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Romantic Love Redoux: Rethinking Romantic Love and Drug Addiction

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Abstract

The purpose of this paper is to understand how recent brain imaging research has shed light on the development and processes of romantic love in couple relationships and how this research has affected the definition and meaning of romantic love. Recent neuroscience research confirms that brain regions activated in drug addiction overlap with brain areas activated in a person experiencing romantic love. The brain systems that are most activated include the reward network, memory storage, areas of huge vasopressin and oxytocin receptors, and pain reduction. While partial overlap in the reward system occurs for both drug addiction and romantic love, the authors argue that the long-term positive effects of naturally occurring romantic love varies greatly from drug addiction, which is not a naturally occurring activity in the reward system. The authors take the view that because of the long-term positive effects of romantic love, defining it primarily as a drive or goal-oriented behavior like cocaine use minimizes its overall place in the establishment and maintenance of an intimate relationship. Romantic love reflects the implicit memory system that is formed prior to conscious thought. Furthermore, the authors believe that therapy for romantic partners has little in common with therapy for drug addicts. Recent research attests to the involvement of negative emotional activation in the amygdala, which can be blocked without preventing experiencing naturally occurring rewarding behaviors. This finding is counter to research that concluded that emotional systems are not activated by romantic love.

Keywords

Neuroscience, Romantic Love, Couple Relationships, Psychotherapy, Addiction

1. Romantic Love Redoux: Rethinking Romantic Love and Drug Addiciton

Thirty to 40 years ago, romantic love was viewed as a passionate, impermanent love which left the couple disappointed and, more often, ready to terminate the relationship when it ended. Romantic love was viewed as immature and needing to give way to a more enduring, rational love, referred to as "companionate love" [1]. Romantic love could cause sleepless nights, heart palpations, sweaty palms, and impulsive behavior. In clinical practice, romantic love was relegated to the ranks of a negative emotion which, for the most part, needed to be controlled and subdued by the more advanced and mature rational brain [2]. Clinicians shied away from addressing romantic love because it was impermanent, and clinicians believed that couples should focus on attaining the more lasting and deeper aspect of love [2]. Although most people married because of romantic love and many divorced when it decreased [3], there was little inquiry into how romantic love contributed to the formation and maintenance of adult intimate relationships.

Over the years, much research has added to our knowledge of relationship formation and maintenance, including expanding the concept of romantic love. One of the most significant contributions was applying attachment theory, which began in the mid-1980s [4]. Romantic love and attachment were viewed as analogous processes in both structure and function. Hazen and Shaver hypothesized that styles of attachment, which developed in early childhood, would correspond with adult romantic relationships.

In addition to applying the attachment model to romantic love, researchers found evidence that romantic love was a

universal, cross-cultural experience in the same way that attachment appears to be universal [5]. These ideas were then applied to clinical settings with couples through such noted work as Susan Johnson [6]. A model for clinical practice was developed based on the similarity of attachment theory and romantic love [2]. This model postulated that both attachment and romantic love form outside of awareness and involved the implicit memory system. In addition, the model suggested that there should be therapeutic interventions, which included building new experiences and indirect methods as opposed to verbal, direct techniques of interventions.

2. Neuroscience Findings on Romantic Love

In the past decade and a half, another significant leap has occurred in the research and application to romantic love literature, namely the use of brain imaging techniques. The purpose of this paper is to understand how recent brain imaging research has shed light on the development and processes of romantic love in couple relationships and how this research has affected the definition and meaning of romantic love. Neuroscientists use a procedure called functional magnetic resonance imaging (fMRI), which is a scanning of the brain using radio and magnetic waves that detect changes in blood flow that indicate increased or decreased activity in various regions of the brain [7]. This technology has provided a window into brain activity associated with intimate relationships, which can detect how the brain functions in intimate relationships. The guesswork is out and, with it, certain assumptions regarding the nature and impact that romantic love exhibits on the relationship.

