

## ABSTRACT

Title of Thesis: INVESTIGATING LIMERENCE:  
PREDICTORS OF LIMERENCE, MEASURE  
VALIDATION, AND GOAL PROGRESS

*Noah R. Wolf, Master of Science, 2017*

Thesis Directed By: Associate Professor, Edward P. Lemay, Jr.,  
Department of Psychology

Limerence is a love experience that involves an obsessive desire for romantic reciprocation from a specific other (the limerent object; LO), which manifests itself as intrusive cognitive preoccupation, emotional dependency, and apprehension. This investigation assessed the construct validity and reliability of a new measure of limerence and examined if various personality characteristics and goal pursuit decisions/outcomes were associated with limerence. College students completed 2 online questionnaires 1 month apart assessing limerence, various love states, personality characteristics, and goal pursuit. Findings suggest the new limerence measure is valid and reliable. Low self-esteem, attachment anxiety, low self-concept clarity, need to belong, validation-seeking goal orientation, social phobia, social interaction anxiety, and mind-wandering were found to be associated with limerence. The association between low self-esteem and limerence was found to be mediated mostly through social phobia and validation-seeking goal orientation. Goal importance and resources allocation mediated associations between limerence and goal progress.

INVESTIGATING LIMERENCE: PREDICTORS OF LIMERENCE, MEASURE  
VALIDATION, AND GOAL PROGRESS

by

Noah R. Wolf

Thesis submitted to the Faculty of the Graduate School of the  
University of Maryland, College Park, in partial fulfillment  
of the requirements for the degree of  
Master of Science  
2017

Advisory Committee:  
Dr. Edward P. Lemay, Jr., Chair  
Dr. Alexander J. Shackman  
Dr. Paul J. Hanges

© Copyright by  
Noah R. Wolf  
2017

## Dedication

This thesis is dedicated to Dorothy Tennov (1928 – 2007).

## Acknowledgements

I am extremely grateful for Dr. Edward Lemay's guidance throughout this process.

Thanks to Dr. Paul Hanges and Dr. Alexander Shackman for their helpful feedback and suggestions. Thanks to Eun Yi for assisting with data collection.

# Table of Contents

Dedication .....	ii
Acknowledgements .....	iii
Table of Contents .....	iv
List of Tables .....	vi
List of Figures .....	vii
Introduction .....	1
A Brief History of Love Research .....	2
Limerence .....	3
Passionate Love .....	5
The Differentiation of Limerence from Other Love States .....	6
Importance of Limerence Research .....	8
Replication of Past Work .....	9
Attachment theory and limerence .....	9
Self-esteem and limerence .....	10
Predictors of Limerence .....	11
Desire for social approval and social anxiety .....	11
Goal Orientation and Self-Concept Clarity .....	12
Mind Wandering .....	13
Exploratory Mediation Model .....	13
Limerence and Goal Pursuit .....	13
Measurement of Limerence .....	14
Summary of the Current Research .....	15
Method .....	16
Participants .....	16
Measures .....	16
Individual difference measures .....	16
Love and Limerence Measures .....	19
Nature of relationship with LO .....	22
Procedure .....	22
Results .....	23
Construct Validity of the New Measure of Limerence .....	23
Zero-order correlations .....	23
Confirmatory factor analysis .....	26
Post-Hoc analysis .....	27
Incremental Validity .....	29
Limerence and Mania .....	33
Test-Retest Reliability .....	34
Predictors of Limerence .....	34
Zero-order correlations .....	34
Prospective Analyses .....	36
Multiple Regression .....	37
Post-hoc Mediation Analysis .....	37

Effects of Limerence on Goal pursuit.....	38
Post Hoc Mediation Model.....	39
Discussion.....	42
References.....	48
Tables.....	55
Figures.....	64

## List of Tables

Table 1. p. 55

Table 2. p. 56

Table 3. p. 57

Table 4. p. 58

Table 5. p. 59

Table 6. p. 60



## List of Figures

Figure 1. p. 64

Figure 2. p. 65

Figure 3. p. 66

Figure 4. p. 67

## Introduction

In 1979 Dorothy Tennov introduced the term “limerence” to the scientific community through the publication of her book *Love and Limerence: The Experience of Being in Love*, which documented her scientific investigation of “being in love.” The investigation took place through interviews, the examination of personal diaries, and the administration of questionnaires. The result was the discovery of a condition characterized by cognitive obsession and emotional instability. People afflicted with this condition, limerence (who are referred to as “limerents” by Tennov), place an excessive amount of importance on establishing and maintaining a romantic bond with their love object (limerent object, or LO) and constantly fear rejection. In addition, the state of limerence is involuntary, intrusive, and relatively stable, with an average duration of 2 years.

The term limerence, although not entirely dismissed, was met with a tepid response from the scientific community. One paper praised the usefulness of the construct, and speculated on its utility in research on psychotherapy (Reynolds, 1983). However, little research on limerence beyond Tennov’s work exists. It seems only two studies have been published in the social sciences that go beyond discussing, or merely mentioning the term; a study linking limerence to anxious attachment (i.e., fears of abandonment by intimate partners; Feeney & Noller, 1990), and another associating limerence with perfectionism (Flett, Hewitt, Shapiro, & Rayman, 2001). Tennov (1999) reported that some academics actively dismissed limerence (p. ix.), and perhaps some did not entirely understand it. Indeed, within a decade there was a tendency to misconstrue limerence as being synonymous with other love related

terms. For instance, Sternberg (1986), when discussing his triangular theory of love, claimed that, “Infatuation is essentially the same as what Tennov (1979) calls ‘limerence’” (p. 124).

It is maintained here that limerence is not a term that should be used interchangeably with other love related terminology. Semantic issues brought about by love’s multitude of meanings impeded Tennov’s (1979) initial investigation. It was eventually realized that while some people reported obsessive preoccupation with their love interests, others did not (p. 15). However, both those who were obsessed with their love interest and those who weren’t used the word “love” to describe how they felt about their partner. This issue is what prompted the coining of limerence. Limerence was termed to differentiate a distinctive state of romantic obsession from other ways of experiencing love. Other states of loving, such as passionate love or infatuation, either hold similar properties of limerence that are not as thoroughly defined, or are absent of certain facets of limerence altogether. Before outlining the predictions tested in this current investigation of limerence, a history of love research is briefly summarized here.

### **A Brief History of Love Research**

Love has been discussed by psychologists for quite some time with notable theories occurring in early psychoanalytic texts. Notable theories include Freud’s (1959; 1961), view that love is characterized by sexual energy flowing outwards towards the love object, and Fromm’s (1956) idea that love exists in an immature form marked by selfish needs for symbiotic union, and a mature form marked by selflessness. Another early psychologist, Maslow (1962), viewed love as existing as

two forms that he termed Deficiency love (D-love) and Being love (B-love). Similar to Fromm's conceptualization of immature and mature love, D-love is a type of love born out of satisfying one's own needs, and B-love is a more developed and benevolent type of love.

Despite these early theories, love was not viewed as an acceptable subject for scientific investigation until Rubin's (1970) attempt to measure romantic love through the use of his newly formed love and liking scale. Shortly after, theories of love began to spring up that were based on scientific work. For instance, Lee (1977;1998) used a complex card sorting task to conclude that there were at least 9 different ways of loving. Also notable is Sternberg's (1986) triangular theory of love, which presents love as a triangle with commitment, intimacy, and passion assigned to one of the triangle's three apexes, with combinations of commitment, intimacy, and passion creating a total of seven different types of love.

### **Limerence**

Tennov's (1979) own research on the experience of love began in the 1960s. Information obtained from 800 surveys, personal diaries, and over 300 interviews culminated in the discovery of a mindset some people fall under when they are romantically interested in someone. This mindset, termed limerence, is characterized by cognitive obsession with the love object. Specifically, the limerent becomes obsessed with establishing a romantic bond with LO in the form of (a) a romantic relationship and (b) reciprocal romantic desire. Aspects of limerence include the following:

- An intense yearning to establish a romantic bond with LO that supersedes other concerns.
- Intrusive cognitive preoccupation with LO that includes anticipating future interactions with LO, replaying past interactions with LO, either for pleasure or in search for signs of LO's romantic desire, and fantasies of LO reciprocating romantic desire.
- Self-consciousness in the presence of LO that can range from general shyness to extreme apprehension, and an inordinate fear of being rejected as a relationship partner by LO.
- Acute sensitivity to LO's behaviors, including interpreting LO's behaviors as diagnostic of LO's level of romantic desire.
- Mood swings that are contingent on perceived likelihood that LO reciprocates or will reciprocate romantic desire.
- Awareness of being in an altered state of mind, and an inability to exit the limerent state or become limerent towards another LO.
- An aching sensation in the center of the chest.
- Downplaying of LO's negative attributes

Limerence usually begins with a trivial gesture from LO, such as a smile, that is interpreted as hidden affection. Following a period of euphoria at the prospect of LO harboring suppressed romantic feelings, steps are taken to decipher the way LO truly feels. Every interaction with LO is picked apart for evidence of suppressed romantic feelings, with even trivial actions from LO being attributed meaning. As thoughts of LO begin to intrusively preoccupy most of the limerent's thoughts, emotions become

increasingly tied to the perceived plausibility that LO wants a romantic relationship. The limerent state itself is involuntary and is sustained by a combination of hope that LO desires a romantic relationship, and uncertainty of LO's true feelings. When uncertainty of LO's true feelings is strong, the limerent cannot exit the state or become limerent towards another.

While Tennov (1979) interviewed some people who claimed that the course of limerence described their intrapersonal romantic experiences perfectly, others claimed the experience was foreign to them. However, both limerent and nonlimerent individuals used the word love to describe the way they felt towards their romantic interests. Limerence was therefore termed to differentiate the aforementioned state of obsessive preoccupation from other states of romantic love.

### **Passionate Love**

Hatfield and Walster (1978) believed that the multitude of views on romantic love from social scientists, and other theorists could be accommodated into a single term, passionate love, with the following definition: "A state of intense longing for union with another. Reciprocated love (union with the other) is associated with fulfillment and ecstasy. Unrequited love (separation) with emptiness; with anxiety or despair. A state of profound physiological arousal" (p. 9). In contrast, passionate love is distinct from another form of love believed to be experienced in romantic relationships, companionate love, which Hatfield and Walster defined as "friendly affection and deep attachment for someone" (p.2). This dichotomization of love has received support from various social scientists (e.g. Berscheid, 2010, Fehr, 2006) and has perhaps been the most utilized conceptualization of love in romantic relationship

research (Graham, 2010). Indeed, since Hatfield and Walster's discussion of passionate love, social scientists have attempted to assess the duration of passionate love (Hatfield, Pillemer, O'Brien, & Le, 2008; Tucker, & Aron, 1993), identify how it arises (Baumeister & Bratslavsky, 1999), how early in life it begins (Hatfield, Schmitz, Cornelius, & Rapson, 1988), and how it relates to marriage satisfaction (Aron & Henkemeyer, 1995). Research on passionate love has even extended outside of the social sciences. Anthropologists, for instance, have begun to investigate the prevalence of passionate love across cultures (Jankowiak & Fischer, 1992), and neuroscientists have attempted to identify its neurological basis (Bartels & Zeki, 2000; Ortigue, Bianchi-Demicheli, Hamilton, & Grafton, 2007).

### **The Differentiation of Limerence from Other Love States**

Out of all the varieties of love, passionate love has been given the most attention in the sciences (Regan, 2009). Limerence, on the other hand, has been largely ignored. This may be due to the fact that some view limerence to be a synonymous, and therefore redundant, term for passionate love (Aron & Acevedo, 2009; Fisher, Aron, Mashek, Li, & Brown, 2002). Although, on the surface, passionate love and limerence may seem to be equivalent, there are aspects of limerence that render it distinct from passionate love. For instance, limerent individuals are inordinately fearful of being viewed as an unsuitable relationship partner. Fear of rejection is not mentioned as being an aspect of passionate love, and it is not included in Hatfield and Sprecher's (1986) listing of passionate love components. Also absent from Hatfield and Sprecher's listing are any components dealing with apprehension in the romantic interest's presence, which is commonly

experienced when limerent, at least to some degree. These differences may reflect an uncertainty about reciprocation that characterizes limerence but not passionate love. Limerence is primarily an obsession with determining the degree to which romantic desire is reciprocated by LO. Uncertainty is what drives the limerent reaction; when certainty is reached, limerence ends. Nowhere is uncertainty discussed as an aspect of passionate love.

