

EMOTIONS AND LEARNING: WHERE BRAIN BASED RESEARCH AND COGNITIVE-BEHAVIORAL COUNSELING STRATEGIES MEET THE ROAD

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Abstract

Counselors in both clinical and educational settings are often confronted with the challenge of working with teenagers who struggle academically due to emotional difficulties that impair their ability to learn. Designing effective intervention strategies to lessen the negative effect these emotions have on learning is an essential skill for counselors working with adolescents who are trying to effectively cope with feelings of depression, anxiety, anger and low self-esteem.

This article discusses how the link among emotion, cognition and learning informs counseling practice, especially with regard to a counseling program called Mood Management, which is designed to be used with adolescents as a means to equip them with the skills to effectively negotiate the emotional demands of adolescence. Grounded in cognitive behavioral counseling theory and driven by research in brain based learning, the Mood Management program has a neurobiological foundation which is discussed in this article in order to provide the reader with a basic understanding of the rationale for choosing this particular counseling methodology.

1 Introduction

“Adolescence is a confusing time. Sometimes you laugh so hard that your sides ache and at other times you think things could never possibly get better. It’s like a roller coaster ride. With its ups and downs, and twists and turns, sometimes things happen so fast that it makes you feel dizzy. It’s a time when adults don’t seem to understand a thing you’re going through and your friends becomes more important than you ever believed imaginable.

Caught up in all of its contradictions it is often difficult for you to understand that adolescence is simply a phase of your life. You are embroiled in its passion and caught in its web. You may act before you think and jump to conclusions before checking out the entire story. Amidst all of this confusion, you may need a road map that helps you find your way through this maze called adolescence. Mood Management is a skills-building program designed to be your road map” (Langelier, 2001, p. 1).

Many adolescents are frequently confronted with a wide range of negative emotions that interfere with their ability to function effectively in academic, vocational and social settings. Emotions such as anger, depression and anxiety can vary in intensity from mild to severe and can be triggered by both acute and chronic factors. As adolescents struggle to cope with the challenges of identity development, learning to effectively respond to the emotional demands they encounter from day to day is essential to their success in school, work and social settings (Cash, 2003; Velting, Setzer, & Albano, 2004).

Although Glover (1999) suggested that the developmental phase of adolescence is not significantly distressful to a majority of adolescents, for those who do struggle with the adverse effects of negative emotions such as depression, anger and anxiety, adolescence is a stage of life that presents significant challenges. As Weissberg, Kumpfer, & Seligman (2003) pointed out, “As we enter the 21st century, substantial percentages of young people experience mental health problems, engage in risky behaviors, and lack social-emotional competencies” (p. 426).

Greenleaf (2002) pointed to the notion that adolescence is an important time for learning, noting, “During adolescence, the brain begins to define what is important to remember; discards useless or irrelevant information; and develops ways to retain, access, and learn new information” (p. 25). Kovalek and Olsen (1998) suggested a significantly important relationship linking emotion, attention, learning and memory. “One of their key roles [emotions] is to tell the brain what is worth attending to and the “attitude” with which one attends.” Connell (2005) writes, “it is our emotions that decide whether or not it is safe to pay attention and learn in school. In short, students’ emotional and safety needs must be met before they can focus on their cognitive needs.

2 The Relationship among Emotion, Cognition and Learning

The relationship among emotion, cognition and learning is important to consider as counselors plan intervention strategies with those adolescents experiencing emotional distress in response to the challenges they encounter from day to day. Given the emphasis on cognition and emotion, and in consideration of Greenleaf’s (2002) assertion that during adolescence the brain functions to “develop ways to retain, access and learn new information” (p. 25), the choice of counseling interventions based on cognitive theories seems consistent with the notion that adolescents can learn to closely examine their emotional response to a given situation. “Students can learn how and when to use rational processes to override their emotions, or to hold them in check” (Sylwester, 1994, p. 64).

Helping adolescents learn how to effectively respond to negative emotions is one of the goals of counselors in both educational and clinical settings. Although a number of different approaches may be employed to move adolescents toward the goal of effectively responding to their emotions, Sylwester (1994) suggested that learning how and when to do this is a rational process governed by complex interrelated brain systems, the brain stem and limbic system. As such, the use of Mood Management, described below, which is grounded in cognitive behavioral theory and driven by research in brain based learning, provides counselors with an opportunity to teach adolescents the skills they need to effectively cope with the emotional demands they encounter from day to day.

