

# Love Is Not an Emotion

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## Abstract

Romantic love—referred to as love—, is a physiological drive, but society has come to understand it as an emotion. Nevertheless, many researchers, mainly psychologists, have established its impulsive and motivational characteristics, which are even similar to those of addictive drug abuse. However, many professionals in the field of psychology and psychiatry still consider love to be a complex emotion or feeling. This article describes some of the causes and consequences of the extensive confusion between love and emotion. Some reasons to consider love as a physiological motivation, like hunger, thirst, sleep and sexuality are also summarized. A *Love Withdrawal Syndrome* is proposed. It concludes by highlighting the urgency to eliminate love from the catalogue of emotions in psychology, as an item or cluster in psychological tests, and also as an emotional mental function, by contributing to its dramatic consequences, mainly divorces, suicides and femicides.

## Keywords

Love, Emotion, Divorce, Suicide, Femicide, Motivation, Brain

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## 1. Introduction

Nearly 12,000 scientific articles each year, or one thousand monthly, have been written about emotion in PubMed from 2012. The number has grown exponentially in the last twenty years; growth has also occurred in related areas, contributing to a better understanding of the nature and neurobiological mechanisms implicated in emotions, and offering a new perspective from which to treat illnesses involving emotional disorders.

Love is a complex mental function, which has been found to interact with other mental functions, such as memory (Alea & Vick, 2010), attention (Langeslaq et al., 2014), perception such as taste (Chan et al., 2013), and reasoning (Weber & Lehman, 2005); it even has been shown to affect health (Perlman et al., 1971; Hart et al., 2007; Anonymous, 2013; Carey et al., 2014). The close relationship between love and beauty has also been highlighted (Takahashi et al., 2015; Zeki et al., 2014; Ishai, 2007). **Love**

**affects every single mental function**, but different types and styles are also recognized within love.

In the classical typology of love (Lee, 1973), the *Eros* style is passionate or romantic love, with intimate, sexual activity and intense feelings. Commitment, one of the basic pillars of love in various suggestions (Sternberg, 1986, 2004), and friendship, which would correspond to the style of *Storge* (friendship-love) could be more valued in some cultures (Hendrick & Hendrick, 1993) than in others (Ferrer et al., 2008). The concept of love also varies according to age group. Thus, while younger people may prefer the *Eros* style, they would later opt for the style of love which favours commitment (*Storge*) and attachment (Shaver et al., 1988), and also the more rational styles (as *Pragma*). (Hendrick & Hendrick, 1986). **All these facets of love have a cultural origin, but equally contribute to society's mistaken perception of love.** It is here proposed that they do not correspond to the powerful physiological motivation created by biological evolution which love is.

Today we are beginning to understand the addictive nature of love as well as its drive attribute, along with many of its psychological, behavioural and neurobiological peculiarities (Fisher, 1998; Bartels & Zeki, 2000, 2004; Fisher, 2004; Zeki 2007). Among the **qualities or components of love**, perhaps attachment (Ohoka et al., 2014), empathy (Ciaramelli et al., 2013), altruism (Ebstein et al., 2010), and sexuality (Rosenberg et al., 2014) are those best known, as seen on numerous studies on behavioural (Höglund et al., 2014), hormonal, (Neumann, 2008), genetic (Schneiderman et al., 2013), or neural (Acevedo et al., 2012) components.

By its extraordinary characteristics, **love has been widely regarded by scientists as an emotion** (an event-focused process), feeling, affective state, cluster or emotional prototype, and is common as an element, and as a gauge element in the evaluation tests of emotions (Buck, 1999; Burkett & Young, 2012; Fredrickson, 2001; Gruber et al., 2013; Izard, 1972; Lazarus, 1991; Panksepp, 1998; Shaver et al., 1988; Toivonen et al., 2012). In general, for people, everyday experience and media exposure tell us that love ought to be an emotion involving deep connection and commitment (Numan & Young, 2016).

This widespread misinterpretation of love as an emotion has several causes, and unfortunately **it is an error which has been consolidated and disseminated by science.** Examples of this include underestimating love in relation to sexuality, as in the influential school of psychoanalysis; insisting on the superiority of will power over love, commending the commitment that can prolong a marital relationship once the passion diminishes, as in the well known *love triangle theory*; or encouraging the belief that love has a limited time period, based in the defence of the children. These and many other misconceptions are extraordinarily serious, because they may cause people enormous suffering and even death.

Love has been dissected with extraordinary precision by scientists and also by poets, but nevertheless Western societies consider love to be **an emotion optionally accompanying sexuality**. As stated by Gonzaga et al. (2006): “when researchers ask partici-

pants to list states they consider emotions, love is typically near the top of that list (Fehr & Russell, 1984)". The population ignores the nuances that have been attached to love by scientists, e.g. "motivational force", "affective state", "complex feelings" or "impulse drive".

