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REVIEW ARTICLE

Treatment of love addiction: Current status and perspectives

M. Sanches[a,b,*], **V.P. John**[b]

[a] *Department of Psychiatry and Behavioral Science, University of North Dakota School of Medicine, Bismarck, ND, USA*
[b] *Department of Psychiatry and Behavioral Sciences, the University of Texas Health Science Center at Houston, Houston, TX, USA*

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Abstract
Background and objectives: Even though love addiction is not recognized by DSM-5 as a specific diagnosis, there is enough literature data to support its characterization as an independent mental disorder. Information on the treatment of love addiction is still scant.
Methods: The databases Medline, Embase, and LILACS were searched for literature findings addressing the treatment of love addiction.
Results: The currently available therapeutic strategies for love addiction are discussed, as well as some perspectives in the treatment of love addiction from a pharmacological standpoint.
Conclusion: There is scant evidence regarding the treatment of love addiction in the medical literature, specially with respect to pharmacological interventions, although several agents may hypothetically be of benefit in this condition. Psychotherapy is often cited as the cornerstone of the treatment of love addiction, but its efficacy has not been properly investigated.

Introduction

The inclusion of certain patterns of behavior under the umbrella of ''behavioral addictions'' has attracted considerable discussion over the past several years.[1] On the one hand, some conditions, such as gambling disorder and, more recently, gaming disorder, have been formally accepted as behavioral addictions (the former was added to the ''Substance-related and addictive disorder'' section of DSM-5 and the latter was included in the draft of ICD 11).[1,2] On the other hand, there are concerns about the risk of pathologization of normal variations of every day experiences, with a virtually unlimited number of behaviors that could, indiscriminately, be potentially classified as addictions.[3] Among the proposed behavioral addictions not yet included in the

* Corresponding author.
E-mail address: marsalsanches@gmail.com (M. Sanches).

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currently available systematic classifications of mental disorders, love addiction (LA) has recently received particular attention.

LA, also called pathological love,[4,5,6] can be defined as a pattern of behavior characterized by a maladaptive, pervasive and excessive interest towards one or more romantic partners, resulting in lack of control, the renounce of other interests and behaviors, and other negative consequences.[4,5,7] Although its prevalence in the U.S. population is estimated at around 3%, studies addressing specific populations, such as young college students, point to rates as high as 25%.[8,9]

The current paper focuses on the clinical management of LA. Initially, some clinical and nosological considerations are addressed, followed by a review on the currently available therapeutic strategies for LA found in the literature. Finally, the potential of pharmacological interventions in the treatment of LA are discussed, based on the putative mechanisms involved in the development of this condition.

Nosological aspects of love addiction

Despite its proposed inclusion among the behavioral addictions, hence its name, there is no consensus regarding the nosology of LA. Literature data suggest that different authors seem to utilize distinct criteria for its diagnosis, according to the clinical and phenomenological aspects emphasized in their descriptions. Of notice, the limits between LA and ''normal'' romantic experiences may be conceptually unclear, depending on the adopted approach. Some authors propose a dimensional approach, according to which the differences between both conditions would be merely quantitative, given the several phenomenological similarities between addictive behaviors and the regular experience of being in love, including the grief associated with the end of a long-term romantic relationship.[6] Nevertheless, current evidence suggests that LA may correspond to an independent disorder, with features distinct from the regular ''falling in love'' experience. According to this approach, in addition to the elevated degree of psychological suffering and functional impact associated with LA, that condition would contrast with ''normal'' love due to other features such as its lack of control, its pervasive nature, and its negative life consequences.[5] Moreover, the co-occurrence of LA with substance abuse or dependence, as well as with other proposed behavioral addictions, such as sex addiction, and pathological gambling, is not uncommon.[8]

