

Why is your Glass Half Empty? The Neural Circuitry of Pessimism Revealed

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Pessimism

It is the anticipation of negative outcome in a given situation due to when the individual considers only the downside rather than the potential benefit. The pessimism is a common trait in neuropsychiatric disorders such as anxiety and depression which makes them resistant for treatment. [1]

Role of caudate Caudate nucleus in pessimism

Research has revealed the area of brain responsible for generating pessimistic thoughts. Animal studies exposed that animals tend to make more number of negative decisions while the caudate nucleus is stimulated. These animals gave more weightage to the drawbacks of a situation rather than the benefits while decision making.[2]

Approach-avoidance decision-making

In this type of decision making phenomenon, an outcome with presence of rewards leads to approach behaviour, whereas outcome with punishments leads to avoidance behaviour. It is an avoid-threat and approach-reward behaviour. During the decision phase, It involves comparison of conflict to non-conflict outcomes with the expected reward. The reward outcome warrants the integrity, whereas punishment outcomes looms the integrity of the individual.[3]

Approach-avoidance conflict

In an individual's routine lifestyle, there will be instances of difficulty in decision making. In which condition, the same option chosen by the individual may result in an outcome that may be either rewarding and threatening, creating the conflict in approach-avoidance decision making.[3] Due to chronic stress a specific kind of decision-making, weighing positive and negative elements, which finally results in choosing high-risk, high-payoff options. This effect is called as approach-avoidance conflict which is often seen in patients with depression, anxiety, or obsessive-compulsive disorders (OCD). This kind of negative affect may have a negative effect on the approach-avoidance decision-making.[1]

Abnormal Brainwave activity in caudate nucleus

The caudate nucleus is connected with the limbic system which regulates the mood of the individual. It is connected with the motor areas and dopamine synthesising regions of the brain. In Human neuroimaging research, Scientists observed that when these decision-making patterns are altered, the brainwave activity in the caudate nucleus was transformed. [2]

Magnetic resonance imaging (MRI) studies exposed that in patients with depression or anxiety, throughout the approach-avoidance decision-making, abnormal activity was recorded in the neocortex connected with the caudate nucleus (medial prefrontal cortex) and caudate nucleus itself. This amounts to disruption of the dopamine activity in these regions of brain. [2]

In patients with anxiety disorders, the approach-avoidance decision making may be dysfunctional. The three main hypotheses that explain this are: (a) Disproportionately higher representation of avoidance valuation; (b) Disproportionately higher or lower representation of approach valuation; and (c) inadequacy in assimilating and adjudicating approach and avoidance decision making.[4]

Conclusion

Further experimental studies are essential for testing the precise type of approach-avoidance dysfunction related with neural representations in caudate nucleus; which may lead to an outcome of cure for the treatment-resistant anxiety and depressive disorders.

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