Interestingly, one finding suggests that romantic love is associated with a reduction of activity in the cerebral cortex, including the temporal parietal and frontal cortex, the brain region linked to moral judgment and reasoning [8]. This finding indicates that while thoughts may be a part of the brain's response to romantic relationships, the brain networks that are activated are something entirely different. Romantic love is not a rational process and does not activate the neocortex [2]. This finding supports the view that romantic love is generated through the implicit memory system and reflects attachment relationship patterns. It also suggests why romantic love may be "blind" since reality and the experience of romance may not be congruent. A person in an intense romantic love state is prone to overlook the negative characteristics of the partner and focus only on the positive attributes [8]. In addition, Zeki and Romaya found similar results for both males and females and for gay and lesbian individuals, which would support the conclusion that these brain changes are universal, and that romantic love affects all persons similarly.

This deficit in cognitive focus can also be seen in related research on the connection of romantic love and lacking appropriate focus in completing a task. Researchers conducted research with 43 subjects who were in a romantic relationship and concluded that the more subjects identified themselves as being in love, the more likely they were to be less focused on completing a task [9]. Furthermore, the researchers found that no gender differences existed in completing daily tasks that needed attention. While previous studies had found that the ability to focus was important for romantic couples to establish a long-term relationship, the findings of Steenbergen and associates were unique because they found the opposite – romantic love and being able to stay focused have a negative relation. A probable reason for this finding may rest on the fact that a person tends to think a lot about the partner, which may be obsessive at times. The researchers concluded that over time, a balance is needed between being able to focus verses not being able to focus [9].

Other recent researchers have also looked at romantic love and the cognitive lack of focus. For example, Loyola University Health System Researchers [10] found that lower levels of serotonin may explain why persons in love lack focus when compared to other couples. These couples with lower serotonin tend to have activity in the same areas of the brain that are normally activated in obsessive-compulsive personality disorders, which are characterized by shallow and repetitive mental processes. Furthermore, the results of this consuming spotlight on the love partner may reduce the ability to process the relationship in a more objective manner. Thus, persons may make poor choices without conscious awareness and only after a time with an accumulation of negative experiences, are they capable of seeing the love relationship more objectively. When reality does not support this idealized relationship, the relationship may not be able to survive. It could be argued that with many couples, the bursting of the romantic bubble kicks in and sets in motion the divorce process. This finding may also account for why persons continue to stay in a relationship that others can assess more accurately as being unhealthy, since they have not had enough negative experiences to change their perception of the partner. Other researchers have noted, however, that some cognitive processes are activated even during the overwhelming experience of romantic love, such as concerns about body image [11].

Neuroscience researchers have found that romantic love is connected to several brain networks. For example, researchers have found three distinct brain networks that are interrelated, including romantic love, the drive for sexual intimacy, and attachment, which is more prominent in long-term relationships [12]. Beauregard, Levesque, and Bourgouin [13] found that the limbic system, specifically the right amygdale and the right anterior pole and hypothalamus, are activated when men view erotic material and for couples experiencing romantic love. However, these two systems function differently for individuals in that romantic love continues despite lack of sexual satisfaction or even physical contact with the other. Also, persons can engage in sexual activity without experiencing romantic love [14]. It seems clear that sexual activity and romantic love brain networks are differentiated, but also connected, with romantic love

being the most influential because the romantic network includes the caudate, which makes it possible for control and assimilation across a number of brain networks.

Research in sexual attraction and romantic love produce some overlapping findings regarding brain networks, but for the most part conclude that romantic love and sexual attraction activate two distinct brain networks [14]. While romantic love, sexual attraction, and attachment in long-term relationships activate similar brain networks – the most powerful of which is the romantic love network – this offers a significant glimpse into the role that romantic love offers for intimate relationships. Not only does this suggest that romantic love should not be dismissed as important for intimate relationship development, but it also provides a necessary sequence in relationship development that would not take place without romantic love. This necessary role of romantic love in the development and maintenance of intimate relationships will be discussed in more detail in the last section of the paper.