From a nosological standpoint, based on the different descriptions found in the literature, LA can be characterized as:

a) a behavioral addiction, which would share several hallmark criteria with classic substance dependence.[5] Authors who agree with this point of view include among the LA features symptoms such as decrease in the repertory of interests due to excessive involvement with the romantic partner (with reduction or abandonment of social, occupational or recreational activities), lack of control regarding the time spent in activities directly or indirectly related to the partner, persistent desire or unsuccessful efforts to stay away from the partner or interrupt the relationship, and persistence in the relationship despite the negative consequences that are likely to have been caused or exacerbated by the involvement with the romantic pattern.[4,10] These authors suggest that, similarly to what is observed in the addiction to substances, the initial stages of any romantic relationship would generate feeling of well-being, reward, and satisfaction. However, as the relationship progresses, a true dependence towards the partner (who becomes essential for the maintenance of the patient's psychological equilibrium) is developed. The loss of (or perspective of losing) the partner is associated with important anxiety, depressive symptoms, and despair. When faced with the loss of the partner, these patients can either persist in trying to reinstate the relationship or quickly shift their focus to a new partner, replacing their source of dependence and perpetuating the dysfunctional relationship pattern. Of notice, functional MRI studies suggest that romantic passion is associated with activation of areas belonging to the brain reward system, such as the ventral tegmental area, the striatum, the orbitofrontal cortex, and the cingulate cortex. Individuals rejected by their romantic partners displayed hyperactivation of the nucleus accumbens, an area known to be hyperactive during cocaine craving.[11]
b) an impulse-control disorder. This model emphasizes the characterization of LA as an impulse control disorder.[12] Patients with LA were found to have elevated rates of trait impulsivity (measured by the Barratt Impulsivity Scale) when compared to controls.[13] The same study found higher rates of novelty seeking among patients with LA. Novelty seeking is strongly associated with impulse control disorders, such as pathological gambling and compulsive buying.[14,15]
c) part of the obsessive-compulsive spectrum: In addition to irresistible impulses related to engage in behaviors that could lead to a romantic involvement, patients with LA may also describe a certain degree of thought intrusiveness in regard to their involvement and concern about the supposed partner, despite sometimes the explicit lack of interest on the partner's side (morbid infatuation).[16,17,18] Ego-dystonic beliefs regarding the need for the relationship to succeed can be prominent.
d) part of the mood disorders spectrum: In one study, adolescents in early stage romantic love were found to have hypomania checklist scores similar to outpatients suffering from bipolar II disorder.[19] The authors hypothesize that some developmental experiences inherent to adolescence, such as intense romantic love, can produce transient hypomanic-like periods. Although the study in question analyzed romantic experiences characterized as ''non-pathological'', it can be hypothesized that mechanisms related to mood instability may be involved in LA.
e) a bidimensional continuum of behaviors: It has been proposed that the different behaviors associated with romantic experiences in humans may be approached from a biaxial perspective.[4] According to this model, the vertical axis contains a quantitative perspective of attachment-related behaviors, whereas the horizontal axis is comprised by impulsivity and reward-seeking

behaviors. Therefore, some patients with LA would suffer from deficits in the attachment system and elevated rates of reward-seeking behaviors, with multiple romantic partners, excessive sexual interest, and poor impulse control. Others, on the other hand, would have elevated rates of both reward-seeking and attachment-related behaviors, resulting in excessive dependence from the romantic partner and obsessive features.

Differential diagnosis

Despite the different considerations mentioned above, there is some consensus in regard to the fact that LA, as a primary disorder of love, should be distinguished from other conditions, which show love-related dysfunctional behaviors as part of a broader spectrum of psychopathological findings, such as manic states and primary psychotic disorders. For example, in the case of manic states, an excessive interest in establishing a romantic relationship can sometimes be observed, but usually subsides once the mood symptoms improve.

Similarly, some personality disorders, such as borderline and dependent personality disorders often display patterns highly suggestive of LA, but those are not usually restricted to the romantic sphere, affecting their relationships as a whole, as well as other areas of their functioning.

Moreover, even though some authors regard erotomania as a pathology of love,[18,20] that condition seems to be distinct from love addiction. Patients with erotomania, in addition to romantic feelings towards the supposed partner, experience a delusional belief in regard to the reciprocity of their love, regardless the lack of evidence to support that belief and reassurances in contrary. In DSM-5, this condition is included as a subtype of delusional disorder.[21] Although erotomania is usually considered an illness distinct from LA by most authors, the limit between both conditions might not be clear from a clinical and even psychological perspective. Impaired judgment is, to some extension, a common feature during romantic experiences and imaging studies point to deactivation of brain areas associated with critical judgment, such as the frontal lobes.[22]

Finally, despite the similarities and the overlap between LA and sex addiction from an epidemiological perspective, there is enough evidence to consider both disorders as distinct. A detailed discussion on sex addiction and its treatment is beyond the scope of the present article.

