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A Measure of Romantic Love: The Psychometric Properties of the Love Bank Inventory

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ABSTRACT

The purpose of this research was to thoroughly study the psychometric properties of the Love Bank Inventory (LBI) with married participants. The LBI is a 21-item Likert-type English survey developed to measure romantic love for a partner. Two studies were conducted with independent data sets (Study 1: n = 143; Study 2: n = 142) that represented 22- to 62-year-old heterosexual, nondyadic married respondents with multicultural citizenship. The results of the two studies provide support for (a) a single-factor model, (b) convergent validity with a positive correlation with the statement about romantic love (r_s = .67 - .68) and construct criterion validity with a positive correlation with the Locke-Wallace Marital Adjustment Test (r = .76 - .80), (c) internal consistency of LBI statements (ω = .95 - .96), and (d) test-retest reliability (r = .88). These two studies provide support for the use of the LBI as a free tool to assess romantic love in marriage education development and applied settings. Further study of this assessment tool with expanded demographics and use of measures of romantic love within marriage education (ME) efficacy research are recommended.

Keywords: romantic love, marriage assessment, marriage education (ME), marital adjustment, Locke-Wallace Marital Adjustment Test

1. INTRODUCTION

The importance of romantic love in marriage has increasingly become a salient topic of study in marriage research, from the time Maslow (1954) said, “Our duty is clear here. We *must* understand love; we must be able to teach it, create it, and predict it, ...” (p. 181) to Kazim and Rafique (2021) that lists romantic love as a predictor of marital satisfaction that spans across cultures. A Pew Research survey (Cohn, 2013) supported the importance of romantic love as the foremost reason why Americans marry (93% - for married responders/84% - for unmarried responders) with more traditional reasons trailing behind, such as making a lifelong commitment (87/74), companionship (81/63), having children (59/44), and financial stability (31/30); the importance of love in determining a marriage partner was confirmed in other research as well (Huston, 2009; Simpson et al., 1986; Sprecher & Hatfield, 2017). In a survey of 605 participants, Willi (1997) stated, “Being in love seems to be of greater importance for the prognosis of the marriage than marital happiness and satisfaction” (p. 171). Furthermore, just as being in love leads to marital satisfaction and a desire to marry, research conversely suggests that falling out of love leads

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to a critical turning point for choosing marriage dissolution (Crabtree et al., 2018; Hemesath, 2016; Huston, 2009; Huston et al., 2001; Roberts, 1992; Sailor, 2013).

Not only is romantic love considered a necessary factor in marriage, a predictor of marital satisfaction, and a motivating factor for getting married and staying married, research shows specific benefits for sustaining romantic love in marriage. In a meta-analysis of 25 studies, Acevedo and Avon (2009) reported that romantic love "appears to be a real phenomenon that may be enhancing to individuals' lives—positively associated with marital satisfaction, mental health, and overall well-being" (p. 64). Fletcher et al. (2015) identified several additional correlates of romantic love in marriage that include lessening vulnerability to outside relational threats, improved health of the couple, and welfare of the children.

1.1. What is Romantic Love?

In a doctoral dissertation, Hemesath (2016) reviewed the meaning of love in marriage and the phenomenon of falling out of romantic love. The thorough literature review and qualitative study identified romantic love as "a combination of desire and high emotional intimacy … and is synonymous with being *in love*" (p. 30); in other words, it is a feeling of emotional and physical interest or connection toward another. Besides romantic love, other primary types of love were identified within research: compassionate love and passionate love (Berscheid & Hatfield, 1969), and consummate love (i.e., intimacy and passion and decision/commitment; Sternberg, 1986).

The results of the qualitative study by Hemesath (2016) confirmed that romantic love was equated with both emotional and physical/sexual interest and was associated with marital satisfaction. The lack of romantic love, however, was associated with marital discord. Behavioral and psychological components of this emotional and physical connection were also identified based on the interviews conducted in the study. For ease of viewing, these elements are listed in Table 1.

Table 1:

Elements of Emotional and Physical Connection in Romantic Love

Emotional Connection	Physical Connection
mutual appreciation	reciprocal sexual desire
desire to help	enjoy hugging and kissing
enjoy time and experiences	other expressions of affection and sexuality
long to be together when apart	physical reaction when thinking about
think about the partner when away	physical reaction when physically close
mutual respect	
trust	
share common interests	
feel the partner is the right person	

Note. Hemesath, 2016, pp. 174-175.

As research supports the importance of being in love in marriage, assessments that measure romantic love for a partner could be used by marriage education (ME) developers and practitioners to determine improvements in marital health.

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1.2. Assessments in Marriage Education: Where Is Romantic Love?