Not only is passionate love dissimilar from limerence in these ways, but the scale commonly used to measure passionate love, the passionate love scale (PLS), seems to be a poor tool for assessing limerence. For instance, the PLS seems to be measuring attachment (emotional bonding) in addition to passionate love (Langeslag, Muris, & Franken, 2013). Also, the PLS contains items that imply a relationship with the romantic interest exists, which are inappropriate for people who experience limerence outside of a relationship. The PLS does, however, contain some items measuring intrusive thinking of the romantic interest, an aspect of limerence. Aron and Acevedo (2009) performed a factor analysis on data sets utilizing the passionate love scale and found a second factor to emerge that included items pertaining to intrusive thinking, implying that the PLS does tap into an obsessive component. However, a meta-analytic factor analysis of several studies utilizing the most commonly used measures of romantic love found that the PLS loaded onto a “general love” factor which was comprised of most of the love measures included in the analysis (Graham, 2010). This factor represented aspects of love that are arguably distinct from limerence, such as liking, intimacy, and commitment. A second “obsession” factor emerged in this meta-analysis, which was comprised solely of the



Mania sub measure of Hendrick, and Hendrick's (1986) Love Attitudes Scale, which was designed to assess six of Lee's (1998) lovestyles. It seems that, while most measures of love seem to assess the same underlying variable, a second type of love that is characterized by obsession exists that only the Mania sub measure is capturing. Interestingly, limerence was found to be associated with the Mania submeasure in a past study (Feeney & Noller, 1990), indicating that the Mania submeasure may be capturing some aspects of limerence. These results suggest that passionate love may not be the same construct as limerence.

### **Importance of Limerence Research**

Even if limerence is a state distinct from passionate love, is this distinction important? There is reason to believe that it is. To the extent that passionate love is thought to be a common experience, at least to those in the beginning stage of a romance, experiences, cognitions, and behaviors associated with this state would not be considered a cause for concern, as they are taken to be part of a normal and fairly short-lived experience. In this case, confounding passionate love with limerence, a fairly stable and long-lasting state, could have potentially dangerous consequences. Some limerents have reported committing dangerous and/or extreme acts in order to gain attention from LO and others have reported becoming so depressed at the prospect of non-reciprocation to have contemplated suicide (Tennov, 1979). Mistaking these thoughts and behaviors as normal and/or common responses to romantic desire could undermine the attention and help an individual may need to manage the debilitating aspects of limerence. To the extent that limerence becomes so severe as to impair an individual's ability to function in society, clinical intervention

may be beneficial. But as long as limerence is conflated with trivial love experiences, clinical interventions may never be developed.

### **Replication of Past Work**

The fact that limerence is not experienced by everybody (Tennov, 1979, p. 15) suggests that there should be certain people who are more predisposed to experiencing limerence than others. Past research has found limerence to be associated with two constructs that involve negative self-views: attachment anxiety and low self-esteem (Feeney & Noller, 1990). The first purpose of this research is to replicate the past associations with limerence found by Feeney & Noller, 1990).

**Attachment theory and limerence.** Expanding on Bowlby's (1969, 1973, 1980) work on infant attachment, Hazan and Shaver (1986) proposed that adult romantic attraction could also be viewed as an attachment process. It was thought that individuals possess one of three types of attachment styles: Secure, anxious, and avoidant. Securely attached individuals have no problems giving or receiving love from others and manage their romantic relationships with a high degree of self-confidence. Anxious attachment describes those who desire love from their partner, but through lack of felt security, obsess and worry about if their partners truly love them. Lastly, those who are uncomfortable with intimacy and dependence are said to have an avoidant attachment style.

There are conceptual similarities between anxious attachment and limerence. Both are characterized by a desire to be close to another and a fear of rejection or abandonment, but, they are not entirely conceptually similar constructs. For instance, adult attachment styles denote a person's general beliefs and expectations about the

self and intimate relationships in general, but limerence is always experienced towards a specific person. However, the concern with interpersonal rejection that characterizes both constructs implies a positive relationship between anxious attachment and limerence (Hazan & Shaver, 1987). It may be that those with this attachment style are more prone to experiencing limerence than those with avoidant or secure attachment styles.

Evidence from past research has shown that limerence may indeed be related to anxious attachment. Feeney and Noller (1990) examined limerence and attachment styles using a revised version of Steffen, McInaney, and Hustedt's (1984) limerence measure and Hazan and Shaver's (1987) original 3-category measure of attachment styles. This research found that people with an anxious attachment style were most likely to experience limerence. The present research intends to replicate Feeney and Noller's work with a newly developed measure for limerence.

*H1: Anxious attachment will be positively associated with limerence.*

**Self-esteem and limerence.** Self-esteem, another construct involving self-views, has been found to be associated with attachment anxiety (Feeney & Noller, 1990). In addition, the aforementioned research by Feeney and Noller (1990) also found low self-esteem assessed with the adult version of the Coopersmith Self-Esteem Inventory (1967) to be related to two aspects of limerence: anxiety and emotional dependency. The present research intends to replicate Feeney and Noller's

work with the aforementioned newly developed measure for limerence and the Rosenberg (1965) self-esteem scale.

*H2: Self-esteem will be inversely associated with limerence.*

### **Predictors of Limerence**

The second purpose of this research was to identify other additional individual differences that may be correlated with experiencing limerence. Feeney and Noller's (1990) finding that negative self-evaluations are associated with limerence lays an important foundation for identifying other personality characteristics associated with limerence. The present research examines several additional personality characteristics that may be predictive of limerence.

**Desire for social approval and social anxiety.** Limerence reflects a strong desire to be accepted by the LO, which is so strong that it produces apprehension in the presence of the LO and fear of rejection. These qualities of limerence suggest new predictions regarding individual differences that may predict proneness to limerence. Specifically, people who tend to have a strong desire for approval generally, as well as those who tend to be anxious about rejection generally (i.e., those high in social anxiety) may be prone to developing limerence.

*H3: Desire for social acceptance will be positively associated with limerence.*

*H4: Social Anxiety will be positively associated with limerence.*

**Goal Orientation and Self-Concept Clarity.** In achievement settings, Dweck (1988) proposed that people either strive to validate their abilities (performance goals) or develop them (learning goals). Dykman (1998) has extended Dweck's model outside of achievement settings to apply to personal goals individuals strive for. Dykman proposed that individuals with a growth seeking orientation primarily have self-improvement goals and view challenging events as opportunities to learn and improve. In contrast, individuals with a validation seeking orientation primarily have goals aimed at demonstrating one's value as a person, and view challenging situations as tests of one's self-worth.

Individuals who develop a validation-seeking orientation are thought to have low self-concept clarity and have self-esteem that is contingent on external sources, such as achievements and social approval (Dykman, 1998). These individuals seek to resolve uncertainty about themselves and regulate feelings of self-worth by seeking successes and social approval, and avoiding failure or interpersonal rejection, which produces strong affective reactions. These individuals may seek reciprocation of romantic interest as an important source of validation and reassurance, which may foster limerence.

*H5: Self-concept clarity will be inversely associated with limerence.*

*H6: Validation seeking goal orientation will be positively associated with limerence.*

**Mind Wandering.** Finally, as limerence is characterized by intrusive thoughts of and preoccupation with LO, which indicates low cognitive control, cognitive control deficits should predict more limerence. Mind wandering is one marker of this cognitive control deficit examined in the current research.

*H7: Mind wandering will be positively associated with limerence.*

**Exploratory Mediation Model.** Several of the hypothesized predictors of limerence described above may be associated with self-esteem and serve as mechanisms through which self-esteem predicts proneness to limerence. Those with low self-esteem often desire approval from others (Leary, Tambor, Terdal, & Downs, 1995), seek validation from others (Dykman, 1998), are socially anxious (Leary, Kowalski, & Campbell, 1988), and have less clearly defined self-concepts (Campbell, 1990). In the current research we explore whether these variables function as mediators of the link between self-esteem and limerence.

### **Limerence and Goal Pursuit**

The third purpose of this research is to examine the effects of limerence on goal pursuit. The goal of obtaining a romantic bond with LO is so important to limerent individuals that it takes precedence over other personal strivings. Tennov (1979, p. 46) reported that limerent individuals become increasingly concerned with activities that are perceived to enhance their desirability to LO. Related to the limerent's goal priorities is research that has shown that alternative goals pull resources away from focal ones (Shah & Kruglanski, 2002). In order to protect

resources allocated to focal goals, individuals engage in a process of inhibiting alternative goals (Shah, Friedman, & Kruglanski, 2002). Assuming the focal goal of limerent individuals is to obtain a romantic bond with LO, alternative goals that are unrelated to this are not likely to be given many resources, and progress on these goals is likely to suffer. In contrast, goals related to obtaining reciprocation are likely to receive many resources. These dynamics lead to following predictions:

*H8: Limerence will be associated with importance placed on the goal to obtain/maintain a relationship with LO.*

*H9: Limerence will be inversely associated with reported progress on personal goals perceived to be unrelated to the goal of obtaining a romantic bond with LO and this effect will be mediated by reduced resource allocation.*

*H10: Limerence will be positively associated with reported progress on personal goals perceived to be related to the goal of obtaining a romantic bond with LO and this effect will be mediated by increased resource allocation.*

### **Measurement of Limerence**

The fourth purpose to this research concerns the psychological assessment of limerence. To date, no scale has been published that assesses the presence of the limerent state in individuals. Therefore, a previous study was conducted in order to construct a scale that could measure limerence (Wolf & Lemay, 2015). In this study, exploratory factor analyses performed on responses from 455 participants on 87 items designed to assess the components of limerence outlined by Tennov (1979, p. 23-24)

resulted in 8 factors that comprise this measure: Intrusive thinking of LO, apprehension in LO's presence, uncertainty of LO's feelings, inability to become nonlimerent, inability to be limerent towards more than one person, elation when reciprocation seems evident, idealization of LO, and aching in the chest. The factor structure replicated across current and past formats (each item had an alternate past tense wording for distribution to people who were not currently romantically interested in anyone) and in another sample of 455 participants. Items from all 8 factors comprise the final 30 item limerence scale. The present research sought to assess the validity and reliability of this measure.

### **Summary of the Current Research**

This investigation involved two online surveys. The first survey consisted of the new Wolf and Lemay (2015) limerence measure and a battery of personality measures to assess hypotheses 1 through 7. Hypotheses 8 through 10 were assessed by asking participants to list and report on goals they perceived to be related and unrelated to establishing or maintain a romantic relationship with their romantic interest. The Wolf & Lemay (2015) limerence measure was also administered along with a previously unpublished measure of limerence by Steffen et al. (1984) and a battery of other love measures to assess the validity of the new measure. The second online survey was emailed to participants one month later to assess prospective effects of personality traits and goal progress, and the test-retest reliability of the Wolf & Lemay (2015) limerence measure.



## Method

### Participants

Six-hundred and twenty undergraduate students (254 Male, 366 Female) from the University of Maryland, College Park were recruited via the University of Maryland SONA system in exchange for class credit in their psychology class and/or entry into a raffle for a 50\$ and 100\$ Amazon.com gift card, depending on the time of the semester. The average age of all participants was 19.63, with a majority of participants identifying as White (58%), followed by Asian (21%), Black/African American (14%), Hispanic/Latino/Latina (7%), Native Hawaiian or Other Pacific (< 1%). Four hundred and twenty-three participants (151 Male, 286 Female) completed the second survey. The mean age of these participants was 19.63 with the racial distribution remaining largely the same. Participants were required to have a current romantic interest in order to participate.

### Measures

**Individual difference measures.** *Trait Self-esteem:* Participants completed Rosenberg's Self-Esteem Scale (10 items; Cronbach's  $\alpha = .90$ ; Rosenberg, 1965) on a 7 point response scale (1 = *Strongly Disagree*; 7 = *Strongly Agree*). Example items from the scale are "I wish I could have more respect for myself," and "On the whole, I am satisfied with myself."

*Goal Orientation:* Participants completed the Goal Orientation Inventory (Validation-Seeking subscale: 18 items; Cronbach's  $\alpha = .96$ ; Growth-Seeking

Orientation: 10 items; Cronbach's  $\alpha = .96$ ; Dykman, 1998), which assess growth and validation seeking goal orientations, on a 7 point scale (1 = *Strongly Disagree*; 7 = *Strongly Agree*). Example items are "One of the main things I know I'm striving for is to prove that I'm really 'good enough'," and "My attitude toward possible failure or rejection is that such experiences will turn out to be opportunities for growth and self-improvement."