This article aims to show the **necessity to eliminate romantic love**, hereafter referred to as love, **from the list of emotions**, not only in the scientific field, but also in the cultural and social field too. Love is usually accompanied by the most intensive emotions, but love is not an emotion, although the creation of love in the evolution of our species is involved in the extreme emotional intensity that can be experienced by humanity.

## 2. The Erroneous View of Considering Love as an Emotion Has Simple Causes

In societies where men and women pair up freely, they both have a number of indicators that are socially accepted as **signs of love**; such signs include character compatibility, having fun together, physical attraction, etc. Buss (1989) has identified a number of love acts that function to signal romantic suitability and to ensure reproductive success (in Ackerman et al., 2011). Intense emotions and feelings which accompany sexual interest become confused with love, a physiological drive which is different from a sexual drive. However, owing to the fact that humans can experience very intense emotions (Hebb, 1949), love has been allocated as purely an emotional entity.

As a result, given that **neither the scientific nor the cultural field clearly differentiate between love and sexuality**, love ends up being wrongly interpreted as getting along well and in many cultures, mutual respect (Fromm, 1956), the concern for the couple's wellbeing, a joint plan for the future, and a rewarding sexual compatibility enveloped in intense and unknown emotions. All this, and often other practical and private reasons (Jin et al., 2015; Candolin, 2003), tend to lead to a decision to begin a life together in order to share projects and responsibilities, especially to bear children.

When society comprising millions of people assumes this type of relationship to be love, the terrible consequence is that **the biological image of love gradually fades and is substituted by its cultural namesake**. For women, e.g., an analysis of single-words descriptors of "love" revealed six distinct definitions of love, interpreted as "attraction, passion & romance", "unconditional love", "sex & fun", "friendship & spirituality", "a permanent commitment", and "separate people, separate lives" (Watts & Stenner, 2014). Although it has been attempted for thousands of years to link sex to love, primarily for reasons of political and religious control by the dominant groups (Burunat, 2014a, 2014b), the reality is that sexual activity should only be understood as part of the whole love experience, but sex is not necessary either in the manifestation or in the course of love.

Love is obviously associated with sex, as perfectly described in a recent meta-analysis of brain activity in both functions (Cacioppo et al., 2012), but love is also associated with breathing, pulse, vision, memories, and many other brain functions, and cannot be

reduced to them. In fact, in the female brain, the intensity of love experienced is mediated by a network comprising the angular gyrus, whilst a different structure, the left insula is associated with orgasm (Ortigue et al., 2007); furthermore, in this work, no relationship was found between intensity of love and partnered orgasm frequency, presumably because **sex is not the most important factor for the emergence of love**.

Love cannot come about by reason, or by some logical argument, nor by will power or through a conscience decision as in the so named, commitment (Sternberg, 1986). Exactly in the same way as these factors are not decisive in other physiological motivations such as hunger or in sleep. **Physiological motivations exist independently of reason or will**, although the consumption of food, water, sleeping or having sex can be delayed or modulated—e.g., by delaying a sexual relationship until after marriage or exchanging sex for economic considerations or reasons such as affection or security-. Love also exists, or does not exist, independently of reason, will or commitment.

This is one of the main causes of confusion between love and sexuality, because **sexual control is the main source and manifestation of power** in many animal species, and also in humans. So, the main rite of most religions is that of marriage which recognizes, legalizes and formally imposes sexual exclusivity, punishing the rupture of such exclusivity; e.g. the Catholic Church prevention of divorce may keep millions of women in abusive marriages (Simister & Kowalewska, 2016). Adultery is illegal in 20 states in the US, and also so called sexual deviations can be punished even by the death penalty in certain countries (Isaacs, 2015); in 2015, two women were sentenced to death by stoning for committing “adultery” while married, one in Maldives and one in Saudi Arabia (Amnesty International, 2016).

**Religions and societies have tried via institutionalized marriage to create a false and forced state of love** in unions mainly motivated by sexual interest, but also by the demands generated by the imbalance of homeostasis which defines love as a physiological drive (which behaviourally is translated as affection craving, company, wellbeing, happiness, etc.). But whilst love implies an addictive component towards a specific person (concerning the similarities between love and addictions, see, Burkett & Young, (2012); Fisher et al., (2016); Ortigue et al., (2010); Xu et al., (2011)), in sexuality, pleasure can be obtained with other persons (regarding the similarities and differences between love and sexuality, Cacioppo et al., (2012); Ortigue et al., (2007); Diamond (2004)).

