

# Neuroscience basis of *Happiness Hypothesis*, Meditation and Prozac

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## Abstract

People are born either left or right cortical. People with right corticalness are more prone to feeling like anxiety, depression, shame, etc. This results in overall lower average level of happiness. This level could be changed by Meditation, Cognitive Therapy or Prozac. These methods are shown to work on prefrontal activity, stimulation of Amygdala and levels of neurotransmitters like dopamine and serotonin.

## Introduction

It is really hard to define happiness, but everybody strives to be happy. Since Aristotle, happiness has been usefully thought of as consisting of at least two aspects: hedonia (pleasure) and eudaimonia (a life well lived). Scientists have worked hard to describe and decipher the neural basis of happiness and have come up with really great insights into the topic. The brain regions like prefrontal cortex, Amygdala, Ventral striatum and neurotransmitters like dopamine, serotonin seem to be the key players.

## Negativity bias and Cortical Lottery

In the book *Happiness Hypothesis*, the final version of Happiness hypothesis of Jonathan Haidt says "The final version of the happiness hypothesis is that happiness comes from between (our life). Happiness is not something you can find, acquire, or achieve directly. You have to get the conditions right and then wait. Some of those conditions are within you, such as coherence among the parts and levels of your personality. Other conditions require relationships to things beyond you: Just as plants need sun, water, and good soil to thrive, people need love, work, and a connection to something larger"

The conditions within us are the opposing sympathetic (makes us ready for fight or flight) and parasympathetic system (calms us down) or the approach and withdrawal system. The withdrawal system is stronger and faster than the

approach system . Information from the eyes and ears goes first to thalamus. From there it is sent to sensory processing areas in frontal cortex and from those areas information is relayed to the frontal cortex .Here information is integrated with higher order mental functions and consciousness.The withdrawal system has a shortcut of amygdala ,which lies just below thalamus and has a access to unprocessed information and direct connections with fight or flight response.The Amygdala also sends projections to the frontal cortex which alters our thinking to a overall withdrawal mode <sup>7</sup>

As the negative bias: Bad is stronger than good ,has it amygdale has no centre for activation due to positive stimuli <sup>10</sup>

A persons average level of happiness depends on the balance between the approach and withdrawal system <sup>4</sup> The brainwaves show asymmetry in the brain, particularly between left and right regions of frontal cortex. It has been shown that the people which show more activity in the left side of the brain are less likely to have anxiety ,fear,shame,depression and in general are more happy compared to the people who show more activity in the right region <sup>5</sup>This asymmetry is believed to have genetic basis.Here Nature triumphs over nurture<sup>3</sup>The difference is seen in infancy and is retained through adulthood<sup>8</sup>Many chemicals and neurotransmitter. like dopamine,serotonin,opoids etc, play a role in determining the happiness levels <sup>12</sup>

One can change the average happiness levelor the affectiveness not by sheer willpower but by methods which change the set of thoughts our brain harbors.The three effective methods are meditation,Prozac and Cognitive therapy

## Meditation

” Meditation refers to a family of self-regulation practices that focus on training attention and awareness in order to bring mental processes under greater voluntary control and thereby foster general mental well-being and development and/or specific capacities such as calm, clarity, and concentration” <sup>15</sup> Meditation decreases the feeling of anxiety, increases contentment, self-esteem,empathy,trust and improves memory<sup>17</sup> . It has been shown during meditation and self-representation and reality testing, detachment form self have similar neural correlates <sup>11</sup>. The regions which play a role in self consciousness and self-recognition, autobiographical retrieval and self-evaluation(right prefrontal cortex) are seen to be involved in meditative states too.<sup>18</sup>. During meditation higher levels of dopamine are seen in the ventral striatum,which is belived to be the reward centre in the brain and in the conscious state of meditation causes a suppression of cortico-striatal glutamatergic transmission.<sup>9</sup>

