

# A Literature Review on the Ideas and Findings of Love

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# Abstract

Since 1970, there have been a immense increase in research on romantic love, starting with Rubin's development of separate scales for the measurement of love and liking followed by other vital theory of love, such as Lee's six styles of love including eros, ludus, storge, mania, agape and pragma), Hatfield's distinction of love between passionate and companionate, and Sternberg's love triangle including intimacy, passion and decision/commitment.

Neuropsychologists point out that romantic love is associated with specific physiological, psychological and behavioural traits, including increased energy, focused attention, obsessive following, affiliative gestures, possessive mate guarding, goal-oriented behaviours and motivation to win a preferred mating partner.

Neuroimaging techniques, such as functional magnetic resonance imaging (fMRI) facilitate better understanding the role of the brain.

An in-depth interview is carried out to study people's view on the love theories.

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# Introduction

Romantic love, well known of every age as one of the most amazing of all affective states, has been the inspiration for some of the highest achievements of mankind (Sternberg, 1997). It has distinguished itself in the art and literature throughout the ages, and it is presumably experienced, at least occasionally, by the vast majority of people (Bartels & Zeki, 2000).

Love is a complex sentiment involving erotic, cognitive, emotional and behavioural components characteristically directed towards a single person (Sternberg, 1986); it is difficult if not impossible to detach ((Bartels & Zeki, 2000). Thus, any study of love suggests that love is an emotion with several components, some of which, like the erotic one, can also act independently of the others; the converse is not true, in that all the above components constitute essential ingredients of romantic love. This, together with the high position that romantic love assumes in the lives of most, even if transiently, prompted this imaging study. Given its uniqueness, we hypothesised that there may be special systems or pathways for romantic love.

In the last decade of the 20th century, the development of neuroimaging techniques, such as functional magnetic resonance imaging (fMRI) helped in better understanding the role of the brain; a review of these fMRI studies is helpful in improving one's knowledge on the neural bases of love (in comparison with the neural bases of sexual function) by extending one's knowledge of the psychology of love in the context of close relationships, and comparing this knowledge with previous fMRI studies on different phases of human sexual response (Bartels & Zeki, 2000).

Though scientists (Kanekar, 1989) assumed that most people do not care about scientific explanation of love, no one provided the evidence to support the assumption. An interview is conducted to analyse people's opinion about researches on love.

## Psychometrics of Love

Love is generally regarded to be the deepest and most meaningful of sentiments (Rubin, 1970). For a century, psychologists have involved in research on love (Sternberg, 1997). Theories of love has evolved from simply striving for an ego ideal (Freud, 1922) and a search for salvation (Reik, 1944) to styles, categorisations, and components of love (Lee, 1977; 1988; Hatfield, 1984; 1988; Davis, 1985; Rubin, 1970; 1973; Sternberg, 1986; 1997).

## Rubin's Measurement of Love

Rubin (1970; 1973) has suggested a theory of love including three components. The first component is physical or emotional needing, labeled as 'attachment', similar to the Greek concept of eros. The second component is altruistic helping or giving, labeled as 'caring', similar to the Greek concept of agape. Both attachment and caring are individualistic, while the third component of love is the bond or link between two persons, labelled as 'intimacy'. The clearest expression of intimacy is through close and confidential communication, both verbal and non-verbal.

Though moderately correlated, liking and love are distinct aspects of one person's attitude toward another in Rubin's theory. It is possible for a person to love another person without liking them, or like another person without loving. Instead of accepting loving as a more intense form of liking, Rubin's conceptualisation considers the two as different dimensions that can be used psychometrically by two different sets of items reflecting the thoughts, feelings, or behavioural dispositions of one person toward another.

Rubin established two 13-item scales, one for measuring love and the other for measuring liking. Rubin's Love Scale consists items reflecting the three components of love suggested by him, and his Liking Scale consists items which

reflect favourable evaluation of the other person regarding adjustment, maturity, good judgement and intelligence, as well as recognised similarity to oneself.

