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Contents

PRACTICE

Our Amazing Brains

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This article was an introduction to a series on how brain research can help us understand young people and ourselves as well. The intent is to alert the reader to important information from recent research on the brain. This initial installment explores the concept of the triune brain, a term coined by neuroscientist Paul MacLean. This refers to three major brain structures which specialize in survival, emotions, and reasoning. While the brain is more complex than any simple model and all parts are highly interrelated, this three-part brain provides a good starting point for exploring our resilient minds.

The last two decades brought phenomenal advances in our understanding of the brain and how it influences behavior. With a sophisticated set of research tools, including “real time” imaging techniques, scientists have been able to locate the neurological structures involved in generating and managing emotions, assessing risk and making decisions, keeping ourselves safe, and processing and storing various kinds of memory.

We also have a clearer idea about how the brain is constructed. From the building blocks of some 100 billion neurons, the brain is constructed into larger structures and lobes that communicate with each other. These various brain structures and pathways develop and change as the child grows and interacts with the world. Neuroscience confirms that those in closest contact with the child will have the most profound influence on the nature of brain growth and development. Human connections underlie brain connections.

Those who work with young people now can have a greater understanding of behaviors related to our need for attachment and the pain in the brain caused by rejection or loss. We know the process by which the brain mobilizes to help us deal with stress and threat, whether physical or psychological. We know how traumatic events that are stored in the brain can alter our perceptions of the world and how we deal with challenge. When experiences are repeated, stronger brain pathways are created, whether these lead to problem behavior or to resilient coping.

Most practitioners have difficulty trying to make sense of recent brain research given the knowledge explosion in this field. Many findings are esoteric and cast in complicated scientific jargon. When popularized in the media, massive distortions can result, such as a recent feature on “your teen’s quirky brain.” In this series of articles, we will attempt to sift through the avalanche of research to identify key findings that might inform our work with young people. Each article will explore key findings arising from research, consider their implications, and suggest practical applications.

Three Brains for the Price of One

We begin with the intriguing notion of the *triune brain* which is a concept coined by neuroscientist Paul MacLean (1990). This is not a new theory but has proven to be very influential for researchers and clinicians. MacLean provides evidence that we have not one but three brains, each with its primary task. They work together in unity – or sometimes clash. To simplify, the three processing areas specialize in survival, emotions, and logic respectively.

The survival brain

Working from the bottom up, the most basic brain structure is dedicated to physical survival. This area develops first in the growing fetus. It is sometimes called the *reptilian brain* because this structure is shared by all living creatures, even those most primitive. This area includes the brain stem, which connects to the spinal cord, and the cerebellum, which handles motor behavior and has a role in emotional calming. The survival brain controls our autonomic functions like heartbeat, respiration, reproduction, and the like. Most important to our concern with behavior, the survival brain activates fight and flight reactions and distress cries if danger is detected. This instantaneous, unthinking reaction ensures our safety when under serious threat-or when we think we are. These reactions are reflexive, instinctive, and patterned, hence the term *reptilian*.

The emotional brain

This is wrapped around the survival brain like a girdle (limbus in Greek) and is called the limbic system. This area is the seat of emotions such as fear, anger, and love. The emotional brain sorts incoming stimuli as pleasurable or threatening. The sentry or danger detector of the emotional brain is the amygdala¹. It scans for any sign of threat, separating friend from foe. The amygdala sits atop the hippocampus (Greek for seahorse, signifying its shape, which stores emotionally charged events in our memory. (Later articles will explore the amygdala and hippocampus in more detail since they are central to all emotional reactions.) The purpose of emotions is to motivate action, such as to approach, avoid, or attack. A small child has not yet developed control of emotions, so strong feelings trigger immediate reactions. With maturity, the logical brain gradually takes charge of managing emotions.

The logical brain

This new brain or neocortex is last to develop. In humans, this makes up the major portion of the brain that distinguishes us from most other animals. In particular, the prefrontal area (behind the forehead) plays a key role in planning, weighing alternatives, making decisions, and regulating emotional impulses. In 95% of humans, the left hemisphere specializes in handling verbal messages while the right hemisphere gets the big picture by analyzing nonverbal and emotional cues. These tasks of the logical brain are sometimes called the *executive functions* because they organize and manage the brain like an executive handles a company. While newborn infants have active survival and emotional brains, the higher brain areas take many years to develop (Chugani, 1998). Research shows that this higher part of the brain is not fully developed until one reaches the twenties. Until then, youth are at much higher risk for a range of impulsive behaviors and delinquencies.

These three *brains* are, of course, highly integrated and connected to each other by a myriad of neural pathways. While we like to think of ourselves as logical beings, research shows that the emotional brain

seems to be in charge of much more than we might have imagined. Pathways from the emotional brain to the survival brain and pathways up to the logical brain develop much earlier into virtual highways of communication. Only later do we lay down trails from the logical brain to keep other areas under control. Unlike other animals, human brains take over two decades to mature. Until then, children and teens are to some degree dependent on guidance and teaching from others. A large part of the task of parents, teachers, counselors, and mentors is to help youth finish wiring their brains. The most powerful effect on positive brain development comes from connections with positive, caring adults and peers.

(1). The emotional brain, like the logical brain, is divided into two halves or hemispheres. Thus, we have an amygdala and hippocampus in both the left and right hemispheres.

References

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