

Appendix 1: What's Going On?

"Differences Do Not Equal Disabilities!"

WHAT'S GOING ON?	OBSERVABLE SYMPTOMS	WHAT'S HAPPENING IN THE BRAIN?
Learned Helplessness	Unmotivated – <i>Chronic</i> "What's the Use" attitude – Disconnected from cause and effect – verbalizes powerlessness – May look like and lead to depression – can be sarcastic or passive in the face of shock	Lower levels of dopamine, serotonin, and norepinephrine. Reward system impaired. Underactive prefrontal cortex – particularly mirror neurons in dorsal lateral PFC.
Learning Delays	Depends upon specific condition but in general they can't keep up with peers and have not met normal developmental benchmarks. Difficulty with compound tasks – can't understand metaphor/simile – may feed back cause and effect relationships but without meaning	The brain is built as neurons are pushed up the neural tube by glial tubes. Sometimes neurons "park" prematurely before they get to where they belong. FAS, poor prenatal care, or premature birth can be the cause. FAS is particularly bad because GABA inhibits neuronal firing. (250,000 neurons created per minute in the first trimester!)
Acquired Brain Injuries	Similar to Learning Delays. Slowed ability to think and work – poor short term memory – mood swings – impulsive. Many ABI's, go undiagnosed because the cause was not noticed: A subset of ABI's are TBI's or traumatic brain injuries which may or may not be significant enough to notice at first.	Any non-heredity insult to the brain. ABI's include abuse, tumors, toxins, etc. and are highest in very young children. TBI's are highest in children 11 -18 before the brain has completed developing. Early alcohol use and illegal drugs are a contributing factor in this age group.
Dyslexia	Reading is difficult, even painful – Rhyming problems –Can't segment words (Pig Latin difficult)– Difficulty with alphabet, lists, names – mix up multisyllabic words – often right/left problems – difficulty with cross laterals. Reading is hard but not impossible. High level of comorbidity with ADHD (50%). Brain is not hardwired to read so many complex <i>connections</i> must be made before reading is possible. Auditory and/or visual systems may be	Overactive frontal lobe and Broca's area and too little in temporal lobes. Sluggish connections between Wernicke's and Broca's areas interfere with word identification, word memory, and meaning making. Poor connections between these areas and frontal lobes interfere with short term memory. Temporal lobes store common nouns and proper nouns in separate areas so connections here must be in place. Broca's area in left dorsal lateral PFC must be wired for rate of processing phonemes and

WHAT'S GOING ON?	OBSERVABLE SYMPTOMS	WHAT'S HAPPENING IN THE BRAIN?
Dyslexia (continued)	<p>involved. The good news is that we have the understanding, programs, and technologies to meet the needs of learners with dyslexia.</p> <p>Gordon Sherman's research suggests some "ectopias" or "rogue cells" may have pushed out of Wernicke's area into other areas and cause connections that individuals who do not have dyslexia don't have!</p>	<p>parts of words, phonemic awareness, phonological processing. Finally, the occipital lobe must be wired to focus, discriminate and make smooth visual movements across the page. All of this information must be transmitted back to Wernicke's area to make meaning and do the motor cortex and speech centers for expression.</p>
Central Auditory Processing Deficits	<p>Easily distracted. Turns head to hear – omission of prefix/suffix – mispronounce words – Reading problems. May look like ADHD but watch for turning head to hear. Can't copy a simple spoken sentence correctly.</p>	<p>Sub-category of dyslexia. Brain is not properly wired for reading. Problems with developing auditory nerve endings. May be a result of faulty prenatal neuronal migration in the first trimester, frequent and severe inner ear infections, toxic exposure to noise, or prenatal toxins. Studies show that learner may not be hearing the beginning or endings of words. (May say "atendin" rather than "pretending.")</p>
Drug Abuse	<p>Different drugs affect individuals differently. Watch for changes in behavior.</p> <p>The Teen Brain as "The Perfect Storm"</p> <ul style="list-style-type: none"> • <u>Greater biological vulnerability:</u> Programmed for risky behaviors as need to separate from birth family and bond with peers. Less aware of early effects of drugs/alcohol than adults are. Poor ability to predict future. (Underdeveloped PFC) • <u>Less parental supervision = Greater opportunity</u> • <u>Greater need to be in accepted by peer group:</u> poor ability to read emotions + greater peer pressure = greater risk for making bad choices 	<p>The frontal lobes of the brain are not fully developed. Anterior cingulate in PFC, the "CEO" that decides if something is a <i>risk</i> or and <i>opportunity</i> develops in girls between 18 and 21 and in boys between 20 and 25. Underage alcohol or drug abuse delays normal development.</p> <p>The "pleasure pathways" of the brain are hijacked. Some drugs are stimulants, some depressants, and some effects are "sideways" – but all require little for the individual to experience relief or "high." Most used by teens are "downers" – alcohol, marijuana, prescriptions – "escape" drugs. "Sideways" drugs like hallucinogens interfere with serotonin uptake. Ecstasy destroys serotonin uptake receptors leaving molecules in synapse. Normal functioning lost and brain can't recover.</p>

