



How the Big Five Personality Traits Influence the Biological and Behavioral Expressions of Love

Madison Lam¹, Jalyn Huang^{1#}

¹ Irvine High School

Advisor

ABSTRACT

A universal subject, depicted in various forms of media across the centuries is love, yet it is still undefined. There's infinite expressions of love, it can transcend culture and time, however it is so subjective there is no universal feeling. Understanding love can be tricky and that's why there is so much mixed media surrounding it, it's too intricate to fully comprehend. However, every person has their own unique way of interpreting it, and studies can be useful in self improvement and growth. Despite this universal definition dilemma, there is a universal way to ensure love can last. There are global traits that promote longevity in relationships, not just between people but in oneself. Exercising these traits and knowing how to apply them in real life can benefit everyone involved. There are five traits that are said by psychologists to define a person - openness to experience, extraversion, agreeableness, and neuroticism. Knowing how to apply them and knowing the effects they bring can be extremely beneficial in people's relationships. Although not everyone is in a romantic relationship, every person experiences some form of love, whether they give it or take it or if it goes both ways. Understanding the influences the brain has in the expression and motivation for love helps people understand how to love better.

Introduction

Love is a thoroughly studied and multi-faceted topic, influenced by biological, psychological, and philosophical factors. It is defined as the inclination to "feel, think, and behave positively toward another person" (Tobore, 2020). Love is associated with feelings of affection, warmth, safety and stability. However, love can also manifest into feelings of depression, neuroticism, or rebellion.

The Big Five Personality Traits are a group of characteristics that provide the framework for the basic aspects of personality, consisting of: Openness to Experience, Conscientiousness, Extroversion, Agreeableness, and Neuroticism. Openness to Experience is a person's tendency to be curious and take risks. Conscientiousness is defined as awareness of our environment and ourselves. Extroversion is defined as sociability and talkativeness. Agreeableness is defined as cooperative and friendly. Neuroticism is defined as emotional instability and worry. These five traits influence how people think, behave, and feel when in love. When someone is in love, certain areas of the brain are affected, and the mental consequences of perceiving oneself to be in love change the intensity of each Big 5 trait.

In biology, there are parts of the brain that increase activity when in love. Physical reactions take place when seeing a loved one, such as the dilation of the pupils and the sweating of the palms. Scientists have captured love-associated brain activity using functional magnetic resonance imaging (fMRI), measuring blood flow to certain regions of the brain which tells us that those areas are active. There is an observed increase in chemical messengers associated with positive feelings. These chemical messengers are known as neurotransmitters, also sometimes classified as drugs. One of these drugs is dopamine which is related to the reward system and increases feelings of pleasure and movement. A hormone that increases when in love is oxytocin, promoting social bonding and trust



while reducing stress. These drugs can be observed in those who report feelings of love. Other neurotransmitters that are present are vasopressin, serotonin, testosterone, and cortisol. The limbic system contributes to emotional responses. The limbic system is split into three main aspects: the basal nuclei, the thalamus and the hypothalamus. The hypothalamus is responsible for regulating the hormones and neurotransmitters such as the ones listed previously, serving as a vital pathway for emotional expression. These parts of the brain were shown as active, correlating to behavioral changes seen in individuals falling in and staying in love.

The behavioral reasons and consequences of being in love are observed throughout multiple concepts and real-life examples. BF Skinner, a psychologist and theorist, coined a type of learning called operant conditioning. Operant conditioning includes positive reinforcement, positive punishment, negative reinforcement and negative punishment. Positive adds a stimulus. Negative removes a stimulus. Reinforcement increases desired behavior. Punishment decreases undesired behavior. Positive reinforcement is associated with love through one partner receiving gifts or compliments and the other partner reciprocating with affection, therefore leading the gift giving partner to continue their behavior. Behaviors that elicit feelings of love, such as touching or spending a lot of time with one another can be encouraged through the drugs that are released and the consequential closeness after engaging in intimate activity.

