

ECPS5003 Brain, Biology and Cognition
Exam Answers 2021-2022

SECTION A: ANSWER FOUR QUESTIONS OUT OF FIVE

1. List any five major internal features of a neuron (5 marks).
 - Any of the following: Endoplasmic reticulum, Nucleus, Mitochondria, Cytoplasm, Ribosomes, Golgi Complex, Microtubules, Synaptic Vesicle, Neurotransmitters
2. List any five characteristics of Korsakoff syndrome (5 marks).
 - Any of the following: Sensory problems, motor problems, extreme confusion, personality changes, risk of death from liver, heart, or gastrointestinal disorder. Lesions to medial diencephalon and several other brain structures: neocortex, hippocampus, cerebellum.
3. List five major classes of anxiety disorders (5 marks).
 - Generalised, Phobic, Panic, Obsessive-compulsive, Posttraumatic stress
4. List any five neurotransmitters in the brain (5 marks).
 - Any five of the following: Glutamate, Aspartate, Glycine, Gamma-aminobutyric acid (GABA), Dopamine, Epinephrine Norepinephrine, Serotonin, Acetylcholine, Nitric oxide, Carbon monoxide, Anandamide, Pituitary peptides, Hypothalamic peptides, Brain-gut peptides, Opioid peptides, Miscellaneous peptides
5. List five forms of forgetting from long-term memory (5 marks).
 - Any of the following: Trace-dependent Forgetting, Interference, Repression, Motivated Forgetting, Directed Forgetting, Cue-dependent Forgetting, Encoding Specificity, State-dependent Forgetting, Context-dependent Forgetting, Memory biases, Misleading information

SECTION B: ANSWER THREE QUESTIONS OUT OF FIVE

1. Compare and contrast Positron Emission Tomography (PET) with functional Magnetic Resonance Imaging (fMRI) (10 marks).

fMRI provides images of brain structure and activity, uses strong magnetic field, two properties of oxygenated blood allow it to work. 1. Active areas of the brain take up more oxygenated blood than needed. 2. Oxygenated blood has magnetic properties through the iron, Structure is imaged using waves emitted by hydrogen ions, Function is imaged using signal created from interaction between oxygen and iron in the blood: Blood Oxygenated Level Dependent (BOLD) signal, Good spatial and temporal resolution, Produces 3D images of activity over the whole brain, But only provides indirect measure of neural activity through BOLD, Also, the 2 to 3 seconds to create image is too slow to capture neural responses e.g., action potentials that happen in milliseconds.

2. Describe the five stages of language production development in infants (10 marks).
 Stage 1 = Cooing 1-2 months – Long drawn-out vowels or combinations of consonant-vowels – E.g. oooooooooh or gaaaaaaaah
 Stage 2 = Babbling 6-10 months – More consonant-vowel combinations and repetitions – E.g., dadadada – Phonemes are beginning to be constrained by language exposure
 Stage 3 = First words 10-15 months – 50 words – A single word has many purposes e.g., juice (request, comment, lament) – holophrases
 Stage 4 = Two-word utterances 18 months – Telegraphic speech – omit grammatical words e.g., milk gone.
 Stage 5 = Vocabulary explosion 24 months+ – Straight from 2 words to sentences! – Sentence structure and grammar develops • Is inconsistent at first • E.g., over generalise – more than one ‘cat’ are ‘catses’, playing with past tense makes ‘go’ becomes ‘goed’ – Grammar develops in a particular sequence • Words ending in –ing (notes verb) • Prepositions in/on • Plural -s – Consistent by age 4. Average 6-year-old – 14,000-15,000words (Clark, 1991)

3. Describe how the human brain is protected (10 marks).
 - Physical Protection: Skull – CNS encased in bone & covered by 3 Meninges – Dura mater – tough outer membrane – Arachnoid membrane – quite fine & web-like – Pia mater – inner & delicate membrane that adheres to CNS surface.
 - Cerebrospinal fluid (CSF) - serves as cushion by filling in space underneath arachnoid membrane, central canal of the spinal cord, and the cerebral ventricles of the brain. 4 large internal chambers of the brain: two lateral, third, and fourth.
 - Chemical protection: The blood-brain barrier: – Because blood can contain many toxins, the body needs to stop these toxins passing into the brain. The cells of the blood vessel walls in the brain are so tightly packed together it forms a barrier which stops any molecules from passing through.

