

Is Love Passion an Addictive Disorder?

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Aims: Inquiry regarding the relationship between passionate love and addiction has long been a topic of intense debate. Recent advances in neurobiology now allow for an examination between these two states. **Methods:** After describing the clinical distinctions between “love passion,” “love addiction,” and “sex addiction,” we compare clinical, neuropsychological, neurobiological, and neuroimaging data on love, passion, pathological gambling (PG) and substance dependence. **Results:** There are no recognized definitions or diagnostic criteria for “love addiction,” but its phenomenology has some similarities to substance dependence: euphoria and unrestrained desire in the presence of the love object or associated stimuli (drug intoxication); negative mood, anhedonia, and sleep disturbance when separated from the love object (drug withdrawal); focussed attention on and intrusive thoughts about the love object; and maladaptive or problematic patterns of behavior (love relation) leading to clinically significant impairment or distress, with pursuit despite knowledge of adverse consequences. Limited animal and human studies suggest that brain regions (e.g., insula, anterior cingulate [ACC], orbitofrontal [OFC]) and neurotransmitters (dopamine) that mediate substance dependence may also be involved with love addiction (as for PG). Oxytocin (OT), which is implicated in social attachment and mating behavior, may also be involved in substance dependence. There are no data on the epidemiology, genetics, co-morbidity, or treatment of love addiction. **Conclusion:** There are currently insufficient data to place some cases of “love passion” within a clinical disorder, such as “love addiction,” in an official diagnostic nomenclature or to firmly classify it as a behavioral addiction or disorder of impulse control. Further clinical and scientific studies are needed to improve our understanding and treatment of this condition. For these studies, we propose new criteria for evaluating addiction to love.

Keywords “behavioral addiction,” “love addiction,” “love neuropsychology,” “love passion.”

INTRODUCTION

Is there any legitimate reason to associate a pathological condition (addiction) and a natural, pleasurable one?

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Some lovers consider themselves addicts because they join groups like “Sex and Love Addicts Anonymous” (SLAA). Writers, poets, and singers have regularly presented love as a painful addiction. Anyone who has been passionately in love has experienced not only the exquisite pleasure but also the desperate longing for the other person who becomes the most important goal of their life.

On a more “scientific” note, long before Stanton Peele (1), Sigmund Freud had already intimated the existence of a similarity between amorous passion and drug addiction: “The Soma Elixir (a love potion) is perfectly in line with this most important intuition, that all our inebriating spirits and our stimulating alkaloids are merely a substitute for a single substance, yet to be discovered, the same that the intoxication of love procures” (2).

More recently, Thomas Insel, director of the U.S. National Institute of Mental Health, asked whether “social attachment is an addictive disorder” (3), and other publications have explored this question (3–5).

First, it is important to distinguish between “love passion” (a universal and necessary state for human beings, implicating an important motivation towards others and thus an imperious craving) and what could be defined as “love addiction” (specific concept of a disorder, characterized, beyond imperious need and craving, by a problematic pattern of love relations leading to significant distress with pursuit despite knowledge of adverse consequences) It would thus be appropriate to clearly define what constitutes the addictive dimension of passionate love.

With this in mind, we will compare the available data concerning “love passion,” “drug addiction,” and “behavioral addiction” such as pathological gambling (PG). Understanding the clinical and psychological aspects of one could provide insights into the other.

Drug addictions short-circuit the natural and complex mechanisms for managing sensations, emotions, and relationships. Understanding the mechanisms of pleasure, craving, and the focus on a unique object in addictions opens the door to understanding these mechanisms in love relationships. Love passion, present throughout history (6–9) and in every culture (3, 10), is

the source of the strongest sensations, emotions, and passions known to human beings.

Investigating the role of oxytocinergic and corticotropic pathways in the mechanisms of fixation to a unique love object and the need for this object helps to better comprehend the role of these pathways in addictions. On the other hand, because sexual desire is simpler and could be dissociated from loving, the purely sexual (physical) desires, needs, and cravings will not be described in detail here. Similarly, we will not address sexual addiction (its characteristics are those of hypersexual disorder from the Diagnostic and Statistical Manual, Revision IV draft) in which pleasure and craving are essentially linked with sexual relations. Schematically, in this case the partner is interchangeable and motivation predominantly towards appeasing sexual tension. (see, in this issue, Garcia and Thibaut). In love passion—and “love addiction”—pleasure, suffering, motivation, and reward are provided by the loved one and mediated above all by the emotional relationship.