*Attachment Insecurity*: Participants completed the Experiences in Close Relationships-Revised Questionnaire (Anxiety Subscale: 18 items; Cronbach's  $\alpha = .93$ ; Avoidance Subscale: 18 items; Cronbach's  $\alpha = .93$ ). Brennan, Clark, and Shaver (1998) described this measure as being able to represent all extant attachment measures while increasing measurement precision. An example statement is, "I rarely worry about my partner leaving me." Participants responded with a 7 point response scale (1 = *Strongly Disagree*; 7 = *Strongly Agree*).

*Desire for acceptance from others*: To measure desire for acceptance from others participants completed the Desire for Interpersonal Value Scale (11 items; Cronbach's  $\alpha = .89$ ; Lemay & Spongberg, 2015) which assesses an individual's desire to be valued by others. Example items include "I very much want to be loved by other people," and "I am interested in being supported by others," and the Need to Belong Scale (10 items; Cronbach's  $\alpha = .81$ ; Leary, Kelly, Cottrell, & Schreindorfer, 2013). Example items include "I try hard not to do things that will make other people avoid or reject me" and "I seldom worry about whether other people care about me." Items were completed on a 7 point response scale (1 = *Strongly Disagree*; 7 = *Strongly Agree*).

*Mind Wandering:* Mind wandering was assessed with the Mind-Wandering Questionnaire (5 items; Cronbach's  $\alpha = .86$ ; Mrazek, Phillips, Franklin, Broadway, and Schooler's (2013). The Mind Wandering Questionnaire is designed to assess trait levels of mind wandering. An example item is "I find myself listening with one ear, thinking about something else at the same time." Items were completed on a 7 point response scale (1 = *Strongly Disagree*; 7 = *Strongly Agree*).

*Self-Concept Clarity:* Self-concept clarity was assessed with the Self-Concept Clarity Scale (12 items; Cronbach's  $\alpha = .89$ ; Campbell, Trapnell, Heine, Katz, Lavalle, & Lehman, 1996), which assess the clarity, consistency, and stability of self-beliefs. Example items are "I sometimes think I know other people better than I know myself," and "My beliefs about myself seem to change very frequently." Participants responded on a 7 point response scale (1 = *Strongly Disagree*; 7 = *Strongly Agree*).

*Goal Progress:* Participants were asked to rate how important it is that they establish (if the participant reported not being in a relationship with their romantic interest) a romantic relationship with their romantic interest, or maintain (if the participant reported being in a relationship with their romantic interest) their relationship with their romantic interest on a scale from 1 to 7 (1 = *Not At All Important*, 7 = *Extremely Important*). Participants were then asked to list two personal goals they have that are related to establishing or maintaining a romantic relationship, and two goals they have that are unrelated to establishing/maintaining a romantic relationship. Each participant was then instructed to assign point values to each of the 4 goals they listed to represent the amount of resources that they invested into that goal in the past month. Participants were instructed to distribute precisely

100 points across the 4 goals. Lastly, participants were asked to report how much progress they feel they had made on each of those goals, and how much progress they felt they have made on the goal to establish/maintain a relationship with their romantic interest on a scale from 1 to 100 (1 = *No Progress*, 100 = *A Lot of Progress*). The variable for goal progress on goals related to establishing/maintaining a relationship was computed by taking the mean of reported progress on the two goals participants listed as goals that were related to establishing/maintaining a relationship with their romantic interest. The variable representing progress on goals unrelated to establishing/maintaining a relationship was computed in the same way - by taking the mean of reported progress on the two goals participants listed as goals that were related to establishing/maintaining a relationship with their romantic interest. The same approach was taken for the variables representing resource allocation. The variable representing resource allocation to goals related to establishing/maintaining a relationship was computed by taking the mean of reported resource allocation between the two goals participants listed as being related to establishing/maintaining a relationship with their romantic interest. The variable representing resources allocated to goals unrelated to establishing/maintaining a relationship was computed in the same way - by taking the mean of reported resource allocation to the two goals participants listed as goals that were related to establishing/maintaining a relationship with their romantic interest.

**Love and Limerence Measures.** Prior to completing the surveys below, participants were instructed to type in the name of their current romantic interest. Romantic interest was defined as “Someone you are romantically attracted toward.”

Participants were told that they did not have to be in a romantic relationship with their romantic interest, but they were instructed to keep the same romantic interest in mind when responding, and the name of the participant's romantic interest was piped in electronically when an item referred specifically to the romantic interest. For instance, the blank in the following item from the Passionate Love Scale was replaced with the name of romantic interest "I feel happy when I am doing something to make \_\_\_ happy."

*Limerence:* Participants were given the new limerence measure that was developed in a previous study (30 items; Cronbach's  $\alpha = .89$ ; Wolf & Lemay, 2015), as well as Steffen's (1993) 39-item revised measure of limerence (Cronbach's  $\alpha = .86$ ). Example items from Wolf and Lemay's (2015) limerence measure include "I never seem to be 100% sure how this person feels about me" and "None of this person's negative attributes bother me." The items were completed on a 7 point response scale (1 = *Strongly disagree*; 7 = *Strongly agree*). Example items from Steffen's measure include "When I'm strongly attracted to someone, I interpret the meaning of their every action, looking for clues about their feelings toward me," And "I love everything about the person to whom I am strongly attracted."

*Lovesstyles:* Participant's lovestyle (Eros, Ludus, Storge, Pragma, Mania, & Agape) were assessed with the Love Attitudes Scale (Hendrick & Hendrick, 1986). Participants responded to items on a 7 point scale (1 = *Strongly Disagree*; 7 = *Strongly Agree*). Example items include "My partner and I have the right physical 'chemistry' between us" (Eros; romantic love; Cronbach's  $\alpha = .76$ ), "I can get over love affairs pretty easily and quickly" (Ludus; game-playing love; Cronbach's  $\alpha =$

.72), “It is hard to say exactly where friendship ends and love begins” (Storge; friendship love; Cronbach’s  $\alpha = .72$ ), “I consider what a person is going to become in life before I commit myself to him/her” (Pragma; practical love; Cronbach’s  $\alpha = .76$ ), “When my lover doesn't pay attention to me, I feel sick all over” (Mania; obsessive love; Cronbach’s  $\alpha = .75$ ), “I am usually willing to sacrifice my own wishes to let my partner achieve his/hers” (Agape; self-less love; Cronbach’s  $\alpha = .86$ ).

*Passionate Love:* Participants completed the Passionate Love Scale (30 items; Cronbach’s  $\alpha = .96$ ; Hatfield & Sprecher, 1986) on a 7 point response scale (1 = *Strongly Disagree*; 7 = *Strongly Agree*). Example items include “I feel happy when I am doing something to make \_\_\_ happy,” and “I’d get jealous if I thought \_\_\_ were falling in love with someone else.”

*Love and Liking:* Participants completed the Love and Liking Scale (Loving Subscale: 13 items; Cronbach’s  $\alpha = .90$ ; Liking Subscale: 13 items; Cronbach’s  $\alpha = .90$ ; Rubin, 1970) on a 7 point response scale (1 = *Strongly Disagree*; 7 = *Strongly Agree*). An example item from the Love Scale is “I would do almost anything for \_\_\_.” An example item from the Liking Scale is “When I am with \_\_\_, we are almost always in the same mood.”

*Triangular Love:* Participants completed an abridged version of the Triangular Love Scale (Sternberg, 1997) on a 7 point response scale (1 = *Strongly Disagree*; 7 = *Strongly Agree*). The scale contains items assessing intimacy (12 items; Cronbach’s  $\alpha = .95$ ), passion (12 items; Cronbach’s  $\alpha = .91$ ), and commitment (12 items; Cronbach’s  $\alpha = .94$ ). Example items are “I have a warm and comfortable relationship

with \_\_\_\_\_,” “I cannot imagine another person making me as happy as \_\_\_\_\_ does,” and “I will always feel a strong responsibility for \_\_\_\_\_.”

**Nature of relationship with LO.** Participants were also asked to list the average amount of time spent with LO that week, the average amount of time spent thinking about LO that week, and the average amount of time LO occupies their thoughts that week. Participants responded on a sliding response scale from 1 to 100 (1 = *None*; 100 = *A lot*).

### **Procedure**

Participants completed the aforementioned measures online via the survey distribution platform Qualtrics.com. After completing the online survey, participants were sent a reminder email one month later with a link to take a second online survey. This survey included the Wolf and Lemay (2015) limerence measure, the measures assessing goal importance, progress, and resource allocation regarding goals the participant listed in the last survey, and a debriefing sheet at the end. Participants were informed that they must complete the second survey within 48 hours in order to receive credit and/or be eligible for entry for a raffle a gift card and were reminded via email and phone to complete the follow-up survey if they had not taken it the day the follow-up survey was sent out. In reality, participants could complete the survey up to a week before they were no longer eligible to receive credit or for entry into the raffle, and data from the second survey was not used if participants completed the survey more than a week from when they were sent the follow-up survey. Based on these criteria, 437 of the 620 participants provided usable data from the follow-up survey.

## Results

### **Construct Validity of the New Measure of Limerence**

The analysis strategy established a-priori to assess the construct validity of the new limerence measure consisted of two steps. The first step involved examining the zero-order correlations between the new limerence measure and the love measures, which is a strategy typically used to assess a measure's construct validity. In general, the new limerence measure should correlate strongly with measures tapping obsessive qualities of love. These measures include the limerence measure by Steffen (1993) and the Mania submeasure of the Love Attitudes Scale. Some items on the Passionate Love Scale also tap into obsession (Acevedo and Aron, 2009), but the scale as a whole generally seems to assess a non-obsessive type of love (Graham, 2010). The new limerence measure should also be uncorrelated, or weakly correlated with measures unrelated to romantic obsession. These measures include the Storge, Agape, Pragma, and Ludus measures from the Love Attitudes Scale. The second step involved a more formal test of convergent and discriminant validity using Confirmatory Factor Analysis (CFA), as described by Cole (1987). This step involves using CFA to replicate the higher-order factor structure of the love measures described by Graham (2010) and, once replicated, adding a limerence latent factor in order to assess convergent validity via factor loadings, and discriminant validity via inter-factor correlations (Cole, 1985).

**Zero-order correlations.** In accordance with step one of the analysis strategy described above, zero-order correlations between the new limerence measure at time 1 (T1) and time 2 (T2) and the love measures were examined (Table 1).



Interpretations of the strength of the correlation were based on Cohen's (1977) standard for interpreting effect size (e.g. small  $r = .10$ , medium  $r = .30$ , and large  $r = .50$  effects). Concerning convergent validity, the new limerence measure was expected to correlate strongly with Steffen's (1993) Limerence Survey and Mania. In accordance, the correlation between the new measure of limerence and Mania was high (T1 & T2) and the correlation between the new measure of limerence and Steffen's Limerence Survey was moderately high for limerence assessed at time 1 and moderately high for limerence assessed at time 2. Concerning discriminant validity, the new limerence measure was predicted to correlate weakly with the measures of Storge, Ludus, and Pragma, if any correlation at all. As predicted, the new limerence measure at time 1 correlated weakly with Storge and Pragma, and did not correlate at all with Ludus. No correlation existed between Storge, Pragma, and Ludus and the new limerence measure at time 2. Correlations observed between the new limerence measure and the remaining love measures also mostly accorded to expectations. The new limerence measure was expected to correlate more strongly with the Love submeasure of Rubin's (1970) Love and Liking Scale than the Liking submeasure, and such was the case. Additionally, the moderate correlations expected between the new limerence measure and the three submeasures of Sternberg's (1997) Triangular Love Scale (intimacy, passion, and commitment) were supported by the data, with exception to a moderately high correlation between the new limerence measure assessed at time 1 and the Passion subscale and a high correlation between the new limerence measure assessed at time 2 and the Passion subscale, which is not surprising, given that, out of the three subscales, passion is the most conceptually

similar to limerence in that it includes items related to elation as well as idealization and intrusive thinking of the romantic interest. A moderately high correlation was expected between the new limerence measure and the passionate love scale. The passionate love scale did correlate with the new limerence measure, but this correlation was much higher than predicted for the new limerence measure assessed at time 1 and time 2. In fact, the passionate love scale correlated more strongly with the new limerence measure than did Steffen's Limerence Survey and Mania. No predictions were made of the new limerence measure's correlation with Agape, of which there was a moderately high correlation between the new limerence measure assessed at time 1 and a high correlation between the new limerence measure assessed at time 2. Although previous literature is scant on discussion of limerence in terms of caring for LO, it could be the case that in the midst of limerents' seemingly self-centered obsession with reciprocated desire, limerents also deeply care for LO, which is entirely plausible, given the high degree of affection limerents report feeling towards LO. The correlations between the new limerence measure and the love measures hypothesized a priori to be highly to moderately correlated with limerence were averaged together to comprise a single index of the correlations hypothesized to represent convergent validity, and, in addition, the correlations between the love measures hypothesized to have a low, or no, correlation with limerence were averaged together to create a composite index of the correlations hypothesized to represent discriminant validity. Steiger's  $Z$  (Steiger, 1980) was then computed to test if the correlation between the new limerence measure and these two indices were significantly different from each other. They were (T1:  $Z_H = 7.41$ ; T2:  $Z_H = 7.04$ ,  $p <$

.001), indicating that there was no overlap between correlations hypothesized to represent convergent and discriminant validity. In sum, these results provide good indication of the convergent and discriminant validity of the new limerence measure.

