BIO 105 Biological Psychology

- BIOLOGICAL PSYCHOLOGY
- THE BIOLOGICAL APPROACH TO BEHAVIOR

From matter

to

Consciousness (Biological systems)

- BIOLOGICAL PSYCHOLOGY

Physiological	serotonin, dopamine levels
Developmental	pre-frontal cortex
Evolutionary	mate selecion

Mechanisms of behavior and experience.

Biological psychology is mostly concerned about the brain functioning

Your body effects your mind and your mind effects your body

Who takes the biological approach?

- Doctors (GPs, Neurologists/Psychiatrists), Neuroscientists, clinical psychologists, neuropsychologists,councellors

To what questions does it tries to give answers?

- In general how our body effects our mind and how our mind effects our body?

- How endocrine or nervous system effects our thinking, feeling and behaviors in different situations?
- What kind of chemical, anatomical or physiological imbalance cause mental disorders?
- Why do we perceive things in certain ways in the certain circumstances?
- Why some people are more aggressive and some more peaceful?
- Why some people are good learners and rememberers but some not?
- How sexual or emotional behaviors are regulated?
- Why woman are better readers and speakers?
- Is there a biological (genetics and brain) side to homosexuality?

And so.

- Biological Explanations of Behavior

Common sense explanations V.S biological explanations

Assuming intention!

Ex. Ayşe did not listen what I had to say!

She must be bored!

(but, are they well informed?)

Exp. She must be bored V.S ?

- Biological Explanations (3+1)

1- Physiological Explanations

Relates behaviors to

&

Ex.

Exp. Her blood sugar level was low.

(attention)

2- Ontogenetic Explanations

Relates behaviors to

It considers

Ex. Inhibition of the impulses.

3- Evolutionary Explanations

Relates behaviors to

Ex. Falling, dark, full moon, territorial behaviors

note that: some organs or some behaviors may remain even if they are not being useful now!

4- Functional Explanation

Considers survival value.

Ex. We live in the crowd.

- Genetics and Behavior

Does genes effect our behavior?

- Genetics and Behavior

Role of the genes,

Very easy to tell, completely depends on genetics

We may not be certain immediately,

Really difficult to tell,

Ex. intelligence, personality

Sexual orientation, obesity, mental ilness

- Mendelian Genetics

In 19th century Mendel discovered that by genes, structural identity is passed through generations.

Deoxiribonucleicacit(DNA) is a self replicating material that acts as an instruction manual. With its partner (RNA) they build living organisms.

- Deoxiribonucleic acit (DNA)

Sugar

Phospade (Deoxiribo)

Bases (Nucleic acit)

Adenin, Timin, Guanin, Cytosine

Genes are like letters that make the words.

Cell translates the DNA and produce RNA.

RNA is just like DNA but it has only one chain (different kind of sugar, Ribo) and Uracil instead of Guanin. After the translation cell understands the RNA and creates proteins.

DNA RNA Amino acids Proteins

(order of

the bases)

(triple of bases) 1 amino acid 20 amino acids

Amino acids can join together to make thousands of different proteins. Scientists have found many different amino acids in protein, but 22 of them are very important to human health.

- Of those 22 amino acids, your body can make 13 of them without you ever thinking about it. Your body can't make the other nine amino acids, but you can get them by eating protein-rich foods.
- Dominant – and-Recessive Genes

1 chromosome 2 sets of genes

- Homozygous (non-identical)
- Heterozygous(identical)
- Chromosomes
- Sex-linked and sex-limited Genes

There are two kinds of chromosomes

Autosomal-chromosomes

Sex-chromosomes

Man: XY Woman: XX

Male determines the gender of the baby.

Sex-limited genes: are present in both sexes but active in only one gender.

Ex.?

Chest hair in man, Brest size in woman

- THE CELLS OF THE NERVOUS SYSTEM
- Alone V.S Together
- Is our mental life linear or is it composed of peaces?

Our mental life acts as one and it is a whole,

but it is composed of peaces

- ANATOMY OF NEURONS AND GLIA

100 billions of neurons

Glia takes

care of the

neurons

What a Neuron does?