## Lee's Typology of Love

The most convoluted typology of love suggested by Lee includes six major kinds of love (1977; 1988): (1) eros, characterised by the search for a beloved whose physical presentation of self embodies an image already held in the mind of the lover (romantic or passionate love); (2) ludus, which is permissive and pluralistic (playful or gamelike love); (3) storge, based on slowly developing affection and companionship (companionate and friendship love); (4) mania, characterised by obsession, jealousy, and great emotional intensity (obsessive, and emotionally intense lovestyle); (5) agape, altruistic love in which the lover views it as his or her duty to love without expectation of reciprocation (selfless or altruistic love); and (6) pragma involving conscious consideration of the demographic characteristics of the loved one (practical love). Analogous to primary and secondary colours, Lee considers the first three lovestyles as primary and the remaining three as secondary, with mania being a combination of eros and ludus, agape being a combination of eros and storge, and pragma being a combination of ludus and storge. In an extensive research programme on Lee's typology, the Hendricks have constructed a Love Attitudes Scale (Hendrick, C. & Hendrick, S., 1986), building up on Lasswell and Lasswell's work (1976), as well as a Sexual Attitudes Scale.

## Hatfield Classification of Love

According to Hatfield & Rapson (1986; 1993), there are two major kinds of love: passionate love (which they labeled infatuation) and companionate love (which they labeled fondness).

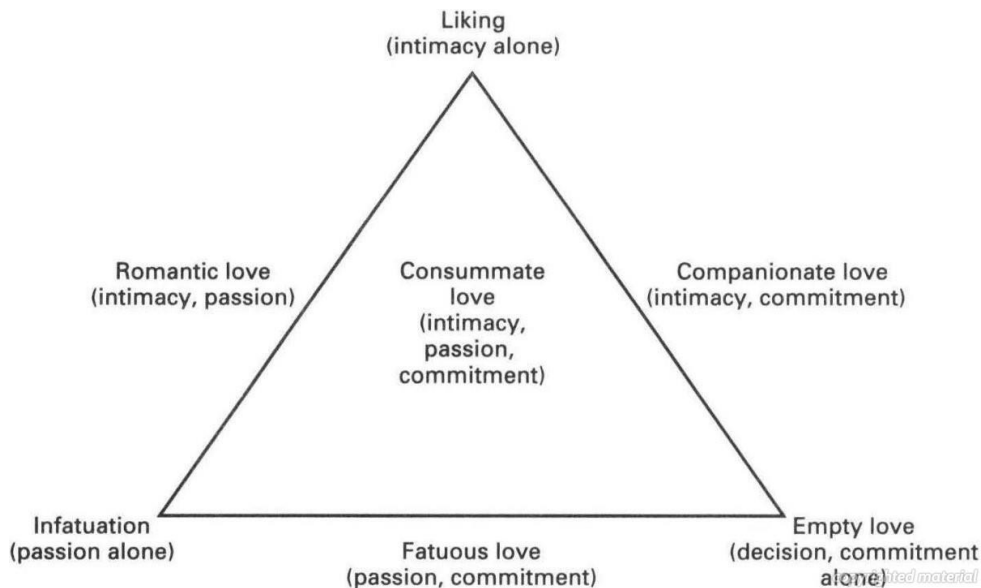
Passionate love is a state of intense longing for union with another. Passionate love is a complex functional whole including appraisals or appreciations, subjective feelings, expressions, patterned physiological processes, action tendencies, and instrumental behaviours. Reciprocated love (union with the other) is associated with fulfilment and ecstasy; unrequited love (separation) with emptiness, anxiety, or despair.

Companionate love is the affection and tenderness we feel for those with whom our lives are deeply entwined. Companionate love is a complex functional whole including appraisals or appreciations, subjective feelings, expressions, patterned physiological processes, action tendencies, and instrumental behaviours.

Elaine Hatfield and Susan Sprecher (1986) has designed and published the *Passionate Love Scale (PLS)* to tap the indicants of longing for union. This promoting more research on this intense type of love.

# Sternberg's Love Triangle

Sternberg's Love Triangle (1986)



Sternberg has proposed a more complicated theory of love in which love has three components — intimacy, passion, and decision/commitment. Intimacy involves 'warm' sentiments of closeness, connectedness, and bondedness in loving relationships (1986; 1997). Passion involves 'hot' desires for romance, physical attraction, sexual consummation, and related phenomena in loving relationships. Decision/commitment, a 'cold' component of love involves the short-term decision that one loves the other and the long-term commitment to maintain the love.

The different combinations of the components can lead to different types of interpersonal relationships. Each of the three components of love goes through different stages, and the differing short stages of the components almost certainly cause changes in the quality of a given loving relationship over time.



Non-love. In this case, all three components are absent. Most of our interpersonal relationship, involving causal interaction rather than love, can be identify as non-love.