**Confirmatory factor analysis.** As described in the analysis strategy above, we attempted a more formal test of convergent and discriminant validity using CFA. The first phase of this process involved replicating the higher-order factor structure described by Graham (2010). Scores on most of the love measures were modeled as loading on what Graham described as a “general love factor.” The liking subscale of Rubin's (1970) Love and Liking Scale, Eros, Ludus, and Agape subscales of the Love Attitudes Scale, Passionate Love Scale, and Passion, Intimacy, and Commitment subscales of the Triangular Love Scale were modeled as indicators loading onto this factor. Additionally, the Mania subscale of the Love Attitudes Scale served as an indicator loading onto a second “Mania” factor. Next, the Storge and Pragma subscales were modeled as indicators loading onto what Graham referred to as a “Practical Friendship” factor. Lastly, correlations among all three latent factors were modeled. To increase the number of indicators for some of the latent factors, the Mania, Storge, and Pragma subscales of the Love Attitudes Scale and Steffen's (1993) measure of limerence were divided into three items parcels each (Floyd & Widaman, 1995).

After achieving model fit, the next step was to add a separate limerence factor to the model comprised of loadings from the limerence measure by Wolf and Lemay (2015) and the unpublished limerence measure by Steffen (1993). Following Cole (1985), factor loadings would be examined to assess convergent validity and inter-

factor correlations would be examined to assess discriminant validity. Correlations among all four of the latent factors would be modeled with the expectation that scores on the Wolf and Lemay (2015) limerence measure would load strongly and significantly on the limerence factor, providing evidence for convergent validity. Additionally, discriminant validity is suggested for limerence when correlations of the limerence factor with the general love, practical love, and manic love factors are significantly less than unity, as this pattern would suggest that limerence is not the same construct as general love, practical love, or mania (see Cole, 1985). However, the utility of these analyses is contingent on the ability of our data to replicate the higher-order factor structure described by Graham (2010). The CFA of the three factor structure modeled in accordance with Graham's factor solution failed to achieve model fit on all three indices selected a priori for assessing the fit of the model  $GFI = .84$ ,  $AGFI = .77$ ,  $RMSEA = .13$ . In an attempt to fit the model, modification indices were examined and additional models were tested that included revisions suggested by observance of the modification indices that were conceptually justified. For instance, some additional models that were tested modeled covariance between the passionate love indicator and mania indicators and covariance between some of the indicators loading onto general love. Despite these attempts to fit the model, acceptable model fit was never achieved, and ultimately the convergent and discriminant validity of limerence was unable to be tested using the CFA procedures outlined by Cole (1985; 1987).

**Post-Hoc analysis.** Because CFA analysis on the current data could not replicate Graham's (2010) factor solution, we reverted to Principle Components

Analysis (PCA) in an attempt to find a factor structure that our data supported. If the limerence measures were to load together onto their own factor, separate from other measures of love, this would provide additional support for the convergent and discriminant validity of the limerence measures. We ran two PCAs in total. The first PCA included only the love measures retained in Graham's PCA solution, which excluded limerence and, due to convergence issues reported by Graham (2010), the Love submeasure of Rubin's (1970) Love and Liking Scale. Analysis of the scree plot suggested extracting three factors. Three factors were extracted with oblique oblimin rotation and the results are displayed in Table 2. The factor loadings of the love measures are consistent with Graham's (2010) PCA solution, with the exception that Ludus loaded more highly onto the mania factor than the general love factor in the current data, which is not an extreme deviation from Graham's solution, as Graham still observed a high loading of Ludus onto the mania factor in his data, despite Ludus loading more highly onto the general love factor.

The second PCA included the two limerence measures in addition to the love measures analyzed in the previous PCA. Results are displayed in Table 3. Once again, the scree plot suggested a three factor solution. With the limerence measures included, the factor loadings diverge a bit more strongly from Graham's (2010) solution in that Storge now loaded more strongly onto factor 1, which still seems to represent a "general love" factor, and Ludus now loaded with Pragma to comprise a third factor and perhaps changing the interpretation of this third factor from what Graham (2010) called "practical friendship" to a factor more strongly representing emotionless love. But regardless, the limerence measures would still not be expected

to load onto this factor, as limerence is still conceptually dissimilar from factor 3. The limerence measures did indeed load together onto a separate factor as expected, but also along with Mania, which is not surprising, given that both are characterized by obsessive qualities and items on the Mania submeasure include behaviors Tennov (1979) described as being characteristic of limerence (e.g. intrusive thoughts, emotional instability, suicide, etc.). This PCA seems to add further support to the convergent and discriminant validity of limerence, as the factor structure indicates the limerence measures with Mania to represent a unique type of love experience.

**Incremental Validity.** It was initially planned that incremental validity would be assessed by regressing goal progress onto each of the love measures, but given the complicated relationship between limerence and goal progress, goal importance ratings were used as the outcome variable instead. Relationship maintenance goal importance and relationship establishment goal importance were regressed onto each of the love measures separately. Next, the new limerence measure assessed at time 1 was added as a covariate to these models. The  $R^2$  and  $R^2$  change for these regressions are displayed in Table 4. Adding the new limerence measure as a predictor did not produce a significant  $R^2$  change for the models using The Passionate Love Scale and the Passion subscale of the Triangular Love Scale as a predictor. But, with exception to the Love subscale of the Love and Liking Scale, the new limerence measure did produce significant  $R^2$  change in all other models. Depending on the model, the new limerence measure added a range of 2 to 19 percentage points to the predictive power of the models. Each individual love measure was also regressed onto additional self-report outcomes regarding LO, and, as before, limerence was added as a covariate to

these models to assess  $R^2$  change (Table 5). With exception to passionate love, limerence produced significant  $R^2$  change in models predicting time spent thinking of LO. Additionally, with exception to Storge, Ludus, and Steffan's (1983) limerence survey, limerence produced significant  $R^2$  change in models predicting time spent with LO and attention received from LO. Including limerence as a covariate in these models increased the predictive power of these models by a range of 1 to 12 percentage points.

Relationship maintenance goal importance and relationship establishment goal importance were also regressed onto all of the love measures and the new limerence measure assessed at time 1 simultaneously. When relationship establishment goal importance was regressed onto the love measures and the limerence measure assessed at time 1, only the Eros subscale from the Love Attitudes Scale ( $\beta = .34, p < .01$ ) and the commitment measure of the Triangular Love Scale ( $\beta = .48, p < .01$ ) were significant predictors of establishment goals, although Steffen's (1993) Limerence Survey had a marginal effect ( $\beta = .36, p = .051$ ). When relationship maintenance goal importance was used as the outcome, passionate love was the only significant predictor ( $\beta = .29, p < .05$ ). Follow-up multiple regressions used the mean of the love measures that comprised the three factor loadings in the PCA that included Graham's (2010) factor solution and limerence as predictors of relationship establishment goal importance and relationship maintenance goal importance. First these outcomes were regressed onto the mean of the love measures that comprised the "General Love" factor and the mean of the love measures that comprised the "Pragmatic/Emotionless Love" factor simultaneously. The General Love factor predicted relationship

maintenance goal importance ( $\beta = .66, p < .001$ ) and establishment goal importance ( $\beta = .43, p < .001$ ), and the Pragmatic/Emotionless Love factor only predicted relationship maintenance goals ( $\beta = -.09, p = .02$ ). The  $R^2$  for the model predicting relationship maintenance goal importance was .46 and the  $R^2$  for the model predicting relationship establishment goal importance was .43. Next, the mean of the measures comprising the "Limerence" factor was added to both of these models. In both models, the change in  $R^2$  (maintenance importance:  $R^2$  change = .01; establishment importance:  $R^2$  change = .001) was not significant  $p > .05$  and the Limerence factor did not predict importance of relationship maintenance ( $\beta = .04$ ) or relationship establishment ( $\beta = -.01$ ) goals  $p > .05$ .

Additional multiple regressions used time spent with LO, time spent thinking of LO, and attention received from LO as outcomes in a multiple regression onto all love measures and the new limerence measure assessed at time 1 simultaneously. Concerning time spent with LO, the new limerence measure was the most significant predictor ( $\beta = -0.15, p = .01$ ), followed by the Love subscale of the Love and Liking Scale ( $\beta = .21, p = .02$ ), the Passionate Love Scale ( $\beta = -.21, p = .04$ ), the Mania subscale from the Love Attitudes Scale ( $\beta = .13, p = .04$ ), and the Eros subscale from the Love Attitudes Scale ( $\beta = .12, p = .05$ ). All other measures did not reach statistical significance ( $p > .05$ ). Concerning time spent thinking of LO, the Passion subscale from the Triangular Love Scale was the most significant predictor ( $\beta = .38, p < .001$ ), followed by the Mania submeasure from the Love Attitudes Scale ( $\beta = .16, p = .01$ ), and the Liking subscale from the Love and Liking Scale ( $\beta = -.15, p = .004$ ). None of the other love measures, including the new measure of limerence reached



statistical significance ( $p > .05$ ). Concerning attention received from LO, the Intimacy subscale from the Triangular Love Scale ( $\beta = .46, p < .001$ ) and the Liking subscale from the Love and Liking Scale ( $\beta = -.17, p < .001$ ) were the most significant predictors, followed by the Eros subscale from the Love Attitudes Scale ( $\beta = .17, p = .001$ ), the new limerence measure ( $\beta = -.16, p = .002$ ), and Steffen's Limerence Survey ( $\beta = -.11, p = .02$ ). These outcomes were also regressed onto the mean of the love measures that comprised the "General Love" factor and the mean of the love measure comprising the "Pragmatic/Emotionless Love" factor simultaneously and then the mean of measures comprising the "Limerence" factor was added as a covariate to assess  $R^2$  change. The  $R^2$  for the model predicting time spent with LO was .10 with the General Love factor being the only significant predictor ( $\beta = .32, p < .001$ ). Adding the Limerence factor to this model increased  $R^2$  to .12, a significant  $R^2$  change ( $p < .001$ ) and the Limerence factor was also a significant predictor of time spent with LO ( $\beta = -.17, p < .001$ ). The  $R^2$  for the model predicting time spent thinking of LO was .22 with the General Love factor being the only significant predictor ( $\beta = .46, p < .001$ ). Adding the Limerence factor to this model increased  $R^2$  to .28, a significant  $R^2$  change ( $p < .001$ ) and the Limerence factor was also a significant predictor of time spent with LO ( $\beta = .28, p < .001$ ). The  $R^2$  for the model predicting time spent thinking of LO was .21 with the General Love factor being the only significant predictor ( $\beta = .46, p < .001$ ). Adding the Limerence factor to this model increased  $R^2$  to .29, a significant  $R^2$  change ( $p < .001$ ) and the Limerence factor was also a significant predictor of time spent with LO ( $\beta = -.33, p < .001$ ).

It would appear that the new limerence measure adds predictive power when included with many love measures individually, and when all love measures were examined as a whole, the new limerence measure made a substantial contribution to predicting time spent with LO, time spent thinking of LO, and attention from LO, but not goal importance.

