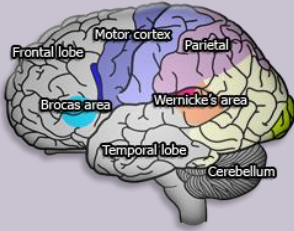


## The Neuropsychology of Emotional Disorders



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## Presentation Goals

1. Discuss why children with emotional disorders remain the single most challenging special education population to educate successfully.
2. Discuss the neural architecture of emotional functioning including six specific brain regions.
3. Explore the neurobiological underpinnings and treatment options for bipolar disorder, depression, and anxiety disorders in children.

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## Educational Facts

- \* Children with emotional disturbances remain the single most challenging special education population to educate successfully. WHY?
- \* Children with emotional disturbances are twice as likely to drop out of school and tend to earn worst grades than children with other disabilities (Reddy, 2001).
- \* Approximately 1/3<sup>rd</sup> of ED children receive homebound instruction- more than any other disability group.

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## Emotional Disturbance

- \* Poverty and family stressors key environmental predictors. Currently 1/3<sup>rd</sup> of all ED children come from households with an annual income of less than \$12,000 per year.
- \* African Americans represent better than 1/4<sup>th</sup> of all children labeled emotionally disturbed.
- \* Approximately half of ED children reside with just one parent.
- \* Disproportionate rate of physical abuse in children with emotion disturbances - more than any other disability group (Reddy, 2001).

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## The ED Paradox for Schools

- \* The rate of diagnosing pediatric bipolar disorder in outpatient clinical settings has doubled in the past five years (Leibenluft & Rich, 2008), though ED in schools remains proportionally the same the last 30 years.

	Percentage of Total Enrollment			
	1980	1990	2000	2006
LD	3.6	5.2	6.0	5.6
Speech	2.9	2.4	2.3	3.0
MR	2.0	1.3	1.3	1.1
OHI	.2	.1	.6	1.2
Autism	--	--	.2	.5
*ED	.6	.9	1.0	1.0
(ALL)	10.1	11.4	13.3	13.6

-Source: National Center for Educational Statistics (2007)

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## The ED Paradox for Schools

### 3 Explanations for the ED Paradox:

- 1) *Other-Health Impaired* coding used as an umbrella term to capture any child s on medication.
  
- 2) School IEP teams comprised mainly of non-mental health professionals determining mental health code.
  
- 3) Federal definition of ED rather vague with few parameters given (*i.e. inappropriate feelings under normal circumstances??*)

**\*\* Universal codes lead to universal treatments\*\***

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### Behaviorism: The good, the bad, and the ugly.

- \* Meta-analysis demonstrated behavior modification one of the most effective intervention strategies for **managing** classroom behavior (Lloyd, Forness, & Kavale, 1998).
- \* Characterizes most behavior as stemming from a lack of incentive to behave properly, most notably due to a poor moral foundation.
- \* Goal is to induce task specific performance, as opposed to the internalization of self-regulatory behaviors (Cicerone, 2002).
- \* Dismisses observable behavior as being reflective of brain functioning.

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### The Neurobiological Architecture of Human Emotion

**Neuropsychology** is the study of brain-behavioral relationships with respect to learning and behavior.

- \* Observable behavior seen by the outside world often reflects striving for **homeostasis** in the brain.
- \* Treatment for behavioral and emotional disorders should focus upon both intrinsic and extrinsic factors, rather than simply exploring rational functions of behavior (*i.e.* BIP's).

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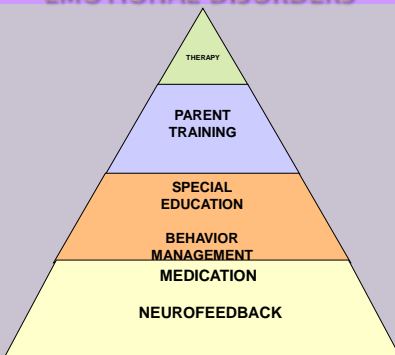
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### INTERVENTION ALGORITHM FOR EMOTIONAL DISORDERS



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### The Cerebral Orchestra of Emotions: Subcortical Regions

(1) **Amygdala** - responds to **unexpected** and **unfamiliar** events (Kagan, 2007). Ascribes emotional valence to stimuli. Primarily responsible for fear conditioning by providing a rapid, *precognitive* assessment of the situation.