EPIDEMIOLOGY

Epidemiology of Romantic Love

Anthropologists like Jankowiak (11) and Fisher (3) showed that passionate love has been described throughout history and in all cultures. This state typically occurs 3–5 times per lifetime and lasts from a few weeks to a few years (3). Its reversibility and the possibility of re-experiencing it with another love object are major differences from drug addictions. Love passion may be followed by a long-lasting attachment, maintaining the characteristic of the amorous state characteristics, although possibly without the pervasive obsessive aspects (12).

Epidemiology of “Love Addiction”

We are not aware of any published data on the epidemiology of “love addiction.” Epidemiological studies are difficult in the absence of a validated, operational definition, particularly regarding the difference between “passionate love” and “love addiction.” There are more than one thousand Sex and Love Addicts Anonymous (SLAA) groups in the United States, including several affiliated fellowships specialized in sex addictions. However, according to group accounts, most men may attend for sexual dependence rather than love addiction, whereas most women usually attend for love (relationship) dependence.

CLINICAL DESCRIPTION

Love as a Passion: The Honeymoon Phase: Getting High on Love

The amorous state includes the following elements involving three levels of brain function: sensations, emotions, and cognitions (13).

Unrestrained Desire and Sexual Pleasure

Amorous folly generally begins with sexual pleasure. Repeated sexual intercourse allows each individual to experience “excess” pleasure and an uncontrolled craving for this excess. Perceived as exceptional, pleasure becomes a primordial center of interest. It is associated with loss of appetite and insomnia (14).

An Emotional Exacerbation (4)

1. Feeling of euphoria and a joyful outlook on life: when the lover is reassured that the loved one reciprocates the passion, he or she feels an irrational gaiety, and sees life through “rose-coloured glasses,” where everything is nice and possible.
2. Emotional dependence: the loved one, the essential object of desires and thoughts, is quickly perceived as absolutely necessary for living.
3. Emotional lability is extremely strong, with mood swings from ecstasy to desperation, depending on the availability of the object of love.

Love is generally evaluated according to the intensity of the feelings and emotions that it engenders: the stronger a love is, the more violent the emotions it arouses.

A unique Cognitive Mechanism, Driven by a Powerful Motivation, Characterised by the Following: (5)

1. Focussed attention (fixation): the “object of our love” assumes a “special significance,” a unique and highly valued stature—a salience—and acquires a primordial importance.
2. Strategy: planning to seduce and to be close the “object of his love.” Lovers are continually seeking emotional union with the loved one.
3. Intense surge of energy: the intensity of the amorous feeling encourages the person to want and to do everything intellectually, socially, and physically. The fixation, motivation, and energy are necessary to leave the family nest (parental or previous marital) and to embark on a new adventure.
4. Pervasive memories: the one deeply in love returns repeatedly to previous scenes, songs, letters, etc. associated with the loved one.
5. Invasive thought processes: intrusive thoughts with the obsessive presence of the loved one.

Getting High on Love versus Getting High on Substance

Love inebriation, the honeymoon phase of amorous ecstasy that initiates the attachment to a love object, shows numerous similarities with acute substance intoxication (getting “high”), including the euphoric mood, absence of recognition of possible adverse consequences, saliency, and persistence in memory.

Absence of Loved One versus Substance Withdrawal

The absence, especially the uncertainty, of the loved person has neuropsychological manifestations similar to the symptoms

of substance withdrawal, including negative mood (irritability, anxiety, depression, anger), suffering and sensations of emptiness, sleep disturbance, and cognitive preoccupation with seeking and meeting the other, and craving for this other.

Love as an Addiction: The Shift from a Heavenly Relation to the Hell of a Destructive Passion (5)

The shift from a normal passion to addiction may be barely perceivable because dependence and need for the other are present in love passion. Addiction would be defined as the stage where desire becomes a compulsive need, when suffering replaces pleasure, when one persists in the relationship despite knowledge of adverse consequences (including humiliation and shame).

This shift embodies the core elements of behavioral addictions as proposed by Potenza (15): a craving state, compulsive engagement, impaired control, and continued behavior despite adverse consequences.

Cognitive and Emotional Functioning in “Love Addicts”

With the shift from normal passion to “love addiction,” a life formerly so fulfilled and colourful now seems empty, grey, unattractive, and uninteresting. There is anhedonia and loss of previous interests—relations with close friends, taking care of the children, sports, working—such as occurs in substance dependence. External cues (place, odour, body shape, situation) associated with the lover evoke powerful memories of the relationship, similar to the effect of drug-associated cues on the drug addict.