Love not only affects who it is directed towards, but affects their surrounding environment through behavior that transcends the relationship. People report a more positive mood when in love, which can increase positive actions and deeds not limited to their significant other. An overall improved well-being when in love is correlated to the effects in personality and self esteem. Those in love have improved self concept and self efficacy. Self concept is defined as the perception of oneself and self efficacy is defined as belief in oneself. The idea of personality relationship transactions are seen through differing events in a relationship and a corresponding emotional reaction and personality shift in the individual. When the relationship is in its honeymoon phase: the early days of a relationship when new emotions and experiences are at play and both partners are excited and bonding, it is shown that the partners in a relationship experience an influx of hormones linked to positive emotions. This leads them to behave positively outside of the relationship as they are more satisfied overall. The need to be loved and have emotional intimacy is met, and as long as other biological needs such as food and water are being supplied, the individual in love experiences improved health. There is also a hypothesized concept that love is important for development, especially in younger stages. Erikson's stages of development, a theory that was coined by psychoanalyst Erik Erikson, highlights eight stages throughout the human lifespan. These stages all need to be achieved to evolve developmentally and can lead to detrimental traits developing if not reached. The stages include Trust vs Mistrust, Autonomy vs Shame and Doubt, Initiative vs Guilt, Industry vs Inferiority, Identity vs Role Confusion, Intimacy vs Isolation, Generativity vs Stagnation, and Integrity vs Despair. The stage most affected by love is Intimacy vs Isolation. Intimacy is defined in this context as the ability to form close and nurturing relationships. Isolation is defined as the state of being alone and disconnected from relationships. Love involve intimacy which is why so many people desire to find love, as it fulfills a social and psychological need while promoting self improvement and well being. Love is a multi-faceted subject because it is not easy to come by, but when achieved, creates effects observed throughout the respective relationship, the microsystem, and interpersonally.

Body

Openness to Experience

Individuals with a strong openness to experience are motivated by adventure and curiosity, leading to perceiving and expressing love in ways that are explorative. People who are open to experience tend to seek thrills and are receptive to new people. When in love, these individuals are more likely to behave more experimentally in their relationships.



They find creative and novel date ideas and ways to express love to their partner. They find imaginative ways to give or spend quality time. Someone high in openness to experience would be more open-minded, leading to an easy-going and fun loving relationship dynamic. They are also perceived as exciting people, leading to more people being attracted to them and more chances of finding a romantic partner. However, openness to experience could lead to a decrease in self-regulated behavior, creating dissonance when in a romantic relationship. Adventure-seeking is related to the reward system in the brain. The neurotransmitters involved in the reward system are catecholamines. More specifically, the chemicals part of this family that have an effect on novelty seeking are norepinephrine and dopamine. Those with high openness can experience positive reinforcement with rewarding aspects of being in love. These individuals can feel more receptive to explore emotional bonds and the willingness to express vulnerability.

Conscientiousness

Conscientiousness can result in responsible and reliable behaviors directed toward loved ones. People who are conscientious tend to be committed in romantic relationships, strengthening their bond with their communication skills and organization. Those with low conscientiousness are more prone to infidelity, leading to failure in romantic relationships opposed to those with higher conscientiousness who tend to be more loyal. Conscientious people are good at planning, leading to a long-term committed relationship with their loved one. In long distance relationships, partners who are conscientious end up finding success despite the physical distance. They communicate their needs, plan dates to meet in person and ways to connect virtually. They're level headed, meaning they avoid reckless behaviors that could result in conflict. This personality trait is correlated with lower levels of cortisol, a hormone involved with stress. This means that stress management is another behavior that is positively linked to romantic success. The frontal lobe is in charge of cognitive function and decision making. The prefrontal cortex, a part of the frontal lobe, typically develops after adolescence and is important for emotional maturity and responsibility. Those who are conscientious typically have a developed prefrontal cortex, meaning older people are seen commonly possessing this trait. Conscientiousness is a beneficial trait, influencing goal setting, long-term stability, loyalty and trust that can help a relationship thrive.

