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The psychology of love

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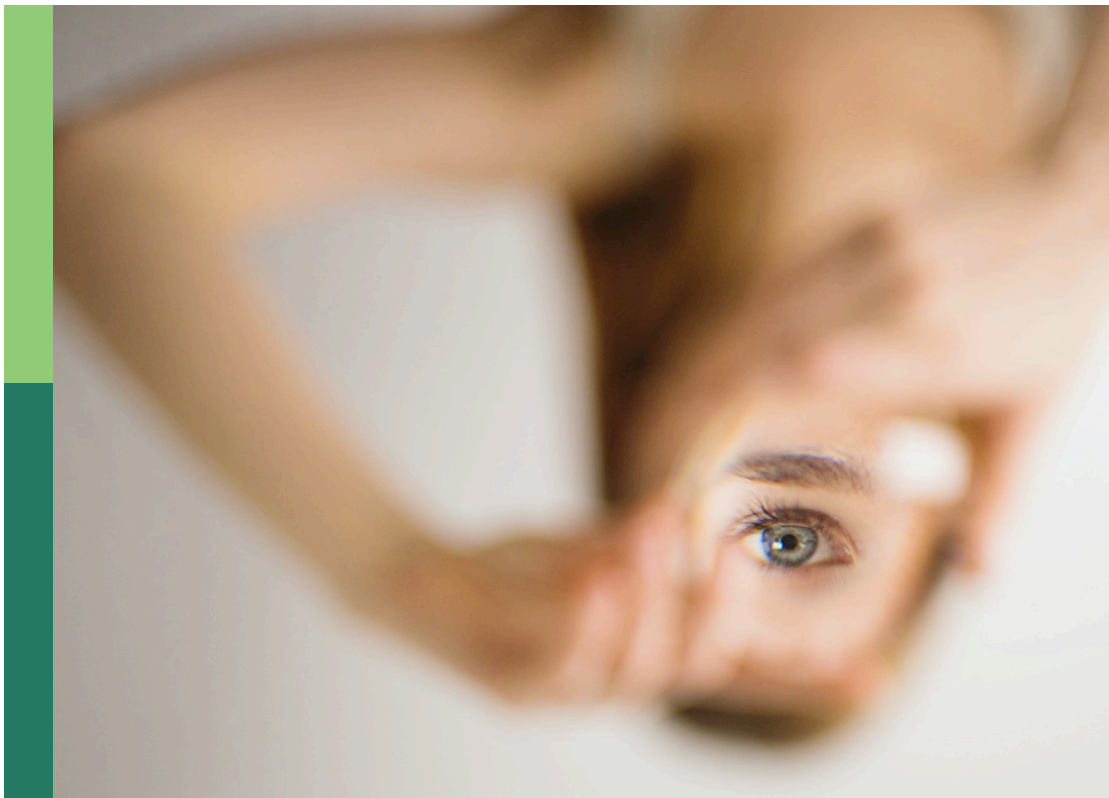

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The psychology of love

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Editorial: The psychology of love

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Editorial on the Research Topic
The psychology of love

Understanding romantic love has been among the central Research Topics in psychology since the 1950s, given its benefits for individual health and wellbeing. In one of the earliest studies in this field, Rubin (1970) developed a scale to assess romantic love and distinguish it from liking and argued that romantic love includes three main components—attachment, caring, and intimacy (Rubin, 1973). This seminal work was crucial to inform the development of theoretical framework widely used (for a review, see Sternberg, 2018). Despite the many difficulties in objectively assessing love (Hendrick and Hendrick, 2019), researchers continue to examine how people experience love, its personal, relational, and contextual correlates, and its implications for functioning. For example, some researchers recently proposed new theories to explain the meaning and experience of love (e.g., Tobore, 2020), whereas others tested the generalizability of established scales (e.g., Triangular Love Scale; Sorokowski et al., 2021). Likewise, some studies have shown that emotional support and involvement in stable romantic relationships can reduce stress reactivity and have positive effects on health (e.g., Coan et al., 2006). Other studies have shown that romantic relationships perceived as valuable by both partners are associated with significant improvements in mental health, including decreased depression, anxiety, and loneliness (e.g., Proulx et al., 2007). Some of these associations have been replicated in longitudinal studies. For example, individuals in stable, high-quality romantic relationships tend to live longer and exhibit lower mortality rates, compared to those who are single or divorced (Holt-Lunstad et al., 2010; Bouchard et al., 2023; Sheng et al., 2023).