Validated assessment measures are essential tools in evaluating the effectiveness of ME programs in general and the effectiveness of an ME program for a specific couple in particular. Numerous validated self-report measures that subjectively tap into the construct of marital health have been used for this purpose (e.g., Marital Adjustment Test, MAT, Locke & Wallace, 1959; Quality of Marriage Index, QMI, Norton, 1983; Kansas Marital Satisfaction Scale, KMS, Schumm et al., 1986; Dyadic Adjustment Scale, DAS, Spanier, 1976, 1988; Satisfaction with Married Life Scale, SWML, Ward et al., 2009). For the most part, these assessments have undergone factor analysis, validity, and reliability testing based on married participants and represent constructs related to marital quality (e.g., adjustment and satisfaction). Yet, the field of ME research seems to have limited assessment tools for romantic love, in particular.

In a meta-analytic study by Graham (2011) that reviewed 81 articles published in the past 40 years in the field of love, five primary assessment measures were used. These measures were: (a) the Passionate Love Scale, measuring passionate love or "a state of intense physiological arousal" in a dating relationship (PLS, Hatfield & Sprecher, 1986, p. 383), (b) the Love and Liking Scale (Rubin, 1970), measuring like and romantic love, or "love between unmarried opposite-sex peers, which could possibly lead to marriage" (p. 266), (c) the Love Attitudes Scale and Love Attitudes Scale: Short Form, measuring love styles to predict the likelihood of falling in love (LAS, Hendrick & Hendrick, 1986; Hendrick et al., 1998), and (d) the Triangular Love Scale, a measure of consummate love, or intimacy and passion and commitment (TLS, Sternberg, 1986, 1997). Overall, only two of these scales were related to measuring romantic love as the primary construct: Sternberg's TLS and Rubin's Love Scale; and only one conducted measure development and validation with mostly married participants: Sternberg's TLS.

Hatfield et al. (2012) provided a thorough review of scales designed to assess romantic love and passionate love developed over the last 60 years. Included in the 33 measures reviewed were those identified by Graham (2011). However, most of the scales measured beliefs, attitudes, styles, or attachments concerning the nature of love and not the specific measurement of romantic love toward a partner. Several measures did relate to this topic: the Relationship Rating Form, (Davis, 2001), the Romantic Love Symptom Checklist (Mathes & Severa, 1981), and the Romantic Attraction Questionnaire (Bessell, 1984). However, no specific validity and reliability data were provided in the review apart from references for these measures, and the authors cautioned that earlier scales fell short of the psychometric standards of modern-day measures.

One recently developed measure of romantic love not included in the research by Hatfield et al. (2012) is the Infatuation and Attachment Scales (Langeslag et al., 2013). Although a promising measure, the three studies to determine exploratory and confirmatory factor analyses, reliability and validity only had five to eight percent represented married participants.

In an attempt to add to the availability of romantic love measures for ME developers and practitioners, this study attempted to conduct a thorough psychometric property assessment of the Love Bank Inventory (LBI; Harley, 2010) using married participants.

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1.3. The Love Bank Inventory

The importance of restoring and sustaining the feeling of romantic love was the primary goal of a marriage counseling theory developed by Harley in the 1970s (Harley, 2001; Harley, 2010). Harley (2001) defined romantic love as the "feeling of being in love—finding someone irresistible" (p. 18). The path to romantic love was caring love, "a decision to try to do what you can to make someone happy [and avoid being the source of unhappiness]—a willingness and effort to care for someone" (p. 20).

A basic concept within this theory was the Love Bank, "the way our emotions keep track of how people treat us" (p. 22). This concept was used to help spouses understand how romantic love is created (experiencing caring behaviors, or *deposits*) and destroyed (experiencing thoughtless behaviors, or *withdrawals*). A spouse's *account balance* was a reflection of how the partner was providing caring love. Essentially, Harley taught a marital lifestyle that involves "mutual extraordinary care" (Harley, 2022, p. 13) with the primary goal of sustaining the feeling of romantic love for a lifetime (Harley, 2001).

As a means of assessing the progress of a couple in marriage counseling, Harley (2010) created the LBI in 1975 as a measurement of being *in love*. The original LBI scale development asked college students to rate the way they felt toward their dating partners. An item analysis of over 100 questions identified 20 statements that were most highly correlated with the statement "I am in love with (the dating companion)." The average of the ratings for these 20 statements became the LBI score, and statement 21, "I feel romantic love toward ____," was added to the assessment to confirm construct validity. Although the LBI has been used within Harley's marital education and therapy contexts for over 40 years, the specific psychometric research was unpublished (Harley 2010) and, similar to earlier scale development, may not have had the sophistication of current psychometric standards (Hatfield et al., 2012).

The purpose of this investigation was to expand upon the research of assessment tools appropriate for determining ME efficacy by exploring the psychometric properties of Harley's Love Bank Inventory (LBI). Two studies were conducted that utilized a multiethnic, married sample to provide an extensive psychometric evaluation of the LBI in terms of factor analysis, validity, and data set reliability. Study 1 conducted an exploratory factor analysis of the factor structure and examined validity and reliability. Study 2 involved a confirmatory factor analysis and replicated validity and internal consistency analyses.