Extraversion

Extraversion is characterized by someone who is sociable and energetic which is helpful when interacting with others. Behaviors such as greeting new people at events, going out often and networking can help the chances of meeting a romantic partner. Extroverts are perceived as charismatic and charming, and their confidence is an attractive trait. Extroverted people in relationships are not afraid to publicly express their love for their partner, leading to more direct appreciation and public displays of affection. They are also very responsive to their partner's emotional needs. Extroverts desire social interaction and experiences, meaning being with their partner can increase dopamine levels through the reward system. Oxytocin, a drug related to love and connection is also present in romantic relationships, especially those who desire social intimacy. Extroverts also tend to like physical touch which can heighten oxytocin levels. Extroverts have good social skills and express themselves positively, which can contribute to romantic success with their partners.

Agreeableness

Agreeable individuals exhibit warm and empathetic behaviors, meaning they are very loving and caring partners. Those who are agreeable are friendly and kind which leads to emotionally connected and vulnerable relationships with their loved ones. They are slow to conflict and quick to resolution which is helpful for mediating fights. However, this trait can be harmful in relationships because it can get taken advantage of. Their forgiveness and desire to have harmony can be mistreated by partners, leading to an abuse of power. Despite this, those who are agreeable find prosperous relationships as long as their partner is just as loving. They are focused on the other's needs, encouraging emotional intimacy and closeness. Oxytocin is also a drug released by agreeable individuals,



promoting feelings of attachment and trust. The amygdala is the brain's fear center, meaning that those who are agreeable have reduced activity in this area. This means they process fear and aggression less which can be associated with lower interpersonal conflict but less prone to perceiving threats. Agreeableness promotes emotional intimacy and cooperation, a significant aspect of a lasting relationship.

Neuroticism

Those high in neuroticism are prone to emotional instability in their interpersonal lives. Insecurity and sensitivity manifests in neurotic individuals which can be harmful for relationships. Jealous and anxious behaviors can arise, creating toxic dynamics. Fearing abandonment, neurotic individuals can act out in their romantic relationships, sparking arguments and conflict. They are more likely to experience a rollercoaster relationship, reaching emotional highs and lows. They can interpret the behaviors of their partner to be negative and react accordingly. Their cortisol levels are increased which means they are more stressed and have an overall decreased sense of well-being. This lack of stress management also means their reactivity and defensiveness in conflict is heightened. Increased activity in the amygdala means their fear response grows at the first sign of discord. On the other hand, neuroticism can increase emotional depth and nuanced conversations with loved ones who aren't afraid to be vulnerable. Despite this, lowered neuroticism is beneficial for emotional regulation and secure attachment while too much leads to unstable and insecure dynamics.

Trait Influence Beyond Relationships

Looking past interpersonal relationships and the influence of these five traits on them, love shapes individual development and self perception in relation to the Big Five traits. Self esteem, efficacy and concept are all impacted by the presence of each trait. High extraversion leads to higher confidence and an improved self esteem. High neuroticism can lead to insecurity and a lower self concept. Erikson's intimacy and isolation stage is also present here as love is a critical part of a person's life. It's crucial for development because the sole experience of being in love satisfies the need for intimacy and closeness. It is vital to experience because each love is special and rare even though most people will experience being in love in their lifetime. It also promotes improved well-being and health, with drugs such as serotonin and oxytocin being released, improving mental and physical health. Platonic, romantic, or familial, love characterizes humans and sets us apart as a species. The intricate nuances of how love motivates and shapes us depending on our personality traits is unique to each individual.