4. Explain how lateral inhibition assists in our perception of edges (10 marks).

Edges are informative because they define the extent and position of all objects in the world. • An edge is where 2 different areas of a visual image meet. • Perception of an edge is perception of contrast between 2 adjacent areas in the visual field. • To enhance these contrasts our visual system creates nonexistent stripes called: Mach bands for contrast enhancement (Makes edges easier to see and a consequence of lateral inhibition). An intensity graph shows what is actually there: • a series of stripes of differing intensities. • But what we see is the brightness changing from darker to lighter. • Next to each edge the brighter stripe looks brighter than it actually is and the darker stripe looks darker. • Mach bands enhance the contrast at each edge enabling us to see the edge easier. When receptor is illuminated by light, it fires & inhibits other receptors around it from firing. • Contrast enhancement is firing rate of receptors on each side of edge • E.g., receptor D fires more than others that are intensely illuminated (A,B,C) because it's next to the edge between intense & dim light. • While receptor E fires less than others (F,G,H) because it's next to the edge between 2 types of lighting but on the dim side.

5. Describe the process of conducting clinical trials for testing a new drug (10 marks).

Translational research – basic research (discovery of the drug, efficient synthesis, testing with animal models – 5 years) - then approval from government agency (1 year), then 3 phases to human clinical trials: screening for safety and finding max safe dose (1.5 years), establishing testing protocol – effective doses and schedule of treatment – 2 years), and final testing (clear demonstration drug is therapeutic – 3.5 years). Then application to begin marketing and review results of clinical trials by government agency (1.5 years), then sell to the public with recovering development costs and continue to monitor safety.

SECTION C: ANSWER TWO QUESTIONS OUT OF FIVE

1. Critically discuss whether biopsychological paradigms of animal behaviour are useful for understanding human functioning (25 marks).

- Assessment of Species-common behaviours: those displayed by all members of the species: e.g., grooming, eating, building nests, etc.). • Main tests

1. Open-field test: place animal in empty chamber & record activity (does it move around or stay close to wall, how much droppings it produces, etc.).

2. Tests of Sexual Behaviour.

3. Tests of Aggressive and Defensive Behaviour: Colony-intruder paradigm: examine no. of combat encounters between dominant alpha male of established colony & smaller male intruder. • Dominant alpha is aggressive: biting, putting hair upright. • Intruder is defensive: goes up on back legs to defend from biting & tries to push alpha away with its front paws. • Elevated plus maze: a maze mounted 50cm from the ground, two arms of maze have sides while other two do not • Amount of time rat spends in closed arms rather the open edge arms is compared. • Giving rat anti-anxiety drugs increases amount of time spent in open arms of maze: used for understanding usefulness of anti-anxiety drugs in humans?

4. Traditional Conditioning Paradigms: • We can infer about the sensory, motor, motivational, and cognitive state of an animal from its ability to learn and perform various responses. • Pavlovian conditioning (pairing an unconditioned stimulus with a conditioned stimulus) • Operant conditioning & reinforcement.

Semi-natural Animal Learning Paradigms:

5. Conditioned Taste Aversion: pairing something that makes an animal ill with food so they learn to avoid it. • This really challenged traditional learning paradigms because taste aversion can be established after a single trial.

6. Radial Arm Maze: place food at the end of the same arms. • Rat learns not to bother looking in the other arms. • Shows their spatial ability is good because all the arms look the same, so they have to orientate themselves to the whole room. • When the maze is rotated their performance is disrupted.

7. Morris Water Maze: rat must find hidden escape platform in an opaque pool of water. • Even when rat is placed in different places around the pool it quickly learns route, using spatial cues from the room. • Brain lesions disrupt ability and in severe cases the rat can be swimming around in circles for a long time even if they are placed in the same starting point on a trial where they successfully found the platform previously.

8. Conditioned Defensive Burying: give rat a single aversive stimulus (e.g., a shock/blast of air) delivered from an object. • They then spray their bedding/hay at the object to cover it. • Anti-anxiety drugs decrease amount of burying behaviour.

2. Critically discuss the methods used to examine memory deficits in amnesic patients, such as H.M., and explain what they tell us about the mechanisms and sub-divisions of memory (25 marks).