In particular, the Psychology of Love has stood out as an interdisciplinary field that investigates multiple dynamics involved in romantic relationships. In recent years, academic interest has evolved considerably, incorporating new perspectives that go beyond traditional approaches to interpersonal attraction, manifestation of affection, and related sexual practices (e.g., sexually diverse individuals; relational diversity; Da Silva et al., 2005; Almeida, 2008, 2010, 2012; Almeida and Lourenço, 2011; Almeida et al., 2008; Sousa et al., 2009; Antunes et al., 2010; Franklin et al., 2015; Lima and Almeida, 2016; Hatakeyama et al., 2017; Almeida and Dourado, 2018; Almeida and Lomônaco, 2018). As Western societies become more complex and human interactions occur in multiple contexts, a deeper and broader understanding of love and its implications becomes necessary.

This Research Topic includes studies exploring different aspects related to the experience of love in samples from around the world:

Individuals' traits and beliefs: Pirrone et al. examined how attachment styles shaped emotional regulation during conflicts in romantic relationships in Belgian individuals. The authors found that negative disengaging emotions (e.g., anger and irritation) were associated with autonomy frustration, whereas negative engaging emotions (e.g., sadness, hurt, and disappointment) were linked to relatedness frustration. The study also revealed that individuals' relationship beliefs moderated the intensity of these emotions, especially regarding relatedness frustration. In another study, Yilmaz et al. showed that traumatic experiences (e.g., parental divorce) negatively shaped trust in future relationships among Turkish university students. This erosion of trust was linked to attachment styles, such that individuals who reported more anxious or avoidant attachment styles experienced more difficulties in maintaining trusting relationships. Moreover, Tartakovsky identified core romantic motivations, such as love and care, family, and status, that reflect individual values and shape relational dynamics in a sample of young individuals in Israel. According to the author, the alignment between these motivations and personal values plays a critical role in the formation and maintenance of romantic relationships.

Expectations and preferences: Thompson et al. investigated the link between idealized first romantic kiss beliefs and romantic love among adults in the United States. Their results indicated that greater endorsement of idealized first kiss beliefs was correlated with higher levels of romantic love. Romantic attachment moderated this link, highlighting the importance of these beliefs for individuals with higher attachment insecurity. In a revision of the literature, Besika examined the link between happiness and meaning in life and proposed that happiness (as the experience of positive emotions) can serve as an indicator of wellbeing, whereas meaning (as ongoing cognitive processes) can help maintain wellbeing. In their study, Liu and Zhang examined the role of similarity in partner selection among Chinese individuals who were single. The authors showed that individuals often prefer partners with similar personality traits. This preference, however, may not be universal and can be shaped by individual factors, like loneliness or perceived self-worth.

Infidelity and jealousy: Fernandez et al. found that love was correlated with jealousy among individuals in Chile jealousy and argued that both experiences serve adaptive functions. For the authors, jealousy plays a role in preserving romantic bonds when expressed in a healthy manner. In their study, Kato and Okubo examined reactions to infidelity among individuals in Japan and found that both women and men in committed relationships reported greater distress over sexual infidelity. Their findings challenge traditional evolutionary psychology views, indicating that relationship status can be more determinant of infidelity reactions than inherent gender differences.

Contextual determinants: Guzmán-González et al. explored how internalized negative feelings over one's sexual identity shaped emotional intimacy among gay male couples in Chile. Internalized homonegativity was found to exacerbate the negative role of attachment insecurity, making it difficult for individuals to achieve emotional closeness. Examining broader environmental factors, Cheng et al. provided new perspectives on how events, such as the COVID-19 pandemic, might have determined the dynamics of romantic relationships among Chinese college students. Their research showed that societal crises can have downstream consequences for subjective wellbeing and relationship perceptions, underlining the importance of considering the sociocultural context in the study of love.