- Structure of A Neuron

All the neurons have the same parts

But, they have different shapes depending on their jobs

- Sensory (Afferent) Neurons

From sensory organs to CNS

- Motor (Efferent) Neurons

From CNS to muscles

- INTER NEURONS

They are the neurons in the brain

Dendrites receive information from other neurons or organs

- Dendrites transmit information to soma (soma keeps the neuron alive) then to axon
- Myelin facilitate the transmission at the axon
- Nudes of Ranvier makes the transmission even faster
- Axon terminals reach to the other neurons and enable the communication
- GLIA(Glue)
- Glias are smaller and more crowded then neurons
- Glias holds the neurons together and allow them to make their job.
- There are many types of Glias
- ASTROCYTES

Connects to the axons and they provide a synchrony of activations. Message can be send in waves.

Removes the death neurons

Controls the blood flow to the brain areas

- MICROGLIA

Act as the immune system of the brain.

Removes the viruses and other microorganisms from the brain

- OLIGODENDROCYTES

- Produces the myelin for the axons
- One oly. Connects more than one axons.

MYELIN: speed up the transmission. It is composed of fat and proteins. It is interrupted periodically by the gaps which called Nodes of Ranvier.

-
- RADIAL GLIA

Guide the neuroblasts during the migration at the beginning of the brain development.

- THE BLOOD-BRAIN BARRIER

THE BLOOD BRAIN BARRIER

1- Enables the brain to get what it wants from the blood

What happens if a cell is infected in the body?

What happens if a neuron is infected in the brain?

2- B.B.B protects the brain from the diseases and irreplaceable damage.

- How the BBB works
- HOW THE BLOOD BRAIN BARRIER WORKS

In the body, the capillary cells have small gaps between them. In the brain they do not. In the brain nothing passes between them and there is a special mechanism (an active transport system) to carry the substances through.

O2, CO2, water and the molecules which dissolves in the fat can cross the BBB

Other required chemicals such as Glucose and amino acids gets in via the active transport which requires energy

-
  NERVE IMPULSE
  THE MESSAGE IS ELECTRICAL AND IT REPRODUCED AT THE EACH POINT!
- Resting Potential
- Membrane of a neuron (fat + phosphate) includes the proteins.

Without the disturbance, membrane maintains an electrical gradient. Outside more positive and inside more negative(-70mvolts). This is called the RESTING POTENTIAL(or polarization).

- Resting Potential

WHEN AT REST:

- Some channels are always open allowing O2, Co2 and water in
- Sodium channels are closed
- Potassium channels are almost closed
- A certain kind of stimulation opens both channels
- Channels works wıth the voltage
- Resting Potential
- Outside is more concentrated with Sodium(Na+)
- Inside is more concentrated with Potassium (K+)

At the and of the transmission (action potential) inside and the outside of the cell polarizes which means that they almost have the same electrical charge . Do we want that?

- How resting potential is sustained?

No!

Having a resting potential with one side is slightly negatively charged (-70mvolts) keeps the neuron ready for the action.

Resting potential is remains stable until the neuron is stimulated

Resting potential is sustained by the consistent movement of Na+ and K+ ions through a Na+/K+ pump. (3Na+ out , 2K+ in)

- ACTION POTENTIAL

The electrical conduction along the membrane is called action potential

When a dendrite is stimulated this cause a chain reaction and opens the neighboring sodium channels one by one letting more sodium in to the neuron. That provides a more negative charge at the outside of the neuron and more positive inside the neuron (this is known as the depolarization).

- ACTION POTENTIAL

- HYPERPOLARIZATION
- DEPOLARIZATION
- STRONGER DEPOLARIZATION
- MASSIVE DEPOLARIZATION

*This rapid depolarization and the reversal to the usual state is called action potential.

- ACTION POTENTIAL

A depolarization passes the threshold creates an action potential. The sodium channels open and allows the Na+ into the neuron. When potential reaches to 0 sodium channels close. Then potassium channels open and potassium gets out. This returns the neuron to the resting potential. This exchange of the chemicals continue along the axon and action potential travels through the axon.