The formal methods of assessment should be explained in detail:

Digit span + 1

Block-tapping memory-span task

Mirror-drawing

Rotary-Pursuit

Incomplete picture

Pavlovian condition

As well as the three major scientific contributions:

1. Medial temporal lobes are involved in memory
2. STM, remote memory, and LTM are distinctly separate – H.M. is unable to move memories from STM to LTM, a problem with memory consolidation
3. Memory may exist but not be recalled – as when H.M. exhibits a skill he does not know he has learned • Difference between explicit (conscious) vs. implicit (unconscious) memories.

3. Describe the symptoms and causal factors of schizophrenia and critically discuss the development and the strengths and limitations of the dopamine theory (25 marks).

“Splitting of psychic functions” • Breakdown of integration of emotion, thought, action

• Affects ~1% of the population • Diverse & complex: multiple types with varied profiles

• Can overlap with other psychiatric disorders & even change during progression.

• Symptoms can be classed as either: • Positive: represent an excess or distortion of normal function • Negative: represent a reduction or loss of normal function. • Positive symptoms:

1. Delusions (of being controlled, persecution, or grandeur), 2. Hallucinations (imagine voices), 3. Inappropriate affect (incorrect emotions for context), 4. Incoherent speech/thought, 5. Difficulty performing everyday tasks, 6. Lack of personal hygiene

• Negative symptoms: 1. Affective flattening (absence of emotional expression), 2. Alogia (no speech), 3. Avolition (absence of motivation), 4. Anhedonia (unable to experience pleasure). Causal Factors in Schizophrenia • Evidence for a genetic contribution • Inherit an increased risk for the disorder but experience may also influence it developing •

Multiple causes • Several different chromosomes implicated • Associated with various early issues – birth complications, infections, autoimmune reactions, toxins, traumatic injury, stress • Interference with usual development of susceptible individuals may lead to the disorder. Discovery of the First Antipsychotic Drugs • Chlorpromazine: originally developed as antihistamine to counteract swelling from surgery • Surgeons noticed its calming effect, so given to calm agitated schizophrenics & to activate emotionally blunt

schizophrenics • Does not cure schizophrenia, just reduces severity. • Reserpine: also found to be effective, but no longer used due to dangerous side effects. • Although chemical structure of both were different, their effects were similar (i.e., no effect for 2-3 weeks, also Parkinson-like motor effects were seen), suggesting they were both working through the same mechanisms. Dopamine Theory of Schizophrenia • 1960 – link between dopamine and Parkinson's disease established • Striatum depleted of dopamine, suggesting disruption of dopaminergic transmission might produce Parkinson's disease. • Due to this & already established relationship between symptoms of Parkinson's & anti-schizophrenic effects of chlorpromazine and reserpine, it was suggested anti-schizophrenic drug effects are produced in same way. • Led to development of dopamine theory – too much dopamine causes schizophrenia & conversely, anti-schizophrenic drugs exert effects by decreasing dopamine levels. • Supported by fact that: • Reserpine depletes brain of dopamine and other monoamines by making vesicles leaky • Chlorpromazine antagonizes dopamine activity by binding and blocking dopamine receptors – So, both antagonize transmission of dopamine but in different ways. Lack of activity at postsynaptic receptors sends feedback signal to presynaptic cells to increase release of dopamine. • This led to revision of the dopamine theory • Instead of high dopamine levels, the main factor is the high levels of activity at dopamine receptors. • 1970s: degree to which various anti-schizophrenia drugs bind to dopamine receptors was assessed. • Radioactively labelled dopamine added to samples of dopamine-receptor-rich neural membrane obtained from calf striatum • Unbound dopamine molecules rinsed away & amount of radioactivity left was measured to obtain number of dopamine receptors. Drugs ability to block binding of radioactive dopamine was assessed - assumed drugs with high affinity for dopamine receptors would leave fewer sites available for the dopamine. • Chlorpromazine & others had high affinity for dopamine receptors whereas ineffective drugs had low affinity..... • Except for haloperidol: very potent but had low affinity. • Solution: came from discovery that dopamine binds to more than one receptor subtype – 5 have been identified. • Chlorpromazine & others bind effectively to D1 & D2 receptors, whereas haloperidol bind effectively to D2 but not to D1. • This discovery led to further revision suggesting schizophrenia is caused by hyperactivity at D2 receptors rather than dopamine receptors in general. Limitations of the Dopamine Theory • Four key discoveries about the neural basis of schizophrenia cannot be explained by the D2 theory. 1. Other receptors are involved: glutamate, GABA, serotonin. • Evidence from studies on LSD, which produce schizophrenia-like symptoms by acting on serotonin & glutamate receptors. • Atypical neuroleptics, such as clozapine has affinity for D1, D4, & serotonin receptors but not for D2. 2. Neuroleptics block D2 receptors within hours but it takes weeks to alleviate symptoms. • Time difference suggests blockage of D2 receptors is not only aspect involved. Limitations of the Dopamine Theory 3. Schizophrenia is associated with widespread brain damage, & meta-analysis of studies has shown reduced volume in 50 different brain regions. • Two aspects about pattern of brain damage observed that causes problems for the dopamine theory: A. Little evidence of damage to dopamine circuits B. Theory does not explain why there is diffuse damage 4. Neuroleptics only marginally effective. • If dopamine theory was correct neuroleptics should be effective to treat all patients. • They only help with some symptoms not others: • Conventional neuroleptics (D2 blockers) are effective for positive symptoms, while negative symptoms might be caused by brain damage.