3 Further Rationale for Choosing CBT with Adolescents

In addition to the link between cognition and emotion as a driving motivator for counselors to consider interventions based on cognitive theories (CBT) as a strategy of choice, Pert (1997) provided further rationale for this type of intervention by pointing out the link between emotion and bodily sensations. “Emotions and bodily sensations are thus intricately intertwined, in a bi-directional network in which each can alter the other. Usually this process takes place at an unconscious level but it can also surface into consciousness under certain conditions or be brought into consciousness by intention” (pp. 141-142).

Given the interdependent nature of the relationship between cognition, emotion, behavior and bodily sensations, cognitive-behavioral therapies appear to be the logical choice for counselors working

with adolescents who exhibit impairment in academic, vocational, social and/or behavioral domains due to ineffective management of distressing negative emotions such as anger, depression and anxiety. Research serves to support this logic.

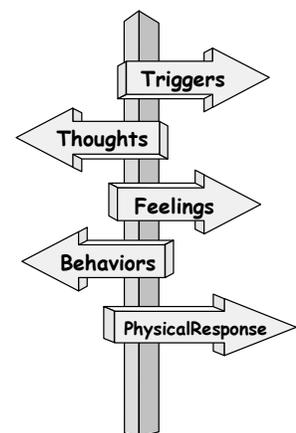
As Velting, Setzer and Albano (2004) stated, "... The past 20 years have advanced our understanding of the psychopathology, course, and disability associated with anxiety disorders in youth. These advances are occurring concurrently with the development of scientifically sound assessment and treatment techniques focused specifically on children and adolescents" (p. 42). The treatment technique found to be most efficacious for treating anxiety in children and adolescents is cognitive-behavioral therapy. "Treatment with cognitive-behavioral therapy (CBT) is the common thread underscoring all effective treatments for anxiety disorders; that is, there are no well-controlled, systematic studies attesting to the acute and long-term efficacy of any other psychosocial treatment modality for anxiety disorders in youth" (p. 49).

Just as research supports the use of cognitive-behavioral techniques with adolescents struggling with anxiety, there is evidence that supports the use of this treatment modality for those struggling with depression as well as anger (Ackerson et al., 1998; Rosello & Guillermo, 1999; Weersing & Weisz, 2002). Thus, the link between emotion, behavior and cognition as well as research supported treatment outcomes suggesting the efficacy of CBT, drives counselors in both educational and clinical settings to strongly consider intervention strategies based on this approach.

3.1 The Mood Management Program

Mood Management (Langelier, 2001) is a cognitive-behavioral skills-building program designed to help adolescents learn how to effectively manage difficult emotions such as anger, depression and anxiety, as well as low self-esteem. The program is used in both educational and clinical settings in individual or group counseling formats and in schools as a classroom guidance program. Teaching adolescents to recognize what triggers the feelings, thoughts, behaviors and physical responses that create conflict in various domains of functioning is the core essence of this program. From setting goals for emotional wellness to maneuvering a challenging map, adolescents learn, step-by-step, the essential elements of CBT that will ultimately enable them to respond more effectively to the triggers that have typically resulted in emotional distress, poor behavioral choices and negative consequences. The analogy of a journey guided by a road map, driving carefully and encountering traffic jams is used throughout the program as a means to introduce the elements of CBT in a language that is meaningful and understandable for adolescents.

For example, the street post they see in the Mood Management Skills Workbook (Langelier, 2001) introduces them to the core elements of CBT by using CBT terminology for street names. Five CBT "streets" are introduced, Triggers, Thoughts, Feelings, Behaviors and Physical Responses. "Mood Management is a skills-building program designed to be your road map. It is a way for us to learn together how five important "roads" often converge to cause an emotional traffic jam. The names of the roads are shown on the street post at the right. We will talk about these roads in much more detail throughout the Mood Management Program. By using this workbook you will learn techniques that enable you to maneuver these five roads more skillfully so you can better negotiate the "traffic jams" of your adolescence" (p. 2).



Throughout the workbook, adolescents answer specific questions aimed at exploring additional CBT concepts. For example, they consider that, "...The name of one of the 'five roads' is Feelings. What feelings do teenagers struggle with? What do teenagers do to try to cope with these feelings? What are some of the consequences of dealing with emotions in an ineffective way?" (p. 2). With this particular set of questions, the importance of the relationship between feelings, behaviors and consequences is introduced and serves as the foundation from which adolescents will ultimately learn the most important skill in their journey toward emotional wellness, challenging their faulty cognitions.

Each unit in the workbook follows the same format. A concept is introduced followed by a discussion focusing on specific questions that guide CBT concepts and terminology. A skill session is then completed, which allows learning the skill with the help of the counselor. Then a general review of the key concepts of the unit is completed followed by assigning homework.