**Limerence and Mania.** Mania and limerence were highly correlated with each other, and all of the personality characteristics hypothesized to be correlated with limerence were more highly correlated with Mania. While it is possible that Mania may capture aspects of limerence, such as elation, cognitive obsession, irrational behaviors, and emotional lability, examination of the 7 items that comprise the measure of Mania suggests that there are also aspects of limerence that the Mania measure does not seem to capture. Fear of rejection, desire for reciprocation, romantic exclusivity, and apprehension in the presence of LO do not seem to be aspects of limerence captured by Mania. Mania also seems to assess romantic jealousy, and limerents are not reported to experience romantic jealousy any more or less so than non-limerents (Tennov, 1979). To test if these apparent differences translate to unique predictive effects, five multiple regression analyses were performed that regressed goal importance, reported time spent thinking of LO each week, reported time spent with LO each week, and reported attention given from LO each week onto the measure of Mania and the new limerence measure assessed at time 1 simultaneously. Limerence predicted importance placed on goals related to maintaining a relationship ( $\beta = .481, p < .001$ ) and establishing a relationship ( $\beta = .234, p = .005$ ) with LO, but Mania did not ( $\beta = -.03 - .10, p > .05$ ). However, Mania predicted time spent thinking

of LO ( $\beta = .30, p < .05$ ) to a greater degree than limerence ( $\beta = .172, p < .001$ ). Mania and limerence made opposing predictions regarding reports of time spent with LO and attention from LO. Whereas Mania predicted more time spent with LO ( $\beta = .18, p < .001$ ) and more attention received from LO ( $\beta = .14, p < .01$ ), limerence predicted less time spent with LO ( $\beta = -.11, p < .05$ ) and less attention received from LO ( $\beta = -.12, p < .05$ ). To the extent that mania captures all aspects of limerence, the effects of limerence and Mania would not have opposing signs, and it appears that some aspects of limerence that are not captured by Mania, such as fear of rejection and apprehension, may be responsible for reduced perceptions of time spent with LO and received attention.

### **Test-Retest Reliability**

The reliability of the new limerence measure was tested by examining the zero-order correlation between limerence measure scores on first survey and limerence measure scores on the follow-up survey completed one month later. The correlation was high  $r = .65$ . and significant  $p < .001$ , indicating the measure to be reliable.

### **Predictors of Limerence**

**Zero-order correlations.** The first set of analyses were aimed at identifying personality characteristics that are predictive of limerence (Hypotheses 1-7). It was predicted that self-esteem and self-concept clarity would be negatively associated with limerence, and that mind wandering, validation-seeking goal orientation, social anxiety, attachment anxiety, and desire for social acceptance would be positively

associated with limerence. To test this, we examined the zero-order correlations between these aforementioned constructs and limerence assessed with the Wolf and Lemay (2015) limerence measure assessed at time 1 (T1) and time 2 (T2). Results are displayed in Table 6. As predicted, self-esteem and self-concept clarity were negatively related to T1 and T2 limerence. Also in accordance with predictions, mind wandering, validation-seeking goal orientation, social anxiety, and attachment anxiety were positively correlated with T1 and T2 limerence. The predicted positive relations between limerence and desire for acceptance from others were partially supported. Leary et al.'s (2013) Need to Belong Scale was positively associated with T1 Limerence but not T2 limerence, and the Desire for Interpersonal Value Scale by Lemay & Spongberg (2015) was not related to T1 or T2 limerence. No formal prediction was made concerning growth-seeking orientation, but the positive correlation between this construct and T1 limerence was unexpected. The association was small, however, and not as large as the association between validation-seeking orientation and T1 and T2 limerence. Although these correlations were usually stronger with the Wolf and Lemay limerence measure than many of the other love measures, Mania, which measures a state of loving similar to limerence, correlated even more highly with the hypothesized personality characteristics, which might suggest to some that Mania measures the same state of loving as limerence. However, evidence during the validation process of the Wolf & Lemay (2015) measure of limerence described above suggests that the Mania submeasure of the Love Attitudes Scale does not assess the same construct as limerence. Table 6 also includes the individual subscales that comprise the Wolf & Lemay (2015) limerence measure.

Although the correlations between the personality characteristics and the subscales of limerence are largely consistent with the correlations between the personality characteristics and the composite score of limerence, the strength and direction of the correlations between the personality characteristics and the individual limerence subscales do not always reflect the strength or direction of the correlations between the personality characteristics and the composite score of the limerence measure, highlighting the multidimensionality of the limerence construct.

**Prospective Analyses.** The present view is that the personality characteristics examined here produce limerent-proneness, and accordingly, an individual should exhibit these personality characteristics before limerence occurs. Although the zero-order correlations are largely consistent with predictions, the correlations are from cross-sectional data and provide no insight on temporal precedence. These correlations alone cannot rule out the possibility that the experience of limerence itself can produce these personality characteristics in an individual. To rule out this alternative explanation, a series of multiple regression analyses tested the prospective effect of these personality variables on limerence assessed one month later while controlling for the prior assessment of limerence. Each personality measure was tested in a separate regression analysis. Each regression produced null findings  $b = -.01 - .03, p > .05$ , with the exception of anxious attachment, which, contrary to predictions, predicted decreases in limerence assessed one month later. This finding is hard to interpret, given the previous finding that anxious attachment had a positive association with limerence. In sum, this set of prospective multiple regression analyses failed to produce further insight into the associations observed in the prior

set of analyses. This failure to find evidence for change over time in the outcome variables may be explained by the fact that limerence exhibited substantial stability over the one month interval,  $b = .743 - .794, p < .001$ , leaving little residual variance to be predicted by the personality variables.

**Multiple Regression.** A multiple regression analysis regressed T1 limerence simultaneously onto each of the personality measures hypothesized to be associated with limerence, with exception to the Desire for Interpersonal Value Scale, which was found to hold no association with limerence. The multiple R associated with this model was  $.37$  (*Adjusted R = .121*),  $p < .001$ , explaining 13 % of the variance associated with limerence, with scores on the anxious attachment submeasure of the Experiences in Close Relationships Scale ( $\beta = .14$ ), and the Social Phobia Scale ( $\beta = .14$ ), serving as the only significant predictors of limerence  $p < .001$ . (All other predictors,  $p > .05$ ). This finding seems suggest that limerence is predominantly driven by fear of rejection.

**Post-hoc Mediation Analysis.** Low self-esteem may be associated with limerence-proneness via several mediating variables. A parallel mediation model was tested in AMOS, with self-esteem predicting T1 limerence via self-concept clarity, need to belong, validation-seeking goal orientation, social phobia, and social interaction anxiety (Figure 1). The effect of self-esteem on T1 limerence was reduced to non-significance in this model. A bootstrap analysis using 5,000 resamples of the data was used to generate 95% confidence intervals for the indirect effects of self-esteem on T1 limerence via each of the potential mediators. The indirect effects of self-esteem on T1 limerence via social phobia 95% CI[-.14, -.04] and goal validation

95% CI[-.09, -.001] were significant ( $p < .001$ ), and the indirect effect of self-esteem on T1 limerence via need to belong was marginal 95% CI[-.03, .02]. The other indirect effects were not significant  $p > .05$ , indicating that goal validation seeking orientation and social phobia may be primarily responsible for the association between low self-esteem and T1 limerence.

### **Effects of Limerence on Goal pursuit**

The next set of analyses tested hypotheses 8-10. Concerning hypothesis 8, it was hypothesized that limerence would be associated with the perceived importance of maintaining/establishing a relationship with LO. This hypothesis was supported. Limerence was positively associated with participants' reports that one of their primary goals was to establish,  $r = .30, p < .001$ , and maintain,  $r = .47, p < .001$  a relationship with the romantic interest.

Hypotheses 9 and 10 pertained to goal progress. Limerence was hypothesized to be inversely associated with progress on goals perceived to be unrelated to maintaining/establishing a relationship with LO and to be positively associated with progress on goals related to obtaining/maintaining a relationship with LO. Both hypotheses posited that resource allocation would be responsible for these effects. A mediation model was tested using structural equation modeling that modeled an effect of limerence on goal progress via resource allocation. Before performing a formal test of the hypothesis, a multi-group analysis was performed to assess if it was necessary to distinguish maintenance goals from establishment goals when testing the effect of limerence on goal progress via resource allocation. The sample was split into two halves based on whether or not the participant had a relationship with LO. Then, to

assess if any of the paths significantly varied across groups, a chi-square difference test was performed on each path by freely estimating the two models while constraining the path to be equal across groups. This analysis revealed that none of the paths significantly varied between the two models ( $p > .05$ ), and so each path was constrained to be equal. In support of hypotheses 9 and 10, a bootstrap of 5,000 resamples of the data revealed that limerence had a significant, positive effect on progress on goals related to maintaining/establishing a relationship with LO 95% CI[.34, 2.30], and a significant, negative effect on goals unrelated to maintaining/establishing a relationship LO 95% CI[-2.85, -.42] via resource allocation to goals related to maintaining/establishing a relationship with LO  $p < .01$  (Figure 2). An additional model tested the prospective effect of limerence on goal progress. Limerence assessed at the first assessment wave (T1) was modeled as predicting resource allocation assessed at the second assessment wave (T2) while controlling for T1 resource allocation, and, additionally, T2 resource allocation was modeled as predicting T2 goal progress while controlling for T1 goal progress. A chi-square difference test of each path in the model revealed no significant variance in the paths across groups and so all paths were constrained to be equal. A bootstrap of 5,000 resamples of the data revealed that the effect of T1 limerence on T2 goal progress via T2 resource allocation was not significant  $p > .05$ .

**Post Hoc Mediation Model.** A post-hoc serial mediation model was tested that included establishment/maintenance goal importance in the indirect pathway between limerence and goal progress. Once again, using the same procedure described above, the sample was split based on whether or not the participant reported



being in a relationship with LO and chi-square difference tests were utilized to test for any significant variance in pathways across the two models. These models were estimated separately due to the chi-square difference tests revealing significant variance in some path estimates. A bootstrap of 5,000 resamples of the data indicated a significant indirect effect of limerence on goal progress perceived to be related 95% CI [.36, 1.81] and unrelated 95% CI [-1.20, -.48] to establishing a relationship with LO via relationship establishment importance and resource allocation ( $p < .001$ ; Figure 3), but the bootstrap test of the indirect effect did not produced significant results for the models tested using the sample of participants who reported being in a relationship with LO  $p > .05$ . An additional model tested the prospective effect of limerence on goal progress via goal importance and resource allocation. T1 limerence was modeled as predicting T2 goal importance while controlling for T1 goal importance. Additionally, T2 goal importance was modeled as predicting T2 resource allocation while controlling for T1 resource allocation. Lastly, T2 resource allocation was modeled as predicting T2 goal progress while controlling for T1 goal progress. Before testing this model, the sample was split based on relationship status with LO and chi-square difference tests were used to test for significant variance between path estimates. There was significant variance between some path estimates and so each model was tested separately. A bootstrap of 5,000 samples of the data revealed a significant indirect effect of limerence on T2 progress on goals related 95% CI [.09, .81] and unrelated 95% CI [-1.01, -.13] to maintaining a relationship with LO via T2 goal importance and T2 resource allocation ( $p < .01$ ; Figure 4). The indirect effect of

T1 limerence on T2 goal progress via T2 goal importance and T2 resource allocation was not significant for the model assessing relationship establishment goals  $p < .05$ .

## Discussion

This research served four purposes: 1. To replicate past findings related to the association between negative self-views and limerence (Feeney & Noller, 1990), 2. To identify personality traits that could render individuals susceptible to experiencing limerence after becoming attracted to someone, 3. To investigate how limerence affects goal progress, and 4. To assess the reliability and validity of a new measure designed to identify limerence in individuals.

Past research has found limerence to be related to attachment anxiety, self-esteem, and perfectionism, but no other research has been conducted on individual differences and limerence. In addition to successfully replicating past associations between self-esteem, attachment anxiety, and limerence, the current investigation identified a cluster of personality traits correlated with limerence. Limerence was negatively associated with self-esteem and self-concept clarity, and positively associated with validation-seeking goal orientation, mind wandering, social anxiety, attachment anxiety, and need to belong. To the degree that these personality characteristics contribute to the likelihood of becoming limerent toward someone in the future, identification of these personality characteristics could be an important step to building a profile of someone prone to limerence. The personality characteristics new to this investigation, with exception to mind-wandering, were thought to stem from the negative self-views found to be associated with limerence in past research (Feeney & Noller, 1990). A parallel mediation model found low self-esteem to affect limerence primarily via social phobia and validation seeking

orientation. This finding provides further elucidation on the psychological profile of limerents beyond a likelihood of harboring negative self-views. It appears limerent individuals may be so reliant on social approval from others as a form of validation that they become inordinately fearful of rejection from others. Of course, any causal mechanisms are speculative. We were unfortunately not able to establish that any of these personality characteristics occur before the onset of limerence. The personality characteristics failed to predict limerence one month later, but the high lag time or substantial temporal stability of limerence may have made a prospective effect of these personality characteristics hard to detect.