Conclusion

The 5 Big Traits of Personality help broaden the understanding of individuals in love and educate on how certain traits evoke a healthier and more long-lasting love. Open individuals show creativity and exploration in love but exhibit recklessness, influenced by the reward system in the brain. People who are conscientious express love through organization and emotional stability, relating to a developed prefrontal cortex and lower cortisol levels, which can encourage a long lasting relationship. Extroverts are social creatures, opening up the opportunity for bonding and deep conversations in relationships, driven by dopamine activity in the pleasure center and in turn, releasing oxytocin. Agreeable individuals have higher oxytocin levels, expressing warmth and connection and lower amygdala activity, meaning their fight or flight response is not triggered as they are trusting individuals. Those who are higher in neuroticism have elevated cortisol levels and higher amygdala activity, meaning their feelings of fear and conflict are heightened. Typically it would be a trait to avoid, although it can be beneficial for emotional expression and intimacy. Each Big 5 trait influences what happens in the brain and what happens interpersonally, defining what relationships can look like depending on the severity of each characteristic.



The Steamology Project

Although love is a universal feeling, measuring it as a broad concept can bring up some conflicts. It is such a unique experience depending on the individual, so researching love as one objective thing is difficult to find accuracy in. Some experimental methods, such as correlational or observational studies can not prove specific findings. Love is defined differently depending on cultural and social environment, meaning researchers need to have a diverse group they study, which is hard when applying random assignments. Despite these limitations, it is hard to find a study not statistically significant when studying love. It covers so many areas and emotions that there are bound to be people for each experience of love reported on.

Studies to further broaden knowledge on personal influences and expressions of love can include experiments with couples and single people, measuring their heart rate and using technology such as fMRI to see their dopamine and neurotransmitter levels in the brain that indicate strong feelings of love. Another method would be measuring someone without their significant other in the room versus after and seeing the mental and physical changes that take place.

These studies can help us understand how to navigate love. No one can truly understand, to a scientific level, what love really is. There isn't one definition or universal truth about it, it varies and changes. Love adapts and grows as well as it can wither, but shown from the studies above, people who express and use an appropriate amount of the 5 Big Personality Traits are always successful as long as their partner is as adaptable and able to meet them on their growth.

Research on love provides more than a general understanding about definitions about the chemistry of love and the logistics of loving someone. It gives a deeper meaning and comprehension about the science of it to help love ourselves and others better. It teaches us universal truths we can apply in our everyday lives and relationships, romantic or not. It is a fact that treating someone with kindness and respect are foundations to loving someone. People concede that in abusive relationships, people interpret love as control and authority but that is not what love is. Through these studies we see the benefits of receiving and giving love, but also what traits and behaviors people express who stay in love consistently. Through their understanding and practice, humans can learn to love healthier and experience the advantages of love's dopamine influx.