WHAT'S GOING ON?	OBSERVABLE SYMPTOMS	WHAT'S HAPPENING IN THE BRAIN?
<p>Drug Abuse (Continued)</p>	<p>A person on marijuana may exhibit decreased motivation and slower, "spacey" movements. Too "laid back." Appetite may change and affect reduced. Reasoning and judgment are impaired. Weaker short term memory and impaired attention span.</p> <p>Alcohol blunts the stress response. Telltale smell. Poor short-term memory and slowed reaction time. Weak visual-spatial functioning and poor fine motor response. Over time the tolerance level builds and dependency is highly likely for underage drinkers as brain systems do not develop normally.</p> <p>Effects of ecstasy combine properties of both stimulants and hallucinogens. Side effects include increased heart rate, blood pressure, and "hangover" symptoms of fatigue and depression. High body temperature has caused several deaths. Not physically addicting although studies about "extreme memories" may create psychological dependence on the feelings of euphoria, peace and closeness that teens have difficulty finding in other ways.</p>	<p>Marijuana changes the way in which sensory information gets into, and is processed by, the hippocampus. The hippocampus is crucial for learning, memory, and integration of sensory experiences with emotions and motivation.</p> <p>Alcohol affects the entire brain – primarily the prefrontal cortex that is responsible for problem solving and decision making. It disrupts the reward pathways and serotonergic system by increasing GABA and inhibiting neuronal firing.</p> <p>Ecstasy involves the prefrontal cortex and reward pathways in much the same way as LSD. Destroys serotonin uptake receptors leaving molecules in synapse. Normal functioning may be lost and brain can't recover. Also affects the circulatory systems.</p>
<p>Oppositional Disorder</p>	<p>"I <i>won't</i> do it!" - Verbally abusive but does not mean it personally – Hates authority. Oversensitive to power differentials. They don't mind change – they mind <i>being changed</i>.) Need sense of control – Keen sense of hierarchy and fairness – Can't shift gears from one state or activity to another. High comorbidity with ADD - 60% are also highly impulsive</p>	<p>Overactive cingulated gyrus. Needed to "shift gears" so it can make state changes. Overactive amygdala causes reactive behavior when deep seated emotions are triggered. Impaired stress response system and underdeveloped PFC.</p> <p>Low serotonin levels.</p>