The hypotheses regarding limerence and goal progress were supported. Limerence had a positive association with progress concerning goals related to maintaining/establishing a relationship with LO and a negative association with goal progress concerning goals unrelated to maintaining/establishing a relationship with LO, and these associations were mediated by resource allocation. Limerence was also associated with importance of goals perceived to be related to maintaining/establishing a relationship with LO. Goal importance was also found to serve as an additional mediator between limerence and resource allocation. For those not in a relationship with LO, the association between limerence and goal progress was mediated by resource allocation and goal importance. Additionally, for those in a relationship with LO, the association between limerence and goal progress measured one month later, limerence was mediated by resource allocation and goal importance also measured one month later. These findings suggest one avenue through which limerence may have a negative impact on one's life. Neglecting goals essential to

one's overall well-being in favor of pursuing goals related to achieving romantic reciprocation could be potentially harmful in the long run. We did not assess the well-being of participants, however, and future research efforts may consider examining the degree to which limerence impacts well-being via goal pursuit behaviors.

The methods used to establish the construct validity of the new limerence measure (Wolf & Lemay, 2015) seemed to suggest that the measure assesses a love experience unique from others. The zero-order correlations between the new limerence measure and other love measures largely conformed to expectations. Unfortunately, the planned tests of convergent and construct validity using Confirmatory Factor Analysis could not be conducted due to the fact that the dataset did not replicate the higher-order factor structure of love found by Graham (2010). Fortunately, post-hoc Principle Components Analyses, similar to the analyses conducted by Graham (2010), were able to provide additional support for the construct validity of the new measure of limerence beyond what was suggested by examination of the zero-order correlations. The new limerence measure loaded alongside the Limerence Survey, and Mania, and away from the other love measures. The fact that Mania loaded alongside the limerence measures is not surprising. Mania correlated highly with the measures of limerence outside of the Principle components Analysis and is comprised of items that appear to capture elements of limerence, although it seems to, on the surface, to pick up on more of the extreme elements, such as mood swings leading to depression, contemplations of suicide, and unrequired love experienced as physical pain (e.g., "When my lover doesn't pay attention to me, I feel sick all over"). The Mania measure may not be entirely useful as a measure of

limerence alone, however, as the items do not capture all aspects of limerence and when limerence and Mania were included as predictors of reported time spent with LO and perceived attention from LO, Mania and the new measure of limerence had diverging effects. Limerence was also a better predictor of goal importance than Mania, whereas Mania predicted time spent thinking of LO to a greater extent than limerence.

This investigation, like any other attempt at scientific inquiry, has its weaknesses. For one, all data was based on self-report measures solely based on one's perceptions, which are often biased. The data were extracted from a convenience sample and recruitment was restricted to a population of students enrolled at a large, Mid-Atlantic University. Also, conducting only one study did not provide the opportunity to replicate findings. This investigation did have several methodological strengths, however. The sample size was large, enhancing the ability to detect effects if they were present, and the inclusion of two surveys allowed us to test the prospective effects of the variables of interest, even if the time-gap between surveys may have been too large to detect some effects of limerence (1 month) or too short to allow for substantial change in outcome variables.

Future research on limerence could focus on establishing the temporal precedence of the personality characteristics found to be related to limerence in this study. Conducting a replication study with less time between assessments may better allow the detection of any extant prospective effects of these personality characteristics. Multiple assessments could be employed over time to assess the trajectory of limerence in response to situational factors thought to influence the

experience of limerence, such as perceived reciprocation. Other research could be aimed at developing clinical interventions. The personality characteristics identified to be associated with limerence here suggest the possibility of developing interventions aimed at addressing over-concern with others' opinions. When limerence was simultaneously regressed onto all of the personality characteristics found to be associated with limerence in this study, only attachment anxiety and social phobia had significant effects on limerence, suggesting that addressing fears of rejection may be one approach to influencing the limerent state. Although, attempting to address anxiety surrounding rejection may be fairly difficult. It might be more practical to influence limerence in more round-about ways, perhaps by reducing hope that LO will reciprocate the limerent's affections, for instance.

Limerence has been absent from many discussions involving the nature of romantic love (e.g. Berscheid, 2010). This research hopefully highlights the importance of including limerence in further discussions of romantic love. Importantly, our research suggests that limerence should be considered to be a type of romantic experience that deviates from types of love widely considered to represent a prototypical experience of love (e.g. passionate love; infatuation). Although prevalence of limerence in the general population is unknown (Tennov noted that about half of the people she interviewed experienced limerence), it should not be taken for granted that one type of love experience is prototypical of all. Such an assumption could even be potentially dangerous if certain events that have been associated with limerence, such as depression, suicidal thoughts, or impulsive

behaviors, are brushed off as harmless side-effects of "puppy love" (Hatfield, Bensman, Rapson, 2011).



## References

- Acevedo, B. P. & Aron, A. (2009). Does a long-term relationship kill romantic love? *Review of General Psychology*, *13*, 59-65.
- Aron, A. & Henkemeyer, L. (1995). Marital satisfaction and passionate love. *Journal of Social and Personal Relationships*, *12*, 139-146.
- Bartels, A., & Zeki, S. (2000). The neural basis of romantic love. *Neuroreport*, *11*, 3829-3834.
- Baumeister, R. F. & Bratslavsky, E. (1999). Passion, intimacy, and time: Passionate love as a function of change in intimacy. *Personality and Social Psychology Review*, *3*, 49-67.
- Berscheid, E. (2010). Love in the fourth dimension. *Annual Review of Psychology*, *61*, 1-25.
- Bowlby, J. (1969). *Attachment and loss: Vol. I. Attachment*. New York: Basic Books.
- Bowlby, J. (1973). *Attachment and loss: Vol. 2. Separation: Anxiety and anger*. New York: Basic Books.
- Bowlby, J. (1980). *Attachment and loss: Vol. 3. Loss*. New York: Basic Books.
- Brennan, K. A., Clark, C. L., & Shaver, P. R. (1998). Self-report measurement of adult attachment: An integrative overview. In J.A. Simpson, W.S. Rholes (Eds.), *Attachment theory and close relationships*, Guilford Press, New York (1998), pp. 46-76

- Campbell, J. D., & Fehr, B. (1990) Self-esteem and perceptions of conveyed impressions: Is negative affectivity associated with greater realism? *Journal of Personality and Social Psychology*, 58, 122-133.
- Campbell, J. D., Trapnell, P. D., Heine, S. J., Katz, I. M., Lavalle, L. F., & Lehman, D. R. (1996). Self-concept clarity: Measurement, personality correlates, and cultural boundaries. *Journal of Personality and Social Psychology*. 70, 141-156.
- Cole, D. A., & Maxwell, S. E. (1985). Multitrait-multimethod comparisons across populations: A confirmatory factor analytic approach. *Multivariate Behavioral Research*, 20(4), 389-417.
- Cole, D. A. (1987). Utility of confirmatory factor analysis in test validation research. *Journal of Consulting And Clinical Psychology*, 55(4), 584-594.
- Coopersmith, S. (1967). *The antecedents of self-esteem*. Palo Alto, CA: Consulting Psychologists' Press.
- Dykman, B. M. (1998). Integrating cognitive and motivational factors in depression: Initial tests of a goal-orientation approach. *Journal of Personality and Social Psychology*, 74, 139–158.
- Feeney, J. A., & Noller, P. (1990). Attachment style as a predictor of adult romantic relationships. *Journal of Personality and Social Psychology*, 58, 281-291.
- Fehr, B. (2006). A prototype approach to studying love. In R. J. Sternberg & K. Weis (Eds.) *The new psychology of love* (pp. 225-248). New Haven & London: Yale University Press

- Fisher, H. E., Aron, A., Mashek, D., Li, H., & Brown, L. L. (2002). Defining the brain systems of lust, romantic attraction, and attachment. *Archives of Sexual Behavior, 31*, 413-419.
- Flett, G. L., Hewitt, P. L., Shapiro, B., & Rayman, J. (2001). Perfectionism, beliefs, and adjustment in dating relationships. *Current Psychology, 20*, 289-311.
- Freud, S. (1959). *Collected papers volume 4* (J. Riviere, Trans). New York: Basic Books, Inc.
- Freud, S. (1961). *The future of an illusion civilization and its discontents and other works* (J. Strachey, Trans). London: The Hogarth Press and the Institute of Psycho-analysis.
- Fromm, E. (1956). *The art of loving*. New York: Harper & Row.
- Graham, J. M. (2010) Measuring love in romantic relationships: A meta-analysis. *Journal of Social and Personal Relationships.28*, 748-771.
- Hatfield, E., Bensman, L., & Rapson, R. L. (2011). A History of Passionate Love Measures.
- Hatfield, E., Schmitz, E., Cornelius, J., & Rapson, R. L. (1988). Passionate love: How early does it begin? *Journal of Psychology & Human Sexuality, 1*, 35-51.
- Hatfield, E., Pillemer, J. T., O'Brien, M. U., & Le, Y. L. (2008). The endurance of love: passionate and companionate love in newlywed and long-term marriages. *Interpersona 2*(1), 35-64.
- Hatfield, E., & Sprecher, S. (1986). Measuring passionate love in intimate relationships. *Journal of Adolescence, 9*, 383-410.

- Hatfield, E., & Walster, G. W. (1978). *A new look at love*. Lantham, MA: University Press of America.
- Hazen, C., & Shaver, P. (1987). Romantic love conceptualized as an attachment process. *Journal of Personality and Social Psychology*, *52*, 511-524.
- Hendrick, C. & Hendrick, S. (1986). A theory and method of love. *Journal of Personality and Social Psychology*, *50*, 392-402.
- Jankowiak, W. R., & Fischer, E. F. (1992). A cross-cultural perspective on romantic love. *Ethology*, *31*, 149-155.
- Langeslag, S. J. E., Muris, P., & Franken, I. H. A. (2012). Measuring romantic love: Psychometric properties of the infatuation and attachment scales. *Journal of Sex Research*, *50*, 739-747.
- Leary, M. R., Kelly, K. M., Cottrell, C. A., & Schreindorfer, L. S. (2013). Individual differences in the need to belong: Mapping the nomological network. *Journal of Personality Assessment*.
- Leary, M. R., Kowalski, R. M., & Campbell, C. D. (1988). Self-presentational concerns and social anxiety: The role of generalized impression expectancies. *Journal of Research in Personality*, *22*, 308–321. doi:10.1016/0092-6566(88)90032-3
- Lee, J. A. (1977). A typology of styles of loving. *Personality and Social Psychology Bulletin*, *3*, 173-182.
- Lee, J. A. (1998). Ideologies of lovestyle and sexstyle. In V. De Munck (Ed.), *Romantic Love and Sexual Behavior* (pp. 33-76). Westport, CT: Praeger Publishers.

- Lemay, E. P., & Spongberg, K. (2015). Perceiving and wanting to be valued by others: Implications for cognition, motivation, and behavior in romantic relationships. *Journal of personality, 83*(4), 464-478.
- Maslow, A. H. (1962). *Toward a psychology of being*. Princeton, NJ: Van Nostrand.
- Mrazek, M. D., Phillips, D. T., Franklin, M. S., Broadway, J. M., & Schooler, J. W. (2013). Young and restless: validation of the Mind-Wandering Questionnaire (MWQ) reveals disruptive impact of mind-wandering for youth. *Frontiers in Psychology, 4*, 560.
- Ortigue, S., Bianchi-Demicheli, F., Hamilton, A. F. de C., & Grafton, S. T. (2007). The neural basis of love as a subliminal prime: an event-related functional magnetic resonance imaging study. *Journal of Cognitive Neuroscience, 19*, 1218-1230.
- Regan, P. C. (2009). Love, companionate and passionate. In H. T. Reis & S. Sprecher (Eds.), *Encyclopedia of Human Relationships* (Vol. 2, pp. 1007-1011) Thousand Oaks, CA: Sage.
- Reynolds, S. E. (1983). Limerence: A new word and concept. *Psychotherapy: Theory, research and practice, 20*, 107-111.
- Rosenberg, M. (1965). *Society and the adolescent self-image*. Princeton, NJ: Princeton University Press.
- Rubin, Z. (1970). Measurement of romantic love. *Journal of Personality and Social Psychology, 16*, 265-273.