Researchers using brain imaging techniques also have revised the long-held belief that romantic love is based in the emotional network of the brain. In fact, a major finding of Aron et al., [12] was that romantic love activated the motivation, drive and reward networks of the brain. While there are emotional components to romantic love, the main areas of brain activation occur in the reward and motivation centers. Furthermore, these researchers found evidence for brain lateralization noting that romantic love is mainly a right brain activity. When the researchers compared subjects who were looking at pictures of their romantic partners with subjects who were simply viewing an attractive face, it was clear that subjects viewing their romantic partner activated the right side of the brain while observing an attractive face activated the left side of the brain.

Researchers have further found that the activation of the reward network activates the same centers of the brain as cocaine and other drugs [15, 16]. By activating the reward network, Fisher et al., [16] postulate that romantic love can now be viewed as less of an emotion and more as a goal-oriented drive. Further, the drive related to romantic love is stronger than similar drives, such as lust [17].

While past conceptualization of romantic love considered it to be short-lived and mainly an emotion, recent brain imaging research has found that it can be lasting and typically is concentrated in non-limbic systems areas of the brain [18]. In comparing long-term romantic relationships with newly formed ones, researchers found that activity in the ventral tegmental area (VTA), activates the release of dopamine, a central part of the brain's reward network. The VTA stimulates other regions of the brain, such as the caudate nucleus, includes the right medial and posterior-dorsal network. The caudate nucleus is important in storing and processing memories and it has also been linked to the presence of obsessive-compulsive disorder. The medial and posterior-dorsal network "is best understood …as provid [ing] information from experiences in the form of memories and associations that are the building blocks of mental stimulations" [19]. These findings support an interpretation of romantic love as being closely related to the goal-oriented reward seeking areas of the brain [20]. This is the same brain network that is activated when one is under the influence of a drug producing a "high," such as cocaine. However, the association of romantic love and reward areas of the brain does not necessarily lead to the conclusion that romantic love is an addiction, nor should it be compared to drugs that produce a "high," as recent scholarship suggests.

Researchers have found that alcohol and oxytocin stimulate similar areas of the brain producing corresponding behaviors [15]. Increased levels of oxytocin have been associated with couples who have strong romantic feelings. Oxytocin is a neuro-peptide and is found in high levels in mothers with children and in couples experiencing romantic love. Altruism and empathy are two experiences that are related to high levels of oxytocin. Although the same networks are not affected, both affect similar behavior through the release of GABA [21]. The decline and loss of romantic love produces a brain response that is similar to cocaine withdrawal. The couple is viewed as being in a state of withdrawal [15; 16]. The significance of this research rests with the view that romantic love stimulates the reward center of the brain and rejection in love does not activate the emotional network, but instead sets off a withdrawal reaction much like withdrawal from a drug. Despite research indicating the similarities between romantic love and drug addiction, overemphasizing these similarities serves to confuse the newfound understanding of the process of romantic love. This will be addressed in detail in an upcoming section.

Researchers have also investigated brain responses to losing a romantic love partner or being "dumped." If experiencing romantic love activates the reward systems of the brain, what areas are activated when one is rejected? Researchers have found that similarities exist between those couples "in love" and those rejected in love [12]. Increased activity was found in the ventral striatum/putamen/pallidum area for rejected in love persons and for those experiencing romantic love. The study also found that there was significantly greater activity in the lateral orbitofrontal cortex and anterior insula/operculum cortex for those rejected in love. Similarity of those experiencing romantic love and those rejected relate to brain areas of rewards, physical pain, and obsessive/compulsive behavior. The relationship between romantic love, related brain areas and therapy will be discussed in greater detail in the last section of the paper.