4. With reference to drug tolerance, withdrawal, addiction, brain structures, the role of dopamine, and with examples from different drugs, critically discuss the effects of drug abuse on brain functioning and cognitive processing (25 marks).

Drug tolerance: People can become tolerant of a drug, where they experience decreased sensitivity to the drug due to repeated exposure. • Demonstrated in 2 ways: either dose has less effect than before, or it takes more of the drug to produce the same effect. • Drug tolerance = shift in dose-response curve: a graph of the magnitude of effect of different doses of the drug to the right.

3 aspects about the specificity of drug tolerance 1. Cross tolerance – one drug can produce tolerance to similar drugs – e.g., alcohol & benzodiazepines. 2. Tolerance often develops to some effects & not others of a drug. Can also have an “inverse tolerance,” or sensitization. 3. Drug tolerance is not a unitary phenomenon – no single mechanism underlies all examples of tolerance.

2 categories of changes that underlie drug tolerance: Metabolic and Functional

Drug withdrawal: Sudden elimination triggers adverse physiological reaction: withdrawal syndrome • Body makes changes to compensate for drug's presence – functions normally with drug present • Withdrawal effect is usually opposite to the initial effect of the drug • Suggests withdrawal effect may be produced by same neuronal changes that produce drug tolerance. Relation between Drug Tolerance and Withdrawal Effects Longer exposure to greater doses followed by rapid elimination produces greater withdrawal effects.

Addiction: “Addicts” continue to use a drug despite adverse effects on health, cognition, and social life and despite repeated efforts to stop. Many equate addiction and physical dependence: – They see addicts as trapped in cycle of drug taking, withdrawal, & further drug taking to combat withdrawal • But this is inconsistent with evidence • Addicts sometimes take drugs to alleviate/prevent withdrawal symptoms but it is not the major factor. • However, addicts often start taking their drug again even after months or years without it.

Role of learning: Research suggests learning and cognition plays role in drug tolerance • Focus has been on two phenomena: 1. Contingent drug tolerance: tolerance develops only to drug effects that are actually experienced. 2. Conditioned drug tolerance: tolerance effects are maximally expressed only when a drug is administered in same situation it has previously been administered.

Conditioned Tolerance and Withdrawal: Situational specificity of drug tolerance • Siegel et al. addicts are susceptible to lethal effects of drug overdose when the drug is administered in a new context. • Hypothesis: addicts become tolerant when repeatedly self-administer drug in same environment, thus take larger doses to counteract diminution of drug effect. • If they administer huge dose in new situation, tolerance effects are not present to counteract effects of the drug. • Research evidence: Siegel et al. many more heroin-tolerant rats died following high dose of heroin administered in a novel situation than died in the usual injection environment.

Effects of long-term tobacco use: Basic design: compare performance of smokers who have had nicotine with control group of smokers not given nicotine. • Short/simple information processing tasks (e.g., search, logical reasoning, digital recall task) show a nicotine benefit (Snyder & Henningfield, 1989). • Grobe et al. (1998): nicotine enhanced performance on the Sternberg memory scanning task when distracting auditory stimuli were presented

concurrently. • Can also be seen to influence real-world cognition: – Sherwood (1995) report positive effects of smoking on tracking and break reaction times in a driving task.