4 Understanding the Emotional Mind

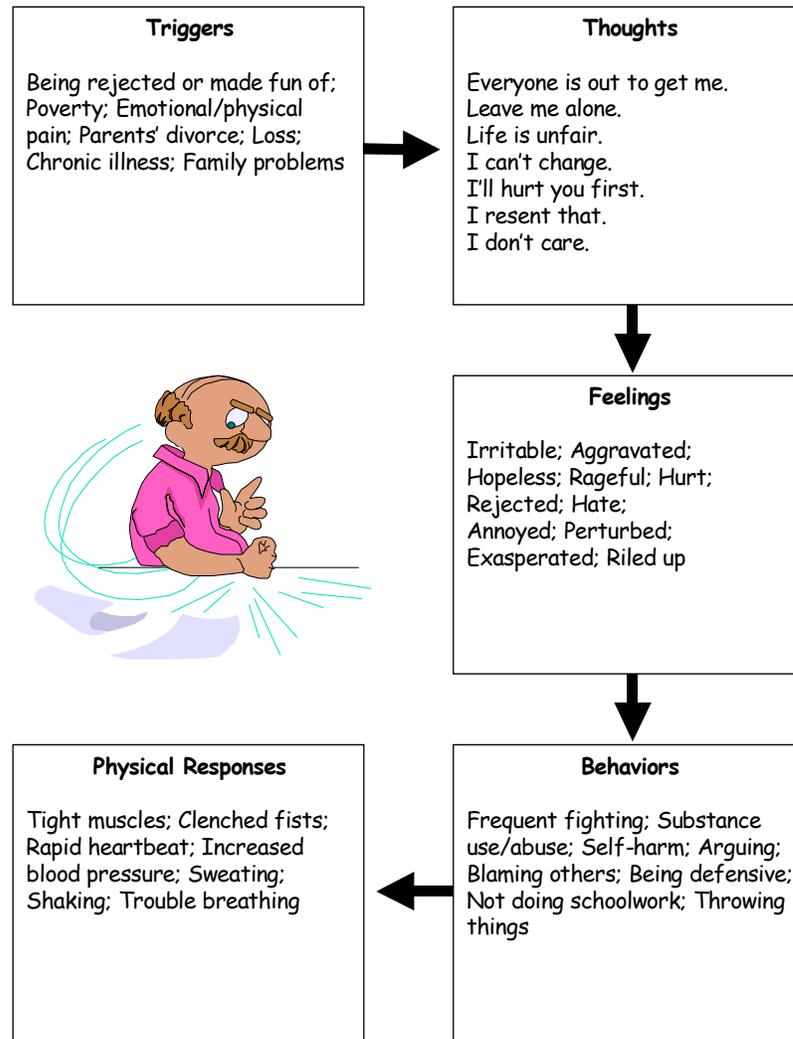
Once the "basics" of CBT are introduced, the program focuses on the concept of the emotional mind vs. the wellness mind. Adolescents are introduced to this concept and learn that the emotional mind creates a way of thinking that keeps them stuck emotionally. Emphasis is placed on teaching them to recognize when they are in their emotional mind with the ultimate goal of learning how to exit from it. "The emotional mind tends to be very powerful. It reacts very quickly in stressful situations, producing thoughts that are negative and self-defeating. You know that you are in your emotional mind when you feel overwhelmed by emotions and can't seem to feel better no matter how hard you try" (p. 34). Connell (2005) writes, "if our day-to-day experiences are full of rejection or neglect, the limbic system conveys the message to our neocortex that the world is frightening and unstable" (p. 27).

When stressed, students cannot learn the academic content being offered because their limbic system is pulling the blood and oxygen away from their neocortex. Their heart rate increases, and the adrenal glands secrete the stress hormone cortisol into the blood. "It is clear that if a student is stressed, he or she will not be able to learn efficiently and perhaps not at all" (Connell, p.36). Goleman (1998) notes, "Cortisol steals energy resources from the working memory. When cortisol levels are high, people make more errors, are more distracted, and can't remember as well. Irrelevant thoughts intrude, and processing information becomes more difficult" (p.76).

4.1 Exiting from the Emotional Mind

Exiting from the emotional mind requires an understanding of the "traffic jam" that keeps adolescents "stuck" in their emotional cycle, resulting in negative behaviors, poor choices and negative consequences. The "traffic jams" of adolescence are explained and specific examples of the emotional cycles are given. Adolescents are then taught to explore their own emotional cycle. The cycle of anger is shown in Fig. 1.