### **3. Divorces are Originated by the Erroneous Consideration of Love as an Emotion**

Before marriage, men and women are likely to react differently to a love confession depending on whether it occurs before or after the onset of sexual activity (Ackerman et al., 2011). In **marriages not motivated by love, but by the cultural creation of love**, through the passage of time and with the same partner, in both sexes a process of tolerance or routine is developed which diminishes the pleasure of sex, in the same way as does the increasing sensitivity and growing intolerance towards the more unbearable

aspects of the sexual partner. The same applies to other types of matching (De Lecce & Weisfeld, 2016). These physiological changes, extensively described in neuroscience (Nestler, 1993; Engelke et al., 2016), pharmacology (Skupio et al., 2016) and psychology amongst other sciences, are those directly responsible for the failure of marriages not based on the motivation of love but rather on sexual motivation.

Infidelity is probably the main cause of relationship break-ups in marriages not based on love. **Love and sex are different things** (Diamond, 2004). In contrast to a marriage based on love, which creates an indestructible bond with an exclusive person, literally a permanent and inextinguishable addiction to another human being, sexual motivation can be satisfied by another person and so, once tolerance and diminished sexual pleasure has come about, a partner becomes sexually, sentimental, and emotionally attracted by others.

The frequent ending of relationships culminating in divorce has been explained from many different perspectives, ranging from the psychological (Yarnoz-Yaben & Comino, 2012) to the mathematical (Rey, 2010) to the genetic (Gettler et al., 2016). **The general erroneous conclusion is that love has an expiry date**, but the couple joined for sexual motives, rather than motives of love: they confuse love with the intense emotions that our species can experience, together with the mistaken cultural interpretation of love.

The divorce rate is slightly over 50% for marriages in the USA and 60% in Spain (Engel, 2014), a medium sized country within the European Union with a population of around 47 million inhabitants, making the rate 2.28 for every 1000 inhabitants. Within the Spanish regions, the Canary Islands have a little over 2 million inhabitants—and more than 13 million visitors per year (ISTAC, 2016). **The Canaries had the highest divorce rates in Spain** with 2.63 divorces for every 1000 inhabitants. In the Canaries, out of the 5383 divorces in 2014, 1660 were not by mutual agreement, whilst in the whole of Spain there were 24,100 divorces without mutual agreement (INE 2016a). Over the past decade, the Canary Islands have been the first or the second in the rate of divorces in Spain (INE, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016b).

**Love is not responsible for the formation of millions of couples and marriages around the world**, doomed to fail by the current ignorance of the meaning of love in the course of human evolution (Burunat, 2014a, 2014b). This may be a crucial factor explaining the high number of failed marriages (about half) and consequential divorces. Also, breakups are the outcome of the majority of nonmarital romantic relationships (Battaglia et al., 1998; DeLecce & Weisfeld, 2016).

#### 4. The Mistake of Considering Love as an Emotion Has Deadly Consequences

Although love is not an emotion, this erroneous interpretation of love can be associated to several emotional disorders and behaviours with huge repercussions in society. Here such consequences are briefly illustrated in terms of suicide and femicide, or the murder of women at the hand of their partner or ex-partner. To varying degrees, both phenomena can be directly associated with the current mistaken paradigm of love: **di-**

**vances are clearly related to suicides and femicides** (Fernández-Teruelo, 2013), **and also to the filicide**, or the murder of one's own children (Shields et al., 2015; Schyma et al., 2013; Marleau et al., 1999—severe marital discord—, Taguchi, 2007).

Although, the authors are usually diagnosed as having mental disorders after these crimes affecting their own children (mood disorder, personality disorder, borderline personality disorder, psychotic symptoms, etc.), **mental illness does not appear to be a feature** in the majority of cases (Putkonen et al., 2009; Flynn et al., 2013—rarely involves a psychotic disorder—Bourget et al., 2007): It might be emotionally challenging to consider someone to have killed a child in a completely responsible state of mind (Putkonen et al., 2009).

#### 4.1. Suicides

Romeo and Juliet, by William Shakespeare, constitute the paradigm of the consequence of an impossible love. Beyond literary fiction, it is a reality that breakups and failures can cause both the contemplation and completion of suicide. Suicide is a complex public health problem of global importance (Turecki & Brent, 2016). Although some reports have found indicators of possible depression in cases of suicide (Namratha et al., 2015), others state fewer than 10% of people with depression attempt suicide (Reardon, 2015). **Suicide is a complication of all existing psychiatric disorders**, and the probability of suicidal behaviour depends in part on a diathesis that includes more hopelessness and more impulsivity (Mann, 2003), even in <12 y.o. children (Sheftall et al., 2016). Some suicides may be inevitable (Sadock, 2012).

**Relationship breakups are decisive in the ideation and suicidal behaviour** of the partners (Yip et al., 2015; Scourfield & Evans, 2015)—also in homosexuals (Wang et al., 2015)—and of the children affected by the breakup in the USA (Adam et al., 1982) and in other countries (Lindström and Rosvall, 2015; Bruwer et al., 2015; Masocco et al., 2008; Ikeda et al., 2007; Goldney 1981; Wyder et al., 2009). Suicides were responsible for more than 800,000 deaths around the world in 2012 (WHO, 2013). Twice as many men die for suicide—even four to one (Wyder et al., 2009)—as women (Stewart et al., 2015), which has been related to testosterone (Rice & Sher, 2015). The risk of suicide is increased not only for months, but for years after the breakdown of a relationship (Batterham et al. 2014).