References

- Bode, A., & S Kavanagh, P. (2023). Romantic Love and Behavioral Activation System Sensitivity to a Loved One. <https://pmc.ncbi.nlm.nih.gov/articles/PMC10669312/>
- Bühler, J. L., Krauss, S., & Orth, U. (2021). Development of relationship satisfaction across the life span: A systematic review and meta-analysis. *Psychological Bulletin*, 147(10), 1012–1053. <https://doi.org/10.1037/bul0000342>
- Chapman, Heather M., "Love: A Biological, Psychological and Philosophical Study" (2011). Senior Honors Projects. Paper 254. <https://digitalcommons.uri.edu/srhonorsprog/254>
- Esch, T. (2005). The Neurobiology of Love [Review of The Neurobiology of Love, by G. B Stefano]. <https://pubmed.ncbi.nlm.nih.gov/15990719/>
- Fardis, M. (2007). Expression and Regulation of Emotions in Romantic Relationships Expression and Regulation of Emotions in Romantic Relationships. <https://scholarworks.umt.edu/cgi/viewcontent.cgi?article=1442&context=etd>
- G Seshadri , K. (2016). The neuroendocrinology of love. <https://pmc.ncbi.nlm.nih.gov/articles/PMC4911849/>
- Gomez-Lopez, M., Viejo, C., & Ortega-Ruiz, R. (2019). Well-Being and Romantic Relationships: A Systematic Review in Adolescence and Emerging Adulthood [Review of Well-Being and Romantic Relationships: A Systematic Review in Adolescence and Emerging Adulthood]. *International Journal of Environmental Research and Public Health*. <https://www.mdpi.com/1660-4601/16/13/2415>
- K GRAHAM , E., J WESTON, S., GERSTORF, D., B YONEDA, T., BOOTH, T., R BEAM, C., J PETKUS, A., DREWELIES, J., N HALL, A., D BASTARACHE, E., ESTABROOK, R., J KATZ, M., A TURIANO, N., LINDENBERGER, U., SMITH, J., G WAGNER, G., L PEDERSEN, N., ALLEMAND, M., SPIRO III, A., & JH DEEG, D. (2020). Trajectories of Big Five Personality Traits: A Coordinated Analysis of 16 Longitudinal Samples. <https://pmc.ncbi.nlm.nih.gov/articles/PMC7869960/>
- Koehler, J. (2024). Love and the Big 5 Personality Traits. <https://www.psychologytoday.com/us/blog/beyond-school-walls/202406/love-and-the-big-5-personality-traits>
- Larissa Buhler, J. (2022). A developmental perspective on personality–relationship transactions: Evidence from three nationally representative samples. <https://onlinelibrary.wiley.com/doi/10.1111/jopy.12757>
- M Wirth, M., M Scherer, S., M Hoks, R., & C Abercrombie, H. (2011). The effect of cortisol on emotional responses depends on order of cortisol and placebo administration in a within-subjects design. In National Library of Medicine. <https://pmc.ncbi.nlm.nih.gov/articles/PMC3110569/>
- Mikulincer, M. (2006). Dynamics of romantic love: Attachment, caregiving, and sex [Review of Dynamics of romantic love: Attachment, caregiving, and sex].



https://www.researchgate.net/profile/Mario-Mikulincer/publication/292779311_Dynamics_of_romantic_love_Attachment_caregiving_and_sex/links/5736e25908ae9f741b2a983c/Dynamics-of-romantic-love-Attachment-caregiving-and-sex.pdf

Minassian, A., R Kelsoe, J., Miranda, A., W Young, J., & Perry, W. (2022). The relationship between novelty-seeking traits and behavior: establishing construct validity for the human Behavioral Pattern Monitor. <https://pmc.ncbi.nlm.nih.gov/articles/PMC9885942/>

Novotney, A. (2023). What happens in your brain when you're in love?
<https://www.apa.org/topics/marriage-relationships/brain-on-love>

Onojighofia Tobore, T. (2020). Towards a Comprehensive Theory of Love: The Quadruple Theory.
<https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2020.00862/full>

Oravecz, Z., Dirsmith, J., Heshmati, S., Vandekerckhove, J., & Brick, T. R. (2020). Psychological well-being and personality traits are associated with experiencing love in everyday life.
<https://www.sciencedirect.com/science/article/abs/pii/S0191886919305525>

R Goldberg, L. (1993). The Structure of Phenotypic Personality Traits.
https://projects.ori.org/lrg/PDFs_papers/Goldberg.Am.Psych.1993.pdf

S. Lerner, J., Li, Y., Valdesolo, P., & S. Kassam, K. (2014). Emotion and Decision Making.
https://scholar.harvard.edu/files/jenniferlerner/files/emotion_and_decision_making.pdf

Schwartz, R., & Olds, J. (2015). Love and the Brain.
<https://hms.harvard.edu/news-events/publications-archive/brain/love-brain>

Visser, L., Pat-El, R., Lataster, J., van Lankveld, J., & Jacobs, N. (2025). The Relation Between Big Five Personality Traits and Relationship Formation Through Matchmaking.
<https://www.mdpi.com/2813-9844/7/2/52>