Based on the statistical analyses from the two studies, the following questions were examined: (a) does the LBI demonstrate a single-factor model with convergent validity, (b) does the data set reflect a reliable measure (internal consistency and test-retest), and (c) concerning concurrent criterion validity, how does the LBI correlate with the Locke-Wallace Marital Adjustment Test (MAT; Locke & Wallace, 1959)?

2. General Method for Study 1 and Study 2

2.1. Participants

Participants for Study 1 and Study 2 were gathered from a research database of those enrolled in a marriage education class between 2014 and 2020 (N = 285). The pool of respondents primarily resided in the National Capital Region (NCR) region of the

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Philippines but were citizens of the Philippines (95%), Australia (1%), South Africa (1%), the United Kingdom (1%), and the United States (2%). From this database, respondents were randomly placed into each study. Any married dyad represented in the pool was randomly split up between studies, even though a preliminary dyad correlation identified them as weakly correlated with 16% of the variance in common between the spouses who completed the LBI on the same day ($r(98) = .40$, 95% CI [.216, .549], $r^2 = 0.16$).

Participants in each study represented nondyadic spouses involved in a heterosexual, monogamous, consensual union with the legal recognition of marriage (Study 1: $n = 143$; $n_{men} = 70$, $n_{women} = 73$; Study 2: $n = 142$; $n_{men} = 70$, $n_{women} = 72$). For test-retest reliability, 69 respondents from the pool of 285 achieved the criteria for participation ($n_{men} = 34$, $n_{women} = 35$). There were no statistically significant differences between the demographics of men and women for either study as determined by the independent sample *t*-test and Mann-Whitney analyses. All respondents considered English as a primary language. See Table 2 for a summary of the demographic data for Study 1, Study 2, and test-retest subgroup.

Table 2:

Summary of Demographic Variables by Participants in Study 1 ($n = 143$), Study 2 ($n = 142$), and Test-Retest Subgroup ($n = 69$)

Demographic Variables	Study 1[a]	Study 2[b]	Test-Retest[c]
M Years Married	14.27 (9.33; 0.2-39)	13.54 (9.21; 0.2-40)	14 (10.53; 0.2-39)
M Age (years)	41.20 (8.55; 22-62)	40.41 (8.18; 23-58)	40.16 (9.59; 23-62)
M # Children	2.22 (1.33; 0-6)	2.23 (1.34; 0-6)	2.00 (1.24; 0-4)
Education Level			
% PHD/MD	1	2	3
% MA/MS/MBA	8	8	6
% BA/BS	80	73	67
% Some Undergraduate/Tech.	7	11	13
% HS	4	6	11

Note. [a]$n_{men} = 70$, $n_{women} = 73$. [b]$n_{men} = 70$, $n_{women} = 72$. [c]$n_{men} = 34$, $n_{women} = 35$.
The numbers identified within the parentheses represent *SD* and range of the variable.

Each participant voluntarily agreed to the assessment data being used for research purposes. They were provided informed consent, which included the purpose of the study, amount of time necessary and expectations, the right of withdrawal, and protection of anonymity/confidentiality (American Psychological Association, 2017). The participants received no tangible or monetary incentive except for the class materials.

2.2. Assessment Measures

All participants individually and concurrently completed the assessments via a private and secured, online testing link. Two self-report assessment measures were used: the Locke-Wallace Marital-Adjustment Test, LWSMAT (MAT; see Locke & Wallace, 1959, to view assessment), and the Love Bank Inventory (LBI; see Harley, 2010, to view assessment).

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With over 4100 research citations across varying cultures and populations, the Locke-Wallace Marital Adjustment Scale (MAT, Locke & Wallace, 1959) seems to be compared regularly with newly developed assessments and has withstood the test of time as a standard for assessing marital health (e.g., Ghoroghi et al., 2015; Jiang et al., 2013; Khatun et al., 2019). The MAT is a 15-statement, Likert-type self-report survey with variable scoring for each statement (potential total score range: 2 to 158) and has been validated as a reliable marital adjustment measure and comparable to more recent pay-per-use marriage adjustment measures despite its development over 50 years ago (Bagarozzi, 1985; Crane et al., 1990; Freeston & Pléchaty, 1997; Jiang et al., 2013). The MAT's Spearman-Brown split-half reliability was .90 (Locke & Wallace, 1959).

The MAT statements focus on general happiness, agreement about marital lifestyle (finances, demonstration of affection, sex relations, philosophy of life), conflict resolution, leisure time, and specific marital choices (e.g., "If you had your life to live over again, do you think you would: (a) Marry the same person; (b) Marry a different person; or (c) Not marry at all."). Locke and Wallace (1959) defined "adjustment" as "accommodation of a husband and wife to each other at a given time" (p. 251). However, the MAT has been highly correlated with other marital health construct scales, such as satisfaction and cohesion (Crane et al., 1990).