Cultural influence, along with the current forced relationship between love and sex that lead to this cause of death, is evidenced by the **higher rate of suicide in groups with different sexuality**, such that gays and bisexuals are twice as likely to take their life as heterosexuals (King et al., 2008). Probably the situation will be worse in non-Western countries: for example, none of the Asian countries admits gay marriage to date (Horton, 2016). This enables us to highlight the main reason for this forced relationship between love and sexuality which is that control of sexuality is one of the main sources of power (Burunat, 2014a, 2014b).

With a rate of 12.1 per 100,000 in the USA, suicide is the second leading cause of death in adolescence (Stewart et al., 2015) and, in some ethnic groups, it is the fourth

cause of death overall (Chang et al., 2015) The cost of suicidal behaviour in the USA is estimated at \$58.4 billion in 2013 (Shepard et al., 2015). The president of the American Psychological Association, Dr. Susan McDaniel, argues that comprehensive care in primary care that includes psychological care is less expensive and more effective (Infocop, 2016). This brief reference to the economical impact of suicide is evidence of a **material cost due to the present confusion which exists between love and emotion**, and between love and sexuality. Of course, the pain and suffering experienced by those affected and their families cannot be calculated.

The rupture or impossibility of love in a couple is not the only implied factor in suicidal behaviour—although it is the most important; **a past with a lack of love in infancy**, maltreatment, abuse and violence also increases the subsequent risk of suicide (Roy et al., 2010; Onishi 2015; Aggarwal, 2015). Recent study from 2003 to 2012 in 17 US states shows that pre-adolescent children who died by suicide more often experienced relationship problems with family members or friends (Sheftall et al., 2016); it must be noted that also in adolescents, insecure attachment is an underexplored risk factor (Sheftall et al., 2014).

The **relationship between suicide, maternal love and romantic love** therefore supports the suggestion proposed here that both are of the same physiological motivation. This is further supported by neural imaging studies (Bartels & Zeki, 2004) and brain distribution of receptors of oxytocin, the neurohormone promoting pair bonding and social behaviors (Feldman et al., 2016) together with other studies, e.g. the complete review of Numan & Young (2016): “remarkable similarities exist in the neural mechanisms of mother-infant bonding and pair bonding”.

A happy person does not commit suicide. It is not sufficient to insist on eliminating poverty and on social-economic factors, although these are also associated with suicide (Wahlbeck & Awolin, 2009; Case & Deaton, 2015) e.g., it has even been suggested that there is some link between fiscal austerity and suicide (Antonakakis & Collins, 2015) and today it is known that this also affects brain development (Noble et al., 2015; Katsnelson, 2015) but instead in recognizing that the encouragement of love between parents and towards their children has considerable social and economic repercussions that should be taken into account by public institutions. In the fields of Psychology and other Health Sciences, obviously, **the search for efficient solutions for poor well-being and for the suffering of those affected** should be at the forefront of their priorities, rather than economic factors.

Suicide as the cause of deaths in Spain—3870 death in 2013, 3910 in 2014—(INE, 2016c) has, since 2008, out-numbered those due to traffic accidents: 1126 deaths in 2015, 1131 in 2014, or 1134 in 2013 (DGT, 2016). The same is true in the United States, with 41,149 suicides in 2013 (Xu et al., 2016) compared to traffic accidents caused 32,166 deaths in 2015, 30,056 in 2014, or 30,202 in 2013 (NHTSA, 2016), in the same way as in several other developed countries.

Given that relationship breakups are the main cause of suicides (Yip et al., 2015; Scourfield & Evans, 2015; Wang et al., 2015; Adam et al., 1982), it seems obvious that

**there is a need to recognize that the erroneous current paradigm of love is directly responsible for most of these deaths.** It is the responsibility of scientists, therefore, to assume the responsibility to stop considering love as an emotion in order to help eliminate these types of deaths.

#### **4.2. Intimate Partner Violence (IPV) and Femicide**

Intimate partner violence (IPV) is defined as violence committed by a current or former boyfriend or girlfriend, spouse or ex-spouse (Modi et al., 2014), and **it is a major public health problem** in the United States (Gehring & Vaske, 2015). Numerous publications exist concerning violence against women (IPV, but also, Gender-based Violence or GBV), its workings and consequences in a great number of countries (see, e.g., Thurston et al., 2016; Rees et al., 2014; Chakraborty et al., 2016; Gillum et al., 2016; O'Doherty et al., 2015).