The Cycle of Anger



Mood Management Skills Workbook - Unit 5 - Page 50

Figure 1: The Cycle of Anger

5 Challenging the Emotional Mind

As Dr. James Zull (2003) stated, “teaching is the art of changing the brain.” In other words, when we learn, through education or counseling, our brain physically changes. Every new thing that we learn changes our electrochemical wiring. Zull has shown us biologically that learning changes the brain by

altering the number and strength of synapses. Challenging faulty thinking, a core concept of CBT, is taught in the workbook through the analogy of a road map (p. 74), shown in Fig. 2. Using the following nine steps, the counselor teaches adolescents to complete their own road map in order to challenge their faulty thinking. It is exciting to realize that as adolescents learn these steps, they are actually changing their brain:

1. Recognize triggers
2. Listen for your emotional mind
3. Identify automatic negative thoughts and core beliefs
4. Identify and rate the intensity of the negative emotions associated with faulty thinking
5. STOP, LOOK & LISTEN
6. Find evidence from your life that disproves negative thoughts and core beliefs
7. Re-think: Change faulty thoughts to more realistic thoughts based on evidence
8. Re-examine and rate the intensity of feelings now that you've changed your thoughts
9. Re-act: Develop an action plan to change your behavior.

The challenging road map is shown below (see Fig. 2).