The addiction model of romantic love posits that when couples "fall out of love," one's partner no longer activates the reward network and instead activates the pain center, and persons may seek to terminate the relationship. Furthermore, this perspective articulates that what is going on with the couple is much more than negative feelings that could be erased through better communications. Consequently, the addiction model of romantic love posits that the loss of love is much more than negative emotion and that it is more like a person in DTs. The addictive perspective of romantic love

calls for an orientation to therapy that addresses the reward centers of the brain.

While there are similar positive effects from alcohol and oxytocin, there are also similar negative effects, such as being more likely to engage in risky behavior [17]. Other research raises questions about the positive effects of oxytocin and investigated some negative behaviors that have not been associated with it [22]. Included in the findings of Guzman and associates is an implication for how negative experiences form in the brain and influence future behavior. For example, when one has a negative experience, oxytocin activates the lateral septum, which in turn increases the negative memory formation, making it more likely that future experiences will be negative. Consequently, the brain's fear network, the extracellular signal-regulated kinases (ERK), swings into action and will more likely negatively respond to future stimuli. The negative effects of oxytocin have been found by other researchers in which excessive levels of oxytocin are associated with negative social interaction [23].

On the other hand, researchers have found that an increase in oxytocin creates a greater feeling of well-being [24]. The sense of well-being was experienced more by women than men and was correlated with the feeling of being trusted. The researchers were not able to determine if the increase in well-being resulted from an increase in oxytocin, or if the women felt trusted and this feeling increased their oxytocin level.

Another important finding is that oxytocin may be helpful in treating addiction, which would be helpful in relationships such as romantic love [25]. The assumption is that low levels of oxytocin are related to the development of addictions, which activate the reward center of the brain. In humans, the level of oxytocin is determined by the age of three, which emphasizes the importance of these early years for adult relationships [25]. The positive effects of oxytocin in relationship development center on increasing the attraction to the partner, thus supporting the bonds of the relationship [26]. According to the addiction model of romantic love, a relationship characterized by low oxytocin is similar to couples in a state of withdrawal. Scheele and colleagues postulated that using oxytocin to treat couples when romantic love is low might be a mistake because it may increase negative feelings from comparing the present relationship to what it was in the past.

In addition, Acevada and associates [18] found that a person in a long-term romantic relationship, who has high sexual frequency, tends to activate the posterior hippocampus, noted as the "sexy brain network." Perhaps the involvement of the posterior hippocampus allows one to remember previous sexual experiences that would be linked to specific rewards. It can then be hypothesized that if romantic love is associated with the brain's reward network, couples with past rewarding intimate experiences would tend to have more satisfying relationships that are long-term. These romantic perceptions may form very quickly. For example, Ortigue et al., [11] found that first time visual contact with a potential intimate partner can cause the brain to respond immediately, which would suggest that romance is an implicit and non-cognitive process. It could also give credence to the idea that falling in love "at first sight" occurs, in a sense.

Researchers have investigated brain areas that are active in attachment – such as maternal attachment – and found that the thalamus and the substantia nigra, both having enormous oxytocin and vasopressin receptors [18], are active in human bonding activity and were also activated by romantic love. Another area of the brain noted as the dorsal raphe, which is related to reduction in pain and stress, is activated in mother/child bonding and also in long-term romantic relationships. Relationships that can reduce stress and pain are more rewarding and valued than other relationships. Researchers have noted that newly formed romantic relationships do not show activation in these same centers of the brain, confirming that attachment bonds take some time to form. In the same way that attachment might work to reduce stress and pain between mother and child, romantic love may also reduce stress and pain in an intimate relationship.

Research from animal studies indicates that long-term romantic relationships – not short-term or newly formed romantic relationships – produce activation of the anterior cingulated cortex and the right mid-insula cortex [21]. In addition, the ventral pallidum, which is associated with higher production of vasopressin, a hormone present in bonding relationships, is activated [12]. While there is not a complete overlap of romantic love and attachment, some of the same systems are engaged. These overlapped regions include medial insula, anterior cingulated gyrus, and caudate nucleus.