Although the MAT uses the term "adjustment" as the construct related to marital health, it is apparent from correlation research with other measures that the MAT is more than adjustment, but includes similar components of marital health, like compatibility, sexual congeniality, and closeness (Kimmel & Van Der Veen, 1974). Crane et al. (1990), and more recently, Whiting and Crane (2003) identified a score of 100 and above as nondistressed or adjusted, 60–99 as moderately distressed, and under 59 as severely distressed.

The Love Bank Inventory (LBI) is a 21-statement, Likert-type self-report survey with a variable rating (−3: Disagree Completely to +3: Agree Completely) for each statement about the spouse. An LBI score is calculated by the sum of ratings for statements 1 through 20, divided by 20 (potential LBI score range: −3 to +3). Previous research using this measure indicated a Cronbach's alpha of .92 (Chalmers, 2019). Based on applied experience, Harley determined that a score of 1.8 usually reflects being in love (Harley, 2010). The Flesch-Kincaid Grade Level for the LBI is 5 (Stockmeyer, 2009).

For participants in both studies, there were negligible to weak positive correlations for years married, age, number of children, and education level with the LBI and MAT, indicating that their scores were not affected by the diverse participant composition (see Table 3).

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Table 3:

Pearson Correlation (*r*) or Spearman's Rank-order Correlation (r_s) for LBI and MAT and Demographic Variables within Study 1 (*n* = 143) and Study 2 (*n* = 142)

	Demographic Variables			
Measure	Yrs Married	Age	# Children	Education
MAT				
Study 1	*r* = .11, *p* = .20 [-.057, .267]	*r* = .05, *p* = .55 [-.114, .213]	*r* = .05, *p* = .54 [-.113, .214]	r_s = .13, *p* = .13 [-.044, .289]
Study 2	*r* = .19, *p* = .02* [-.031, .348]	*r* = .16, *p* = .06 [-.006, .315]	*r* = .11, *p* = .20 [-.057, .268]	r_s = .13, *p* = .14 [-.045, .289]
LBI				
Study 1	*r* = .05, *p* = .59 [-.119, .209]	*r* = -.01, *p* = .96 [-.169, .160]	*r* = .03, *p* = .75 [-138, .190]	r_s = .12, *p* = .16 [-.052, .281]
Study 2	*r* = .09, *p* = .28 [-.074, .253]	*r* = .09, *p* = .29 [-.077, .250]	*r* = .09, *p* = .28 [-.075, .252]	r_s = .10, *p* = .22 [-.068, .268]

Note: Numbers in brackets represent lower and upper confidence intervals, 95%, two-tailed.
*p < .05.

Table 4 summarizes the descriptive statistics for the data sets in each study.

Table 4:

Descriptive Statistics of LBI and MAT within Study 1 (*n* = 143) and Study 2 (*n* = 142)

	Descriptive Statistics				
Measure by Study	Mean	SD	Range	Skew	Kurtosis
MAT					
Study 1	115.59	22.78	32 - 158	-1.09	1.75
Study 2	115.86	23.30	43 - 155	-0.88	0.55
LBI					
Study 1	2.15	0.84	-2.35 - 3	-1.94	5.54
Study 2	2.14	0.78	-1.80 - 3	-1.72	4.38

2.3. Data Inclusion Criteria

The data inclusion criterion for Study 1 and Study 2 required all participants to individually submit the LBI and MAT on the same day. No outlier data were excluded or transformed.

The inclusion criteria for the test-retest reliability coefficient calculation were based on the completion of at least two assessments before entering the marriage class and the second assessment needed to be completed within 1 to 15 days of the first assessment. (*n* = 69; n_{men} = 34, n_{women} = 35).

2.4. Statistical Analyses

Study 1 and Study 2 conducted statistical analyses of the data using (a) SPSS (Version 28.0.0.0, IBM Corp, 2021); (b) Hayes' OMEGA macro for SPSS (Hayes, 2020; Hayes & Coutts, 2020) to generate McDonald's Omega (*ω*: Hancock & An, 2020; McDonald, 1999; Revelle & Zinbarg, 2009) and 95% confidence intervals using bootstrap samples (1000); (c) JAMOVI (Version 1.6.23; Jamovi Project, 2021; Seol, 2020) to generate Rasch model analyses;

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and (d) FACTOR (Version 11.05.01, Lorenzo-Seva & Ferrando, 2006) to generate polychoric correlations for exploratory factor analysis (EFA) with ordinal variables (Flora & Curran, 2004; Li, 2016), as well as the goodness of fit indices for confirmatory factor analysis (CFA).