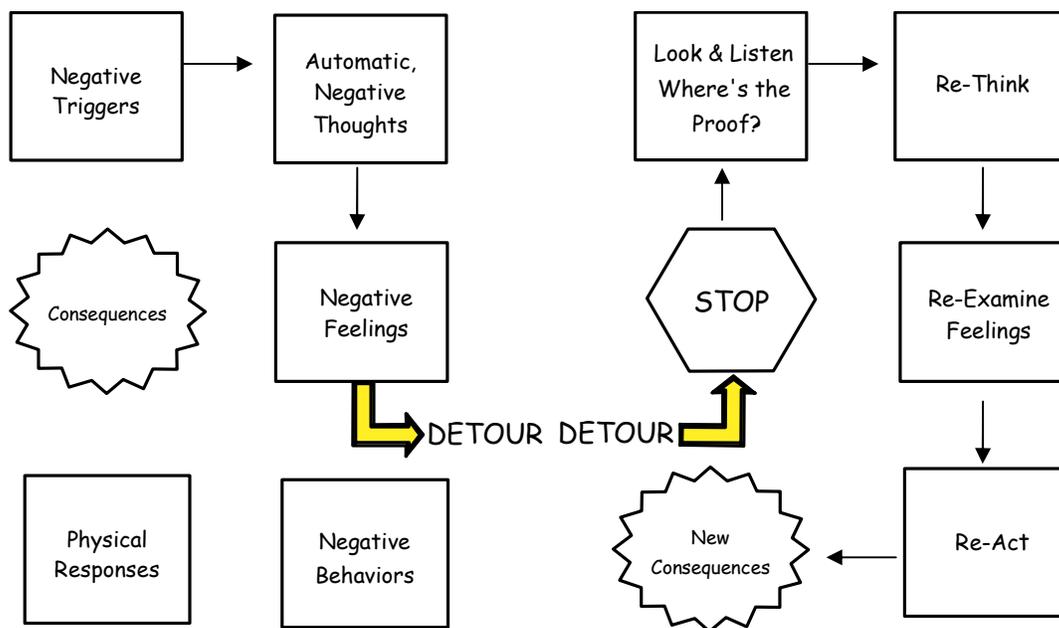


Figure 2: The Challenging Map

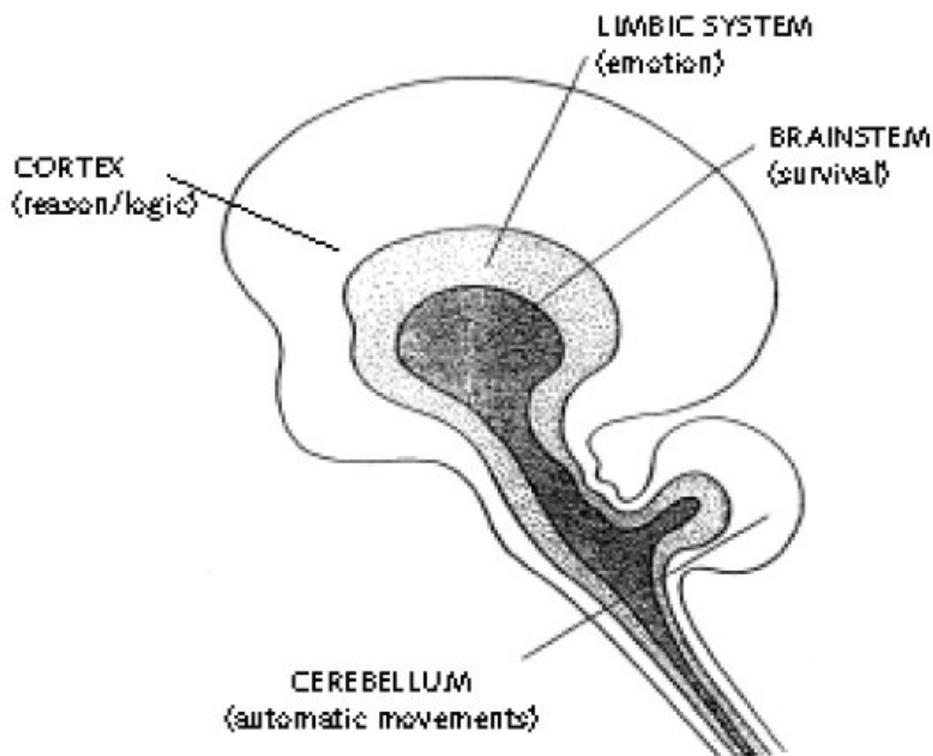
Thus, counselors use Mood Management as a means to apply CBT strategies and concepts in their work with adolescents, teaching them how to challenge self-defeating thoughts and core beliefs in order to feel better and engage in more appropriate choices. Restak (2003) writes, “if you want to learn a new skill or make use of new knowledge, you must change your brain. You must engage in repetitive exercises that set up the relevant (neural) circuits and sharpen their expression” (p.13). The numerous practice exercises found in the Mood Management book supports this notion as it provides each adolescent with numerous opportunities to shift from the non-productive emotional mind to the more efficient wellness mind.

5.1 Understanding Brain Physiology: A Closer Look at Why CBT Makes Sense

An understanding of brain physiology, described below, offers strong evidence for the choice of cognitive behavioral counseling strategies, such as the Mood Management program, as effective modalities to be used with adolescents who struggle emotionally. An overview of brain structure and discussion of concepts such as plasticity, pruning and downshifting will serve to provide the reader with knowledge of the neurobiological foundation of cognitive behavioral counseling strategies, especially Mood Management.

5.2 The Triune Brain Theory and Learning

In 1976, Paul MacLean proposed an evolutionary theory of brain development called the Triune Brain Theory. This theory suggests that the human brain is actually composed of three brains that appeared at different stages in our evolution: the reptilian brain, which includes the brain stem and cerebellum, is the oldest; the limbic system, or the old mammalian brain came next; and the (3) neocortex, or the neomammalian brain, emerged most recently (see Figure 3).

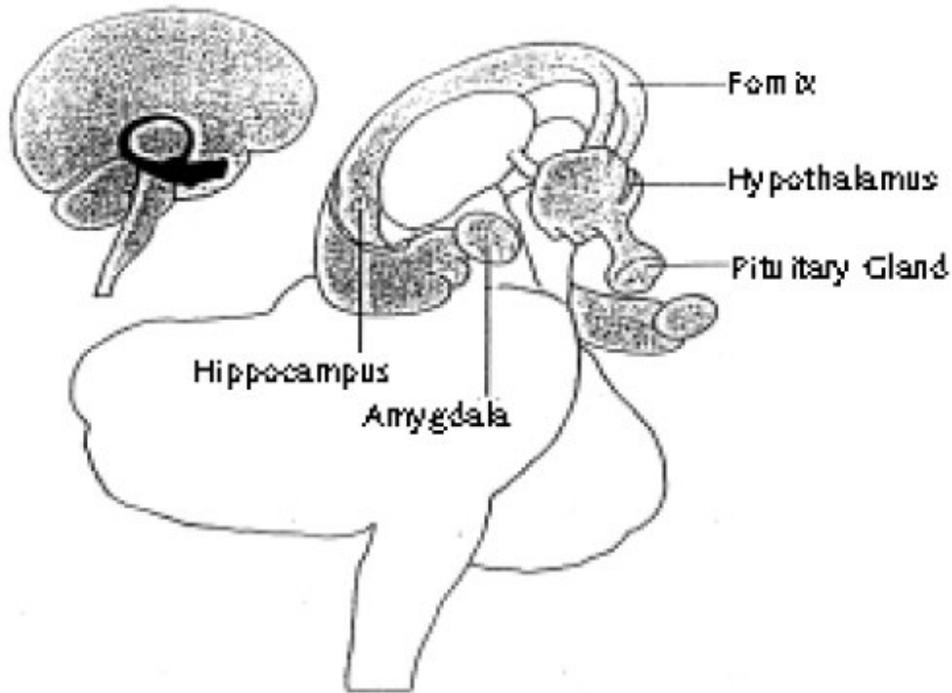


Adapted from Paul MacLean, "A Mind of Three Minds: Educating the Triune Brain," in Education and the Brain, edited by J. Chall and A. Mirsky (Chicago: University of Chicago Press).