In conclusion, the study of love is vast and ever evolving, encompassing not only the positive aspects of the romantic experience, but also its challenges, such as jealousy, conflict, and insecurity. Interdisciplinary research offers valuable insights to psychologists and theorists, facilitating more comprehensive views, informing the development of more effective interventions, and promoting healthy and resilient relationships. Enjoy the reading!

Author contributions

TA: Writing – original draft, Writing – review & editing. DR: Writing – original draft, Writing – review & editing.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Singles' similarity preferences in an ideal partner: What, when, and why

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This study investigated singles' similarity preferences concerning their ideal partner's personality traits, physical attractiveness, and social resources, as well as potential moderators (fear of being single and mate value) and mediators (forecasted satisfaction). With 1,014 Chinese singles, we found that singles preferred their ideal partner to share similarities in the HEXACO traits, physical attractiveness, and social resources, and they preferred higher similarity in Honesty–Humility and Openness to Experience. Fear of being single, mate value, and forecasted satisfaction did not affect similarity preferences concerning Honesty–Humility and Openness to Experience but had some mixed influence over similarity preferences for other features.

KEYWORDS

attraction, HEXACO model, ideal partner preference, similarity, personality traits

Introduction

In recent years, the topic of ideal partner preference has gained much attention from scholars (e.g., Thomas et al., 2020; Walter et al., 2020; Csajbók and Berkics, 2022). One line of studies primarily examined the similarity preferences for an ideal partner and have generally supported the idea that people prefer their ideal partner to be similar in many attributes, such as personality traits, attitudes, and affects. However, people with intimate relationships tend to adjust their ideal partner preferences based on the characteristics of their current partner (Fletcher et al., 2000; Overall et al., 2006). Liu et al. (2018b) addressed this limitation by recruiting only singles when examining similarity preferences for personality traits in an ideal partner and found that the similarity preference was still held by singles. This study aims to extend the conclusions from Liu et al. (2018b) to show that singles not only have similarity preferences for personality traits but also in physical attractiveness and social resources. In addition, this study explores potential moderators and mediators of such similarity preferences among singles.

Similarity preferences for ideal partner's features

It is well established that people prefer to have a similar partner from both theoretical and empirical perspectives. From an evolutionary perspective, having a similar partner can promote the passage of one's genes because when two parents share similarities, each parent can contribute more than 50% of their genetic material to their offspring (Thiessen et al., 1997). Niche construction theory indicates that having a similar partner can help people to form congenial and smooth relationships and to construct a desirable environment that fits their needs and facilitates their goals (Laland et al., 2001). From a psychological

perspective, pairing with a similar partner is rewarding because similarity can satisfy one's demand for self-affirmation by validating their beliefs and values (Byrne and Clore, 1967) and because similarity can enhance mutual attraction between partners by fostering mutual liking (Condon and Crano, 1988). Besides the theoretical support, some empirical studies have also supported the importance of similarity between partners. For example, partners sharing similar personality traits and/or emotions tend to have more satisfying and stable relationships (Anderson et al., 2003; Luo and Klohnen, 2005; Gonzaga et al., 2007).

Given the importance of having a similar partner, people do depict their ideal partner based on their own characteristics. Past research has shown that people prefer their ideal partner to be similar to them in many aspects, including personality traits, physical attractiveness, attitudes, and values (Botwin et al., 1997; Figueredo et al., 2006; Dijkstra and Barelds, 2008; Watson et al., 2014). However, the relationship status of participants from these studies is either not clear or with some in relationships. Being in a relationship can influence one's ideal preference since people tend to adjust their ideal preference based on their current partner (Fletcher et al., 2000; Overall et al., 2006). Liu et al. (2018b) addressed this issue by only recruiting singles and examining their ideal preference. They found that singles did prefer their ideal partner to share similar personality traits. But Liu et al. (2018b) did not examine whether singles have similarity preferences regarding physical attractiveness and social resources. The current study aims to examine similarity preference among singles not only on personality traits but also on physical attractiveness and social resources. Based on prior literature, we hypothesize that singles prefer their ideal partner to be similar in personality traits, physical attractiveness, and social status (Hypothesis 1).