Liking. Only the intimacy is present whilst there is no passion or decision/commitment. The term liking involves the set of feelings one has in relationships that can truly be characterised as friendships. One feels emotionally close toward the other, without feelings of intense passion or long-term commitment. However, friendships may have elements of passionate arousal or long-term commitment, but in such cases, the friendship exceeds mere liking and is best classified in one of the categories below.

Infatuated love. Infatuation involves passionate arousal without intimacy or decision/commitment. Infatuations can happen almost right away and disappear immediately under the certain circumstances. They tend to be distinguished by a high degree of psychophysiological arousal, demonstrated by physical symptoms such as increased heartbeat or even palpitations of the heart, increased hormonal secretions, erection of genitals (penis or clitoris), and so on.

Empty love. This only involves the decision/commitment and neither intimacy or passion. This occurs at the start of all arranged marriage or in some love marriage that lasts for years but that have lost both the emotional closeness and physical attraction. Unless the commitment to the love is very strong, such love can be close to none at all, because commitment can be so likely to be influenced by conscious alteration.

Romantic love. Romantic love develops from a combination of the intimacy and passion. Romantic lovers are not only attracted physically by each other but also bonded emotionally. This version of romantic love seems similar to that in classical literature, such as Romeo and Juliet and Tristan and Isolde. This view of romantic love differs, however, from that of Hatfield and Walster (1981), who argue that romantic love does not differ from infatuation.

Companionate love. This derives from a combination of the intimacy and decision/commitment. It occurs in a long-term, committed friendship or marriages in which the physical attraction (a major source of passion) has withered.

Fatuous love. This comes from the combination of the passion and decision/commitment in the absence of the intimacy. The commitment is made as a result of passion without the stabilising element of intimate involvement. Although passion can begin almost immediately, intimacy component cannot, so fatuous love may lead to divorce in a short time.

Consummate love. Consummate, or complete, love involves all three components. It is an ideal model of love, but it can exist in real life. For example, some parents' love for their children contains deep feeling of intimacy, motivational desire (e.g. for nurturance, self-esteem, self-actualisation) of passion, and tenacious commitment of decision/commitment. Consummate love can be easier or more difficult to form and maintain, depending on the relationship and the situation in which it is developed and maintained.

The triangular love theory can be extended taking account of greater complexity of love in close relationship by changing the geometry of love triangle or using multiple love triangle. The geometry of the love triangle depends upon two factors: amount of love and balance of love. The area represents amounts of love experienced in three hypothetical relationships: the larger the triangle, the greater the amount of experienced love. The balance between the three components is presented in the shape of the triangle. By changing both its area and its shape, the triangle of love can represent a wide variety of different kinds of relationships and the course of a close relationship over time. Love involves a great number of triangles rather than only one, only some of which are of major theoretical and practical interest, e.g. real vs ideal triangles, self vs other triangles, interactions among the love triangles.

## Biology of Love

Intense romantic love is a cross-culturally universal phenomenon (Aron, 2005). Fisher, Aron and Brown suggest that human romantic love engage a wide range of varying, overlapping and dynamic brain systems, as would be appropriate of a multifaceted phenomenon that has significant social, reproductive and genetic consequences (2006). Nevertheless, the primary neural correlates associated with intense, early-stage romantic love are likely to remain similar across individuals and cultures, even among species, because this neural mechanism evolved to direct a crucial aspect of mammalian reproduction, mate choice (Fisher, Aron & Brown, 2006).

## Evolution

Charles Darwin differentiated two types of sexual selection: intra-sexual selection, by which members of one sex evolve traits that facilitate direct competition with one another for mating opportunities; inter-sexual selection, by which individuals of one sex evolve traits that are preferred by members of the opposite sex, a process known as 'mate choice' (Darwin, 1871). Members of many species show mate preferences and focus their courtship energy on these preferred conspecifics (Fisher, Aron & Brown, 2006). The phenomenon of 'courtship attraction' is so common in nature that the ethological literature regularly uses several terms to describe it, including 'female choice', 'mate preference', 'individual preference', 'favouritisms', 'sexual choice' and 'selective proceptivity' (Andersson, 1994). In humans the neural mechanism associated with courtship attraction is developed, forming the physiological basis of what is commonly known as passionate love, obsessive love, 'being in love,' or romantic love (Fisher, Aron, Brown, 2006).