Figure 3: MacLean's Triune Brain Model

According to MacLean's theory, our cerebellum and brain stem developed approximately 500 million years ago. Since it resembles the brain of reptiles and other early species, it is referred to as the

reptilian brain. The brain stem, attached to our spinal cord, consists of the medulla, pons, and the cerebellum. It is responsible for body functions needed for survival, such as heart rate and breathing. Our brain stem also determines our level of alertness; it warns us of important incoming information, such as a child riding a bicycle on our side of the road.



The Limbic System and Its Position in the Brain

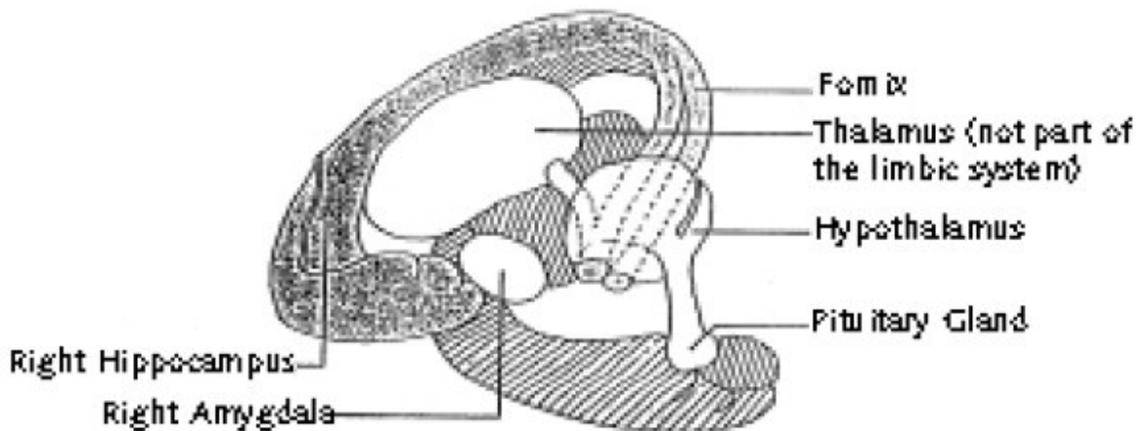


Figure 4: The Limbic System

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The limbic system was the second part of our brain to develop, about 250 million years ago. Since it corresponds to the brain of most mammals, it is often referred to as the mammalian brain. It is located deep inside the brain between the brain stem and the cortex. The key components of the limbic brain are the amygdala, hippocampus, thalamus, and hypothalamus. This section of our brain is known mainly for our emotions; some researchers call the limbic brain our emotional brain. The limbic system is responsible for regulating our appetite, sexual urges, sleeping, hormones, and our immune system (see Fig. 4).

Our neocortex, which is the outer part of the cerebrum (and which makes up about 85 percent of the human brain), is the last part of the brain to develop, about 200 million years ago. Reptiles do not have a neocortex and mammals only have a small one. Our highly developed neocortex is the part of the brain that makes us 'human.' It allows us to understand time, a sense of the past, present, and future. It allows us to reflect, to plan, and to make goals. Neurologists believe that our neocortex is still evolving. Our cerebrum (neocortex) is divided into two hemispheres, our left and right. The hemispheres are connected by a band of nerve cell fibers called the corpus callosum. Both our left and our right hemisphere house four highly developed areas called brain lobes.

These three parts of our brain are distinct, but they interact and interconnect. Each area of the brain affects the other areas; there are neural passageways connecting the different parts of the brain. Hannaford (1995) states, "...The neocortex is always growing neural networks linked to the brain stem and the limbic system, developing the neural connections that enable it to become the integrator of knowledge" (p.83).

This is important information for counselors to consider as they choose intervention strategies that are most effective in teaching adolescents to manage negative emotions more effectively. In essence, the choice of an intervention strategy, such as cognitive behavioral therapy, that emphasizes the link between emotion, cognition and learning has, at a deeper level, the ability to encourage the development of neural connections between the brain stem, limbic system and neocortex so the adolescent can integrate knowledge more meaningfully, especially knowledge of how to cope more effectively with the emotional demands of adolescence.