To self-justify this destructive relation, the love addict underestimates the costs of the relationship, as would a substance addict.

Can “Love Addiction” Criteria Be Defined?

The definition of “love addiction” should avoid the medicalization of a universal feeling. We are not aware of any published diagnostic criteria, nor is “love addiction” a recognized category in any official diagnostic nomenclature. We propose the following criteria, based on duration and frequency of suffering similar to the criteria for substance dependence:

“A maladaptive or problematic pattern of love relation leading to clinically significant impairment or distress, as manifested by three (or more) of the following, (occurring at any time in the same 12-month period for the first five criteria): (source: DSM-IV).

1. Existence of a characterized withdrawal syndrome in the absence of the loved one, by significant suffering and a compulsive need for the other.
2. Considerable amount of time spent on this relation (in reality or in thought).
3. Reduction in important social, professional, or leisure activities.
4. Persistent desire or fruitless efforts to reduce or control his relation.

5. Pursuit of the relation despite the existence of problems created by this relation.
6. Existence of attachment difficulties (see 3.5. for more clarification), as manifested by either of the following:

- (a) repeated exalted amorous relationships without any durable period of attachment;
- (b) repeated painful amorous relationships, characterized by insecure attachment.”

Mechanisms Leading from Pleasure to Addictive Love

As with substance dependence, “love addiction” requires the convergence of a vulnerable individual with a rewarding (desired) object.

In the case of substance dependence, vulnerability factors in the individual and the rapidity of onset and intensity of the experienced drug effects influence the risk of addiction, more so than the drug’s chemical nature. Similarly, in “love addiction” (the loved partner is the drug), destructive passion is more likely when the initial contacts have been particularly intense and rich with pleasure (particularly sexual pleasure).

When the loved one is subject to greater and greater absences, either because he is less available, inaccessible (differences in class, culture, age, or married) or far away (separated in space or time), the addictive process may be enhanced, as repeated withdrawal episodes may enhance substance dependence. Some lovers may instigate “psychological absence” to enhance the addiction (5), i.e., alternating extremely close amorous proximity with escape, kindness, and caresses with cruelty and absence.

Comorbidity and Risk Factors

Here too, the absence of a definition leaves us with a lack of reliable data. We are not aware of any systematic studies of comorbidities associated with “love addiction” and of any studies of personality traits or genetic factors that may be related to the risk of love addiction.

Risk Factors

However, based on clinical practice, certain subjects are more concerned with addictive relationships: they present similar risk factors known to facilitate the onset of addictions either through sensation seeking or to calm suffering.

1. Either through the repeated search for this extraordinary pleasurable state, mixing sensation, emotions, and feelings with exacerbated seduction, sexual, narcissic pleasures: Here we find real addiction to the emotional sentiment of love with Don Juanism behaviors.
2. Or, on the contrary, seeking the appeasement of suffering and underlying unease. These are particularly vulnerable subjects suffering from a “structural” affective dependence. For those

subjects, most or all love relationships bear the seal of suffering and craving. They appear to systematically look for painful relationships. Only the “name of the pain” changes. Frequently, these subjects have insecure attachments.

Comorbidities

These situations can overlap with sexual addiction (see Garcia and Thibaut, in this issue). Usually, in “love addiction,” the core disturbance is focussed on the (psychosocial) relationship with one significant other. In sex addiction, the core disturbance is focussed on the need for the physical act of sex (often with multiple partners). The identity of the sexual partner may be irrelevant. But it can be difficult to separate love relation rewards from sexual rewards.

On a phenomenological level, “love addiction” may have similarities with mood disorders. The passionate lover may show exaltation, increased energy, and liveliness resembling hypomania. The lover deprived of his love object may appear depressed, and experience irritability, anhedonia, and sleep disturbance.

NEUROBIOLOGICAL LINKS BETWEEN PASSIONATE LOVE AND ADDICTION

Neurobiological mechanisms mediating sexual, mating (in animals), and loving behaviors can be compared with those of substance dependence (16–19). Two endogenous neurochemical systems appear to play a major role: dopamine (20, 21) (also implicated in behavioral addiction as PG (for review see (22)), and oxytocin (OT) and vasopressin (23, 24).

Other neurotransmitter systems, such as GABA and glutamate (25), noradrenaline (26) and serotonin (27), opioid (28), and cannabinoid are also implicated in these phenomena, as is the corticotropin system, which modulates the oxytocinergic and dopaminergic systems (29–31).