- THE ALL OR NONE LAW

If a stimuli reaches to the threshold level an action potential starts. If it does not reach to the threshold level the action potential does not start.

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Whatever the intensity of the stimulus is, the velocity that an axon transmits a message is the same.

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- PROPAGATION OF THE ACTION POTENTIAL

Across the axon, sodium and potassium channels open and closes one after another. That carries the depolarization along the axon and transmit the signal.

COMMUNICATION AT SYNAPSES

IF YOU HAD TO COMMUNICATE WITH SOMEONE IN THE DARK, WITHOUT SIGHT OR SOUND

WHAT WOULD YOU DO?

THE CONCEPT OF THE SYNAPSE

WAYS OF NEURAL COMMUNICATION AND ACTIVATION

TEMPORAL SUMMATION

SPATIAL SUMMATION

INHIBITORY SYNAPSES

Some synapses, instead of depolarizing the cell to the excitation threshold, they hyperpolarize the membrane to inhibit the activity.

Why?

When you contrast a specific muscle amongst many others, the neighboring muscles need to be inhibited to prevent them from getting involved to the intentional movement.

WIRING DIAGRAM OF THE NERVOUS SYSTEM

Wiring diagram

Back to Sherrington

After the discovery of the difference of the transmission speed between neurons, he was quite famous at his time.

He was saying that the transmission between neurons is electrical, chemical reaction can not be fast enought.

Is he right or wrong?

Loewi, was having restless nights

One night he woke up from a dream

and…

AND SYNAPSE!!!!

The sequence of the chemical events at the synapse

1- neuron contains neurotransmitters at the terminal buttons. Neurotransmitters are the chemicals which stimulates the post-synaptic cell.

2- action potential travels down the axon and when it comes to the terminals it allows the calcium to enter the cell releasing the transmitters in to the synaptic cleft.

3- transmitters go and bind to the receptors of the P.S.N. altering its state.

4- transmitters break free from the receptors

5- some of the transmitters collected back by P.S.N, and some of them are destroyed by enzymes.

TYPES OF NEUROTRANSMITTERS

Brain uses different kinds of neurotransmitters

How many N.Ts one neuron releases?

One neuron releases many kinds of transmitters.

Different neurons secrets different kinds of transmitters.

SECRETING DIFFERENT TRANSMITTERS ENABLES MESSAGE TO BE VERSATILE AND COMPLEX

<u>EXCITATORY</u>

Acetylcholine

(arousal and sustaining attention)

Epinephrine

(fight or flight response)

Nor-epinephrine

(vigilant, concentration)

Glutamate

(learning and memory)

Dopamine

(reward and motivating behavior)

INHIBITORY

GABA

(inhibition)

Serotonin

(control)

IONOTROPIC – METABOTROPIC EFFECTS

The effect of a neurotransmitter depends on the receptor which receives it.

Receptor may open a channel exerting an ionotropic effect

Or

May produce slower but longer –metabotropic- effect

These two effects contribute to different aspects of the behavior and sensation

IONOTROPIC EFFECTS

Most ionotropic effects depends on either Glutamate or GABA

Ionotropic effects starts and stops very quickly

For vision and hearing, brain needs rapid and quickly changing information.

That's why that's kind of effect is well suited for conveying visual, auditory and other kind of information that needs to be up-dated as quickly as possible.

METABOTROPIC EFFECTS

At some receptors, neurotransmitters initiates slower and longer-lasting effects

Metabotropic synapses are better suited for more enduring effects such as taste, smell, pain, arousal, attention, pleasure and emotion.

In this situations exact timing is not important!

Metabotropic effect rises slowly and last longer in comparison to visual or auditory stimuli.

INACTIVATION AND RE-UPTAKE OF THE NEUROTRANSMITTERS

A neurotransmitter does not stay neither at the receptor nor at the synaptic cleft. There are two mechanisms for removing neurotransmitters from the environment.