5.3 Coping with Negative Emotions is a Learning Process so Let's Consider How we Learn New Information

Neurons are called the brain's computer chips. The power of a brain increases with the number of cells it has. For example, a fruit fly has 100,000 brain cells, a mouse has 5 million, a monkey has 10 billion, and humans have 100 billion neurons. A neuron is a special type of brain cell that has 3 basic parts: dendrites, the cell body, and an axon. When the cell body receives new information, it begins to grow dendrites (Jensen, 2000). Dendrites are always looking to receive new information, because our brain is programmed to want to learn.

Learning involves groups of neurons, or neural networks. One neuron is able to forge connections with up to 10 thousand other neurons. Our brains are capable of making approximately one million billion neural connections, and messages can travel along these passageways at speeds up of to 250 miles per hour (Jensen, 2000; Hardiman, 2003). But how do we create new neural passageways in the brain?

When we first learn something new, it is slow going, similar to cutting a path for the first time in a large, dense forest. As we travel over the path time and time again the same neurons are activated over and over. Myelin is laid down each time we travel on the path; the more myelin, the faster the neural

transmission. Essentially, we go from cutting the initial path through the forest to driving slowly on a path which becomes a road, then a highway. When two separate roads, (or two neural passageways, or two different thoughts) are connected together, we call this a neural superhighway (Jensen 2000). Thus, as adolescents learn to cope more effectively with negative emotions through the use of cognitive behavioral counseling interventions, their neurons are repeatedly activated, which, over time, results in a neural superhighway that fosters their ability to adapt more effectively to the emotional demands they encounter from day to day.

5.4 Learning Changes the Brain via Plasticity and Pruning

Our brains have neural plasticity, the ability to learn and to adapt (or to relearn). For example, people can learn to live in different types of homes, wood houses, tents, igloos, or brick houses (Connell, 2005). We can adapt to living in a cold climate in New England or a hot climate in Florida. Neural plasticity is built into the human brain giving it a remarkable capacity to reorganize itself, to make brain wiring more efficient, and to find compensatory neural pathways if there is a brain injury of some kind (Hardiman, 2003).

During the first two years of life, the brain makes neural connections at a fast rate. The brain is connecting the infant to his body, making connections for sight, sound, touch, and movement. In addition the brain is helping the baby make emotional connections with his/her primary caretakers. The brain's ability to grow and change is called plasticity. As we grow and learn, the cells in our brain and our nervous system connect in complex patterns of neural pathways. Restak (2003) writes that our brains transform itself each day "on the basis of experience, and this transformation can occur over very short intervals. For instance, your brain is different today than it was yesterday. Think, therefore, of the human brain as a lifetime work in progress that retains plasticity—the capacity for change—as long as the 'owner' is still alive" (pp. 7 and 8).

5.5 Designing our own neural passageways

As we age, the myelin sheath around the axons grows thicker, which improves the transmission of neuro-electrical connections in the brain. Our dendrites grow new branches as we age, resulting in more interconnections for a richer, deeper, and more profound type of thinking! Researchers have stated that our frontal lobes are not fully developed until late adolescence (Kolb and Wishaw, 1996) or into our early twenties. This information helps explain why so many teenagers make misguided decisions. Around the age of thirty, refinement of fine motor development in the hands and face occurs. This development can help musicians move their fingers more easily, and vocalists who have more control over their vocal cords. Restak (2001) states, "all of the new research on the brain means that no matter how old you may be at this moment, it's never too late to change your brain for the better" (p.41).

In a sense, as we grow, we can "design our own brain." We can choose what we read, what we study, our hobbies, and what graduate degree we want. With each new hobby, we, in essence, create new neural passageways. The more often the pathways are used, the stronger they become. Often our neural passageways intersect with one another, very much like a superhighway complete with bridges, overpasses, underpasses, rotaries, and the like. According to Hannaford (1995), we custom design our own nervous systems to meet the choice and challenges of our interests and livelihoods. We all are in the process of becoming.

There is brain based evidence to suggest then, that the use of a cognitive behavioral intervention strategy, such as the Mood Management program, is one way to help adolescents design their own, more

healthy, brain. In fact, the Mood Management program is one way to help adolescents get out of their limbic system (emotional mind) and into their Wellness Mind or neocortex.

6 Emotions, the Brain, and Learning: Our Emotions and Our Intellect Are Intertwined

Our emotional center, or the limbic system, is located deep inside of our brain, some might say in the “heart” of the brain (see Figure 4). What effect do emotions have on our ability to learn? In order to more fully understand how our emotions are connected to our intellect, two central components of the limbic system will be examined: the hippocampus and the amygdala.