## Neurophysiology

Romantic love is associated with specific physiological, psychological and behavioural traits (Tennov, 1979; Hatfield & Sprecher, 1986; Fisher, 1998), including increased energy, focused attention, obsessive following, affiliative gestures, possessive mate guarding, goal-oriented behaviours and motivation to win a preferred mating partner (Fisher et al., 2002, 2002; Fisher, 2004). Romantic love begins as an individual starts to regard another individual as special and unique. This then leads to focused attention on the beloved, increase in the beloved's worthy traits and minimisation of the beloved's flaws (Fisher, Aron & Brown, 2006). The lover feels ecstatic if the love goes well, but depressed during times of adversity. Adversity and barriers intensify romantic passion, which has been referred to as 'frustration attraction' (Fisher, 2004). The lover experiences anxiety when apart from the beloved and sympathetic nervous system reactions when with the beloved, e.g. sweating and a pounding heart. (Fisher, Aron & Brown, 2006) Lovers are emotionally dependent on, empathic for the beloved and willing to sacrifice for the beloved (Fisher, Aron & Brown, 2006). The lover expresses sexual desire, intense sexual possessiveness and mate guarding for their beloved, but the lover's desire for emotional union supersedes his/her desire for sexual union with the beloved (Fisher, Aron & Brown, 2006). Most characteristic, the lover thinks obsessively about the beloved, 'intrusive thinking'. Rejected lovers first experience protest, during which they try to win back the beloved and often feel abandonment rage; then they move into resignation and despair (Fisher, Aron & Brown, 2006). Romantic love is also involuntary, hard to control and mostly temporary (Fisher, Aron & Brown, 2006).

Love may be characterised by a broad variety of changes of neurohormones and neuropeptides (e.g., oxytocin) that mediate attachment between individuals, social memory, and reward (Aron et al., 2005). Since romantic love has many features similar to mammalian courtship attraction, it has been hypothesised that this human preference system would also be connected with the monoamines, particularly elevated activity of central dopamine and/or central norepinephrine (Fisher 1998). It has suggested that mesolimbic dopamine pathways in the reward system of the brain trigger the pleasurable feelings, focused attention, motivation and goal-oriented behaviours associated

with romantic love (Fisher, Aron & Brown, 2006). However, activation of subcortical dopaminergic pathways of the VTA and caudate nucleus may involve only the 'general arousal' component (Pfaff, 1999) of this brain system for mate preference and mate pursuit (Fisher, 2004). Other neurotransmitters can be involved, including glutamate in the mesocortical system, due to their role in the release of dopamine in the VTA (Legault & Wise, 1999) and/or their fast signals in the prefrontal cortex regarding reward (Lavin et al., 2005). Central norepinephrine may also be associated with courtship attraction (Fisher, 1999) because increased activity of norepinephrine generally produces alertness, energy, sleeplessness and loss of appetite, increased attention, and increased memory for new stimuli, some of the primary characteristics of human romantic love (Tennov 1979; Hatfield & Sprecher 1986; Fisher 2004). As norepinephrine is also associated with peripheral sympathetic nervous system responses, including increased heart rate, sweating and trembling, central norepinephrine may contribute to these aspects of romantic love/courtship attraction as well (Fisher, 1998).

Romantic love is dissimilar to the sex drive (Aron & Aron, 1991; Fisher, 1998). The sex drive, characterised by the urge for sexual gratification, is associated with the androgens and oestrogens in non-primate mammalian species and primarily with the androgens in many primates, especially humans (Edwards & Booth, 1994; Sherwin, 1994; Van Goozen et al, 1997). Sex hormones may exert developmental effects on neural systems involved in social attachments and may mediate both genetic and environmental influences on the propensity to love and form attachments (Seshadri, 2016). However, the androgens are central to the sex drive and these gonadal and adrenal hormones have not been associated with human romantic love (Fisher, Aron & Brown, 2006). Several fMRI studies (Arnow et al, 2002; Beauregard et al, 2001) support the hypothesis that the sex drive is associated with specific networks of brain activation and that these networks are largely distinct from those associated with human romantic love/ mammalian courtship attraction. Animal studies also indicate that several brain structures are associated with the sex drive and sexual expression, including the medial amygdala, medial preoptic area, paraventricular nucleus and periaqueductal gray (Heaton, 2000), as well as the septum and the ventromedial hypothalamus (Dixson, 1998).