Neurobiological Correlates of Sexual Acts and Love Influence Dopamine

The hormones of desire and sexual relationship include testosterone, luteinizing hormone, opioids, oxytocin, and dopamine. Schematically, testosterone may be considered the hormone of sexual desire, luteinizing hormone the sexual relations hormone that triggers endorphin release during orgasm, and oxytocin and vasopressin as social attachment hormones (32–34). Each of these hormones activates dopaminergic pathways, thereby reinforcing desire expectation of reward, pleasure, its encoding in memory, and the desire to repeat it.

Pleasure Intensity

Ecstasy/euphoria is an aspect of love linked to opioid and dopamine levels. Elevated brain dopamine levels trigger euphoria and numerous symptoms experienced by lovers: a surge of energy, hyperactivity, insomnia, loss of appetite.

The relationship of mesolimbic dopamine to sexual motivation and sexual pleasure has been demonstrated not only in animal studies, but also in humans (14, 27, 28). The intensity of sexual desire and sexual behaviors has been linked to DRD4 gene polymorphisms, which are also associated with sensation-seeking and risk-seeking behaviors (35–37) and with drug addiction (38). Subjects with variant 4 of the D4 receptor gene experience almost no sexual desire, whereas those with variant 7 have very strong sexual desires (39). Genes coding for dopamine influence the age at first sexual intercourse (40) and the frequency of orgasms (41).

Fixation on a Sole Partner

A high dopamine level in the brain is associated with preference for a specific mate, triggering strongly concentrated attention, coupled with unflinching motivation and goal-oriented behavior (42). In prairie voles, mating is associated with a 50% increase in dopamine levels in the nucleus accumbens (43). Mating establishes a clear preference of one partner for the other. Dopamine D2 receptor agonists induce partner preferences even in the absence of mating, while D2 receptor antagonists prevent the development of a partner preference (44).

Addiction-Associated Stimuli

In substance dependence, the phasic-dopaminergic response strengthens the association between addiction-associated stimuli and the rewarding response (45). Dopamine released during sexual intercourse might serve the same function in love passion.

OT Pathways Are Implicated in Loving Attachment

OT, beyond its peripheral effects promoting uterine contractions and milk ejection from the breasts, is now known to modulate “social” behaviors at the cerebral level. OT acts in the brain to promote maternal behavior, sexual arousal and orgasm, peer-to-peer social interaction, trust in the partner, social memory, and the formation of monogamous pair-bonds, at least in animals (46, 47).

OT, secreted during sexual intercourse and at the time of orgasm, intensifies affectionate relationships. It brings lovers closer together, potentially triggering a “virtuous” cycle: the more you make love, the closer you feel, and the closer you feel, the more you make love (48). Other types of physical closeness, e.g., tender gestures, caresses, and sweet words, can also trigger the secretion of OT and vasopressin (49).

In monogamous animal species, mating and bonding release oxytocin (or AVP) that amplifies the dopamine signal in the nucleus accumbens (50).

The Partner Preference

The enduring partner preference that is produced by sexual intercourse in monogamous prairie voles is blocked by both dopamine antagonists or OT antagonists injected into the nucleus accumbens (23). Oxytocin, given centrally to females,

facilitates the development of a partner preference even in absence of mating (47, 51). Oxytocin and AVP fail to induce pair bonding in mountain voles, which, in contrast to prairie voles, are promiscuous and fail to form bonds after mating. Mountain voles have fewer and less functional OT receptors (52).

In humans, the reactivity of the OT/vasopressine system is implicated in attachment. A study in men carrying allele 334 for the gene coding for the vasopressin receptor (AVP R1A) showed that they expressed a lighter network of receptors and that they have less stable relationships (53).

OT Facilitates Social Memory

Both OT and AVP facilitate social memory in animals (54). The interplay between Corticotropin Releasing Factor (CRF) and OT in the central and medial amygdala is a fundamental determinant of social approach and avoidance behavior (55).

Other Neurotransmitter Pathways Implicated in Addiction and Passion

As in drug addiction, noradrenergic pathways are implicated in sexual desire, awakening, attention, and memory (56). Similarly, there are major interactions between the oxytocinogenic and serotonergic pathways (57). We know that serotonin depletion occurs at the onset of passionate love to levels approaching those of patients suffering from Obsessive Compulsive Disorders (58, 59).

NEUROIMAGING DATA

Recent neuroimaging data on sexual desire, orgasm, and amorous relationships suggest that the brain mechanisms and neural circuits involved are similar to those involved with substance dependence (60).

