9.01 Introduction to Neuroscience
Fall 2007

9.01 Monday Recitation, Nov. 26

Chapter 22 – Mental Illness

Anxiety Disorders: inappropriate expression of fear (or fear that is not adaptive); see Table 22.1

	Description	% Population	Misc.
Panic Disorder	Frequent panic attacks consisting of the sudden onset of intense apprehension, fearfulness, or terror; persistent worry of further attacks.	2% — Twice as common in women as in men	Onset after adolescence and before age 50; half also suffer from major depression
Agoraphobia	Severe anxiety about being in situation where escape is difficult or embarrassing; avoidance of situations that seem threatening.	5% — Twice as common in women as in men	Often adverse outcome of panic disorder
OCD	Characterized by obsessions (thoughts or impulses perceived as inappropriate that lead to anxiety) and compulsions (repetitive behaviors to reduce anxiety)	2% — Equal incidence among men and women	Usually appears in young adult life; symptoms fluctuate in response to stress levels

Biological Basis of Anxiety Disorders

- Review of Stress Response: **hypothalamic-pituitary-adrenal (HPA) axis** mediated response

  stressor → parvocellular neurosecretory cells in the hypothalamus release CRH (corticotrophin-releasing hormone) → anterior pituitary releases ACTH (adrenocorticotropic hormone) → adrenal cortex releases cortisol

- Regulation of HPA by Amygdala – activation of amygdale stimulates CRH release. Sensory information enters amygdala for processing, is relayed to central nucleus; if neurons in the central nucleus of the amygdala become active, stress response begins (Figure 22.4)

- Regulation of HPA by Hippocampus – activation of hippocampus suppresses CRH release. Hippocampus has receptors for cortisol and other glucocorticoids and participates in feedback inhibition when circulating cortisol levels get too high.

Treatment for Anxiety Disorders

- Psychotherapy: repeated exposure to the stimuli that causes anxiety, reinforces idea that the stimuli is not dangerous

- Anxiolytic Drugs: Benzodiazepines – modulates GABA channel; makes GABA more effective in opening channel and producing inhibition. Remember that GABA is an inhibitory neurotransmitter. Example of benzodiazepine is Valium.

- Anxiolytic Drugs: SSRIs – prolongs actions of released serotonin by preventing reuptake. Example of SSRI is Prozac.

Affective Disorders: mood disorders

	Description	% Population	Misc.
Major Depression	Lowered mood, decreased interest or pleasure in activities; symptoms may include loss of appetite, insomnia, fatigue, feelings of worthlessness and guilt, etc.	Most common affective disorder; 5% each year	Usually don't last more than 2 years; chronic form in 17% of patients; commonly recurs
Bipolar Depression	Repeated episodes of mania, depression. Manic episode symptoms: inflated self-esteem, disinhibited and reckless behavior.	Type I — 1% Type II — .6%	Type II always associated with major depression

Biological Basis of Affective Disorders

- Monoamine Hypothesis – depression is result of deficit in NE and/or 5-HT diffuse modulatory systems in brain; evidence from drugs discovered to work against depression (reserpine prevents loading of these neurotransmitters into vesicles; and MAO inhibitors, which prevent MAO from breaking down neurotransmitters)

- Diathesis-Stress Hypothesis ("diathesis" = predisposition for a disease) – depression is result of a combination of predisposition for the disease and environmental stress factors; HPA axis is main site where genetic and environmental disorders converge to cause mood disorders.

  Perhaps a decreased hippocampal response to cortisol because of a decrease in receptors; this decreased feedback inhibition, along with elevations in CRH because of stressful life events, may make the brain vulnerable to depression.

Treatments for Affective Disorders

- Electroconvulsive therapy (ECT) – mechanism for depression relief unknown; may cause memory loss

- Psychotherapy – helps depressed patients overcome negative views of themselves and their future

- Antidepressants
  a. Tricyclic compounds – block reuptake of NE and 5-HT by transporters (i.e. imipramine)
  b. SSRIs – blocks reuptake of 5-HT by transporters (i.e. fluoxetine)
  c. NE-selective reuptake inhibitors – blocks reuptake of NE by transporters (i.e. reboxetine)
  d. MAO inhibitors – inhibits breakdown of NE and 5-HT by monoamine oxidase (i.e. phenelzine)

- Lithium – highly effective in stabilizing mood of bipolar patients (page 679)

Schizophrenia

- Description – loss of contact with reality, disruption of thought, perception, mood, and movement; paranoid schizophrenia is characterized by delusions organized around a theme (i.e. powerful adversaries are out to get them); disorganized schizophrenia (lack of emotional expression, incoherent speech); catatonic schizophrenia (peculiarities of voluntary movement; immobility and stupor); disorder becomes apparent typically during adolescence or early adulthood

- Positive Symptoms (presence of abnormal thoughts, behaviors) – delusions, hallucinations, disorganized speech, disorganized or catatonic behavior

- Negative Symptoms (absence of normal responses) – reduced expression of emotion, flatness of affect, difficulty in initiating goal-directed behavior, poverty of speech, memory impairment

Biological Basis of Schizophrenia

- Genes and Environment – large genetic component, runs in families; environmental stresses exacerbate the condition; physical changes in the brain – ventricles are enlarged in those with schizophrenia

- Dopamine Hypothesis – psychotic episodes triggered specifically by activation of DA receptors in the mesocorticolimbic dopamine system (amphetamines enhances neurotransmission of DA, can cause psychotic episodes; neuroleptic drugs block DA receptors and seem to reduce positive symptoms of disorder)

- Glutamate Hypothesis – disorder reflects diminished activation of NMDA receptors in the brain (PCP inhibits NMDA glutamate receptors, PCP intoxication includes many symptoms of schizophrenia)

Treatments for Schizophrenia – neuroleptics act at certain dopamine receptors, reducing positive symptoms; unfortunately, neuroleptics have many side effects, including Parkinson-like symptoms and tardive dyskinesia.

Review Questions for Chapter 22

53. Which of the following will activate the HPA axis:
    a) Binding of cortisol to glucocorticoid receptors in the Hippocampus.
    b) Activation of the central nucleus in the Amygdala.
    c) Being chased through the forest by a grizzly bear (and you are scared!).
    d) A and C
    e) B and C

54. Current models for the cause of the symptoms of Schizophrenia include
    a) Levels of Dopamine in the brain are too high.
    b) Levels of Glutamate are too high
    c) Levels of Estrogen are too high
    d) All of the above

55. Which of the following systems most likely plays a role in the etiology of clinical depression?
    a) The diffuse modulatory systems.
    b) The Hypothalamic-Pituitary-Adrenal Axis.
    c) The mesocorticolimbic dopamine system.
    d) A and B
    e) All of the above

56. All of the following support the hypothesis that there is a dopaminergic basis to schizophrenia EXCEPT:
    a) PCP users can experience symptoms similar to those shown by schizophrenic patients.
    b) Amphetamine users can experience symptoms similar to those shown by schizophrenic patients.
    c) Antagonizing dopamine receptors helps alleviate certain symptoms of schizophrenia.
    d) Drugs effective in treating schizophrenia can produce Parkinsonian side effects.

57. Anxiety or Panic Disorder is associated with
    a) decreased size of lateral ventricles
    b) decreased binding of radioactive benzodiazapine in the frontal cortex seen in PET scans
    c) difficulty with the Wisconsin Card Sorting Task
    d) hallucinations