

Article

# The Healing Power: A Review on the Various Aspects of the Love-Pain Relationship

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**Abstract**— Love is mesmerising yet complicated. Brain imaging studies of love found that many different areas of the brain are involved in processing this intriguing emotion. Just looking or thinking about a loved one causes the release of a variety of neurotransmitters across the brain. The universal nature of love is manifested in various forms, including the warm feeling felt towards family, child, spouse, pets or friends. What is more special about love is that it may have the ability to heal! A study was undertaken to investigate scientifically factors underlying the reputed healing power of love through neuroimaging. The results of the study, which were published recently proposed a brain connectivity model of areas that are involved in reducing pain threshold when a loved-one is nearby, termed “*Love Heals*”. This article discusses the healing power of love with supporting evidences from previous studies. We focus on three aspects, namely the neurochemistry of romantic love, the psychological aspect of emotion and the neuroimaging aspect.

**Keywords**— Love, pain, healing power, brain response, neuroimaging, emotion.

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## INTRODUCTION

Love is mesmerising and complicated. Brain imaging studies of love found that many different areas of the brain are involved in processing this emotion. These areas release a variety of neurotransmitters across the brain, such as dopamine and norepinephrine when looking or thinking about a loved one [1].

Expressing the love may be varied depending on the situation. Indeed, love is universal that it can take many forms. There is a love i.e. a feeling towards family, child, spouse, pets, friends and even things. What is so special about love is, it has an ability to heal the world!

A human's first love affair begins at birth, with a scream [2]. During childbirth, a mother experiences intense pain. The question is whether the labour pain felt by the mother is modulated by her acceptance or love of the baby.

Another situation where a person can tolerate pain is when he/she is in the presence of a loved one. This situation somehow involves empathy from the person accompanying him/her. According to Hurter et al, empathy has long been considered a critical feature of supporting, close relationships, however, they showed that the partners' empathy increases pain ratings. [3].

Taking this into consideration, a study was developed to find the relationship between love and pain threshold, the point when the pain starts to be felt. One of the aims of the

study was to investigate scientifically factors underlying the reputed healing power of love, through functional neuroimaging. The results of the study proposed a brain connectivity model of areas that are involved in reducing pain threshold when a loved-one is nearby, termed “*Love Heals*” [4,5].

This article discussed the healing power of love with supporting evidences from previous studies. This work focuses on three aspects, namely the neurochemistry of romantic love, the psychological aspect of emotion and the neuroimaging aspects.

### A. Psychological Aspect of Emotion

In previous research, “*Love Heals*” was demonstrated by all subjects with a romantic partner, as evidenced by a higher pain threshold when the partner was nearby [4,5]. This effect was, however, not seen with the other types of love. Thus, the “*Love Heals*” probably influenced by the behavior of a couple. There is evidence showed that the early stages of a romantic relationship are believed to have strong feelings of euphoria, well-behave, and preoccupation with their partners and may modulate the pain perception [6].

Love creates a sensation of warmth [7], initiates happy mood and other positive emotions [7,8]. Fredrickson and Cohn in their book, stated that people who experience high levels of positive emotions tend to experience less pain [9]. As an extension of this, the healing power of love demonstrated in previous study is in synchrony with other behavioural studies

which demonstrated that the viewing of pictures of a romantic partner effectively reduced pain perception [6].

In another research, it was found that subjects had high tolerance to cold pressor pain when the romantic partner was present in the next room as an observer. Knowledge and awareness that the partner was around affected the pain experience. The author suggested that, this effect may be explained by the social process of empathy, which play a role in prompting compassionate behaviours to lighten the distress of others [10].

### B. Neurochemistry of Romantic Love

The neurochemistry of love would explain better how love can affect the pain response. In fact, love at an early stage stimulates all happy chemicals at once and can induce euphoria [11]. Love is a cocktail of brain chemicals comprising several hormones such as dopamine, serotonin, oxytocin and endorphin [12].