Effects of alcohol: Alcohol molecules are so small & soluble in fat & water, they invade all parts of the body. • Classed as a depressant because it reduces neural firing. • Has a genetic component, heritability estimate for alcohol addiction ~ 55% • Metabolic & functional tolerance develop • Experience cognitive, perceptual, verbal, motor impairment as well as loss of control leading to unacceptable actions. Severe withdrawal in 3 phases: – 5-6 hrs post drinking: tremors, nausea, sweating, vomiting, headache, cramps, etc. – 15-30 hrs: convulsive activity – 24-48 hrs: delirium tremens (DTs) disturbing hallucinations, bizarre delusions, agitation, confusion, hypothermia: may last 3-4 days • Korsakoff's syndrome: brain damage, memory loss, sensory and motor dysfunction. • Cirrhosis: scarring of the liver • Erodes heart muscles & increases risk of heart attack. Irritates lining of digestive tract & increases risk of oral & liver cancer, stomach ulcers, pancreatitis, and gastritis. • Foetal alcohol syndrome: affects children of mothers drinking alcohol during pregnancy. People who drink excessively can suffer blackouts and almost total memory loss for all events that occurred while drunk. • Blackouts indicate a failure to consolidate memories formed during intoxication. • Moulton et al. (2005): – LTM was impaired in Ps who drank alcohol BEFORE learning information. – Alcohol consumption shortly AFTER learning led to improved memory. • Explanation: alcohol may have inhibited the formation of new memories that would interfere with the consolidation of those formed just before alcohol consumption.

Effects of marijuana: MRI shows prolonged use of large doses (~five joints everyday for ~20 years) reduces hippocampus & amygdala volume (Yücel et al., 2008) – link to memory. – But this study is correlational: cannot prove extremely high doses causes brain damage. • Many studies have documented memory deficits, but they tend to be acute and disappear after a few weeks of abstinence (Grant et al., 2003; Jager et al., 2006). • People who become heavy users in adolescence display memory and other cognitive deficits. – However, Pope et al. (2003) found that adolescents with lower verbal intelligence were more likely to become users, which could account for the poor cognitive performance.

Effects of cocaine: • Binges/sprees may lead to cocaine psychosis • Mistakenly diagnosed as paranoid schizophrenia • Effects include tremors, nausea, hyperthermia, seizures, loss of consciousness, respiratory problems, heart attack, stroke. • During a spree, users become tolerant to euphoria, so larger doses are needed to feel the same effect. • While tolerance may develop to most effects of cocaine (i.e., to the euphoria), sensitization is seen to its motor and convulsive effects • Although highly addictive, withdrawal is relatively mild

• Amphetamine (“speed”) • Effects like cocaine – can produce psychosis • Other amphetamines include methamphetamine (meth), which is used in an even more potent crystallized form (ice or crystal meth). • MDMA (“ecstasy”) • Impairs dopaminergic and serotonergic function in animal studies; human relevance unclear • Impairs executive function, inhibitory control, and decision making (as shown by cortex and limbic functional brain scan abnormalities).

Effects of opioids: Desire to avoid withdrawal adds to motivation to use & tolerance encourages use of higher doses. • Withdrawal symptoms begin 6-12 hours after last dose & include restlessness, pacing, fidgeting, eyes watering, runny nose, yawning, sweating, sleep fits • Once awake they experience chills, shivering, nausea, vomiting, diarrhea, cramps, dilated pupils, tremor, muscle pains and spasms. • Many health hazards related to use of dirty

needles & poorly processed “street” versions. • Death from overdose by suppressing breathing. • Main treatment: Methadone (an opiate itself) • Binds to opiate receptors, but.... • Produces less pleasure than heroin • Administered orally • Prevents withdrawal • Buprenorphine: similar but longer lasting • Substitute less dangerous drug for abused drug.