- \* A hyperactive amygdala source of most anxiety problems.
- \* Kids with anxiety issues need structure in their day to reduce chances for unexpected and unfamiliar events.
- \* Serotonin can help calm down amygdala, like a warm blanket over brain.

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### The Cerebral Orchestra of Emotions: Subcortical Regions

(2) **Hippocampus** - located in medial temporal lobe and responsible for laying down new memories, and retrieving older ones. Also involved with emotional learning.

- \* Emotional learning (classical conditioning) can take place outside of conscious control with paired association between amygdala and hippocampus .....a **phobia!!**
- \* Chronic stress from abuse or neglect releases cortisol which reduces hippocampal volume and leads to memory loss and clouded thinking.
- \* A hypervigilant hippocampus develops from chronic stress thereby priming the system to over-react to benign situations (*PTSD*).

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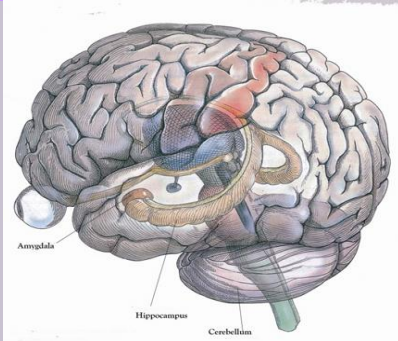
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### The Cerebral Orchestra of Emotions: Subcortical Regions



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### The Cerebral Orchestra of Emotions: Subcortical Regions

(3) **Nucleus Accumbens** - located in forebrain and part of basal ganglia.

- \* Reward center of brain which is activated in anticipation of reward.
- \* Most recreational drugs including cocaine and amphetamines increase **dopamine** in this area.
- \* Involved in task motivation and rewards.
- \* Under-activity of reward center of our brain associated with anhedonia and depression.

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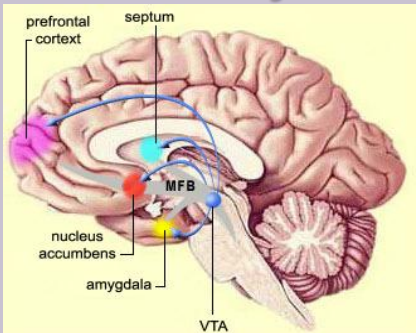
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### The Cerebral Orchestra of Emotions: Subcortical Regions



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### The Cerebral Orchestra of Emotions: Cortical Regions

(1) **Orbitofrontal cortex** - region of the brain responsible for ascribing an emotional valence or value judgment to another's feelings. Often triggers an automatic social skills response (Rolls, 2004).

- \* Has rich interconnections with the limbic system.
- \* Responsible for emotional *executive functioning*.
- \* Self-regulation of behavior as highest levels of emotional decision making dictated by this brain region.

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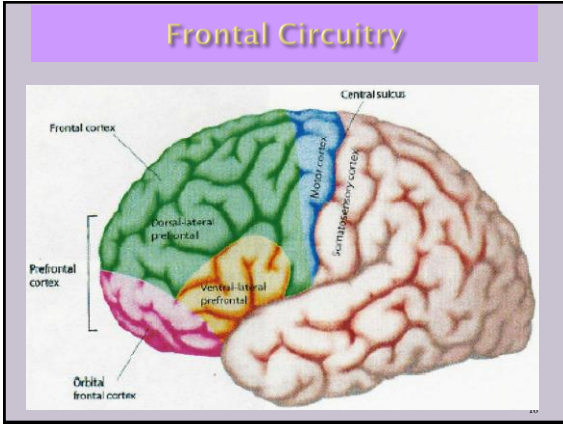
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### The Cerebral Orchestra of Emotions: Cortical Regions

**(2) Ventrolateral prefrontal cortex** - responsible for response inhibition and emotional regulation.

- \* Has rich interconnections with the limbic system.
- \* Responsible for monitoring our own internal states (Goldberg, 2009).
- \* Situated adjacent to orbitofrontal cortex and involved in the ability to take another's perspective on an emotional event (*theory of mind*).