Treatment of love addiction: literature findings

The databases Medline, Embase, and LILACS were searched, using the descriptors ''love addiction'', ''pathological love'', and ''treatment''. The search was complemented through manual search of cross-references. Articles addressing solely the treatment of sex addiction were excluded.

Through the search strategy described above, twelve papers containing information on the clinical management of LA were identified. However, only one original study specifically addressing the treatment of that condition could be found.[2] The results of the search in question are described below.

Psychosocial interventions

Self-help groups

Self-help groups are by far the most adopted intervention for the treatment of LA. Several 12-Step groups are available in the United States for the treatment of love addiction, although most of them also address the treatment of sex addiction.[5] Examples are the ''Women Who Love Too Much'' group, based on the homonymous book by Robin Norwood,[23] and the Sex and Love Addicts Anonymous (SLAA), also called the Augustine Fellowship. Despite the popularity of self-help groups and the fact that they are often cited by experts as a cornerstone in the treatment of LA, we were not able to identify controlled studies assessing their efficacy. Furthermore, admission criteria for inclusion into these groups are usually broad and, sometimes, based on the administration of screening questionnaires. Consequently, individuals who participate in these groups may suffer from other issues involving dysfunctional romantic relationships.[5]

Cognitive-behavioral therapy

Cognitive-behavioral therapy (CBT) has been cited by some authors as of potential benefit in the treatment of LA. The psychopathological features involved in love addiction point to a potential role of automatic thoughts and cognitive distortions (such as generalization, catastrophizing, and arbitrary inference in the perpetuation of LA. These distortions could be successfully addressed through CBT. Nevertheless, we were not able to identify any studies addressing the use of CBT in the treatment of LA.

It has been advocated that the best results in the treatment of LA are achieved through the use of rational self-counseling.[24] This approach focuses on the assessment of the self-communication and its resulting beliefs and values. Improvements in self-communication, as well as interventions aiming at enhancing the separation between feeling and facts related to the loss are some of the possible interventions that may be of benefit for patients with LA.

Psychodynamic psychotherapy

Since it has been hypothesized that, from a psychological standpoint, LA would result from disturbances in attachment during early childhood, psychodynamic psychotherapy has been advocated by some as the treatment of choice for LA.[4] Again, no studies addressing the efficacy of this therapeutic modality for the treatment of LA could be found. It has been suggested, though, that the treatment of patients with love addiction can be particularly prone to problematic transferential and counter-transferential reactions, due to the attachment and intimacy-related issues usually experienced by the patients.[25]

Psychodrama group psychotherapy

Although many authors seem to believe that group therapy is the treatment of choice for LA, only one study analyzed the impact of this intervention in a systematic way.[7] In that study, psychodrama was the group therapy modality utilized. Eight subjects with a putative diagnosis of pathological love underwent 8 weekly therapy sessions. The primary outcome measures included the Love Health Scale (LHS) and the

Love Attitudes Scale (LAS), two instruments aiming respectively at the degree of healthiness in a relationship and the person's predominant love style (where the most dysfunctional style, called ''mania'' love style, was considered the most indicative of LA). Results indicated statistically significant increases in the mean scores of the LHS, after the intervention. Several methodological limitations limit the generalization of these findings, including the lack of a control group, the absence of a clear definition of LA as inclusion criteria, and the fact that five of the subjects also met criteria for major depressive disorder.

Perspectives in the treatment of love addiction: is there a place for pharmacotherapy?