Globally, in all substance dependence (alcohol, opioids, cocaine, cannabis, tobacco), there exists a hyperactivation of the ventral tegmental area, the ventral striatum (nucleus accumbens), and the anterior cingulate (ACC), orbitofrontal (OFC) and prefrontal cortex, and the insula (19, 61, 62). The same frontal regions and ventral striatum that are activated by cocaine-associated stimuli in cocaine-dependent patients are also activated in normal subjects viewing sexually explicit videos (63). These studies link drug-related craving with natural drive states, and illustrate the idea that addictive drugs hijack endogenous reward circuits that have evolved to ensure survival (64). Moreover, the brain reward circuitry responds to drug and sexual cues presented outside awareness (63).

It is interesting to compare available data in PG, another behavioral addiction: an involvement of the ventral tegmental-orbitofrontal cortex (65), a consistent fronto-thalamic increase during high-risk situations, and a decrease in low-risk situations; an enhancement of ventral striatal and posterior cingulate activity upon winning (66). Some results are also quite similar in online gaming addiction (67).

Sexual Pleasure

During human male ejaculation, primary activation occurs in the mesodiencephalic transition zone, including the ventral tegmental area (VTA) and intralaminar thalamic nuclei. Neocortical activity was only found in the prefrontal cortex zone exclusively on the right side (48, 68–70). During female orgasm, primary activation occurs in the hypothalamic paraventricular nucleus, the midbrain periaqueductal grey matter ACC, and frontal, parietal, and insular cortex. The insula and cingulate cortex are brain areas involved not only in pleasure but also in pain, empathy, irrepressible desire, mate selection, recognition of social signals from facial expressions. These two areas are particularly active during female orgasms (71, 72).

Passionate Love

Individuals “deeply in love,” when viewing a picture of their loved one, show increased activation on functional Magnetic Resonance Imaging (fMRI) of brain regions associated with pleasure and motivation, e.g., ventral tegmental area, caudate, ACC cortex, and left insular region, and increased hypothalamic hormonal secretion (4, 73, 74).

The more intense the passion, the greater the activation in these regions (4, 72, 73). Activation of these brain regions is also associated with substance dependence (19, 61, 62), suggesting mechanisms mediating love addiction are, in some aspects, quite similar to those for substance dependence. Romantic and maternal love activate overlapping regions in the brain’s reward system that coincide with regions rich in OT and vasopressin receptors (74). In addition, romantic love activates the hypothalamus, which is the production site for sexual hormones. Moreover, in both cases, a common set of regions associated with negative emotions, social judgment, and “mentalizing” (the negative assessment of other people’s intentions and emotions) were deactivated (75), illustrating the parallelism between passionate love and the unconditional love of a mother for her infant.

The Imagery Expression of Craving: Heartbreak

Studies in deeply heartbroken subjects revealed, in reversed symmetry with passionate love, decreased activity in the ventral striatum, the ACC, OFC, and prefrontal cortex, the thalamus, and the insula, particularly on the left side, and increased activity in cortical areas associated with “mentalizing” (76, 14).

If the circuits implicated in addictions are fairly clearly defined, additional research is needed to understand the dynamics of need and satisfaction and to compare them with other addictions, in addition to changes in receptor sensitivity and the implicated neuronal metabolisms.

TREATMENT

We are not aware of any studies on the treatment of “love addiction,” and no medication is approved for such treatment. However, the management of romantic despair and of “love withdrawal” has been widely discussed by psychotherapists

(77). The SLAA groups practice is based on 12-step programs. Other seasoned therapists (78, 79) suggest the same strategies as used for psychosocial treatment of substance dependence.

CONCLUSIONS

“Love addiction,” or excessive and suffering romantic attachment to a love object, has been described in literature for centuries and appears in many different cultures. However, it has never undergone systematic study, in part because there is no recognized definition or diagnostic criteria. As a consequence, very little is known about its epidemiology, psychiatric comorbidity, neurobiology, or treatment. Animal studies and limited human research suggest that the brain mechanisms mediating “love addiction” are similar to those involved with substance dependence. At the present time, the scientific evidence is insufficient to place “love addiction” in any official diagnostic nomenclature, or to firmly classify it as a behavioral addiction or disorder of impulse control destined to be used by a wide variety of professionals. There is a risk of misunderstanding and “overmedicalizing” persons with such disorders. However, neurobiological and clinical research on the subject has already brought much to both fields of research and will probably continue to do so.

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