These findings are interesting and raise particular questions related to the formation and maintenance of romantic relationships. This emerging body of research is important since it supports the clinical application of an implicit process that forms outside of consciousness and activates areas of the brain that responds poorly to direct interventions. While there is still much to learn from this emerging perspective, it seems clear that romantic love increases dopamine and activates the reward network in the brain. At the same time, couples are developing bonding through increased oxytocin and vasopressin, which perpetuate their romantic attachment. Implicit memory kicks in to reinforce the reward system.

Some researchers have suggested that a new definition of romantic love is in order [16]. According to this view, romantic love is a drive and partner with the reward network rather than the definition of love. The proposed new definition can include goal-oriented behavior alongside other drives that can be taken for granted. The authors of this paper raise a caveat for this new definition of romantic love: the impact romantic love has on understanding long-term relationships is severely diminished if defined solely as an addiction. The newer addiction model of romantic love is overly reductionist of the impact and process of romantic love. The next section will discuss how romantic love and drug addiction differ and, therefore, should not share the same definition of addiction.

3. The Difference in Romantic Love and Drug Addiction

Although romantic love is felt by almost everyone and experienced in every society, it still receives only scant attention from therapists. The reality is that there is no real starting place for discussing romantic love in couple therapy. The prevailing assumption that romantic love does not last limits attempts to recognize the importance and contributions to long-term relationships that it offers. The recent research that likens romantic love to drug addiction further creates a shallow basis for understanding the broader contribution to long-term relationships. The irony is that therapists spend countless energy in emphasizing communication skills and other direct interventions with couples without ever raising the question of love and addressing it as a cornerstone of the relationship. This section of the paper will attempt to shed light on romantic love as an essential element of the couple's relationship.

Recent research on neuroscience and romantic love also tends to cast a shadow over understanding the uniqueness and importance of romantic love. For example, at first glance the research claiming that romantic love is like a drug that increases dopamine levels in the blood and results in addiction that can lead to withdrawal and depression [16], can reduce romantic love's credibility for being a significant factor in marital therapy. Generally, addictions are viewed negatively and fit a disease model, while romantic love is an aspect of normal relationships. This point will be discussed later in the paper.

While the research by Fisher et al., [16] is well respected, there is a need to address romantic love and substance addiction in a boarder sphere than that of the reward center of the brain that tends to be activated for both. In fact, many behaviors and experiences activate the reward center of the brain, including disparate behaviors of sexual encounters, meditation, and religious experiences [27]. Typically, behaviors that occur in daily activities that stimulate the reward center, such as exercise, are labeled as positive addictions, while those like substances that create obsessive patterns are considered negative addictions. Fisher et al., [16] state that romantic love for most people is a positive addiction but can be considered a negative addiction in extreme behavioral contexts. The authors of this paper believe that romantic love should not be considered addictive at all. Rather, romantic love should be viewed as a natural part of long-term bonding, the foundation upon which relationships grow and develop. The following paragraphs will detail why this is so.

Drug addiction refers to a voluntary behavior that over time and repeated regularly will cause physical dependency, irrational longing, compulsive behavior, a decrease in other rewarding behaviors and mental and psychological decline. It is a hijacking of the reward systems that does not occur naturally from various activities, behaviors, and experiences. Romantic love, on the other hand, is a naturally occurring relationship experience that may have some of the same consequences as drug addiction, such as preoccupation, but is a building block for long-term relationships and pair bonding. The overlap with drug addiction includes activation of similar brain areas that are strengthened by repeated efforts [28]. The break-up of a romantic relationship and drug withdrawal have similar brain pathways as well, displaying activation of the meso-cortico-limbic areas.