In the last few years research in this field has been particularly encouraged in Spain. Thus, femicides are being studied in great depth by different Spanish research groups (Cobo, 1999; Echeburúa et al., 2009; Echeburúa & Corral, 2009). It has been found that unemployment does not appear to be a significant factor (Torrubiano et al. 2015), and that immigrant women and rural women are at greater risk of being murdered (Sanz-Barbero et al., 2016). Researches repeatedly refer to the point that **it is the prevailing model of love that exists in society that contributes to violence against women in couples** (González & Santana, 2001; Garrido, 2001; Sanmartín, Molina, & García, 2003).

The **close relationship between femicides and suicides**, which goes well beyond being merely anecdotal, is evidenced by the fact that, in Spain, in the 9 years between 2005 and 2013, nearly 1 in every 5 or 6 murderers (18.4%) committed suicide after committing murder. In fact by mid July 2016, 27 women had already been murdered by their ex-partners, 4 of whom also took their own lives (Feminicidio.net, 2016). Such appalling regularity would be *amazing* if it were not equally so *horrific*.

In Spain, domestic violence is the cause of between 50 and 75 deaths of women at the hands of their partners or ex-partners each year for the last 15 years (CGPJ 2015); according to other sources, it is more than 100 per year (Feminicidio.net, 2016). Within the Spanish regions, the Canary Islands have suffered 26 murders of women by domestic violence since 2003. Between 2005 and 2013, **the Canary Islands have shown the highest rate of intimate partner-related femicide**, adjusted by age and unemployment rates and percentage of foreigners in Spain's regions (Torrubiano et al., 2015). In addition, the Canaries currently also have the highest rate of complains for Gender Violence in Spain (CGPJ, 2016).

It is imperative to highlight the **undoubtable relationship between the high percentages of divorces in this region**: The Canary Islands has the highest divorce rates in Spain along the last decade (first or second position, INE, 2016b), **along with these high rates of femicides and legal procedures for Gender Violence**. In the light of what is suggested in this article, as well as by other authors (Fernández-Teruelo, 2013; Fisher et al., 2016; Hardesty et al., 2016), the Health System must establish protocols of



treatment for the partners at risk: divorces and relationship break-ups are a public health problem, and should not only be considered to be a legal or economic matter (division of assets and custody of the children) as presently occurs in the world.

It is proposed here that, apart from the individual circumstances surrounding the femicide, there are, as with suicide, general underlying neurobiological mechanisms, which are mainly responsible for the persistence and regularity of these phenomena, and which **could be worked on in a preventive, pharmacological and therapeutic way by the National Health Systems**. Relationship breakups should stop being treated exclusively on a legal level, as has happened up to now, and should be considered as a public health problem to be treated and dealt with by specialists in Psychology and Medicine: for these and many other reasons, the Canary Islands would surely be the best place in the world to test this therapeutic approach.

## 5. Love Is Necessary for Survival, as Hunger, Thirst, Sleep or Sex

Physiological motivations ensure the survival of the individual and the species. Prolonged disruption of food or water intake causes death, as do other severe physiological alterations of homeostasis. **Love is also necessary for survival** in the early stages of life and probably is also an essential factor of survival at all ages. Thus, as previously reported, most suicides are caused by breakups, as are most femicides.

Imbalances in homeostasis generators of sleep are partially known (George et al., 1964; Grace & Horner, 2015; Eban-Rothschild et al., 2016; Tashibana & Tsutsui, 2016) while those of love are beginning to be understood. Love stimulates the homeostasis of a whole constellation of cortical and sub-cortical functions, structures and cerebral circuits, throughout life, from birth to death. **The lack of love during development is extremely important** and affects all the mental and physiological functions, just as there are consequences for multiple deficiencies in the diet during growth and aging (Araújo et al., 2015).

Months and years of diets deficient in essential nutrients can also slowly lead to deficiency illnesses and death. Like the lack of love during development (Teicher & Samson, 2016), breakups, separations and divorces have been associated with higher incidence of mental and physical illness, or the worsening of previously existing illnesses. **Just as lack of nutrients or sleep causes serious disturbances to the mind**, so too, does the lack of love.

Lack of love can mean all types of neglect and abuse, physical and emotional abuse, physical and emotional neglect, verbal and physical violence including bodily harm and sexual abuse. There are numerous references regarding the consequences of a lack of love (Márquez et al., 2013; Edmiston et al., 2011) and several recent comprehensive reviews (e.g., Teicher & Samson, 2016; De Bellis & Zisk, 2014).

Indeed, recent results in rodents show that early-life stress induces distinct dysregulation in the midbrain reward circuitry of males, suggesting the existence of sex-specific psychopathology of the reward system (Chocyk et al., 2015), whilst in female rodents early-life stress eliminates brain and maternal behavioral sex differences (Del Cerro et

al., 2015). In humans, sex differences in the reward system of the brain (Gillies et al., 2014; Lei et al., 2016) could lead to **male violence responsible for IPV, femicides and the superior rate of suicides in males**.