2.5. Reliability

For both studies, McDonald's omega (ω) was calculated to determine the internal consistency within the data sets of the 20 statement ratings that make up the LBI score as recommended for ordinal data (Gadermann et al., 2012; Hayes & Coutts, 2020). Additionally, in Study 1, test-retest reliability correlations on LBI scores were calculated using the Pearson correlation coefficient.

2.6. Validity

Convergent Validity. Study 1 and Study 2 analyzed the relationship of LBI scores and the direct rating of romantic love (statement 21) with the Spearman's rank-order correlation coefficient (r_s), as appropriate for combinations with ordinal data.

Concurrent Criterion Validity and Conversion Formula. The Pearson correlation coefficient was used to evaluate the correlation between the MAT scores and LBI scores.

2.7. Exploratory Factor Analysis (EFA) and Rasch Analyses in Study 1

Although the original factor analysis of the LBI was previously based on a combination of prior theory and psychometric testing by Harley (2010), no published factor analysis information was available. Thus, calculations were primarily conducted to confirm the plausibility that the LBI represents a single-factor structure and the amount of variance within the statements due to the factor.

This investigation accepted a complementary, or augmenting, approach to item analysis by using the Rasch item analysis model (RM) and factor analysis model (FA) to provide more in-depth analyses (Aryadoust et al., 2020; Bailes & Nandakumar, 2020; Salzberger, 2021). Rasch analyses were calculated for the measure items (Rasch, 1960; Boone, 2016). A Wright map was also generated to identify respondent levels and item difficulty.

An adapted process recommended by Watkins (2018) was followed for EFA. Before conducting the analysis, the distributional properties of the data sets were investigated. The LBI scores for both studies revealed a leptokurtic and negatively skewed distribution. This suggested that the participants reported higher scores than a normal distribution would identify indicating that they were healthier couples on average, which is not unusual in marriage education research (Schumm et al., 1983). Therefore, the factor analysis extraction method was chosen as recommended (Flora & Curran, 2004; Forero et al., 2009; Li, 2016) in consideration of the distribution characteristics and use of ordinal data (Dispersion Matrix: polychoric correlations; Factor Extraction: Robust diagonally weighted least squares, DWLS).

It was hypothesized *a priori* that there would be a one-factor structure or potentially correlating factors; thus, a method that allows for partial correlation of factors with an oblique rotation method was chosen (PROMIN, Ferrando & Lorenzo-Seva, 2017). A parallel

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analysis and scree plot visual analysis for eigenvalues was also included in the exploratory analysis of factors.

The data set was determined as suitable for factor analysis. The Kaiser-Meyer-Olkin measure (KMO: .70; Kaiser, 1974) and Bartlett's test of sphericity ($\chi^2(190) = 1548.5$, $p < .001$; Bartlett, 1954) suggested sampling adequacy. The participant-to-item ratio (7:1) was considered suitable as well (Hair et al., 2010).

2.8. Confirmatory Factor Analysis (CFA) in Study 2

The following goodness-of-fit indices were generated: root mean square error of approximation (RMSEA; Steiger, 1990), goodness-of-fit index (GFI), Tucker-Lewis non-normed fit index (TLI/NNFI; Bentler & Bonett, 1980; Tucker & Lewis, 1973), and comparative fit index (CFI; Bentler, 1990).

3. Results of Study 1: Exploratory Factor Analysis: Reliability, and Validity of the LBI

3.1. EFA

The factor analysis extraction using the data set of 20 statements revealed two components that met the criteria of an eigenvalue greater than 1. Component 1 explained 65% of the variance (eigenvalue = 12.94) and component 2 (eigenvalue = 1.21) explained 6% within the data set.

Upon visual analysis of the scree plot, there was a clear delineation between Component 1 and the remaining components, suggesting that Component 1 had the strongest factor loading. Further investigation compared the eigenvalues generated by the factor analysis for components 1 and 2 with a parallel analysis of randomly generated eigenvalues for each component (Watkins, 2000; 100 replications). The parallel analysis of Component 1's eigenvalue (1.74) was well under the actual eigenvalue (12.94), but the parallel analysis of Component 2's eigenvalue (1.60) was greater than the actual eigenvalue (1.21); thus, exploratory factor analysis suggested that the LBI statements are related to one factor; or in other words, the greatest proportion of variance for each statement could be explained by Component 1.

The factor-loading and communalities for a one-factor structure are shown in Table 5. The percentage of variance in the LBI statements that are explained by the factor ranged from 21% to 81%, with a correlation of .46 to .90 between the factor and LBI statements.