While some overlap in brain activation occurs, it is neither a complete copy nor does it occur in the same intensity as drug addiction [29]. One of the major differences in drug addiction and in romantic love is that the levels of oxytocin and arginine vasopressin (AVP) are elevated in romantic love and there is actually a reduction of both oxytocin and AVP in drug addiction. Generally, this is portrayed by enhanced social relationships for persons experiencing romantic love, while drug addicts experience social deficits [29]. Consequently, there is a decrease in drug addicts seeking out additional rewarding behaviors. For romantic partners, the initial decrease in seeking other rewarding behaviors is reversed after some time.

Although some researchers refer to drug addiction as a special type of pair bonding between the addict and the drug [29], the authors of this paper believe that pair bonding between persons in a romantic relationship is qualitatively different from bonding with a drug. Research investigating the cognitive processes involved in pair bonding in romantic love is stronger and varies greatly from pair bonding in drug addiction [30]. Furthermore, stability in a relationship is closely associated with the presence of romantic love and there is research evidence that romantic love continues long-term in the relationship [18].

If romantic love is the first step in forming a paired bond and continues in some form to help hold the relationship together, its unique role in pair bonding over the life course reverberates far beyond its activation of the natural reward system. In addition, the drive to form a pair bond is a biological force that develops pre-cognitively before the age of three as attachment of the child to parents [31]. Attachment develops from implicit brain processes not under the direct influence of the undeveloped neocortex, the conscious, thinking part of the brain. The child develops an attachment style that may continue into adulthood and affect romantic relationships [32]. The quality of the parent/child relationship in the forming of attachment leads to a secure or insecure attachment. Attachment can be altered by relationships and experiences throughout the lifespan, but is heavily influenced before the age of three. Children who have secure attachment early in life tend to have secure attachment in romantic relationships, and those with unsure, anxious, or avoidant styles tend to form unstable romantic relationships as adults. Stress has a major effect on stability and satisfaction throughout the lifespan, but is lower in persons with secure attachment. The lower stress level from a secure attachment in childhood is a good buffer against chaotic and unexpected setbacks experienced throughout the lifespan.

A secure attachment is accompanied with higher levels of oxytocin, which is known as the bonding agent [32]. Higher

levels of oxytocin are associated with increased attention to the romantic partner and decreased attention to other potential partners [33]. Because of the level of oxytocin, social functioning of persons in romantic relationships is not affected negatively as it is in drug addiction. Fisher et al., [16] suggested that increasing oxytocin through romantic relationships might be a treatment for drug addiction. This suggestion that romantic love, considered a positive addiction by Fisher and colleagues, could be used to treat drug addiction seems to beg the question of romantic love as an addiction on the same level as drug addiction.

Apart from the activation of the reward system, romantic love and drug addiction have scant similarity. Romantic love is adaptive and significant for the long-term pair bond, while drug addiction leads to a downward spiral related to a host of mental, social, psychological, and physical deterioration. The positive effects of romantic love thwart the label of addiction. The positive effects of romantic love are long-term because it is the crucial first step leading into long-term pair bonding. These long-term effects of romantic love are unlike the positive effects of drug addiction, in that romantic love contributes to the formation of stronger immune systems, quicker recovery from illness, better sleep patterns, lower incidences of autoimmune diseases, and lower rates of dementia [34].

Romantic love has been likened to obsession and strong "wanting" of the other person similar to drug addiction in which the addict is obsessed with getting the next "fix" [18]. The authors of this paper believe that a preoccupation with the other person that usually presents itself in the beginning stage of romantic love should not be confused with the obsessive desire to obtain a drug. The authors also believe that a distinction between the term "repetitive" and "obsession" should be made. Early on in experiencing romantic love, there are some characteristics of preoccupation and repetition, but the outcome aids in deepening the level of intimacy. The repetitive nature of romantic love does not significantly differ from other positive behaviors, such as going for a walk or engaging in creative activities. As stated earlier, this is not to say that an obsessive romantic relationship is positive and contributes to overall well-being, but the authors believe that negative romantic love is not typical of most couples.