Although the behavioural and neurobiological effects caused by a lack of love are not looked into in depth here, it is worth considering its enormous consequences: **“abuse and neglect have confounded neuroimaging studies on psychopathology for the last 30 years, and may be responsible for many erroneous assumptions and conclusions”** (Teicher & Samson, 2016).

Several reviews compile the neurobiological and behavioural effects of maltreatment in infancy, which can be interpreted as effects of the absence of love, and also enables us to understand some of the effects of love on brain development, in the same way as the **understanding of sight development has benefitted by studying the effect of a lack of light** on the retina (Wiesel & Hubel, 1963; Shatz & Stryker, 1978; Horton & Hocking, 1998).

Social relationships as a whole are necessary for human development (Yang et al., 2016), but love, or the lack of it, is decisive in the homeostasis and in disturbances of the functioning of the mind. Indeed, **the lack of love is possibly the main cause of psychopathology** and its more dramatic consequences, suicides and femicides.

## 6. Love Is a Physiological Motivation

Stricto sensu, love is a physiological motivation which changes the brain (Song et al., 2015) and not only a physiological state similar to other feelings. All the different motivations imply physiological states, but not all the physiological states are behavioral motivations. **All the physiological motivations may be associated with emotional states and feelings** which are not motivations. Love is different from the other motivations due to its origin, its neurobiological substratum and the nature of the imbalance of the homeostasis from which it originates.

Whilst “hunger” and “thirst” are satisfied by the intake of different substances after breastfeeding has ended, immediately after birth these are *undifferentiated* motivations. Another motivation, “sleep” occupies almost the entire life of the newborn but gradually decreases until senescence. Finally, the sexual drive is developed from puberty onwards. This demonstrates that **physiological motivations appear and change throughout the course of life**, and so too does love.

The physiological **motivations exist to maintain the homeostasis**, the balance of the internal system. When imbalances occur or when balance is reached, peripheral and central signals are generated. When these signals are caught by central detectors, specifically hypothalamic detectors, internal states and behaviours are activated which recover and ensure the maintenance of homeostasis.

Essential for this is the activation of **midbrain ventral tegmental area, which is active in all motivated behaviors**, such as hunger (van der Plasse et al., 2015, Wei et al., 2015), thirst (Papp & Bal, 1986), sex (Beloate et al., 2016) and sleep (Eban-Rothschild et al., 2016), and is also active in love (Acevedo et al., 2012). The midbrain even regulates

addictive states in other drug (Grieder et al., 2014) or behavioral induced addictions, such as running (Chen & Kenny, 2015). It has strong connections with the posterior portion of the anterior cingulate cortex, which is also linked to pain cognition, whilst a more anterior portion is deeply involved in emotion (Kobayashi, 2011). Activity in the dorsal part of the anterior cingulate cortex is more prominent in romantic love than with maternal love (Bartels & Zeki, 2004, Zeki, 2007). There are also gender differences: the ventral part of the anterior cingulate cortex that was activated with maternal love also reached significance in the female-only analysis of the romantic love study, while it was not activated in males (Bartels & Zeki, 2004). On the other hand, posterior cingulate cortex, which is essential in long-term memory formation and which is specifically activated by romantic love (Bartels & Zeki, 2004), has been related to obsessive-compulsive disorder (Brennan et al., 2016). The cingulate cortex is connected with other cortical—prefrontal dorsolateral, orbitofrontal, parietal—and subcortical areas, including the amygdala and thalamus (Lorberbaum et al., 2002). Addictions, obsessions and love are closely related in the brain.

**Motivations and emotions act synergistically to achieve homeostasis.** A fight for food can cause aggressive behaviour tainted by raw emotions, but hunger is not an emotion. Sexuality can also be accompanied by strong emotions and generates the need for intimacy between individuals, including for those who lead solitary lives, but sexual desire is not an emotion. Nevertheless, the extreme emotions associated with the sex drive are often interpreted as love, and hence, in many societies love is reduced to a simple emotion accompanying the sex drive. Love generates the need for closeness, and is also accompanied by strong emotions, but love is not an emotion.

The **development and homeostasis of the human brain requires love.** If during infancy and childhood the mother provides this love (and hence the evolutionary origins of this motivation), later on this motherly love can be, and should be substituted by love from a partner. Unlike other motivations where the reasons are known and external (food for hunger, water for thirst, another body for sex), with love, as in sleep, the reasons are purely internal and central but affect the whole organism and behaviour. Lack of love is at the origin of most psychopathologies; this has been recently stated in relation to childhood maltreatment (Teicher & Samson, 2016).