Whereas the pharmacological treatment of comorbid conditions associated with love addiction, such as depressive and anxiety disorders, would potentially be of benefit, no literature data specifically addressing the pharmacological treatment of LA (without psychiatric comorbidities) could be identified. Nevertheless, given the phenomenological characteristics of this condition, as well as some of the neurobiological mechanisms possibly involved in its pathophysiology, several psychopharmacological interventions could, hypothetically, be of benefit for the management of LA. Some of them are outlined below. It is necessary to notice, however, that the use of pharmacological agents targeting specifically symptoms of love addiction might face bioethical issues, given its undefined nosological placement and the nature of the condition in question (with the potential ''anti-love'' effect of the proposed treatments). In a recent paper, Earp at all enumerated the potential situations where hypothetical biological treatments for love addiction could possibly be justifiable, including clear evidence of harm associated with the behaviors in question and the failure of non-biological/psychological treatments, as listed above.[6] The authors also mentioned concerns about patient's autonomy, highlighting that, for obvious reasons, such hypothetical treatments should not be administered on a involuntary basis or to minors. Again, it is important to emphasize that, to date, no scientific data is available in regard to the efficacy and safety of pharmacological agents in the treatment of LA and that the authors do not suggest or recommend their use in clinical practice, in light of the lack of available evidence.

Antidepressants

The phenomenological similarity between obsessive-compulsive disorder (OCD) and some cases of LA suggests that antidepressants, especially selective serotonin reuptake inhibitors (SSRI) could be of potential benefit in the treatment of these patients.[26] Normal subjects who recently fell in love were found to have decreased density of the platelet serotonin transporter, similarly to patients with OCD but significantly lower than controls.[27] These findings suggest the existence of some resemblance, not only at the cognitive but also at the neurochemical level, between romantic love and OCD. Given the efficacy of SSRIs in the treatment of the latter, one can hypothesize that this class of medications may play a role in the treatment of LA.

One open-label clinical trial analyzed the efficacy of L-5-hydroxytryptophan, a serotonin precursor, in the treatment of patients with high levels of romantic distress.[28] In that study, 15 non-depressed subjects with high levels of romantic distress were treated with L-5-hydroxytryptophan for a total of 6 weeks. Improvements in romantic distress were found to be, at least in part, correlated with increases in the levels of platelet serotonin (BDNF). The inexistence of a control group limits the interpretation of these findings.

Further, the release of oxytocin, a neuropeptide that can enhance the experience of secure attachment, improving well-being, and reducing separation anxiety, seems to be modulated by serotonergic activity.[29] Citalopram was found to increase oxytocin release in rodents,[30] and evidence points to a direct correlation between the concentrations of platelet serotonin transporter and plasmatic oxytocin in humans.[31]

Moreover, SSRIs seem to decrease the dopaminergic transmission at the ventral tegmental area, one of the key areas involved with reward and motivation.[32] This could bring about decreases in the feelings of romantic love and less excitement associated with romantic relationships,[33] and one case report described marked reduction in love duration and intensity associated with the use of sertraline.[34] Whereas this could be seen as an undesirable potential side effect in the treatment of patients with depression, it may have a therapeutic role in the treatment of patients with LA. In consonance with this hypothesis, venlafaxine, a dual-action antidepressant that seems to increase dopaminergic transmission in higher doses, has been associated with induction of erotomania in a case report.[35]

Finally, there is evidence suggesting that patients with love addiction have higher rates of harm avoidance and reward dependence, what would make them more susceptible to anxious patterns of attachment and more likely to persist in unsatisfactory relationships in order to prevent loneliness.[13] These temperament traits are classically attributed to dysfunctions in the serotonergic and noradrenergic system.[36] Since it has been demonstrated that SSRI treatment may produce decreases in harm avoidance,[37] we can hypothesize that this class of medications can play a role in the management of patients with LA.

Mood stabilizers

The strong association between LA and impulsivity suggests that mood stabilizers may play a role in the treatment of this condition. Although there is evidence suggesting that lithium and other mood stabilizers seem to be effective in the treatment of aggression and other behaviors secondary to poor impulse control,[38] we are not aware of any clinical evidence regarding the efficacy of these medications in LA. Likewise, the fact that some experiences associated with romantic love may show similarity with those observed during mood episodes supports a putative therapeutic effect of these agents in patients with LA (see section ''Phenomenological Aspects of Love Addiction'').

Antipsychotics

Given the putative association between dopaminergic activity and romantic feelings (see above), one could hypothesize that antipsychotics, due to their dopaminergic antagonism, may play a role in the treatment of LA. Furthermore, patients with LA seem to show higher novelty seeking than healthy controls[13] and this temperament trait seems to be modulated by dopaminergic activity,[36] more specifically the D4 subtype dopamine receptor.[39,40] Nevertheless, antipsychotics have no role in the treatment of other disorders classically associated with elevated novelty seeking, such as substance dependence, and no clinical evidence suggesting that they might be useful in the treatment of LA is currently available.