Dopamine and drug addiction: Following research on role of dopamine in intracranial self-stimulation, studies implicated dopamine in the rewarding effects of neural reinforcers and addictive drugs. • E.g., in rats dopamine antagonists blocked self administration of, or the conditioned preference for several types of addictive drugs & reduced reinforcing effects of food. • Findings from research suggest dopamine signals something similar to reward value or pleasure and the nucleus accumbens appears to play a key role in this. 1. Lab animals would self-administer microinjections of addictive drugs directly into nucleus accumbens. 2. Microinjection of drugs into nucleus accumbens produced conditioned place preference for compartment where they were administered. 3. Lesions to either nucleus accumbens or ventral tegmental area blocked self-administration of drugs into general circulation or the development of drug associated conditioned place preferences. 4. Both self-administration of addictive drugs & experience of natural reinforcers were found to be associated with elevated levels of extracellular dopamine in the nucleus accumbens. Volkow et al. administered various doses of radioactively labelled cocaine to addicts and asked to rate the high. – Used PET to measure degree to which the labelled cocaine bound to dopamine transporters. – Intensity of high experienced correlated with degree to which cocaine bound to dopamine receptors – No high was experienced unless the drug bound to 50% of the dopamine transporters. • Healthy non-addicted humans given amphetamine injection. – As dopamine levels in nucleus accumbens increased in response to injection, Ps reported increase in euphoria. But reward is a complex process with many psychological components – so what exactly is the role in reward of dopamine release in the nucleus accumbens. • Extracellular dopamine levels in the NA increase following presentation of a natural reward (e.g., food or addictive drug) • Ventral tegmental neurons, which release dopamine into the NA fire in response to a stimulus at a rate proportional to its reward value. • Dopamine released in the NA is related to the expectation of reward rather than to the experience itself.

Critical review: Addiction is psychologically complex • Addicts show poor decision making & lack of self control, suggestive of prefrontal cortex role • Drug addiction may be related to other nonadaptive behaviors, e.g., compulsive eating, gambling, sexual behavior, kleptomania, etc. • Other neurotransmitters also involved: glutamate, endogenous opioids, norepinephrine, GABA, and endocannabinoids. Current research not in complete agreement but there is consensus other areas are involved in.... 1. Initial drug taking: mediated in same way as pleasure activity, with the mesocorticolimbic pathway (particularly nucleus accumbens playing a key role). – But it does not act alone – Instead it interacts with 3 other areas: • Prefrontal lobes (role in decision making); • Hippocampus: provides info about previous experiences; • Amygdala: coordinates positive and negative reactions. Craving & compulsive drug use: repeated consumption brings major changes in motivation as addict develops habit & compulsion despite adverse effects. – Due to direct neural response to repeated exposure of drug-induced pleasure and as product of conditioned response to drug-associated cues. – Several changes in brain’s response contribute to development of addiction: • Change in how striatum reacts to drugs, which spreads from the NA to the dorsal striatum, which is known to play a role in habit formation. • At same time the prefrontal cortex in controlling behavior declines & stress circuits in hypothalamus begin to interact with dorsal striatum. • Development of addiction is a pathological neuro-plastic response. Relapse – thought to be triggered by 3 factors: • Stress – drug use as a coping mechanism

- Priming – a single exposure leads to a relapse
- Environmental cue – certain people, times, places, objects previously associated with the drug
- Evidence from animal studies shows: – Prefrontal cortex mediates priming-induced relapse, – Amygdala mediates condition cue induced relapse, – Hypothalamus mediates stress-induced relapse.

5. Critically discuss the causal factors, brain pathology, and treatments of affective disorders (25 marks).

Affective Disorders: Depression & Mania

- Depression: normal reaction to loss, abnormal when it persists or has no cause.
- Experience anhedonia
- Unable to meet essential requirements of daily life
- Mania: overconfidence, impulsivity, distractibility, and high energy for no apparent reason.
- When extreme it is a clinical problem: wake up in total enthusiasm with nonstop talking that switches rapidly between topics & overconfidence can lead to disaster.

Affective disorders:

- Psychiatric disorders characterized by mood or emotion disturbances.
- Known as mood disorders
- Depression and mania
- Can be seen as opposite to each other but many depressive patients can experience periods of mania.

Types of depression

- Unipolar & Bipolar
- Reactive (triggered by negative experience)
- Endogenous (from within with no apparent cause).

Causal Factors in Affective Disorders

- Genetic factors contribute to differences.
- Twin studies suggest concordance rate of ~60% for identical twins & ~15% for fraternal twins regardless if brought up together or apart.
- Concordance higher for bipolar than unipolar

However, most research on causal role of experience on affective disorders focuses on stress. Although evidence suggests depression is a stress-related disorder, evidence linking them is sparse.