1- RE-UPTAKE MECHANISM

Pre- synaptic neuron re-collects the neurotransmitters and uses them again

2- Termination mechanism

They get destroyed by the enzymes. This happens when a certain brain area does not have the re-uptake channels for a specific neurotransmitter. To avoid accumulation, transmitter get destroyed.

NEGATIVE FEEDBACK FROM THE
POST-SYNAPTIC NEURON

It is like saying someone who sends you the same message over and over again, ok I got it!

There are two mechanisms for stopping pre-synaptic neuron's secration

1- Pre-synaptic neuron has receptors that sensitive to the neurotransmitters it secrets. This receptors detects the transmitter secreted and stops its secretion. This receptors are called auto-receptors and provide negative feedback.

2- Post-synaptic neuron release chemicals that travels to the pre-synaptic neuron and stops secretion of the neurotransmitters

NERVOUS SYSTEM AND THE BRAIN ANATOMY

NEUROANATOMICAL TERMS AND STRUCTURES

Each individual has a role in the society

Similarly each neuron and each brain area

Has a unique role, however effective

Functioning depends on collaboration.

NERVOUS SYSTEM

The nervous system informs the body about itself and the world around it. Enables body to react to this information.

Peripheral nervous system divided in two.

Somatic N.S **:**is the sensory gateway between outside of the body and CNS. Sensory receptors provide connection between stimuli such as heat, cold, pain and CNS. Later via motor neurons, appropriate action will be taken and messages will be send to muscles.

Autonomic **N.S:** is responsible for reflexive action. (Ex. Increasing or decreasing the heart rate.)

Central nervous system process the information received from peripheral N.S. Interprets the signals and send them back.

PERIPHERAL NERVOUS SYSTEM AND THE SPINAL COURT

PNS accomplishes two very important tasks.

1- collecting info. And controlling voluntary muscles

2- controlling the heart rate and the involuntary muscles

PNS enables organism to be aware of its environment by sending all the info. to the CNS. CNS understands and interpret the information. It is composed of the BRAIN and the SPINAL COURT

THE SPINAL CORD

THE AUTONOMIC NERVOUS SYSTEM

A.N.S receives the necessary information and sends the outputs for required adjustments to the involuntary muscles and the organs such as hearth.

It divided in two.

-sympathetic

-parasympathetic

Sympathetic N.S

It prepares the organism for fight or flight response by increasing the heart rate, breathing and decreasing the digestive activity

The sweat glands, muscles that constrict the blood vesicles and body hairs only have sympathetic input. That's why they require more time to return normal.

Parasympathetic N.S

It is the opposite of the S.N.S

It decreases the heart rate and relaxes the organism.

We need Ps.N.S. to get back to our normal levels after a anxious situation.

Ps.N.S , uses neurotransmitter Asetylcolin for its activities

Sy.N.S , uses norepinephrine for its activities

Because they use different neurotransmitters, different drugs can excite or inhibit the any one system's activity .

THE MAJOR DIVISIONS OF THE BRAIN

BECOUSE THE BRAIN IS 3D

We need special words to navigate around it

The ways you see the brain is

HORIZONTAL SAGITAL CORONAL

LOCATIONS AND DIRECTIONS IN THE BRAIN

MAJOR DIVISIONS OF THE BRAIN

FOREBRAIN: thalamus, hypothalamus, hippocampus, basal ganglia, amygdala, cerebral cortex…

MIDBRAIN: superior and inferior colliculus and substantia nigra

HINDBRAIN: medulla, pons, cerebellum

THE HIND-BRAIN

-Lowest part of the brain

- Medulla + Pons+ Cerebellum + Mid-brain+ Thalamus = Brain-stem
- Medulla controls reflexes(sustains a normal rhythm):

breathing, vomiting, heart rate, salivation, coughing, sneezing

Damage to Medulla is fatal. Large doses of opiates might kill people because they suppress Medulla and breathing stops

PONS, means the bridge.

At the Pones axons from the each half of the brain crosses to the opposite side.

Cerebellum

CEREBELLUM, is known for its contribution to balance of the body and the motor coordination.