Previous research not only shows that people prefer their ideal partner to be similar on various attributes but also suggests that similarity preference is particularly pronounced for certain traits. Honesty-Humility and Openness to Experience (from here referred to as Openness) are two potential candidates (Liu et al., 2018b; Liu and Ilmarinen, 2020). For example, Liu et al. (2018b) reported that singles preferred their ideal partner to share a higher similarity in Honesty–Humility and Openness compared to the other HEXACO traits, with participants coming from across China, Denmark, Germany, and the USA. But Liu et al. (2018b) did not examine singles' ideal partner preferences concerning physical attractiveness and social resources. Given that physical attractiveness and social resources are also important when depicting one's future partner as illustrated by ideal standards models, describing the ideal partner from three aspects, including physical attractiveness and social resources (Fletcher et al., 1999; Fletcher and Simpson, 2000), the relative importance of similarity preferences for these two features and personality traits is hard to judge. Some initial observations can be gleaned from studies examining the necessary attributes that people refuse to compromise on when choosing future partners. Li et al. (2002) found that both women and men considered kindness and intelligence as necessities compared to physical attractiveness (which men emphasized more) and social status (which women emphasized more). The two features—kindness and intelligence—nicely mirror some aspects of Honesty–Humility and Openness. Though Li et al. (2002) did not directly examine similarity preferences, their results that kindness and intelligence are prioritized over physical attractiveness and social status are likely to suggest the same when it comes to similarity preferences. Accordingly, we hypothesize that singles have a higher similarity preference concerning Honesty–Humility and Openness compared to the other HEXACO traits, physical attractiveness, and social resources (Hypothesis 2).

Moderators and mediators of similarity preferences in an ideal partner

Though it is well documented that singles prefer their ideal partner to be similar in many domains, the factors influencing such preferences remain largely unexplored. Liu and Ilmarinen (2020) tackled this issue by exploring the moderation effect of core self-evaluation (i.e., one's overall evaluation of oneself) on singles' similarity preferences in an ideal partner. They found that singles whose overall evaluation of themselves was high preferred their ideal partner to share a higher similarity in Emotionality, Extraversion, Agreeableness, and Conscientiousness, relative to singles whose overall evaluation of themselves was low, suggesting that higher similarity on these traits is deemed as more desirable and only people with more mate-attracting advantages can hope to achieve it. Liu and Ilmarinen (2020) also found that singles' similarity preferences for Honesty–Humility and Openness were not influenced by core self-evaluation, suggesting that similarity preferences for these two traits is less likely to be based on how one evaluates oneself.

In addition to core self-evaluation, other factors are likely to influence singles' similarity preferences in an ideal partner. In this study, we aim to explore not only moderators (i.e., fear of being single and mate value) but also mediators (i.e., forecasted satisfaction) of such preferences.

Fear of being single is defined as "concern, anxiety, or distress regarding the current or prospective experience of being without a romantic partner" (Spielmann et al., 2013, p.1050). Spielmann et al. (2013) showed that people scoring high in fear of being single tend to have lower standards concerning their future partner and are less selective in expressing romantic interest at speed-dating events. Thus, people high in fear of being single might compromise more on their ideal standards.

Mate value describes one's value as a mate to a potential or actual partner (Landolt et al., 1995). Edlund and Sagarin (2010) found that people with high mate value tend to have higher standards when visualizing a future partner (e.g., the partner must be highly attractive, more humorous, livelier, and richer). Accordingly, people high in mate value might be more demanding concerning their ideal standards.