- Shah, J. Y., Friedman, R., & Kruglanski, A. W. (2002). Forgetting all else: On the antecedents and consequences of goal shielding. *Journal of Personality and Social Psychology, 83*, 1261-1280.
- Shah, J. Y., & Kruglanski, A. W. (2002). Priming against your will: How accessible alternatives affect goal pursuit. *Journal of Experimental and Social Psychology, 38*, 368-383.
- Steffen, J. J. The revised measure of limerence. Paper presented at the Annual Mid-continent Conference of the Society for the Scientific Study of Sex. Cincinnati, OH, May, 1993.
- Steffen, J. J., McLaney, M. A., & Hustedt, T. K. (1984). The development of a measure of limerence. Unpublished manuscript, University of Cincinnati.
- Steiger, J. H. (1980). Tests for comparing elements of a correlation matrix. *Psychological Bulletin, 87*, 245-251.
- Sternberg, R. J. (1986). A triangular theory of love. *Psychological Review, 93*, 119-135.
- Sternberg, R. J. (1997). Construct validation of a triangular love scale. *European Journal of Social Psychology, 27*, 313-335.
- Tennov, D. (1979). *Love and limerence: The experience of being in love*. New York: Stein and Day.
- Tennov, D. (1999). *Love and limerence: The experience of being in love*. Lanham/New York: Scarborough House

Tucker, P. & Aron, A. (1993). Passionate love and marital satisfaction at key transition points in the family life cycle. *Journal of Social and Clinical Psychology, 12*, 135-147.

Wolf, N. R., & Lemay, E. P., Jr. (2015) Development of a scale to measure limerence. *Unpublshid data.*

## Tables

**Table 1**

*Zero-Order Correlations Between the Wolf & Lemay (2015) Limerence Measure and All Other Included Love Measures*

Love Measure	Limerence Measure (2015)	
	T1	T2
	<i>r</i>	<i>r</i>
Limerence Survey (Steffen)	.470**	.318**
LLS: Love	.505**	.520**
LLS: Liking	.387**	.360**
LAS: Eros	.276**	.328**
LAS: Ludus	-0.062	-0.096
LAS: Storge	.163**	0.09
LAS: Pragma	.089*	-0.005
LAS: Mania	.589**	.481**
LAS: Agape	.472**	.512**
TLS: Intimacy	.270**	.360**
TLS: Passion	.471**	.507**
TLS: Commitment	.379**	.466**
PLS	.630**	.584**

Note. \* Correlation is significant at the 0.05 level (2-tailed); \*\* Correlation is significant at the 0.01 level (2-tailed); LLS = Love and Liking Scale; LAS = Love Attitudes Scale; TLS = Triangular Love Scale; PLS = Passionate Love Scale



**Table 2**

*Principle Components Analysis With Love Measures Retained in Graham's (2010) Meta-Analytic Factor Solution*

	Factor		
	1	2	3
	Variance Explained		
Love Measure	50%	13.14%	9.61%
	Factor Loadings		
TLS: Passion	0.944	-0.045	-0.007
PLS	0.919	0.172	-0.085
TLS: Commitment	0.892	-0.124	0.059
TLS: Intimacy	0.857	-0.216	0.072
LAS: Agape	0.829	0.142	-0.005
LAS: Eros	0.77	0.029	0.014
LLS: Liking	0.651	-0.162	0.259
LAS: Ludus	-0.303	0.751	0.192
LAS: Mania	0.555	0.704	-0.071
LAS: Pragma	-0.043	0.231	0.804
LAS: Storge	0.149	-0.118	0.737

Note: LLS = Love and Liking Scale; LAS = Love Attitudes Scale; TLS = Triangular Love Scale; PLS = Passionate Love Scale.

**Table 3**

*Principle Components Analysis With Love Measures Retained in Graham's (2010) Meta-Analytic Factor Solution with Limerence Measures Included*

	Factor		
	1	2	3
	Variance Explained		
Love Measure	43%	10.44%	4.44%
	Factor Loadings		
TLS: Commitment	0.991	-0.12	0.038
TLS: Passion	0.942	0.047	-0.009
TLS: Intimacy	0.929	-0.094	-0.119
LAS: Eros	0.709	0.027	0.024
LAS: Agape	0.688	0.185	0.13
PLS	0.652	0.471	-0.044
LLS: Liking	0.61	0.133	-0.138
LAS: Storge	0.265	0.034	0.105
Limerence Survey (Steffen)	-0.065	0.752	-0.179
LAS: Mania	0.114	0.7	0.39
Limerence Measure (Wolf & Lemay)	0.205	0.627	0.061
LAS: Ludus	-0.326	0.057	0.515
LAS: Pragma	0.136	-0.044	0.362

Note: LLS = Love and Liking Scale; LAS = Love Attitudes Scale; TLS = Triangular Love Scale; PLS = Passionate Love Scale

**Table 4**

R-Squared Change for Regression Models of Goal Importance Predicted by Each Individual Love Measure (Model 1) When the Wolf & Lemay Limerence Measure (2015; T1) is Added as a Predictor (Model 2)

Initial Predictor	Outcome					
	Establish Relationship Goal Importance			Maintain Relationship Goal Importance		
	Model	R <sup>2</sup>	R <sup>2</sup> Change	Model	R <sup>2</sup>	R <sup>2</sup> Change
Limerence Survey (1984)	1	0.06		1	0.1	
	2	0.1	0.04***	2	0.22	0.12***
LAS: Mania	1	0.07		1	0.05	
	2	0.1	0.03**	2	0.22	0.17***
LAS: Love	1	0.14		1	0.41	
	2	0.16	0.02 †	2	0.42	0.01*
LAS: Like	1	0.11		1	0.28	
	2	0.14	0.03**	2	0.35	0.07***
LAS: Storge	1	0.02		1	0.02	
	2	0.1	0.08***	2	0.22	0.2***
LAS: Agape	1	0.1		1	0.27	
	2	0.13	0.02**	2	0.31	0.05***
LAS: Ludus	1	0.01		1	0.07	
	2	0.09	0.09***	2	0.26	0.19***
TLS: Intimacy	1	0.1		1	0.37	
	2	0.14	0.05***	2	0.42	0.05***
TLS: Passion	1	0.15		1	0.44	
	2	0.16	0.01 †	2	0.44	0
TLS: Commitment	1	0.17		1	0.41	
	2	0.18	0.01 †	2	0.43	0.02***
PLS	1	0.17		1	0.414	
	2	0.17	0	2	0.415	0

Note. †  $p < .10$  \*  $p < .05$  \*\*  $p < .01$  \*\*\*  $p < .001$ . Model 1 = Models with initial predictor; Model 2 = Models with initial predictor and the Limerence (2015) Measure added as an additional predictor. LLS = Love and Liking Scale; LAS = Love Attitudes Scale; TLS = Triangular Love Scale; PLS = Passionate Love Scale.

**Table 5**

R-Squared Change for Regression Models of Self-Report Outcomes Concerning LO Predicted by Each Individual Love Measure (Model 1) When the Wolf & Lemay Limerence Measure (2015; T1) is Added as a Predictor (Model 2)

Initial Predictor	Model	Outcome					
		Time Spent with LO		Time Spent Thinking of LO		Attention from LO	
		R <sup>2</sup>	R <sup>2</sup> Change	R <sup>2</sup>	R <sup>2</sup> Change	R <sup>2</sup>	R <sup>2</sup> Change
Limerence Survey (1984)	1	0.005		0.077		0.01	
	2	0.005	0.001	0.138	0.06***	0.01	0
LAS: Mania	1	0.012		0.163		0.004	
	2	0.02	0.008*	0.182	0.019***	0.014	0.009*
LAS: Love	1	0.088		0.201		0.146	
	2	0.123	0.034***	0.221	0.019***	0.222	0.075***
LAS: Like	1	0.02		0.056		0.038	
	2	0.025	0.004	0.135	0.079***	0.054	0.016**
LAS: Storge	1	0.007		0.008		0.015	
	2	0.007	0	0.126	0.118***	0.018	0.003
LAS: Agape	1	0.07		0.168		0.118	
	2	0.093	0.023***	0.2	0.032***	0.172	0.054***
LAS: Ludus	1	0.001		0.018		0.007	
	2	0.001	0	0.138	0.12***	0.009	0.002
TLS: Intimacy	1	0.118		0.158		0.291	
	2	0.128	0.01*	0.227	0.069***	0.326	0.035***
TLS: Passion	1	0.103		0.235		0.211	
	2	0.133	0.03	0.255	0.02***	0.291	0.08***
TLS: Commitment	1	0.112		0.159		0.226	
	2	0.132	0.02***	0.207	0.048***	0.279	0.053***
PLS	1	0.042		0.258		0.086	
	2	0.074	0.032***	0.259	0.001	0.169	0.083***

Note. \*  $p < .05$  \*\*  $p < .01$  \*\*\*  $p < .001$ . Model 1 = Models with initial predictor; Model 2 = Models with initial predictor and the Limerence (2015) Measure added as an additional predictor. LLS = Love and Liking Scale; LAS = Love Attitudes Scale; TLS = Triangular Love Scale; PLS = Passionate Love Scale.

**Table 6***Zero-Order Correlations Between Personality Characteristics and all Love Measures*

Measure	SES	ANX	AVD	MWD	GSO	VSO	DIVS	NTB	SCCS	SPS	SIAS
Limerence Measure (2015) T1	-.176**	.290**	-.157**	.204**	.090*	.256**	0.063	.166**	-.224**	.284**	.222**
Limerence Measure (2015) T2	-.126*	.128**	-.191**	0.057	0.048	.173**	0.017	0.093	-.119*	.174**	.194**
Limerence Measure (2015) T1: Exclusivity	-0.071	-0.039	-.366**	0.018	0.049	.090*	0.012	0.036	0.022	.127**	0.073
Limerence Measure (2015) T2: Exclusivity	-.097*	-0.061	-.322**	-0.024	0.023	0.091	0.002	0.03	0.016	.136**	.123*
Limerence Measure (2015) T1: Intrusive Thoughts	-0.038	.129**	-.253**	.199**	.123**	.094*	.169**	.123**	-.109**	.099*	0.074
Limerence Measure (2015) T2: Intrusive Thoughts	-0.05	0.036	-.244**	0.046	0.05	.101*	.110*	0.085	-0.032	0.045	0.062

Limerence Measure (2015) T1: Uncertainty	-.183**	.454**	.363**	.198**	-0.052	.211**	-0.025	.111**	-.312**	.190**	.196**
Limerence Measure (2015) T2: Uncertainty	-.118*	.388**	.279**	.165**	-0.037	.157**	-0.022	0.063	-.253**	.137**	.204**
Limerence Measure (2015) T1: Idealization	-0.063	0.043	-.140**	.097*	.110**	.098*	-0.027	0.04	-0.075	.112**	0.073
Limerence Measure (2015) T2: Idealization	-0.02	-0.074	-.129**	-0.013	.143**	-0.004	-.128**	-0.049	-0.018	0.087	0.09
Limerence Measure (2015) T1: Ache in Chest	-.133**	.186**	-.137**	.089*	.099*	.206**	0.058	.126**	-.179**	.201**	.150**
Limerence Measure (2015) T2: Ache in Chest	-.120*	.103*	-.193**	0.034	0.066	.186**	0.048	.139**	-.125*	.178**	.131**
Limerence Measure (2015) T1: Elation	.116**	0.039	-.342**	.105*	.109**	-0.012	.224**	.164**	.083*	0.033	-0.019
Limerence	.100*	-0.047	-.285**	-0.041	0.042	-0.057	.170**	0.079	0.09	-0.081	-0.032

Measure (2015) T2: Elation											
Limerence Measure (2015) T1: Apprehension	-.228**	.335**	.253**	.129**	0.008	.268**	-0.039	.129**	-.279**	.297**	.280**
Limerence Measure (2015) T2: Apprehension	-.194**	.282**	.220**	.122*	-0.008	.248**	-0.083	0.065	-.230**	.226**	.256**
Limerence Measure (2015) T1: Inability to Become Nonlimerent	-.094*	.086*	-.270**	.103*	0.036	.144**	0.035	0.076	-0.064	.184**	.125**
Limerence Measure (2015) T2: Inability to Become nonlimerent	-0.09	-0.011	-.276**	-0.022	-0.019	.113*	0.02	0.057	-0.015	.099*	.113*
Limerence Survey (1993)	-.158**	.371**	-.154**	.322**	-0.008	.304**	.387**	.398**	.270**	.235**	.241**
LAS: Mania	-.294**	.435**	-.099*	.280**	-0.037	.381**	.143**	.306**	.309**	.328**	.248**
LAS: Eros	.146**	-.100*	-.442**	-0.017	.168**	-0.06	.133**	0.025	.114**	-0.041	.122**