Further, we know that cerebellar damage results in attention switching difficulties between visual and auditory stimuli.

Patient also experience difficulties in timing.

-Beat = Rhythm (when we perform procedural activities)

THE MID-BRAIN

Superior colliculus:

Enables organism to perform rapid reflexive actions which depend on the vision

Inferior colliculus:

Enables organism to perform reflexive actions depend on sound.

Substantia nigra:

Is the center for the 'dopamine' production. Dopamine is important for several vital functions in the brain such as mental functions and movement.

THE FOREBRAIN

It is the newest part of the brain. It evolved up on the midbrain and composes the cerebrum. Forebrain is consists of two cerebral hemispheres.

CEREBRAL HEMISPHERES:

Cerebrum is divided in two by the longitudinal fissure and bind together by Corpuscollosum. Cerebral hemispheres need to work together (bilaterally) to produce most of the higher cognitive functions such as imagination, defense reactions, decision making, planning, appropriate expression of feelings, learning and memory.

Receives info and controls muscles at the contra lateral side

Under the cerebral cortex we can find, thalamus, basal ganglia, limbic system(form a border around the brain stem)

Limbic system includes olfactory bulb, hypothalamus, hippocampus, amygdala and cingulate gyrus.

Limbic system is particularly important for emotions, learning, motivation.

Simply it deals with 4 Fs.

Fighting, fleeing, feeding, f….ing(sexual intercourse).

THALAMUS

It is located in the middle of the brain. This is no coincident. All the sensory information comes from different parts of the brain with afferent nerves and goes through Thalamus before they reach to the neo-cortex. Thalamus reduces or increases the amount of the information which goes to the neo-cortex. That way, organism can focus its attention on a certain kind of stimuli. Thalamus is connected to every part of neo-cortex with its fibers. Protects neo-cortex from being overwhelmed and acts as a filter.

HYPOTHALAMUS

PITUITARY GLAND

It is beneath the Hypothalamus and connected to it. It gets messages from the hypo. And it synthesize hormones and release them to go to organs and other tissues in the body.

BASAL GANGLIA

Basal ganglia is a term that refers to a group of nuclei. Its known role is facilitation of movement and filtering to prevent inappropriate movement in an organized movement. It sends information directly to the supplementary motor area. It also plays a role in the some higher cognitive processes. Basal ganglia gets impaired in Parkinson and Huntington disease where the consequence appears as impaired movement, memory, attention and reasoning.

HIPOCAMPUS

HIPOCAMPUS

It plays a major role in information processing. It is closely related with memory, learning, cognitive mapping and attention. When neo-cortex is highly stimulated hippocampus works slowly, monitor what has been received and encode them. After something is learned and stored, its activity diminishes. Damage to the hippocampus reduces the ability for learning and remembering. Damage to the left hippocampus disrupts verbal memory. Damage to right hippocampus disrupts emotional, visio-spatial and facial memories.

AMYGDALA

Hippocampus and Amygdala are interdependent in regard to memory. Hippocampus mediates the amount of information which will be encoded, where Amygdala identifies emotional-motivational value of this information and generates emotional rewards to reinforce learning, memory and reoccurrence of behavior.

THE VENTRICLES

Baby brain develops around a tube filled with the fluid. Each hemisphere involve a large lateral ventricle. In total there are 4 ventricles.

Ventricles produce the cerebrospinal fluid. This fluids covers the brain and clean it. Also protects it from sudden moves and pressure. Help to support the weight of the brain. It contains some hormones and nutrition for the brain and spinal cord.

When baby emerge, if the flow of this fluid is blocked , hydrocephalus occurs and results in mental retardation (hydrocephalus)

- BIOLOGY OF EMOTION

Everyone knows what it is until they are asked to define it!

What are our emotions?

Happy, sad,a **fearful**, contend, friendly, hostile, **angry**, **disgust**, inspired, amazed, surprised, **love**, hate and mixed!

- A new species have been found!

Scientists want to test it.