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### The Cerebral Orchestra of Emotions: Cortical Regions

**(3) Anterior Cingulate Cortex** - task motivation and reward based decision making.

- \* Selective attention allows us to shift our focus from the outside world of objects and events toward the inside world of thoughts and ideas (*self awareness*).
- \* Helps provide constraint over behavior.
- \* The brain's gear shifter between cognition and emotion. When stuck, can result in obsessive and ritualistic types of behaviors, as well as cognitive inflexibility (Swingle, 2007).
- \* Key brain region in developing "*theory of mind*".

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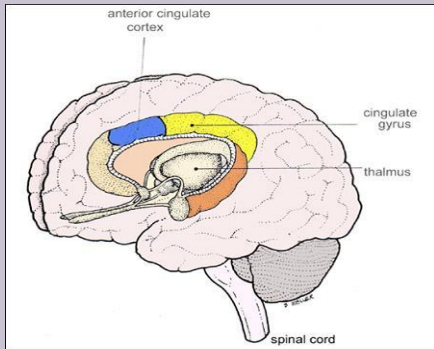
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### The Cerebral Orchestra of Emotions: Cortical Regions




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### Vignette #1

Brianna is celebrating her 5<sup>th</sup> birthday and is brimming with excitement now that the time has come to open gifts (*nucleus accumbens*). Her first gift is from Megan, her best friend, and is a Cinderella dress, slippers, and crown. She responds with intense excitement (*amygdala/ orbitofrontal cortex*).

Brianna races to Megan and impulsively gives her a huge hug (*ventrolateral prefrontal cortex*). After opening the rest of the presents, Brianna realizes that Megan's birthday is next week and wonders how Megan would feel if she bought her the new Disney Leapster (*anterior cingulate cortex*).

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### 4 Brain Regions Involved with Bipolar Disorder

(1) **Amygdala** - Smaller amygdala size is a consistent neuroanatomic finding in children with bipolar disorder (DeBello et al., 2006). The amygdala plays a role in the perception of threatening information, the *appraisal of social signals* that convey a threat, and the acquisition of fear conditioned responses (LeDoux, 2003).

\* Kagan (2007) argued that the amygdala responds to **unexpected** and **unfamiliar** events.

(2) **Hippocampus** -Studies in children have suggested smaller hippocampal volume is evident in *depression* (Caetano, et al., 2005). The hippocampus lies in close proximity to the amygdala and is primarily responsible for consolidating new memories and retrieving older ones.

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### Neurofeedback Summary

- \* Research for using neurofeedback on a range of disorders ranging from anxiety disorders, emotional regulation, ADHD, autistic symptoms, mood disorders, depression, TBI, migraines, and tics is extremely promising, though admittedly incomplete (Lubar, 1995; Sterman, 2000; Demos, 2005; Swingle, 2007; Budzynski, et al., 2009 ).
- \* International Society for Neurofeedback & Research (ISNR) at [www.isnr.org](http://www.isnr.org) is an excellent source of information as well as the **Journal of Neurotherapy** for research in this field.
- \* Should neurofeedback be used in schools????

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### Generalized Anxiety Disorders

- \* Generalized Anxiety Disorder (GAD) may have elevated *amygdala* activity at the core of the disorder, especially when attention is constrained to our own internal emotional states (McClure et al., 2007).
- \* The *anterior cingulate cortex* primarily functions as the brain's gear shifter, and allows children to shift between cognition and emotion in order to adopt a more adaptive response to emotionally significant events (Allman et al., 2001) Children may be too fixated monitoring their own internal states.