LAS: Storge	0.037	-0.015	-.165**	0.049	.125**	0.04	0.074	0.045	-0.067	0.022	0.009
LAS: Pragma	.104*	0.037	-0.028	-0.005	.235**	.102*	-0.016	0.056	0.022	0.049	-0.018
LAS: Agape	-0.079	0.007	-.381**	.090*	.140**	.115**	0.072	0.075	-0.056	0.072	0.024
LAS: Ludus	-.145**	.239**	.356**	.165**	0.029	.229**	-.238**	-0.038	.219**	.222**	.145**
LLS: Love	-0.018	0.022	-.461**	.128**	.101*	.110**	.190**	.171**	-0.024	.118**	0.068
LLS: Liking	.158**	-.108**	-.414**	0.013	.211**	0.005	.191**	.124**	0.08	0.011	-0.043
TLS: Intimacy	.177**	-.199**	-.531**	-0.017	.159**	-0.075	.191**	0.051	.131**	-0.067	.109**
TLS: Passion	0.057	-.089*	-.477**	0.035	.137**	0.024	.100*	0.069	.082*	0.053	-0.004
TLS: Commitment	0.076	-.143**	-.477**	-0.023	.146**	0.01	0.048	0.015	.116**	0.057	-0.014
PLS	-0.042	.125**	-.405**	.175**	.095*	.140**	.209**	.198**	-0.056	.140**	.093*

---

Note: \*  $p < .05$  \*\*  $p < .01$

SES = Rosenberg's Self-Esteem Scale; ANX = Experiences in Close Relationships Scale: Anxious Attachment; AVD = Experiences in Close Relationships Scale: Avoidant Attachment; MWD = Mind Wandering Questionnaire; GSO = Goal Orientations Inventory: Growth-Seeking Orientation; VSO: Goal Orientations Inventory: Validation-Seeking Orientation; DIVS: Desire for Interpersonal Value Scale; NTB: Need to Belong Scale; SCCS: Self-Concept Clarity Scale; SPS = Social Phobia Scale; SIAS: Social Interaction Anxiety Scale.



## Figures

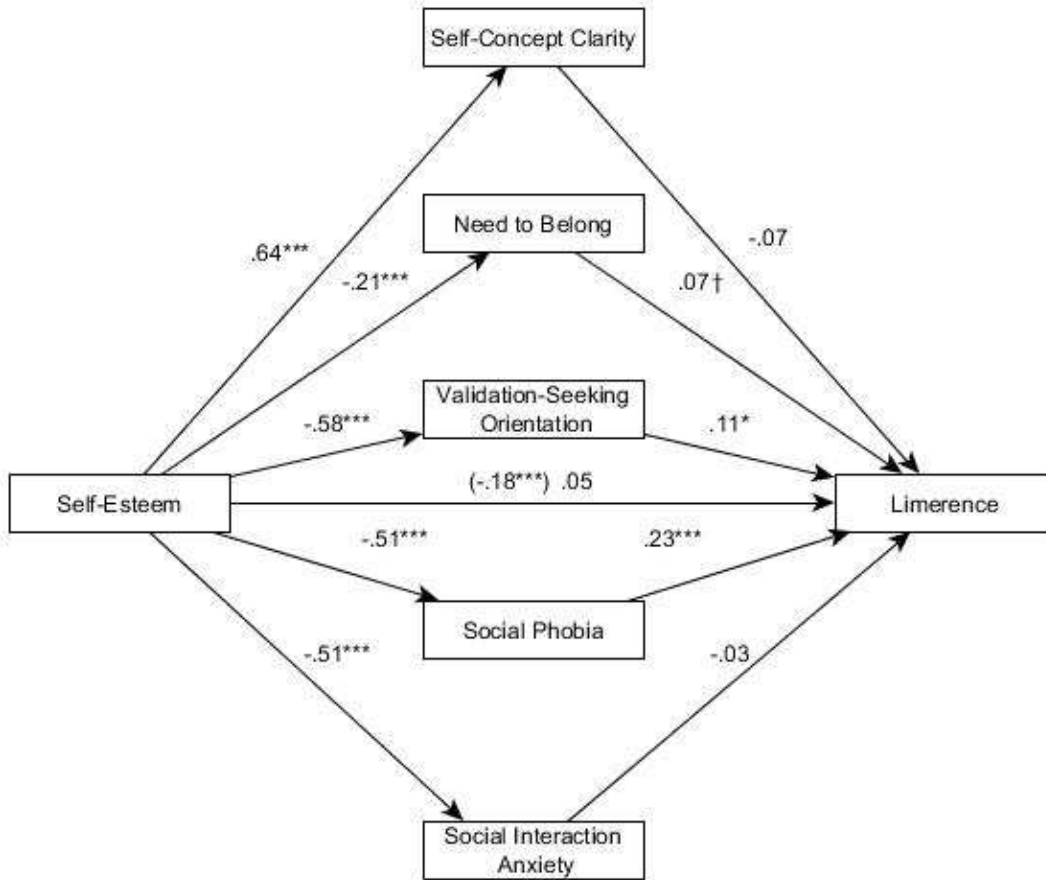


Figure 1. *Effect of self-esteem on limerence via 5 hypothesized mechanisms.* Note. The value in the parentheses reflects the total effect of self-esteem on limerence when not controlling for the 5 mediating variables.

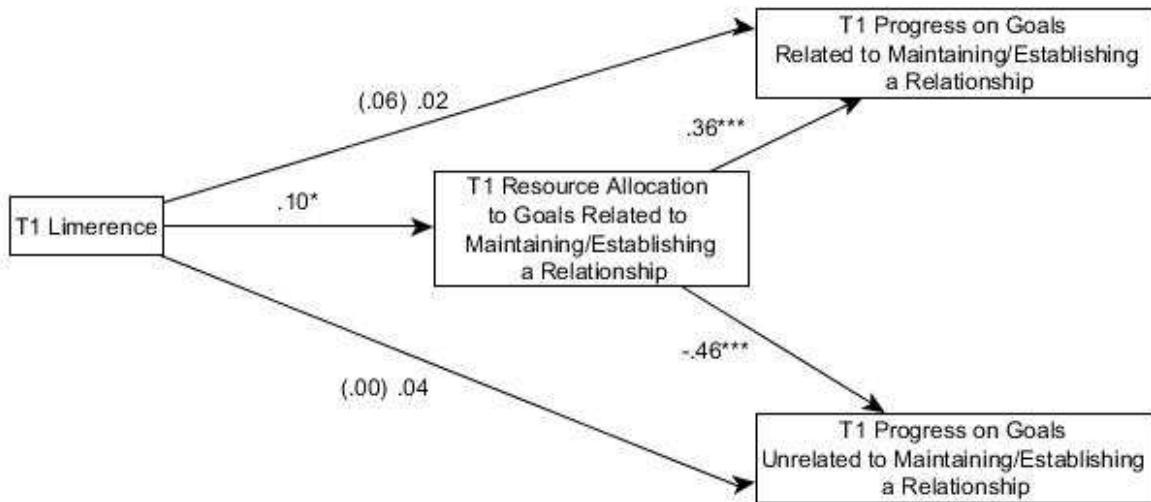


Figure 2. *The effect of limerence on goal progress via resources allocation.* Note. The total effect of limerence on goal progress is displayed in parentheses.

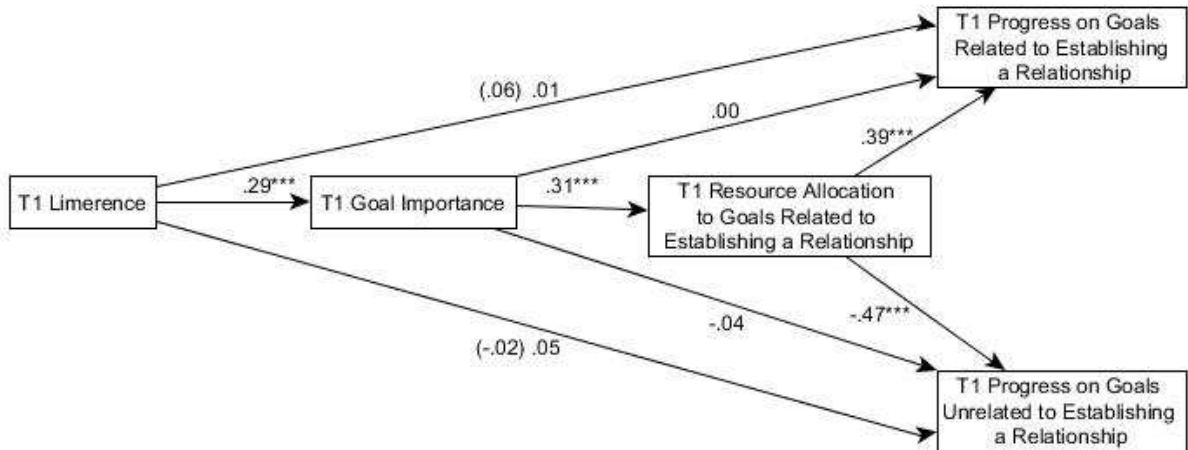


Figure 3. *The effect of limerence on progress on goals perceived to be related to establishing a relationship with LO mediated by resources allocation and relationship establishment importance.* Note. The total effect of limerence on goal progress is displayed in parentheses.

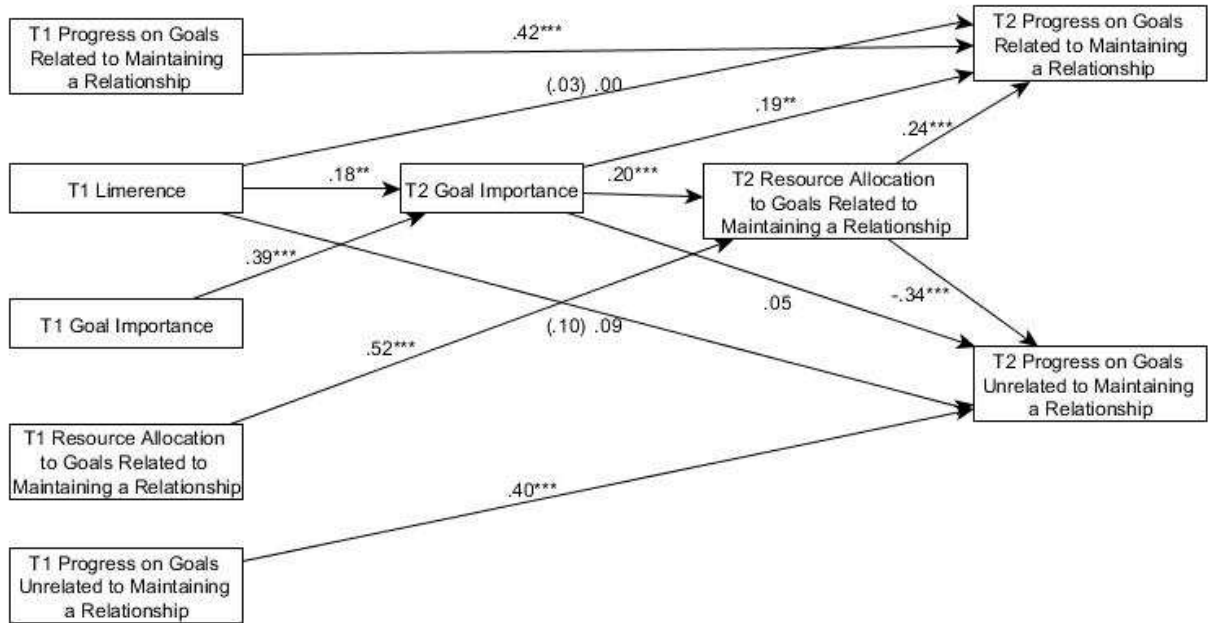


Figure 4. *The prospective effect of limerence on progress on goals perceived to be related to maintaining a relationship with LO mediated by resources allocation and relationship maintainment importance.* Note. The total effect of limerence on goal progress is displayed in parentheses. Covariances between exogenous variables suppressed for space.