Although motherly love is traditionally considered different to romantic love, **there is sufficient evidence to understand them as simple evolutionary or temporary variants of the same balance in the brain homeostasis.** Adult pair bonds and attachment bonds between parents and infants are likely to be extremely important for the survival of the species (Kringelbach et al., 2008). Thus, Coria-Avila et al., (2014) conclude that “intra-specific and parental attachments seem to share common neural circuits. This is based on the fact that natural stimuli that facilitate those types of attachments increase or decrease activity within similar areas”. Even, grandmaternal love similarly involves different regions of the prefrontal cortex, as maternal and romantic love (Kida et al., 2014). A detailed description of the neurochemical substrate of mother-infant bonding and pair bonding can be found in Numan & Young (2016), who

show how dopamine and oxytocin actions on the nucleus accumbens-ventral pallidum circuit are also involved.

It is important that the scientific community accepts and spreads the fact that love is not an emotion, although it can definitely be accompanied by intense emotions. In fact, **in human evolution love promoted the capacity to experience the most intense emotional states**, firstly in women in the mother-child relationships, and later in men in sexual relationships. This evolutionary viewpoint would underlie some detected adaptive sex differences in romantic attachment with respect to some personality dimensions, such as anxiety and avoidance (Del Giudice, 2011). The vast majority of laboratories and love researchers already assume its motivational component (Fisher et al., 2016), and although still in debate (Reynaud et al., 2010), its relationship with addictions (Burunat, 2007, 2014b; Burkett & Young, 2012, Fisher et al., 2016).

Here it is proposed that **maternal love and romantic love are the same motivation** created by natural selection in the line of human evolution. It is responsible for the evolution of our species (Burunat, 2014b; Fletcher et al., 2015; eroticism in Fellmann, 2016) but with special differential features and characteristics (which are reviewed in the seminal works of Bartels & Zeki (2004) and Numan & Young (2016)), just as arise in the other physiological motivations and change as they develop.

## 7. Love Is an Inextinguishable Addiction to Another Person

In the first months of life, discontinuation of breastfeeding causes hunger and thirst, indistinguishable by the baby. After that period, abstinence from nutrients causes hunger, abstinence from water causes thirst, and the abstinence from sleep generates somnolence and sleep. After puberty but not before, abstinence from sex increases sexual drive. When love arises, at any age, serious and extreme symptoms follow the sentimental breakup culminating in a genuine syndrome of withdrawal from love. **Physiological motivations are reinforced by the unpleasant consequences of withdrawal.**

Marital dissolution is known to be among the most stressful life events (Knöpfli et al., 2016). It might be that the distinction between jealous love and morbid jealousy was not so precise in many cases: Love is jealous when it is devoured by the desire for the exclusive and total possession of the partner, whose unconditional and continued presence is avidly requested (Maggini et al., 2006). A meta-analysis of 25 relevant studies has shown that obsession was positively related to relationship satisfaction in short-term relationships (Acevedo & Aron, 2009). Among the signs of love identified by Buss (1989) is the display of *distress even in short separations* (in Ackerman et al., 2011, emphasis added).

In the same way as in addiction to opiates, cocaine and other drugs, the pleasure associated with love, when interrupted, may cause a withdrawal syndrome. This has been referred to as “**Love withdrawal syndrome**” (LWS) taking into account its equivalence with opioid withdrawal syndrome (Burunat, 2007). LWS shares features with depression and with the obsessive compulsive disorder but is characterized as a withdrawal syndrome because it is associated specifically with the lack of a particular person, more

than with the lack of a sexual partner. The characteristics of LWS—anhedonia, obsessive or ruminative thinking, mood disorder, sleep and feeding disturbances, and, above all, an extraordinary suffering which, is incomparable with any other previous life event-set it apart from symptoms caused by the separation of the sexual partner, who may be replaced with a new sexual partner.

Hypersexuality is maladaptive for the individual (Kühn & Gallinat, 2016) and could be really understood as addiction to sex which can be satisfied by any person (discussed in Stein, 2008; Bancroft, 2008; García & Thiebaut, 2010; Kafka, 2010; Echeburúa, 2012; Karila et al., 2014; Blum et al., 2015; Reid, 2015) or by no other person; then, it may be the cause of autoerotic deaths in both men and women (Sauvageau & Racette, 2006; Behrendt et al., 2002). Love, however, is here proposed as an **addiction to one specific person, independently of sexual intercourse**: In a US sample, affection had stronger associations with intensity of romantic love than sexual intercourse for both men and women (O’Leary et al., 2012).