Green card → food

Red card → nothing

Green cards V.S grey cards what does that tell us?

Hot triangle → moving toward it.

Screamed and run away → is that fear?

It is not an animal but a robot ---→ Still fear?

- EMOTION AND MOTIVATION ARE RELATED

Emotion: special sensations that we feel in the face of the special circumstances.

Motivation: an internal process that modifies the way organism responds to certain kind of external stimuli.

OR (a memory, an expectation of a good/bad thing to happen)

A desire, an urge to have something; to meet somebody; to be somewhere; to be in a certain existential state.

- Imagine that you are in a closed bass station. You suddenly realized that a big fire is coming toward you.
  WHAT DO YOU DO?

- EMOTIONS, AUTONOMIC AROUSAL AND THE JAMES- LANGE THEORY

Emotional situations arouse the autonomic N.S. and each situation evokes its special mixture of sympathetic and parasympathetic arousal.

Ex. Nausea, is associated sympathetic stimulation of the stomach (constructions and acids) and parasympathetic activation of intestines and salivary glands.

- How does autonomic N.S relates to emotions?

Common sense view:

Frightening situation → Fear → increased heart rate, breathing and physiological changes to create fight or flight response

James-Lange Theory:

Frightening situation → increased heart → Fear

rate, breathing

and physiological changes to

create fight or flight response

- An emotion has 3 components

COGNITION – ACTION –FEELING

The cognition comes first: we label things!

This automatic assessment leads to autonomic responses of fight, flight, seat motionless with your heart racing or pretend dead.

- JAMES-LANGE THEORY

EVENT (activating situation)

ASSESSMENT (the cognitive aspect)

ACTION/Physiological Changes(autonomic response of the body)

EMOTIONAL FEELING

MOVEMENT (if any!)

Autonomic arousal and changes in the body (physiological changes) led to emotions.

Emotional feelings depend on the feedback from autonomic responses.

<u>CAN WE TEST THESE ASSUMPTIONS?</u>

It follows from the theory that, someone with decreased autonomic activity should feel less!

- Pure Autonomic Failure

in this condition heart beats and all the other organs continue to work as they should <u>but</u> autonomic nervous system no longer regulates them. People in this condition does not react to the stressful situations by the changes at the heart rate or blood pressure.

According to James-Lange theory we would expect these people to have less emotions or report no emotions. <u>IS THAT THE CASE?</u>

People with this condition have little difficulty identifying what emotion a character in a story experiences in a particular circumstance.

However, they reports that they fell emotions less intensely than before.

Actually it has found out that, when they report emotions they refer to the cognitive aspect of emotion.

When they say I'm angry, this is because the situation call for the anger. They experienced anger in a similar situation before and they have its memory but actually they feel anger very weakly.

!Which is consistent with James-Lange Theory!

- Is physiological arousal sufficient for emotion?

Lets say you had increased heart rate, breathing and sweat. Would you feel an emotion?

If you were running, NO!

You were just exercising.

OK! But what if you were sitting on a chair comfortably in your room and experiencing excessively increased heart rate and breathing.

What if there were no external reasons for you to create this excessive activity?

What emotion you would be experiencing?

PANIC!

Panic attacks are marked by extreme sympathetic system arousal

- OUR BODY AND EMOTIONS

-FAKE IT UNTIL YOU MAKE IT! –

Would faking a smile make you slightly happier?

Experiment 1

People who read the comics with a pen in their mouth (smiling) rated these comics as funnier in comparison to those that who read the comics with a pen in their mouth preventing them from smiling.

- Experiment 2

Motor task involved holding golf tees touching each other at their eyebrows which made participants frown.

Results showed that people who frowned while assessing photos rated them more unpleasant.

- BRAIN AREAS ASSOCIATED WITH EMOTIONS

DO DIFFERENT BRAIN AREAS RESPOND TO DIFFERENT EMOTIONS?

Yes! Different brain areas responds to different emotions.

There are different factors that affect the functioning such as the type of objects or people involved in the situation and the kind of the emotion.

- Contributions of the hemispheres

Right hemisphere is more responsive to emotions.