Overall, past research suggests that people low in fear of being single or high in mate value tend to have higher standards concerning their ideal partner. Relating to similarity preferences for personality traits, higher standards indicate higher similarity in Emotionality, Extraversion, Agreeableness, and Conscientiousness (Liu et al., 2018b; Liu and Ilmarinen, 2020). Consequently, we hypothesize that fear of being single and mate value

moderate similarity preferences for Emotionality, Extraversion, Agreeableness, and Conscientiousness in the way that people low in fear of being single or high in mate value have higher similarity preference for these traits (Hypothesis 3a). This also applies to physical attractiveness and social resources (Hypothesis 3b). Noticeably, Liu and Ilmarinen (2020) show that similarity preferences for Honesty–Humility and Openness were not affected by moderators. Accordingly, we hypothesize that both moderators had no influence over similarity preferences for Honesty–Humility and Openness (Hypothesis 4).

In addition to examining moderators, we also explore mediators of similarity preferences in an ideal partner. We propose that forecasted satisfaction might be one mediator. Forecasted satisfaction is defined as "anticipated fulfillment and pleasure associated with the relationship in the future" (Lemay, 2016, p.35). Perhaps, people prefer a similar ideal partner due to the belief that they could have good relationships when being with such a partner (Fletcher et al., 2013). Therefore, we hypothesize that forecasted satisfaction mediates singles' similarity preferences for personality traits, physical attractiveness, and social resources (Hypothesis 5).

The current study

To recap, the current study aims to examine all these hypotheses by recruiting singles who are not currently involved in any kind of intimate relationship. We not only try to replicate previous studies where singles prefer their ideal partner to share similarities concerning personality traits, and such similarity preferences are most pronounced in Honesty–Humility and Openness, but also aim to extend previous studies by examining singles' similarity preferences for physical attractiveness and social resources, determining the relative importance of similarity preferences for these two features and Honesty–Humility and Openness. In addition, we explore two moderators (fear of being single and mate value) and one mediator (forecast relationship satisfaction) of similarity preferences.

Methods

Participants and procedure

Singles were recruited from advertisements posted on online social media platforms (e.g., WeChat). Participants were informed that the study would involve participating in an online survey about personality and ideal partner preference. Participants took part in this study voluntarily without monetary compensation but with personalized personality feedback. A total of 1566 participants started our survey and 1078 completed it. Sixty-four participants were deleted because of their patterned response (i.e., reporting 1 or 5 for all personality items). The final sample comprised 1014 participants (81% female), aged between 18 and 46 ($M = 20.8$, $SD = 2.75$).

Measures

Personality

The personality of participants was assessed with the 60-item HEXACO Personality Inventory–Revised (Ashton and Lee, 2009). One sample item is "I would be quite bored by a visit to an art gallery." These items were answered with a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The personality of the ideal partner was measured by an adapted version of the HEXACO inventory about oneself by replacing the first-person pronoun with "my ideal partner" and making grammatical changes only when necessary. Corresponding to the earlier sample item in the measures concerning self-evaluation, the sample item in the ideal partner version is "My ideal partner would be quite bored by a visit to an art gallery."

Physical attractiveness

The physical attractiveness of a participant and their ideal partner was assessed by the vitality–attractiveness dimension from Fletcher et al. (1999). Six descriptions are used, including "nice body" and "attractive." Participants were instructed to describe their self-perceived physical attractiveness and their ideal partner's physical attractiveness based on these descriptions with a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*).

Social status

The social status of participants and their ideal partner was assessed by the status–resources dimension identified by Fletcher et al. (1999). Five descriptions[1] are used, including "good job" and "financially secure." Participants were instructed to describe themselves and their ideal partner based on these descriptions with a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*).

Fear of being single

Fear of being single was measured by a scale from Spielmann et al. (2013) and was answered on a 9-point Likert scale (1 = *strongly disagree*, 9 = *strongly agree*). One sample item is, "It scares me to think that there might not be anyone out there for me."

Mate value

Participants reported their self-perceived mate value by three items from Landolt et al. (1995). These items include "Men/women notice me" and "Men/women feel attracted to me." They were measured on a 9-point Likert scale (1 = *strongly disagree*, 9 = *strongly agree*).