Exogenous neuropeptides

Animal research indicates that the neuropeptides oxytocin and vasopressin are involved in several neurobiological mechanisms related to romantic attachment. It has been proposed that the release of these hormones during mating is responsible for linking social signs to the dopamine reward systems in the brain, producing positive reinforcement, ultimately contributing to the establishment of bonding and attachment.[41] In this sense, while oxytocin seems to be particularly involved in the formation of bonding in females, the role of vasopressin seems to be more important in males. Moreover, classic research findings have demonstrated that differences in the expression of vasopressin receptor genes seem to explain the differences between two different species of male voles. Prairie voles, which show a higher number of vasopressin receptor 1a in the amygdala and ventral pallidum, show more monogamous behavior when compared to mountain voles, which usually have multiple partners.[10,41] Of notice, the administration of exogenous vasopressin to mountain voles does not seem to impact their non-monogamous behavior, but genetically engineered procedures aiming at increasing the expression of the vasopressin receptor 1a gene have been shown to make them monogamous.[42]

Regardless of all the limitations that result from the extrapolation of animal research findings to the study of human behavior, the findings above suggest that, from a pathophysiological perspective, ministration of exogenous oxytocin and vasopressin might not be of benefit in the treatment of LA. Yet, it has been demonstrated that exogenous oxytocin seems to reduce the amygdala response to social fear signals.[43] It is unclear if these effects could have a putative impact on the quality of attachment and ultimately contribute to improvements in the quality of romantic relationships.

Other medications

Imaging studies suggest that long-term romantic love is associated with hyperactivation of several reward brain systems, including the globus pallidus, an area rich in opiate receptors.[44] Given the similarity between LA and addiction to substances, we can speculate that medications used in the treatment of other addictions could be of benefit in the treatment of this condition. For instance, naltrexone, a opioid mu receptor antagonist, is able to block the reward response associated with substance use, and is commonly utilized in the treatment of alcohol dependence. Buprenorphine, a kappa-receptor antagonist, is able to decrease craving associated with substance withdrawal. Studies are necessary in order to investigate if these medications may play a role in the management of LA.

Table 1 Potential pharmacological targets for the treatment of love addiction.

Targeted symptoms	Pharmacological agents
Obsessive features	Antidepressants
Mood instability	Mood stabilizers
	Antidepressants
Multiple partners	Mood Stabilizers
Impulsive relationship-seeking	Antipsychotics
	Naltrexone
	Buprenorphine
Impaired attachment	Vasopressin
	Oxytocin

Summary of potential pharmacological targets for the treatment of LA

Given the fact that LA seems to be a multifaceted condition, the different pharmacological agents that could, in theory, be of benefit for its management may be grouped according to the aimed symptoms, which might vary from patient to patient. A summary of this approach can be found in Table 1.

Conclusions

The present paper corresponds to a critical review of the current literature on LA and its treatment. Findings indicate that:

- To date, the scientific evidence addressing the treatment of LA is limited. While several authors highlight psychotherapy as a cornerstone in the management of LA, very little controlled evidence regarding these interventions is available;
- At this point, there is no evidence supporting the use of pharmacological agents in the treatment of LA, although several classes of medications might have a potential role in its management, considering the putative pathophysiological mechanisms involved in this condition.
- There is a need for a better characterization of LA from a nosological standpoint, with the possible establishment of diagnostic criteria, facilitating the distinction between LA and normal romantic experiences. That would allow the formulation and implementation of controlled studies, aiming at examining the efficacy of therapeutic interventions in the treatment of LA.

Despite these reservations, the diagnosis and management of LA may be a promising area of research. Romantic love has always been (and will continue to be) strongly associated not only with rewarding feelings but also with marked

suffering. Paraphrasing William Shakespeare, '''If you love and get hurt, love more; If you love more and hurt more, love even more; If you love even more and get hurt even more, love some more until it hurts no more...''.

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Conflict of interest

The authors have no conflict of interest to declare.

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