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### Social Anxiety Disorders: Two Fears

- \* The *amygdala* is the primary brain region for fear processing and also functions to generate a behavioral response to fear (Goossens et al., 2007). It is the principal brain region activated during the initial flash of fear, which is primarily reflexive.
- \* The second fear functions to keep the first fear alive and occurs at a more cerebral, than reflexive level, through *automatic negative thoughts* (ANTS). Higher level brain regions such as the *orbitofrontal cortex* and *anterior cingulate cortex*, both of which have rich interconnections with the amygdala, comprise the second fear circuit (Goossens et al. 2007).
- \* Medication management of anxiety disorders should begin with SSRI's to address the first fear system . Cognitive behavior therapy can assist children in reducing automatic negative thoughts by addressing the second fear system (Mancini et al., 2005).

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### 5 Treatments for Anxiety Disorders

- 1) SSRI's may be the most effective treatment for *bottom-up* disorders which occur outside of conscious control (Reinblatt & Riddle, 2007).
- 2) Exposure therapy can quiet an overactive amygdala in more "bottom-up" types of anxiety disorders (Goossens et al. 2007)
- 3) Cognitive behavior therapy is equally as effective, or in some cases, can surpass medication (Pine, 2008).
- 4) Structured class settings that minimize unpredictability best for kids with anxiety disorders.
- 5) Neurofeedback aimed at diminishing arousal (beta waves) while simultaneously increasing the amplitude of alpha waves holds much promise for many anxiety conditions.

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### Depression (Stahl, 2008)

- \* Depression is twice as likely in women, three times higher in families with positive history, and highest for unmarried males and married females.
- \* Not terribly common for younger children, though more common in adolescence (5%), thus implicating the role of the prefrontal cortex.
- \* 35-50% of depressed patients make a suicide attempt.
- \* 15% of severely depressed patients commit suicide (300,000 attempts per year with 30,000 suicides per year)
- \* Two out of three patients respond to medication.
- \* Prozac (SSRI) is only FDA approved antidepressant for children over age 8.
- \*4% of children on Prozac have suicide ideation, twice that of a placebo.....WHY??**

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### 5 Therapeutic Treatments for Depression

- 1) Cognitive behavioral therapy aimed at replacing ANT's (automatic negative thoughts) with more adaptable cognitions.
- 2) Play therapy techniques teaching young children how to identify their feelings and better ascribe verbal labels to them, as well as monitoring feelings with homework assignments.
- 3) Utilizing neurofeedback techniques aimed at diminishing the amplitude of theta (slow) waves in the cortex.
- 4) Psychopharmacological approaches (SSRI's).
- 5) Increasing the number of interpersonal connections in a child's life.

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### Why School Mental Health?

- \* Children spend 15,000 hours in school from kindergarten through high school.
- \* Children are most successful academically, personally, and socially when they have supportive relationships with caring adults (Doll & Lyon, 1998; Pianta, 1999).
- \* School mental health services should focus upon maximizing wellness by promoting positive interpersonal interactions.
- \* Building “*resiliency*” through satisfying relationships and feelings of connectedness is the key to overcoming obstacles and achieving psychological wellness.

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### Concluding Thoughts

- 1) Emotional dysfunction is not rooted in immorality but rather in neurobiology. Nevertheless, we are all to be held accountable by the choices we make.
- 2) Caution against over-relying on behavior rating scales. They are an opinion from observers not schooled in assessing mental health.
- 3) Not all behavior has a rational function (teleology).  
Antecedent → Behavior → Consequence should be:  
Antecedent → Executive Functioning → Behavior → Consequence.
- 4) Medication in combination with therapy and environmental supports key to success. Neurofeedback may be the *wave* of the future.

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