The psychological literature distinguishes between emotions (affective states of feeling) and motivations (brain systems oriented around the planning and pursuit of a specific want or need). Aron has proposed that romantic love is not primarily an emotion, but a motivation system which enable suitors to build and maintain an intimate relationship with a preferred mating partner (Aron & Aron, 1991; Aron et al, 1995). The VTA is directly associated with motivation- and goal-oriented behaviours, as is the caudate nucleus. Moreover, the caudate nucleus has widespread afferents from all of the cortex except primary visual areas and is organised to integrate diverse sensory, motor and limbic functions (Eblen & Graybiel, 1995). Thus, regions of the caudate nucleus could effectively integrate the behavioural and biological actions associated with a complex state, such as romantic love (Fisher, Aron & Brown, 2006).

These findings suggest that romantic love is a primary motivation system, a fundamental human mating drive (Fisher, 2004). Pfaff (1999) defines a drive as a neural state that energises and directs behaviour to acquire a particular biological need to survive or reproduce and he reports that all drives are associated with the activity of dopaminergic pathways and a few other specific neural systems (as well as other neural systems specific to each individual drive state). Romantic love has many features in common with drives (Fisher, 2004). (i) Like drives, romantic love is persistent, whereas emotion is temporary, (ii) romantic love is focused on a specific reward, whereas emotions are associated with a range of phenomena instead, (iii) romantic love is not associated with a distinct facial expression, whereas the primary emotions are all associated with specific facial expressions, (iv) romantic love is difficult to control and all of the basic drives are difficult to control, and (v) human romantic love and mammalian courtship attraction are associated with dopamine-rich neural regions and all the basic drives are also associated with dopaminergic pathways. Drives lie along a continuum. Thirst is almost impossible to control, while the sex drive can be redirected, even quelled. Romantic love is evidently stronger than the sex drive because when one's sexual overtures are rejected, people do not kill themselves or someone else (Fisher, Aron & Brown, 2006). Instead, abandoned lovers sometimes stalk, commit suicide or homicide or fall into a clinical depression (Fisher, Aron & Brown, 2006).

## People's View on Researches of Love

Though Kanekar (1989) suggested that not many people would care for a scientific analysis of love, he did not present any evidence. People's opinion toward researches about love is crucial in the further researches on love.

## Method

### Research Participants

Participants were students in Dulwich International High School Suzhou and their parents and teachers. There were 30 participants, 15 female participants and 15 male participants. 4 of them study psychology, and 11 study biology or chemistry. The age range of the participants are from 17 to 60, with a mean age of 29 and standard deviation of 12.6. There are 14 participants aged below 20, 4 aged between 21 and 30, 6 aged between 31 and 40, 3 aged between 41 and 50, 3 aged between 51 and 60.

## Material

The data is collected through in-depth interviews with the participants. The following questions are used in the interview.

Do you think love can be explained scientifically?

Are you interested in psychological researches on love?

Do you care about the neuroscience explanation of love?

What is love? An emotion or sentiment (Choice A)? Mate choice (Choice B)? Change in neurohormones and neuropeptides (Choice C)? A motivation or drive (Choice D)? Others (Choice E)?

The first question asks about participants' idea of explanations of love in general. The second and third questions are designed to find out people's opinions toward researches on love in two main disciplines, psychology and neuroscience. The last question is a multiple choice question; the choices are constructed based on different definitions of love found in other researches. According to Rubin (1970), Sternberg (1997) and Hatfield & Rapson (1986), love is a sentiment. Romantic love, 'courtship attraction' is referred to as 'mate choice' in the evolution point of view (Fisher, Aron & Brown, 2006). Other findings imply that love is a motivation or mating drive (Fisher, 2004).

## Procedure

The researcher asked the participants the questions in order and inquired the reason of the answers. The participants could give clear yes/no answers to the first three questions and explain the reasons for the answers, and they could either choose one or more among the choices given or give their own definitions in the last question. The interviews were recorded.

The answers and information of the participants are collected in Table 1.1 and coded as shown in Table 1.2.



# Result and Discussion

Table 1 and Table 2 shows the result of the interviews.

Contrary to the presumption of previous researcher (Kanekar, 1989), the majority of participants care for a scientific analysis of love. 16 (63.3%) participants believe love can be explained scientifically; 18 (60.0%) participants are interested in psychological researches on love; 16 (53.3%) participants care about the neuroscience explanation of love. More than half of the participants stick with the psychological description and accept that love is an emotion, nearly a quarter regard love as motivation or drive, and 20.0% of people think none of the give definitions can feature love.