- Stress can trigger attacks in those already depressed but little evidence showing stress increases susceptibility.
- Extreme stress is more likely to cause post-traumatic stress disorder (PTSD) than depression.
- Two affective disorders where the cause is more apparent due to timings of the attacks: 1. Seasonal Affective Disorder (SAD)
- Wintertime depression and lethargy, due to reduction of sunlight
- Evidence: incidence rates different between N. America & Florida
- Light therapy thought to reduce symptoms
- 2. Postpartum depression.

Four major classes of drugs used in the treatment of affective disorders

1. Monoamine oxidase inhibitors (MAOIs): Iproniazid
- Increases levels of monoamines by preventing their breakdown by oxidase enzymes in cytoplasm of neuron
- Must avoid foods high in tyramine – “cheese effect”
- Normally these foods have little effect on blood pressure because tyramine is metabolized in the liver by MAO, but people who take MAO inhibitors & eat food containing tyramine run risk of stroke caused by surges in blood pressure.
- Tricyclic antidepressants – Imipramine
- Chemical structure includes 3 rings of atoms
- They block reuptake of serotonin and norepinephrine – Thus, increasing levels of these in the brain
- They are thought to be safer than MAOIs
3. Selective serotonin-reuptake inhibitors (SSRIs)
- They are serotonin agonists that exert effects by blocking the reuptake of serotonin from synapses.
- Include Prozac, Paxil, Zoloft, and others
- No more effective than tricyclics, but side effects are few and they are effective at treating other disorders
4. Selective norepinephrine-reuptake inhibitors (SNRIs): effective & block reuptake of norepinephrine.

Hollon et al. (2002) compared efficacy of various pharmacology treatments for depression and found they were about the same for MAOIs, tricyclics, & SNRIs:

- ~50% of clinically depressed patients improved
- But a control

group showed a 25% improvement • So, really only 25% of the depressed group were helped. • Kirsch et al. (2008): meta-analysis indicated that placebo was about 82% as effective as anti-depressants in severely depressed individuals • Drugs even less effective for mild to moderately depressed individuals. MRI of bipolar patients shown reductions in overall brain size and particularly the amygdala, cingulate cortex, and prefrontal cortex. • But certain brain structures found to be of reduced size in one study is of normal size in other studies. • Not all patients with bipolar suffer from same disorder? • Two structures are found to be abnormal in many studies: amygdala and anterior cingulate cortex. • Connections between these also disrupted in patients with affective disorders. Monoamine theory of depression: Suggests depression is associated with underactivity at serotonergic and noradrenergic synapses. Support provided by autopsy: serotonin and norepinephrine receptors more numerous in brains of deceased clinically depressed individuals who had not had pharmacological treatment whilst alive, which implicates a deficit in monoamine release. • When not enough amount of a neurotransmitter is released at a synapse, there are usually compensatory increases in the number of receptors for that neurotransmitter – called Up-regulation. • However, overall support for the monoamine theory of depression is weak and not all patients respond to monoamine agonists. Diathesis-stress model of depression: Suggests some people inherit a diathesis (genetic susceptibility) incapable of initiating the disorder by itself. • If susceptible people are exposed to stress early in life their systems become permanently sensitized and end up over reacting to mild stressors for the rest of their lives. • Diathesis + stress = depression • Support is indirect: depressed people... • Tend to release more stress hormones. Also, fail the dexamethasone suppression test: • Assesses adrenal gland function by measuring how cortisol levels change in response to injection of dexamethasone.... • which is an exogenous steroid that provides negative feedback to the pituitary gland to suppress the secretion of adrenocorticotrophic hormone. • Weakness of theory: • Evidence of early stress based on recollections of distant past - likely faded or perhaps even distorted • May not be any way of confirming the events recalled. • Sometimes there is no evidence of excessive early stress in the lives of a number of depressed patients. Treatment of depression with brain stimulation. Sleep deprivation • More than 50% of depressed patients improve after one night of sleep deprivation • Depression returns with normal sleep pattern • Not explained by any current theory Exercise • Helps reduce depression • Increases adult hippocampal neurogenesis • Findings suggests that depression may be caused by reduced adult hippocampal neurogenesis.