

# How our brain impacts our personal identity.

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## Introduction

Our brains have neurons that are constantly communicating with each other through an action potential which releases chemicals<sup>1</sup> and these chemicals are what influence how we think about, sense and feel the world around us. As the chemistry of the brain is what can influence and change our mood, it is not unreasonable to suggest this has a major impact on our personal identity and how we present ourselves to the world. What makes us happy and feel pleasure to what scares us and makes us flee are all governed by chemistry in the body.

## 1. Neurotransmitters

In tiny sacs at the end of neurones (nerve cells) called vesicles, chemicals are contained which can be released by an electric impulse or action potential<sup>2</sup>. These chemicals are called neurotransmitters and these can range from dopamine to adrenaline to serotonin. Neurotransmitters are in essence chemical messengers which are responsible for our responses to stimuli and everyday life.

Neurotransmitters are usually amines (containing the  $-NH_2$  functional group) and generally act as agonists or antagonists. Agonists increase certain neurotransmitter activity through ways such as encouraging neurotransmitter synthesis, and reducing reuptake from gap junctions between neurones called synapses. Antagonists decrease the activity of certain neurotransmitters by blocking receptors or interfering with neurotransmitter synthesis.<sup>3</sup>

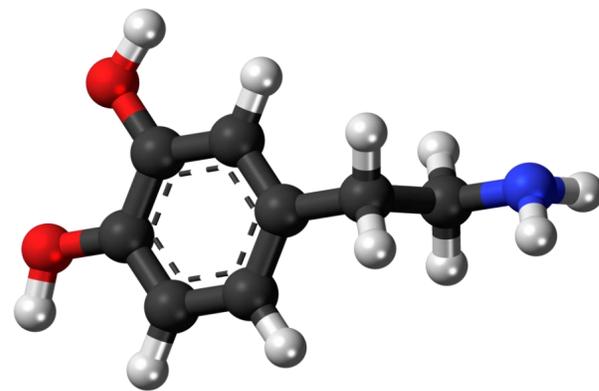
## 3. Chemically-influenced emotions

Chemical imbalances in the brain and more specifically the limbic system (the part of the brain that is most linked to emotion) have been shown to contribute to various physical and mental illnesses and conditions.<sup>3</sup> Serotonin, a neurotransmitter, is partly responsible for modulating mood and emotion.<sup>5</sup> Reduced serotonin levels have been linked to predisposition to depression and aggressive behaviour.<sup>6</sup> However, we must be careful not to go as far as to say this is the sole reason for conditions such as depression, which can be caused by a number of different social factors rather than just biochemical factors.<sup>7</sup>

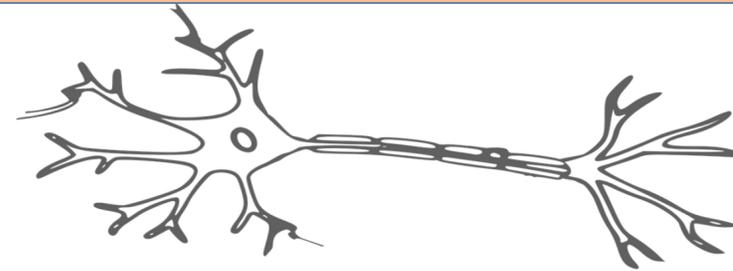
Drugs can also influence the emotions of humans with chemicals such as ethanol aiding GABA in inhibiting neurones firing and communication in the nervous system and cocaine inhibiting the re-uptake of neurotransmitters like serotonin and dopamine, leaving them in the synapse for longer and causing feelings of euphoria and pleasure.<sup>5</sup>



Cartoon of a synapse between two neurones with neurotransmitters in their vesicles.



A molecule of dopamine, the amine group  $-NH_2$  is highlighted as the blue ball (nitrogen) with two white balls attached (hydrogen).



Cartoon of a typical neuron or nerve cell.

## 2. The effects of neurotransmitters

As mentioned before, neurotransmitter activity can be increased or decreased. After a neurotransmitter binds to a receptor, it can exert control on an ion channel and open channels for ions to pass through. When positive ions flow through, this results in depolarisation and a continuation in nerve impulse. When negative ions flow through, this results in hyperpolarisation and this decreases the chance of nerve impulses continuing to transmit.<sup>4</sup>

An example of a neurotransmitter that causes hyperpolarisation is gamma-aminobutyric acid (GABA). GABA acts by binding to a protein on the presynaptic neurone (the neurone from which neurotransmitters are released) and inhibits cell activity. This happens as a result of the molecule distorting the cell's structure and widening the ion channel, allowing an influx of chloride ions ( $Cl^-$ ) and so hyperpolarisation occurs meaning the cell is unable to fire.<sup>5</sup> GABA's inhibitory effect on the nervous system leads it to have a calming effect on yourself and in essence 'slows down' brain activity. This is just one example of how neurotransmitters affect your response to situations and therefore your personal identity.

## References

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## Conclusion

Our brain and the processes inside it contribute a great deal to our personal identity, from the emotions we feel to the way we perceive the world around us, however, this is not the only way we can describe our personal identity as various social and psychological factors ultimately influence the way these chemical processes affect us and how we express this.