The proportion of 'yes' to the first three questions decreases as the age of participants increases. As a participant said, 'I used to be interested in these researches, but these researches are mostly about romantic love. After I got married, I do not care about romantic love as much as I used to.' People become less interested in researches of love as they grow old. However, there is no strong correlation between understanding of love and age.

There is a larger proportion of female participants believe and show interest in researches on love than that of male participants, but they tend to neglect the neuroscience explanation which is more commonly accepted by male participants, since none of the female participant defines love as the change in neurohormones and neuropeptide.

# Table 1

	Number of answers	'Yes' for Question 1	'Yes' for Question 2	'Yes' for Question 3
Subject the participants study				
Psychology		1 (25.0%)	2 (50.0%)	3 (75.0%)
Biology/Chemistry		7 (63.6%)	6 (54.5%)	7 (63.6%)
Age of participants				
<21		10 (71.4%)	8 (57.1%)	8 (57.1%)
21-30		3 (75.0%)	3 (75.0%)	3 (75.0%)
31-40		3 (50.0%)	4 (66.7%)	3 (50.0%)
41-50		2 (66.7%)	2 (66.7%)	2 (66.7%)
51-60		1 (33.3%)	1 (33.3%)	0 (0.0%)
Gender of participants				
Female		11 (73.3%)	11 (73.3%)	7 (46.7%)
Male		8 (53.3%)	7 (46.7%)	9 (60.0%)
Overall		19 (63.3%)	18 (60.0%)	16 (53.3%)

Participants studying psychology does not have much confidence in scientific or psychological researches on love. 'I don't think love can be explained scientifically because love is not quantitative. There are too many individual differences which make it extremely difficult, if not impossible, to measure love.' Yet they still believe neuroscience is a part of the explanation of love.

Different from participants studying psychology, participants who study biology or chemistry are more inclined to the scientific approach of research on love. They care more about the neuroscience explanation than the psychology students do about the psychological researches on love, yet many of them only study the neuroscience of love as a subject of learning, but do not care about it in their personal lives.

3 (50%) participants aged between 31 and 40 chose more than one option in the last question. People in their thirties are more open to different definitions of love probably because they are transforming from the young to the old. Also, these participants are teachers, so they think more analytically about the question than other people.

## Table 2

	No. of answers	Choice A	Choice B	Choice C	Choice D	Choice E
Subject the participants study						
Psychology	2 (66.7%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (33.3%)
Biology/Chemistry	6 (54.5%)	0 (0.0%)	2 (18.2%)	1 (9.1%)	2 (18.2%)	2 (18.2%)
Age of participants						
<21	8 (57.1%)	1 (7.1%)	1 (7.1%)	3 (21.4%)	2 (14.3%)	2 (14.3%)
21-30	1 (25.0%)	0 (0.0%)	0 (0.0%)	2 (50.0%)	1 (25.0%)	1 (25.0%)
31-40	4 (66.7%)	0 (0.0%)	3 (50.0%)	1 (16.7%)	1 (16.7%)	1 (16.7%)
41-50	1 (33.3%)	0 (0.0%)	1 (33.3%)	1 (33.3%)	1 (33.3%)	1 (33.3%)
51-60	2 (66.7%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (33.3%)
Gender of participants						
Female	7 (46.7%)	1 (6.7%)	0 (0.0%)	4 (26.7%)	4 (26.7%)	4 (26.7%)
Male	9 (60.0%)	0 (0.0%)	5 (33.3%)	3 (20.0%)	2 (13.3%)	2 (13.3%)
Overall	16 (53.3%)	1 (3.3%)	5 (16.7%)	7 (23.3%)	6 (20.0%)	6 (20.0%)

# Evaluation

There are much more participants aged below 20 than participants of other age groups. The results are biased toward the young people's opinion about researches on love. The most participants aged between 41 and 60 are parents rather than teachers and students, who are less interested in researches on love. In some way, their opinions may reflect the general viewpoints of researches on love better because they do not have to read or write academic journals like most people in the society.

The sample is too small and does not have enough participants who study psychology. The result is inaccurate because four psychology students and teachers can not reflect the majority of psychologists opinions on theories of love.

There is only one participant who choose mate choice (Choice C) in the last question. Compare to the other options, mate choice is not effective enough to define general interpersonal love.

