Modeling positive behaviors
- Supporting healthy brain development—making sure adolescents are physically active, have healthy diets, and get eight to ten hours of sleep each night
- Helping youths find ways to reduce stress (e.g., playing sports, listening to music, journaling)
- Developing routines
- Setting boundaries
- Communicating high expectations
- Establishing consequences
- Providing opportunities for young people to take risks in a secure and safe environment
- Encouraging youths to express their feelings
- Reinforce positive behaviors

FOSTERING THINKING & LOGIC SKILLS

People are not born with the ability to think abstractly, reflectively, and critically. These are skills and abilities that develop throughout adolescence. In fact, the capacity for moral thought and future planning begins to develop around age 16 and continues until age 21.

While part of adolescence is about seeking new experiences and independence, most teenagers seek caring adults who provide support, challenge them with new opportunities, and help them build their critical thinking and problem-solving skills as they transition into adulthood.

ADULTS CAN HELP BY:

- Coaching or teaching, not telling
- Encouraging young people to try new things
- Giving opportunities that help young people test out ideas and behaviors and experiment with different roles
- Teaching problem-solving and decision-making strategies, such as defining the problem, listing potential options or solutions, and identifying desired outcomes
- Providing support when challenges/barriers arise
- Allowing young people time to think about and explore their futures
- Working with youths to identify their goals and develop plans to achieve them
- Organizing team-based, applied learning projects
- Providing opportunities for youths to observe and practice appropriate work place behavior
- Providing leadership opportunities
- Holding youths accountable
- Providing critiques and instructive feedback
- Challenging young people to make a difference through community service
- Giving your time and sharing your expertise
- Offering encouragement and keeping young people motivated
- Acknowledging accomplishments

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[1] Fostering Perspectives (2014). Adolescent Brain Development: Implications for Parents. Retrieved from http://fosteringperspectives.org/fpv18n2/brain.htm.
[2] American Academy of Child & Adolescent Psychiatry (2019). Teen Brain: Behavior, Problem Solving, and Decision Making. Retrieved from: https://www.aacap.org/aacap/families_and_youth/facts_for_families/fff-guide/the-teen-brain-behavior-problem-solving-and-decision-making-095.aspx.
[3] Raising Children Network (2019). Brain Development: Teenagers. Retrieved from https://raisingchildren.net.au/pre-teens/development/understanding-your-pre-teen/brain-development-teens.
[4] American Academy of Child & Adolescent Psychiatry (2019).
[5] Ibid.
[6] Fostering Perspectives (2014).
[7] National Center for Biotechnology Information, U.S. National Library of Medicine (2013). Maturation of the Adolescent Brain. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3621648/.
[8] American Academy of Child & Adolescent Psychiatry (2019).