Listening to laughter or cry activates right amygdala more.

When people look to the impression of the faces, right temporal lobe gets activated more then left. Patients with cerebral damage to this area can not differentiate the emotions.

In Etcoff et al. (2000)'s study, people asked to differentiate between honest and dishonest autobiographies by the same individuals.

Only patients with left hemisphere brain damage scored above chance in identifying the dishonest autobiographies.

WHY?

Left out of the way, right hemisphere done what it is best at.

In Ross et al. (1994)'s study, Wada procedure has applied (anesthetizing one hemisphere of the brain), to 11 patients. When they were tested right hemisphere deactivated, it appeared that they only remembered the facts but not emotions.

Ex. One patient remembered visiting his dying mum but denied being felt sad.

When patients tested both hemispheres activated they expressed strong emotions for the same events.

- From functional perspective:

Emotion is a tool for directing organism for rewarding things and keeping it away from non-rewarding or non-satisfying, dangerous circumstances.

- WHAT ARE THE FUNCTIONS OF THE DIFFERENT EMOTIONS?

FEAR,

Enables us to avoid danger

ANGER,

Enables us to attack to something that we perceive as dangerous or very irritating

DISCUST,

Enables us to avoid things that would make us sick

HAPPINESS,

Means that we like the experience we have

SADNESS,

Means that we dislike the experience that we have

- WHY DO WE HAVE EMOTIONS?

In time, specific emotions get paired with specific events and circumstances. Then, we get motivated for experiencing the good ones again, and we get motivated avoid the bad ones.

Experiment:

Damasio (1994) carried a study with patient who had an injury to the pre-frontal cortex and not able to feel any emotions at all.

- What if a counter gives you a lots of extra money?

Despite participant knew the consequences of the both actions (bringing the money back or running away with it), his answer was:

I don't know what to do.

He was not able to give an answer because he was not able to feel or recall the emotions as he would experience with the any consequence.

He was not able to decide!

- Experiment: IOWA gambling task
- Experiment: IOWA gambling task

Deck A and B make people lose in the long run

Deck C and D make people win in the long run

Normal people show a tendency toward C and D because they experience less stress that way

-

- Patients with pre-frontal or amygdaloid injury continues to draw from A and B

Because they do not anticipate to feel good or bad as a consequence, they do not try to avoid stressful circumstances.

To date, we know that different brain areas contribute for emotions. There is no specific brain areas for specific emotions. However, Insula pose a contradiction as it consistently activates for the emotion disgust.

- FIGHT AND FLIGHT RESPONSES

Most of the animals behaviors corresponds to categories of fight or flight. Sympathetic system adjusts the fight or flight responses and it requires the fear and anger to operate.

Experiment:

- Hamster A alone in the cage
- Hamster B comes in
- Hamster A sniffs and then attacks to hamster B
- Hamster B taken out of the cage

Attacking increase the chance of attacking again in the next 30 minutes.

In that time interval amygdaloid activation increases

Then they put hamster C in to the cage

Hamster A attacks immediately.

We can see similar behaviors in human children and adults.

- HORMONES AND EMOTIONS

Animals and aggressive behaviors

Testosterone is responsible for males' aggressive behaviors

Among humans?

Violent crimes V.S non- violent crimes

There is not a great difference

'Triple imbalance theory'

- Triple imbalance theory

In the stressful situations which increase the level of cortisol hormone creates a feeling of fear.

On the other hand, low level of cortisol is related to inhibition difficulty

So, aggressive behaviors are observed most, when testosterone level is high and cortisol level is low.

It is also known that serotonin is a neurotransmitter that help controlling the aggressive behaviors.

That's why when serotonin and cortisol levels are high we do not expect to observe much of aggressive behaviors

- SEROTONIN AND AGGRESSION

EXPERIMENT:

Monkeys observed ın theır natural envıronment

Serotonin levels made a difference

What about in humans?

Difference in prison

No difference in normal population and controversial results

Experiment

Participants' serotonin levels are reduced

Serotonin hypothesis