Table 5:

Factor-loading and Communality for a One-factor Model by LBI Statements (n = 143)

Item	Statement	Factor	h^2
14	I feel that there is a "chemistry" between me and __.	.90	.81
2	I enjoy being with __ more than anyone else.	.90	.81
12	I am fascinated by __.	.89	.80
1	I usually experience a good feeling whenever I think about __.	.89	.80
11	I find __'s personality to be attractive.	.88	.77
16	__ is a type of person that is easy for me to like.	.88	.78

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Item	Statement	Factor	h^2
17	__ has many personal traits that I admire.	.86	.73
15	__ brings out the best in me.	.85	.71
5	I enjoy talking to __.	.84	.70
18	I enjoy doing things for __.	.84	.70
13	I enjoy telling __ my deepest feelings and most private experiences.	.82	.67
10	I would be very upset if I were to lose the companionship of __.	.77	.60
7	I have **NOT** recently considered ending my marriage or relationship with __.	.77	.59
8	I find __ to be physically attractive.	.76	.57
4	Whenever I daydream, I tend to think about __.	.73	.54
9	I enjoy __'s sense of humor.	.70	.49
3	I am easily aroused sexually by __.	.70	.48
20	I want __ to tell me his/her deepest feelings and most private experiences.	.68	.46
19	I find myself spending quite a bit of time thinking of ways to make __ happy.	.65	.42
6	I tend to overlook __'s mistakes.	.46	.21

Note. Factor Matrix and Commonality Extraction Method: robust diagonal weighted least squares with polychoric correlation dispersion matrix (FACTOR). h^2 = commonality.

3.2. Validity

Convergent Validity. The Spearman's rank-order correlation for ratings of statement 21 ("I feel romantic love toward ____.") and LBI score identified a strong positive relationship (r_s (141) = .68, p < .001, 95% *CI* [.573, .759], two-tailed; for interpretation of r_s, see Muijs, 2004, p. 126). Men and women scores revealed a slight correlation difference, yet both revealed a strong positive correlation ($r_{s\text{-}men}$ (68) = .71; $r_{s\text{-}women}$ (71) = .64).

Concurrent Criterion Validity. The LBI with the MAT, an empirically validated scale to assess marital adjustment, demonstrated a statistically significant and strong positive correlation (r(141) = .80, p < .001, 95% CI [.732, .852], two-tailed); this suggests that both the MAT and LBI are measuring a similar area of marital quality. There were only slight differences between men and women for MAT and LBI correlation ($r(68)_{men}$ = .78; $r(71)_{women}$ = .81).

3.3. Reliability

Internal Consistency. The McDonald's omega (ω) was .96 (95% BootCI [.933, .973], Boot*SE* = .01) suggesting a strong internal consistency within the constituent items of the LBI from the data set. Again, there was only a slight difference between men and women for the same calculation (ω_{men} = .94; ω_{women} = .97). Given that McDonald's omega is not the typical analysis used in past ME assessment research, although appropriate for ordinal data (Revelle & Zinbarg, 2009), Cronbach's alpha (Cronbach, 1951) was also calculated as .96 (95% BootCI [.933, .972], Boot*SE* = .01) for a comparative reference.

Test-retest. The Pearson correlation coefficient for test-retest reliability suggested a high level of consistency over time within this data set (r(67) = .88, p < .001, 95% CI [.808,

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.922]; $r_{men}(32) = .86$, $p < .001$, 95% CI [.727, .925]; $r_{women}(33) = .90$, 95% CI [.808, .948], $p < .001$) with a range of one to 15 days between tests ($M = 7.3$, $SD = 3.56$). As this particular data set included dyads (i.e., married partners), the correlation was also calculated with an average test-retest score for dyads ($r(33) = .90$, 95% CI [.803, .947], $p < .001$), confirming a strong positive correlation for test-retest.

Rasch. Table 6 summarizes the Rasch analyses for items. The item difficulty measure ranged from -0.57 to 0.93 (SE: 0.08 to 0.11). The infit values ranged from 0.46 to 1.71. The outfit values ranged from 0.41 to 1.50. Item 6 was identified as having the highest infit (1.71), outfit (1.50), and measure difficulty value, or most difficult to endorse by the responders (0.93), yet upon further reliability analyses, if an item was dropped, the internal consistency did not change ($\omega = .96$). Item infit and outfit scores between 0.50 and 1.50 would be considered ideal (Linacre, 2002).

Table 6:

Rasch Analyses by LBI Item (n = 143)

Item	Difficulty	*SE*	Infit	Outfit
1	-0.30	0.12	0.64	0.62
2	-0.61	0.14	0.71	0.56
3	0.13	0.11	1.17	1.28
4	0.66	0.10	0.83	0.95
5	-0.11	0.12	0.81	0.72
6	1.18	0.09	2.19	2.07
7	-0.27	0.12	2.36	1.79
8	-0.11	0.12	0.95	0.85
9	0.26	0.11	1.16	1.32
10	-0.80	0.14	1.41	1.08
11	-0.07	0.12	0.66	0.63
12	0.35	0.11	0.53	0.57
13	0.26	0.11	1.22	0.96
14	0.03	0.11	0.84	0.76
15	0.03	0.11	0.86	0.80
16	-0.08	0.12	0.76	0.66
17	-0.11	0.12	0.67	0.98
18	-0.17	0.12	0.87	0.74
19	0.28	0.11	1.37	1.30
20	-0.53	0.13	1.49	1.16

Note. Standard Rasch model performed by joint maximum likelihood (JML), rating-scale type, step = 6 (7 response categories - 1; Bailes & Nandakumar, 2020), mean-square statistics for infit and outfit (JAMOVI; Willse, 2014). *SE* = standard error.