Other researchers found that, men and women who are experiencing passionate love released neurotransmitters and other chemicals that prompt greater euphoric sensations such as attraction and pleasure. Those couples had high levels of dopamine, oxytocin and vasopressin; and low level of serotonin; which resulted in low pain sensitivity [13].

Neurotransmitters dopamine and oxytocin are closely linked to motivation and reward. Not only that, dopamine is a 'happy' hormone associated with a range of processes related to reward and learning as well as love and sex [14] while oxytocin and vasopressin are the foremost hormones linked to attachment [15]. The loving couple also turns on the neurotransmitter dopamine, stimulating the brain's pleasure centre, and drops the level of serotonin, which is responsible for the madness and obsessive aspect of love [15]. Dopamine has been shown to play a role in reducing pain. Another factor of the romantic couple to feel less pain is because of the secretion of endorphin. Endorphin leads to feelings of euphoria and with high endorphin levels, one may feel less pain and fewer negative effects of stress [16].

### C. Neuroimaging of Love-Pain Related

In many studies, fMRI images were analyzed to look at parts in the brain which is responsible for pain processing and is associated with love. The studies found that most of the pain related area were activated such as cingulate cortex, insula, somatosensory cortex (SII), thalamus, hippocampus, amygdala and ventrolateral prefrontal cortex (VLPFC). All of these areas play important roles in pain processing [4,5]. For example, the thalamus which is a relay station actually acts as a gateway to transmit the pain signals originating from the peripheries to the cerebral cortex [17]. In addition, it is essential in the interpretation of our sensation, especially pain [18].

The laser stimulus was delivered onto the dorsum of hand. Thus, the somatosensory cortex is activated to provide information about the location and intensity of stimulation. This area processes mostly the discriminative aspect of pain, although sometimes, as shown in infants, processes the affective aspect of pain as well [4,5,19].

The "Love Heals" was observed to occur and shows some differences in brain activation regions compared to the group who felt greater pain in the presence of the loved one. Areas

with high intensities were the entire cingulate cortex comprising the anterior (ACC), middle (MCC) and posterior (PCC) cingulum [4,5]. These areas are also essential in pain processing where they describe the affective-motivational aspect of pain such as the influence of emotion, attention, expectation and anticipation [20]. Therefore, the love experience by the subject towards the loved one is likely to be associated with the process of emotion or the expectation towards their partner.

Many neuroimaging studies of pain report that the pain related area includes major parts of the prefrontal cortex and some in temporal lobe. The VLPFC is not only crucial for executive functions, but also in pain processing [21]. The prefrontal cortex is responsible for executive functions such as problem solving, planning and social control. It also has the ability to represent information or knowledge used to guide thought, actions, feelings and emotions [22].

There are many brain regions activated were associated with pain. One of the regions activated was amygdala. Amygdala has been shown to help coordinate responses to the environment, especially those that trigger an emotional response. Amygdala works together with hypothalamus that process the stress response and nervous excitement when someone is falling in love [23]. As the feeling grows, the hormones of dopamine, oxytocin and vasopressin were secreted [23].

## CONCLUSIONS

The study revealed that the increase in pain threshold due to love hinged on several factors such as type of relationship, the strength and stage of relationship, emotion at the time of receipt of the pain, and the expectation. All of these aspects modulate how they reacted to pain stimulations. The mechanism of love-pain relationship is likely to be explained from various aspects, namely the psychological perspective, the neurochemistry and from neuroimaging research. The psychological perspective suggests that the higher tolerance of the person who are attached to their significant figure, is mostly modulated by the positive emotion in themselves. The good mood is said to improve their pain perception. Meanwhile, the mechanism of the love and pain interactions was explained through neurochemistry involving the secretion of neurotransmitter hormones. The neuroimaging study using fMRI confirmed the "Love Heals" phenomenon and the brain regions activated are associated with their main roles in assessing and processing the emotion and hormonal systems explained psychologically and through neurochemistry. Thus, this study provides evidence on the healing power of love and scientifically supported by various fields of studies.

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