WHAT'S GOING ON?	OBSERVABLE SYMPTOMS	WHAT'S HAPPENING IN THE BRAIN?
Conduct Disorder	<p>Similar to OPD but is physically as well as verbally violent. Can be safety hazard for self and others. Aggressive – disruptive. Cruel and vindictive with no remorse or regard for others. After violent incident can't understand why they can't be trusted.</p>	<p>Brain is wired for violence. Prefrontal cortex, limbic pathways, and amygdala are all involved. High noradrenaline and cortisol and low serotonin levels. ¹</p> <p>Negative emotions processed in right hemisphere of brain. One court reduced the sentence for a young person with a hole in the right hemisphere where positive emotions are processed.</p>
Autistic Spectrum Disorders	<p>Each is unique. Wide variance in abilities. Generally poor social skills – Can't mimic – Poor eye contact – Possible repetitive behavior. Poor attunement in developmental autism can be seen at 12-18 months. Normally children can follow where someone else points. They are reading intent.</p> <p>Generally school staff is not qualified to apply the better diagnostic tools for ASD. This should be done by medical professionals such as licensed clinical psychologists, neuropsychologists, psychiatrists, or neurologists. School staff can contribute by responding to checklists or identifying and reporting on the presence of specific symptoms. (Page 82 in notebook.)</p>	<p>Many areas of the brain are involved. The immune system is also typically compromised. As a spectrum disorder there is wide variance in brain function.</p> <p>A new discovery is the absence of functioning mirror neurons in individuals with ASD. Discovered in the dorsal PFC in 1995, mirror neurons were first connected to autism in 2003!</p> <p>Misattunement with mother during infancy may result in over pruning of synapses in the right prefrontal cortex causing and inability to modulate emotion.</p> <p>Brain is "compartmentalized" – good at some things but difficulty generalizing. Hypersensitive sensory systems. Individuals with Ausberger's Syndrome process stories and faces in different places in brain. Lack of attunement with caregiver in infancy can lead to over pruning of synapses in right PFC causing an inability to modulate emotion.</p>

¹ Kotulak, Ronald. (1996). *Inside the Brain: Revolutionary Discoveries of How the Mind Works*. Kansas City: Andrews McMeel Publishing. 65-73.

WHAT'S GOING ON?	OBSERVABLE SYMPTOMS	WHAT'S HAPPENING IN THE BRAIN?
ADD/ADHD	<p>Remember symptoms as “MIA”</p> <ul style="list-style-type: none"> • <u>Memory</u>: Poor short term memory especially on visual tasks. • <u>Impulsivity</u>: Doesn't learn from mistakes. Easily frustrated. • <u>Achronica</u>: From Greek meaning “out of sync with time.” Difficulty reflecting or projecting. Can't delay gratification. <p>Not so much a disability than a <i>mismatch</i> with traditional school. Many ADHD children do well in alternative environments. Important to distinguish mild, moderate, and severe as treatments are very different. (See page 93 in notebook.)</p> <p>Low levels of dopamine, glucose, and amines may result in self-medicating with food, drugs, alcohol.</p> <p>Correct diagnosis is important. Don't confuse ADHD with bipolar or unipolar manic since treatments are very different.</p>	<ul style="list-style-type: none"> • Dopamine transporter irregularities interfere with working memory and shorten delay gradient • Glial glucose metabolic defect interferes with working memory – need constant supply of sugar. Hippocampus uses a great deal of glucose and is important for memory formation. • Low PFC amine activity interferes with working memory and delay gradient. Uppers – like caffeine, Ritalin help this. • Striatal (reward pathways) lesions shorten delay gradient (Impulsivity) • EEG theta excess hippocampal gating interferes with temporal processing and working memory • Underactive thalamus does not organize incoming stimulus well <p>Highly comorbid with other brain dysfunctions (See page 90 in notebook): Hypoactive attention system, chemical imbalances and mood swings, miswiring that leads to dyslexia, DD, MR, FAS, etc, Sensory system breakdowns, overactive cyngulate gyrus that results in oppositional issues.</p>
Sensory Integration Disorders	<p>This is a spectrum disorder – from mild to severe. In general they seem uncomfortable in their bodies – Oversensitive or under sensitive – Too much movement – <i>Distinguish from ASD because social skills are within normal range.</i> This is a “learning style gone awry.” Beyond a kinesthetic learner. May smell nonfood objects – take excessive risks – lack safety awareness – inappropriate social skills</p>	<p>Systems involved:</p> <ul style="list-style-type: none"> • Central Nervous System: (Basic building blocks for all learning) • Proprioception (Sense of self in space) • Tactile (Touch) • Vestibular (Balance)² <p>The thalamus takes in all sensory inputs before connecting with sensory or motor cortex. In SID it isn't</p>