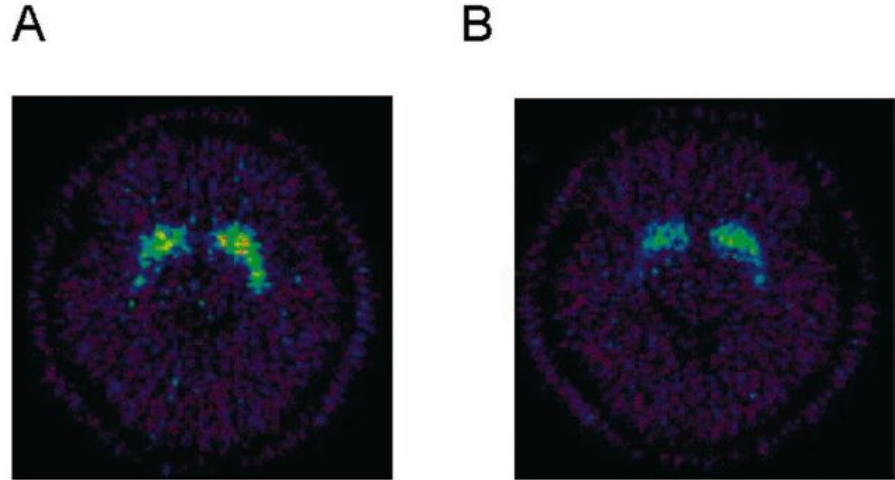


Figure 1: The C-raclopride binding potential images at the level of the striatum for one participant (No. 8) during attention to speech (A) and meditation 11 (B). The reduced C-raclopride binding potential in ventral striatum is evidence of increased endogenous dopamine release during meditation .(Adapted from Reference 9)

Also during meditation neurotransmitters like GABA ,serotonin etc reflect changes in their system and cortical stimulation of both the hemispheres is seen<sup>14</sup>. Meditation is shown to be clinically effective in treating psychiatric disorders <sup>16</sup>

Thus meditation seems to work towards changing the average happiness levels by increasing cortical stimulation,levels of neurotransmitters like dopamine and serotonin. But there still seems to be a disconnect between how these changes result into overall increase in level of happiness. Also the experiments conducted need to be looked critically for their validity as complex task like meditation which cannot be described properly and are hard to practise , could create ambiguity while experiments are conducted

## Prozac

Prozac gives feeling of well-being,highself-esteem and confidence.Prozac belongs to a class of chemicals called SSRIs. Selective serotonin reuptake inhibitors. It acts on the serotonergic synapses and inhibits the reuptake of serotonin. This results in more levels of serotonin in the synapse and more firing of the post-synaptic neuron.Though serotonin levels rise for few hours the effects are seen for 2-3 days. This suggests adaptative change in the synapse. This is debatable<sup>7</sup>

Another theory suggests that it raises the level of a neural growth hormone in the hippocampus, a part of the brain crucial for learning and memory. People who have lower happiness values generally have higher levels of stress hormones in their blood. Stress hormones tend to kill off or prune back some critical cells in the hippocampus. Hippocampus cells actually function to shut off stress hormones. This results in minor neural damage to the hippocampus, but this can be repaired in four or five weeks after Prozac as growth hormone helps revival of the hippocampal cells<sup>13</sup>  
Prozac works very effectively, but how it works is not clear from the study

## Cognitive Therapy

Aaron Beck in 1960s developed cognitive therapy. It trains patients to keep a vigil on their thoughts, catch the distorted thoughts, describe the distortion, and change the thoughts with more accurate and realistic thoughts. Studies have shown that activities like "refocusing, explicit evaluation, and cognitive processing of emotional experiences leads to a more intense amygdalous response, subjectively stronger emotional reaction, and characteristic physical changes"<sup>19</sup> Cognitive therapy could be changed by metacognition and mindful techniques which have similar correlates with changes occurring in cortical and subcortical structures and endocrine and immune systems.<sup>2</sup> Thus these studies show that these techniques work on the pathway for withdrawal approach. Cognitive Behavioral Therapy are also being practiced, which show good results. Cognitive therapy though has similar effect as Prozac<sup>6</sup>, but its additional benefit is that it results in life long changes, whereas Prozac only works when it is taken. Thus Cognitive therapy is a good solution as it is easy compared to meditation and long-lasting compared to Prozac.

## Conclusion

The methods work well to treat lower levels of happiness, but more experiments need to be done to understand the mechanisms behind the methods.

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