1 The original status–resources dimension has six descriptions, with "appropriate ethnicity" included. We excluded this one because it is not meaningful in China.

Forecasted satisfaction

Forecasted satisfaction was measured by an adapted version of the satisfaction scale from Rusbult et al. (1998) and was answered on a 9-point Likert scale (1 = *strongly disagree*, 9 = *strongly agree*). One sample item is "With my ideal partner, our relationship is much better than others' relationships." An overview of all assessments, datasets, and analyses can be found at https://osf.io/xemyj/.

Results

Similarity preference

Table 1 presents the correlations of our main variables. The correlations between self and ideal partner HEXACO traits, physical attractiveness, and social resources ranged from 0.17 to 0.61 (*ps* <0.001), indicating the existence of similarity preferences. These results remain unchanged after controlling for age and sex (refer to Table 2). Thus, Hypothesis 1, that singles prefer their ideal partner to share similarities in HEXACO traits, physical attractiveness, and social resources, is supported.

Next, we examine Hypothesis 2, that similarity preference for Honesty–Humility and Openness is more important than the other features, by comparing the correlations of these two traits with that of the other features (Liu et al., 2018b). Specifically, we used the method of comparing two non-overlapping correlations from the same group *via* the cocor package in R (Diedenhofen and Musch, 2015). This method is appropriate because all correlations (e.g., the correlation between self-ratings and ideal partner ratings for Honesty–Humility and the respective correlation for Agreeableness) were from the same participants but shared no common variables (e.g., there is no overlap in the items assessing Honesty–Humility and Agreeableness, respectively). Age and sex were also controlled in these comparisons. The results show that the similarity preference is higher for Honesty–Humility and Openness not only relative to the other HEXACO traits but also to physical attractiveness and social resources ($7.37 \leq z \leq 11.82$, *ps* <0.001; refer to Table 2) supporting Hypothesis 2.

Fear of being single and mate value as moderators

We examine Hypotheses 3a and 3b, using linear regressions, that fear of being single and mate value moderate similarity preferences for Emotionality, Extraversion, Agreeableness, Conscientiousness, physical attractiveness, and social resources. For each moderator, six regression models were performed with each of the features of self (e.g., self-Emotionality), the moderator (e.g., fear of being single), the interaction (e.g., Emotionality*fear of being single), and control variables (i.e., age and gender) as predictors, and the corresponding feature of ideal partner (e.g., ideal partner's Emotionality) as an outcome. The results show that fear of being single moderated similarity preference for Agreeableness and social resources but not on the other characteristics (Refer to Table 3). Simple effects show that singles high in fear of being single showed lower similarity preferences for Agreeableness ($b = 0.21$, $\beta = 0.24$, $t = 5.90$, $p < 0.001$) and social resources ($b = 0.10$, $\beta = 0.11$, $t = 2.80$, $p = 0.005$) compared to singles low in fear of being single ($b = 0.32$, $\beta = 0.37$, $t = 8.90$, $p < 0.001$ for Agreeableness; $b = 0.23$, $\beta = 0.25$, $t = 6.26$, $p < 0.001$ for social resources; refer to Figures 1, 2).

Mate value moderated similarity preferences for Extraversion Conscientiousness, physical attractiveness, and social resources. Simple effects indicate that singles scoring high in mate value have higher similarity preference for Extraversion ($b = 0.23$, $\beta = 0.32$, $t = 7.09$, $p < 0.001$), Conscientiousness ($b = 0.27$, $\beta = 0.31$, $t = 7.63$, $p < 0.001$), physical attractiveness ($b = 0.29$, $\beta = 0.36$, $t = 8.29$, $p < 0.001$), and social resources ($b = 0.23$, $\beta = 0.25$, $t = 6.27$, $p < 0.001$), relative to their counterparts low in mate value ($b = 0.07$, $\beta = 0.09$, $t = 2.28$, $p = 0.023$ for Extraversion; $b = 0.17$, $\beta = 0.19$, $t = 4.87$, $p < 0.001$ for Conscientiousness; $b = 0.14$, $\beta = 0.17$, $t = 3.73$, $p < 0.001$ for physical attractiveness, and $b = 0.04$, $\beta = 0.05$, $t = 1.18$, $p = 0.240$ for social resources; Refer to Figures 3–6). These results partially supported Hypotheses 3a and 3b.