The sample is all taken from people related to Dulwich International High School Suzhou; the sample is not random, so the result may not reveal general people's view on researches of love. The result would be more reliable if the sample was taken from the whole city, but the cost of research would be much higher.

# Conclusion

A century ago, psychologists started researching on love, but not until 1970, psychometrics on love flourished. Rubin proposed a three-component theory of love and constructed a Love Scale and Liking Scale which differentiate love and liking. This is a significant breakthrough of psychometrics of love. Lee's typology of love distinguishes clearly the personal and social expression of the various conceptions of love, the various styles of loving involved in intimate adult affiliation. Later, the Hendrick assessed the typology and constructed Love Attitude Scale. Hatfield focuses on the passionate aspect of love and has boldly speculated about the universality of love and its neurophysiological basis (Kanekar, 1989). Sternberg's triangular theory of love is clever and simple; it combines all important features of other theory into a comprehensive triangle in which three vertexes represent three element of love. However, the three components of the Sternberg Triangular Theory of Love Scale are so very highly correlated, so a unifactorial measure (like Hatfield's Passionate Love Scale) which is likely to be better represented by a straight line rather than a triangle in the absence of adequate divergent validity (Hendrick and Hendrick, 1989).

Due to the invention and development of fMRI, love can also be examined in neuropsychology studies. In humans the neural mechanism associated with courtship attraction is developed to form the physiological basis of love. Love is 'an emergent property of an ancient cocktail of neuropeptides and neurotransmitters' (Seshadri, 2016). Mesolimbic dopamine trigger the pleasurable feelings, focused attention, motivation and goal-oriented behaviours experienced in romantic love. Gonadal hormones seem to be facilitatory but peripheral in love.

Most theories of love accept that love is a basic emotion (e.g. Hatfield & Rapson, 1993) However, the fMRI researches argue that love is a motivation system, a human mating drive, rather than an emotion. Love is persistent, and focused on a specific reward, but not associated with a distinct facial expression.

According to the result of the in-depth interview, researches on love is a topic of interest to a relatively large proportion of people. Yet still, people prefer the psychological researches on love to the neuroscience one.

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# Appendix

## Result Tables

Table 1-1

	Gender	Age	Subject	Q1	Q 2	Q 3	Q4
Participant 1	F	51 — 60		N	N	N	E
Participant 2	M	51 — 60		N	N	N	A
Participant 3	M	—20	C	N	N	N	A
Participant 4	F	—20		Y	Y	N	D
Participant 5	F	—20		Y	Y	Y	A/B
Participant 6	M	31 — 40		N	N	N	A/C
Participant 7	M	31 — 40		Y	Y	Y	A/C
Participant 8	F	41 — 50		Y	Y	Y	D
Participant 10	F	—20	B, C	Y	N	Y	A
Participant 9	F	31 — 40		Y	Y	N	D
Participant 11	F	—20	B, C	Y	Y	Y	E
Participant 12	F	—20	B, C, P	Y	Y	Y	A
Participant 13	M	—20	C	Y	Y	N	D
Participant 14	F	—20	B	Y	Y	N	A

Table 1-1

	Gender	Age	Subject	Q1	Q 2	Q 3	Q4
Participant 15	F	31 — 40	B	N	Y	Y	A
Participant 16	M	—20	C	Y	N	Y	C
Participant 17	F	—20	P	N	N	Y	E
Participant 18	M	31 — 40	B	Y	Y	Y	A/C
Participant 19	M	—20	P	N	N	N	A
Participant 20	F	21 — 30		Y	Y	N	D
Participant 21	M	—20	P	N	Y	Y	A
Participant 22	M	—20		Y	N	Y	D
Participant 23	F	—20		Y	Y	N	A
Participant 24	F	31 — 40	C	N	N	N	E
Participant 25	F	51 — 60		Y	Y	N	A
Participant 26	M	21 — 30	B	N	N	Y	E
Participant 27	M	21 — 30		Y	Y	Y	D
Participant 28	M	21 — 30		Y	Y	Y	A
Participant 29	M	41 — 50		N	N	N	E
Participant 30	M	41 — 50		Y	Y	Y	A/C

Table 1.2

Heading	Term	Code
Gender	Female	F
	Male	M
Subject	Biology	B
	Chemistry	C
	Psychology	P
Question 1 — 3	Yes	Y
	No	N
Question 4	An emotion or sentiment	A
	Mate choice	B
	Change in neurohormones and neuropeptides	C
	A motivation or drive	D
	Others	E