A Wright map is presented in Figure 1 that graphically shows the respondent score variations within the data set ("student ability") and ease of endorsement ("item difficulty") measures. Item 6 is shown as having the highest difficulty rating, or in other words, the

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most difficult to score highly or endorse. Also, there is a larger number of responders that scored higher on most items, as would be predicted from a data set of marriage education participants versus marriage therapy respondents. Also, although most literature recommends eliminating outliers and repeating the analyses to improve the outcome values (Boone & Noltemeyer, 2017; Watkins, 2018), this investigation chose a fully inclusive-data approach to allow the finding to shed light on the psychometric properties of the measure and not suggest measure improvements.

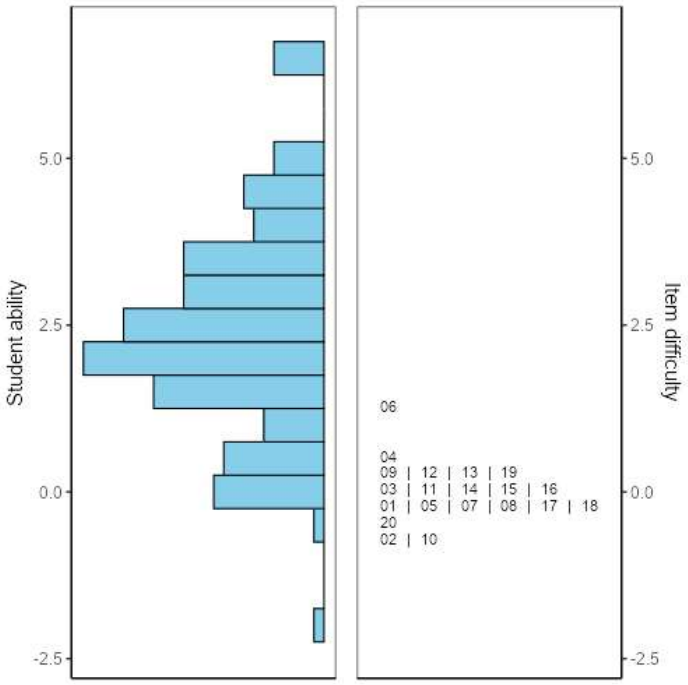

Figure 1: *Wright Map with Student Ability and Item Difficulty of the LBI*
Note: Type: rating scale (figure generated by JAMOVI; Martinkova & Drabinova, 2018; Seol, 2020).

4. Results of Study 2: Confirmatory Factor Analysis, Reliability, and Validity of the LBI

4.1. CFA: Goodness of Fit Indices

When using polychoric correlation and DWLS extraction, Xia and Yang (2018) cautioned the use of conventional cut-off interpretations (Hu & Bentler, 1999) as these have been determined by using continuous observed data with assumptions of multivariate normality met with maximum likelihood extraction (ML). Thus, these indices were solely used in this study as a "diagnostic tool for model improvement" and not an interpretation of "good fit" (Xia & Yang, 2018, p. 421). The goodness of fit indices and confidence intervals (biased-corrected bootstrap method, Lambert et al., 1991) suggest that the model did not need to be improved: RMSEA = 0.000, 95% BootCI [0.000, 0.073], GFI = .982, 95% BootCI [.974, 0.989), CFI = 0.999, 95% BootCI [0.956, 1.012], TLI (aka NNFI) = 1.018, 95% BootCI [1.000, 1.098].

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4.2. Validity

Convergent Validity. A strong positive relationship was suggested between statement 21 ("I feel romantic love toward ____.") and LBI score (r_s (140) = .67, p < .001, 95% *CI* [.564, .754], two-tailed; Muijs, 2004, p. 126). There was a slight gender difference, yet both revealed a strong positive correlation ($r_{s\text{-}men}$ (68) = .68; $r_{s\text{-}women}$ (70) = .65).

Concurrent Criterion Validity. The LBI and MAT demonstrated a statistically significant and strong positive correlation (r(140) = .76, p < .001, 95% CI [.679, .821], two-tailed). There was only a slight gender difference between the MAT and LBI correlation ($r(68)_{men}$ = .78; $r(70)_{women}$ = .73), again suggesting a strong positive correlation.