² <http://www.childsolution.org/>

WHAT'S GOING ON?	OBSERVABLE SYMPTOMS	WHAT'S HAPPENING IN THE BRAIN?
<p>Sensory Integration Disorder</p> <p>(Continued)</p>	<p>– jumpy, anxious – may avoid bright lights or loud sounds – hands over ears.</p> <p>Excessive movement is an attempt to “self medicate” by changing metabolic states. Help learner find better ways to do this.</p> <p><i>Most commonly diagnosed as ADHD and teachers want to medicate. This is not appropriate for SID.</i></p>	<p>processing or connecting with other parts of the brain in a balanced way and signals are wrong. Child must move or adjust body to feel comfortable.</p> <p>May be hyposensitive or hypersensitive in any one or a combination of brain systems. (See pages 105-106 – <i>The Fragile Brain Notebook</i>)</p>
<p>Anxiety and Stress Disorders</p>	<p>Invisible to the untrained eye but is the largest group of any disorder. Trance-like states – bored and listless – lack of energy or enjoyment – short-term memory impaired – weakened episodic memory. May be hyper-vigilant. Likely to abuse drugs. Sometime most outspoken or “happy-go-lucky” child is the most vulnerable to stress disorders.</p> <p>Treatable. Most learners respond well to environment that is good for children with anxiety or stress disorders.</p> <ul style="list-style-type: none"> • Old paradigm = Homeostasis – i.e. Systems return to balance. • New paradigm = “Allostatic Load” = i.e. A new “normal” results after the brain becomes accustomed to chronic stress. 	<p>Amygdala records early stress or trauma. Later acute or prolonged stress can result in symptoms of PTSD. Hypothalamus is the thermostat that regulates stress Under acute or prolonged stress it signals adrenals to produce stress hormones – in particular, cortisol. Chronic exposure to cortisol in early years may result in attachment disorder.</p> <p>Hippocampus has more receptors for cortisol than any other place in the brain. High levels of cortisol put the brain on “red alert” and shuts down everything except what is needed for survival. Higher level thinking shuts down and organism goes into “fight or flight.” If stress is chronic and body develops pattern of allostasis, the person feels “normal” even though long term physical and/or emotional damage is being done. ³</p>
<p>Reactive Attachment Disorder</p>	<p>Wide variance in symptoms. Some children are too inhibited and other not inhibited at all. Inappropriate social skills. Highly impaired relationships may be caused by early abuse or major trauma. They do not forgive. RAD</p>	<p>Extreme form of stress disorder resulting in the brain becoming organized around the fear response. Stress response system is formed in the first five years of life. High stress or trauma results in an overactive</p>

³ Sapolsky. Robert M. (1994). *Why Zebras Don't Have Ulcers: An Updated Guide to Stress, Stress Related Diseases, and Coping.* New York: W.H. Freeman and Co.

WHAT'S GOING ON?	OBSERVABLE SYMPTOMS	WHAT'S HAPPENING IN THE BRAIN?
Reactive Attachment Disorder (Continued)	<p>may be confused with OPD, Conduct Disorder or even Bipolar. Destructive, cheating, lying, denial with no conscience. May be explosive or highly reactive. Highly manipulative. Impaired attention span. May even show signs of mild retardation, impaired speech and language skills or weakened cognitive functioning.</p> <p>Object permanence problems. Fear abandonment and tend to set it up for themselves. They do not trust.</p>	<p>amygdala that has stored bad emotional experiences. Life script says "people who care about me will hurt me." Exposure to violence from 0-5 is absorbed by the brain in much the same way as language. ¼ of the brain is dedicated to processing visual images so it is important to protect young children from frightening visual stimuli that becomes recorded in the amygdala and is easily triggered later.</p>
Depression	<p>Watch for changes in behavior – unusual anger, moodiness, loss of relationships. Sad, irritable or crabby. Negative thoughts, language. Fatigue – inability to concentrate. Unipolar manic can be mistaken for ADHD. Weight loss or gain paired can accompany depression</p>	<p>Imbalances in chemical and/or electrical systems in the brain can be addressed with medication, diet, and lifestyle changes.</p> <p>Bipolar brain can swing between abnormal fast and slow synaptic connections.</p>