The hippocampus, like all structures in the limbic brain, is located in both our left and our right hemispheres. Shaped like a seahorse, the hippocampus organizes factual information and sends it into our long-term memory. The hippocampus is extremely susceptible to stress hormones. Jacobs and Nadel (1985) state “stress elicits the release of ACTH from the pituitary gland, which in turn stimulates the secretion of cortisol” (p. 518). Although cortisol receptors are found throughout the brain, they are most prominent in the hippocampus. “Stress in adults has been shown to regulate the number of cortisol receptors in the hippocampus,” (Jacobs and Nadel, 1985, p.518).

The hippocampus is linked with spatial behavior; some examples include being able to remember where objects are located and reading a road map to navigate from one place to another. In essence, the hippocampus helps us find our way from home to work, and in general it helps us get around in the world. O’Keefe and Nadel wrote the book, *“The Hippocampus as a Cognitive Map.”* They believe that the hippocampus also helps us “find our way around our own brain, meaning that when we try to find where an obscure fact is stored (say the street address of our childhood), the hippocampus will guide us to where it has been stored, and not used for years. Kotulak (1997) calls the hippocampus the “Grand Central Station of memory,” (p. 142). The authors of this article believe that mastering the steps in the Mood Management program is likely to help adolescents grow healthy neurons in their hippocampus. Kotulak (1997) states, “in adulthood, the brain finally settles down but it is not idle. It will keep building and destroying connections and strengthening and weakening established one for the rest of its life as it adjusts to the continuous changes in its environment” (p.17). According to Restak (2001), our “capacity for new learning remains and may increase as you grow older” (p. 37). Neurologists have recently discovered that as we age, brain cells continue to multiply in our hippocampus (Restak 2001).

The amygdala is an almond-shaped structure that permanently stores our most intense negative and positive emotions; it enables us to monitor and make meaning out of our experiences. The amygdala is constantly screening sensory input. It influences our ideas and ability to judge. LeDoux (1996) states in his book, *The Emotional Brain*, “...the amygdala has a greater influence on the cortex than the cortex has on the amygdala, allowing emotional arousal to dominate and control thinking” (p.301). He continues, “... Although thoughts can easily trigger emotions (by activating the amygdala), we are not very effective at willfully turning off emotions (by deactivating the amygdala).”

Interestingly, neurologists have discovered neural pathways that run between our limbic system (mammalian brain) and our neocortex (human brain). Although we can see that the neural passageways flow both ways between our neocortex and our amygdala, it is important to note that more neural connections run from the amygdala to our neocortex than vice versa. This means that our “emotional brain” can and will take control over our “thinking brain” when we least expect it. Understanding this phenomenon, called ‘downshifting,’ is critical as we consider the rationale for selecting cognitive behavioral counseling methodologies such as Mood Management.

6.1 Downshifting: Why downshift?

In our early history, in order for humans to survive the very real physical threats that were part of the landscape, our ancestors needed a mechanism to assess and respond to potential danger, what is known as the a fight or flight response. When our limbic system sends signals that the environment is not safe, a large amount of blood leaves the cortex and goes into the limbic brain and the brain stem causing us to go into the ‘fight or flight’ mentality. When the majority of blood and oxygen shifts down to these ‘lower’ centers of the brain, effective cognitive reasoning cannot take place. Today, even though we do not have to fight off wild animals, we can witness the same phenomenon of downshifting almost daily in our classrooms, counseling rooms, lunchrooms, school buses, or in our playgrounds. “Downshifting, then, appears to affect many higher-order cognitive functions of the brain and thus can prevent us from learning and generating solutions for new problems” (p.70, Caine and Caine, 1994).

When a child feels angry or threatened, the blood and oxygen literally ‘downshifts’ from the neocortex (the human brain) to the brain stem (the reptilian part of the brain that developed first). When this happens the child reacts physically instead of thinking through the situation. Downshifting leaves the child unable to think clearly. In the classroom, when our student’s amygdala perceives something as threatening, the cognitive information we are teaching simply does not make it into the cortex. Robert Sylwester (1995) explains that in the classroom, our emotions determine what we pay attention to, and what we pay attention to influences what we learn. A calmer limbic system means clearer thinking.

Putting It All Together

Since a calmer limbic system means clearer thinking, which, in turn, means better learning, strategies to calm the limbic system, such as Mood Management, are logical choices for those who work in both educational and clinical settings with adolescents who grapple with negative emotions that impair learning. It is exciting to consider that the use of CBT approaches serve to increase neural pathways in the brain which ultimately results in fewer episodes of downshifting in the adolescent brain. Simply stated, if we can change the brain, the adolescent will be able to learn more effectively. CBT modalities provide counselors with an opportunity to do just that.

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