4.3. Reliability

Internal Consistency. The McDonald's omega (ω) was .95 (95% BootCI [.930, .969], Boot*SE* = .01) suggesting a strong internal consistency within the constituent items of the LBI from the data set. Again, there was only a slight difference between men and women for the same calculation (ω_{men} = .95; ω_{women} = .94). Cronbach's alpha was .95 (95% BootCI [.929, .969], Boot*SE* = .01).

5. Discussion

The psychometric properties of the LBI were analyzed in two studies. Overall, the data analyses suggest that the LBI represents strong convergent validity (Study 1: r_s = .68; Study 2: r_s = .67), and internal consistency (Study 1: ω = .96, α = .96; Study 2: ω = .95, α = .95), with only slight differences between genders. Within Study 1, the data set reflected strong reliability concerning test-retest (r = .88), and EFA identified one factor that accounted for 65% of the variance within the 20 statements of the LBI. Confirmatory factor analysis in Study 2 indicated that a single-factor model did not need improvement (RMSEA = 0.000, GFI = .980, CFI = 0.999, TLI = 1.019), thus, it could be postulated that the LBI is assessing a construct related to being in love in marriage, or termed romantic love, as identified by the developer (Harley, 2010). As Kline (2016) cautioned, labeling of factors is primarily a subjective means to aid communication, however, the LBI statements are consistent with the romantic love elements (emotional and physical connection) as identified by Hemesath (2016). Additionally, the construct criterion validity analysis indicated a strong positive correlation between the MAT and LBI (Study 1: r = .80; Study 2: r = .76), suggesting that the LBI could provide a similar measurement of marital health as the MAT.

While the results of this investigation suggest that the LBI is a valid measure as an assessment of romantic love in marriage, several directions and implications for future studies are recommended. First, as the MAT measures marital "adjustment," future research could study the possible reasons why the MAT and LBI are highly correlated and yet the items are different. One possible area of investigation could be the weight that the MAT gives to the degree of happiness in marriage (statement 1), with nearly one-quarter of the total test score (22%) even though it represents one statement out of 15 (6%). Perhaps the MAT and LBI share a commonality in that romantic love is related to happiness in marriage as previously discussed (Huston, 2009; Huston et al., 2001; Willi, 1997).

Second, an implication for future research could consider this commonality between happiness and romantic love. ME curriculum has rarely focused on improving

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romantic love as a primary goal (Chalmers, 2019). However, ME developers may be encouraged to include an outcome measure for romantic love alongside the standard marital satisfaction measures when conducting program efficacy research.

Another path for inquiry is related to mitigating response-set bias. The data sets collected within this report represented a negatively skewed and leptokurtic distribution, which is not uncommon within marriage research and assessment validation (Schumm et al., 1983); yet the propensity of a social desirability response-set bias for self-report measures of romantic love in marriage could be a topic for further research. Research has identified less bias with measures of marital satisfaction constructs (Murstein & Beck, 1972); however, the construct of romantic love could have more bias as spouses may believe that one should be in love with a spouse (O'Leary et al., 2012). Although this study attempted to mitigate response-set bias with a private, online platform and assurances of confidentiality, future research could incorporate social-desirability measures to determine if the participants were responding with bias due to the nature of the construct and suggest ways to further mitigate the bias.

Future research could also investigate the discriminant validity of the LBI by including statements about like, dislike, and hatred (e.g., "I have a feeling of hate toward ___."). The LBI is a romantic love measure and does not have an estimated cutoff score for distressed or nondistressed couples as reflected in the MAT research. Additional statements concerning the feelings of like, dislike, and hate could be useful to discriminate between LBI scores and confirm cutoff scores for these alternative feelings.

Finally, although the LBI demonstrated solid findings for validation and reliability within the data sets of the two studies, the question of validity and reliability among samples that present varying demographics is worthy of future study. As Graham and Christiansen (2009) cautioned, reliability is primarily dependent on the respondents using the measure. Thus, it is highly recommended that reliability analyses (e.g., McDonald's omega) are calculated for each ordinal data set used from any Likert-type measure before the interpretation of findings. In addition, expanding on this research by using participants from varying cultures and demographics would enhance the LBI's external validity.

Overall, the need for assessments within ME development and applied applications was previously highlighted as there seems to be very few current measures of romantic love that are validated with married couples. Based on the promising results of this study, the LBI may help add to the existing measures of romantic love that are validated using data sets representing married respondents. It is recommended that future assessment research be expanded in the area of romantic love in marriage and that the LBI would be used alongside other validated marital health measures to confirm the results of this investigation.

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Competing Interests

The author has declared that no competing interests exist.

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Author Note

This article utilized a similar description for the MAT and LBI in the Method section as in the previously published article, "What's love got to do with it? Improving the effect of marriage education" (Chalmers, 2019).

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