Romantic love in most couples opens up the relationship to more positive activities and does not become a pursuit in and of itself [35]. According to Peele and Brodsky, wanting to be with the loved one has different parameters than addiction to drugs, which is an obsessive need that reduces other positive behaviors. Instead of limiting the exposure to other positive addictions as is true in drug addiction, romantic love opens the door to more positive experiences.

According to Fisher et al., [16], when a romantic relationship breaks up, there is a similar process to an addict's state of withdrawal in giving up drugs, and therefore, the treatment modality is the same. Treatment for drug addicts consist of terminating the use of the drug, and this strategy is suggested for romantic partners. The authors of this paper take a different view regarding treatment for romantic partners who break up. We are aware that in negative romantic love relationships where there is stalking, unrequited love, extreme obsession, or mental illness, the suggestion to terminate all contact would be the preferred treatment modality. For naturally occurring romantic relationships without a history of dysfunction, the authors propose that there is little overlap with treatment modality for addicts. This assumption is based on the following discussion.

First, almost half of former romantic partners continue as friends or acquaintances, and in some case, lovers after the break up [36]. The nature and depth of that contact depends on individual and couple dynamics. This continuing contact may be helpful in sorting out feelings of rejection and mourning the loss of the relationship. What is needed is a redefining of the boundaries of the relationship.

Second, romantic relationships typically involve children, pets, mutual friends, and other circumstances that necessitate some ongoing contact. When children are involved, co-parenting requires cooperation between former spouses. The literature on adjustment in children after divorce strongly indicates the need for cooperative and civil contact between the former spouses [37]. A small minority of former spouses are so negative with each other that continued contact with each other should be discouraged.

Third, when romantic partners break up, they are not giving up on romantic love -- they are giving up on a particular relationship. The period after the break-up is a transition period into another relationship, which, no doubt, will be initiated by romantic love. Romantic partners do not break up generally to be alone, but to heal and be able to find another love interest. What tends to be therapeutic is resolving past relationship issues that carry those same problems into the new relationship. Murray Bowen [38] addressed the concern of how persons establish differentiation. According to Bowen, people fuse with the family of origin, or with a romantic partner. The tendency is to emotionally cut off those with whom we have been intimate by getting physical distance. This maneuver only serves to keep one connected because the emotional issues have not been resolved. Bowen believed that persons should continue to be connected, but not emotionally reactive to those with whom we have been intimately involved.

Finally, addiction to drugs, such as heroin, circumvents brain functioning by changing gene activation and brain plasticity in the ventral and dorsal striatum producing over activity of gene expression [39]. Furthermore, researchers have found that cocaine addicts continue to use cocaine to lessen the emotional lows of nonuse, rather than because of the activation of the reward system [40]. Researchers have also found that drug addiction, especially to cocaine, activates the amygdala, and sets off cascading negative emotions. In addition, Kallupi et al. [41] found that blocking the kappa opioid overactive receptors in the brain still allows for naturally-occurring positive reward signals to occur. The suggestion to treat drug addicts with oxytocin is ill-advised since increasing oxytocin artificially may create further negative effects. All of these findings undermine categorizing

romantic love as an addiction that parallels drug addiction and also provide an alternate view to the position that addiction is primarily a reward, goal-oriented activity. Moreover, therapy for romantic partners would be based on increasing positive implicit memories and activating safety and security while at the same time offering some risk and novelty. Creating new experiences that activate the reward network and form powerful bonding implicit memories could create a change dynamic.

4. Conclusion

In sum, the authors of this article believe that romantic love is a powerful naturally-occurring reward that reflects the implicit memory system and builds a long-lasting intimate relationship, in contrast to drug addiction that has long-term negative physical, psychological, and mental deterioration. There is little overlap between treating the loss of romantic love and drug addiction, and a number of recent research findings challenge the view that drug addiction does not activate the amygdala, emotional center of the of the brain. Romantic love should be understood as the first step to building long-term relationships and should not be compared to drug addiction, as the addiction model for romantic love grossly oversimplifies two very different experiences.

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