Sex and love are distinct physiological motivations, although the **current misperception of love as a simple emotion associated with sexual interest** has contributed to their confusion. In stereotyped behaviors, the persistence of behaviours and emotions seems to depend on the prefrontal cortex maturation and its functional circuits (Zhou et al., 2016; Morgan & Le Doux, 1995), as well as from other areas of the fore-brain, such as the cingulate cortex, (Brennan et al., 2016), the orbitofrontal cortex (Atmaca et al., 2016), and striatal areas such as putamen (Kubota et al., 2016; Real et al., 2016). All of these are also involved, among other areas, in obsessive compulsive disorder; examples include greater distant connectivity in the orbitofrontal cortex and basal ganglia (Beucke et al., 2013), or decrease in gray matter volume in the bilateral cingulate cortex and bilateral striatum (Tang et al., 2016).

These areas are also involved in love, wherein data exists on specific brain configurations in the union of long-lasting couples that support the **indelible aspect of love** (Acevedo et al., 2012, Xu et al., 2012). Indeed, it hardly makes sense that someone can become permanently addicted to alcohol or nicotine and yet only be in love for a set period of time (Burunat, 2014b), for a few years during the growing up period of the children: In long-term marriages (30 years or more), there are still respondents who report being “very intensely in love” both in US (O’Leary et al., 2012) and in Spain (Cuenca-Montesino et al., 2015).

Frascella et al. (2010) concluded that functional brain imaging studies of sex, romantic love and attachment provide ample evidence for an **extended but identifiable system central to natural, non-drug reward processes** and survival functions. Similarly, Schneiderman et al. (2012) suggest that parental and romantic attachment share underlying bio-behavioral mechanisms. Indeed, the overlap of classic reward brain areas involved in sexual arousal, love and attachment is complete (ventral tegmental area, accumbens, amygdala, ventral pallidum, orbitofrontal cortex) (in Love et al., 2015).

From these and other findings, it has been previously proposed (Burunat, 2007, 2014b) that all types of addictions including newer addictions to the smartphones (Kwon et al.,

2013), the internet (Uddin et al., 2016), internet gaming and internet pornography (Love et al., 2015), perhaps are **only evidence of spurious activations of love circuits**, i.e. activation of similar brain circuits which have been also associated with love (Bartels & Zeki, 2000, 2004; Childress et al., 2008; Fisher 1998, 2004, 2006; Fisher et al., 2002, 2006; Kühn & Gallinat, 2014; Voon et al., 2014). Indeed, intense, passionate, romantic love can be understood as a natural addiction (Fisher et al., 2016).

## 8. Conclusion

The present article sets out to briefly justify love as a physiological drive, and it also outlines the motives for its cultural misinterpretation as merely an emotion. It is further suggested that **this misinterpretation can cause many deaths and suffering**, including divorces, suicides and the murder of women by their partners or former partners.

Indeed, it may be that the lack of love, and sentimental breakups, **may be the ultimate cause of many horrendous crimes**, perhaps wrongly attributed to other reasons such as terrorism. The terrorist truck driver who slaughtered 84 people in Niza was about to finalize his divorce, and “*He danced, he smoked, he ate pork. It was almost as though he wasn’t even Muslim*” ... “*He didn’t even pray.*” (Nossiter et al., 2016).

**The lack of love is a major cause of mortality, as previously summarized.** The research in many laboratories and research centers around the world clearly shows that love (maternal and romantic love being different forms of the same love) is a physiological motivation like hunger, thirst, sleep or sex and not an emotion or feeling with which love is usually confused. It is surely because of emotion, motivation, reinforcement and arousal that these closely related topics often appear together in proposals about emotion (Le Doux, 2012). But in any case, love itself is not an emotion (Ekman, 2015; Fisher, 2016).

Physiological motivations are essential for survival, just as love is essential for survival at the early stages of human life. Subsequently, love is also necessary for brain homeostasis, with **consequences for the survival at all ages**, given that adult pair bonds and attachment bonds between parents and infants (Kringelbach et al., 2008) is the main consequence of love. So, the survival of babies and survival throughout the whole infancy and childhood would not be possible without the deployment of love in all human species along the last one million years (Burunat, 2014a, 2014b, 2015).

This article also explains the cause and present confusion between love and sexuality and suggests that **the misconception of love as being an emotion has extremely serious consequences**. These consequences range from frequent relationship break downs, **divorces**, which are wrongly attributed to a so-called love expiry date, to the **suicide** and to the murder of women by their partners and ex-partners (**femicide**), wrongly attributed to educational and cultural factors, when in truth the main cause is the erroneous social interpretation of love as being only an emotion.

These deadly consequences can only be gradually corrected by a clear position in the scientific community to acknowledge that love is a physiological motivation such as hunger, thirst, sleep and sex drive. Academics can help activists and politicians reduce

violence against women (Simister & Kowalewska, 2016).

The acceptance of this proposal must entail profound educational, cultural and social changes. Most importantly, it must entail the **consideration of sentimental separations and divorces as a priority for attention of National Health systems** in order to detect potentially dangerous situations for those involved, especially for women.

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## Conflicts of Interest

The author declares no conflict of interest.

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