We then examine Hypothesis 4 that fear of being single and mate value have no impact over similarity preference for Honesty–Humility and Openness. Results from Table 3 show that these moderators did not influence similarity preference for Honesty–Humility and Openness, supporting Hypothesis 4.

Forecasted satisfaction as a mediator

Hypothesis 5 forecasted that satisfaction may explain the similarity preferences that singles have in their ideal partner, which was examined with mediation models. These mediation models were performed with the Mediation package in R (Tingley et al., 2014). The indirect effect of forecasted satisfaction was significant for similarity preference for Extraversion ($\beta = 0.03$, 95% CI [0.01, 0.04]), Conscientiousness ($\beta = 0.01$, 95% CI [0, 0.03]), physical attractiveness ($\beta = 0.04$, 95% CI [0.02, 0.06]), and social resources ($\beta = 0.04$, 95% CI [0.02, 0.06]), indicating that the similarity preferences for these features can be partially explained by forecasted satisfaction, partially supporting Hypothesis 5.

Discussion

This study examined singles' similarity preferences regarding ideal partner's personality traits, physical attractiveness, and social resources, and we found that singles had similarity preferences for all features, most pronounced in Honesty–Humility and Openness. In addition, we examined the moderation effect of fear of being single and mate value on similarity preference, and the results indicated that neither of these two moderators influenced individuals' preferences for Honesty-Humility and Openness. However, both of the moderators affected similarity preferences for some other features. Specifically, fear of being single moderated similarity preference for Agreeableness and social resources, indicating that singles low in fear of being single preferred their ideal partner to share higher similarity in both features; mate value moderated similarity preference for

TABLE 1 Descriptive statistics and correlations for main variables.

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. S_HH	3.44	0.64	0.72																		
2. S_EM	3.55	0.62	−0.11*	0.71																	
3. S_EX	3.27	0.68	−0.00	−0.11*	0.78																
4. S_AG	3.33	0.56	0.25*	−0.19*	0.25*	0.67															
5. S_CO	3.26	0.57	0.14*	−0.12*	0.22*	0.17*	0.70														
6. S_OP	3.38	0.67	0.04	−0.12*	0.20*	0.15*	0.15*	0.72													
7. S_PA	2.96	0.71	−0.11*	−0.17*	0.56*	0.16*	0.19*	0.29*	0.69												
8. S_SR	3.01	0.73	−0.05	−0.11*	0.45*	0.16*	0.27*	0.19*	0.54*	0.71											
9. P_HH	3.72	0.57	0.61*	−0.02	−0.01	0.10*	0.08*	−0.01	−0.13*	−0.05	0.69										
10. P_EM	2.96	0.53	0.02	0.18*	−0.02	0.03	−0.07*	0.04	0.01	−0.03	−0.07*	0.63									
11. P_EX	3.87	0.50	0.07*	0.12*	0.21*	0.09*	0.07*	0.05	0.12*	0.09*	0.14*	−0.16*	0.69								
12. P_AG	3.78	0.49	0.19*	0.05	0.12*	0.30*	0.06*	0.05	0.06*	0.08*	0.31*	−0.14*	0.37*	0.64							
13. P_CO	3.72	0.50	0.03	0.18*	0.07*	0.02	0.26*	0.07*	0.04	0.07*	0.18*	−0.26*	0.40*	0.35*	0.67						
14. P_OP	3.59	0.57	0.08*	−0.00	0.12*	0.14*	0.09*	0.56*	0.15*	0.12*	0.16*	−0.04	0.33*	0.31*	0.30*	0.72					
15. P_PA	3.93	0.57	−0.13*	0.12*	0.17*	0.05	−0.01	0.09*	0.29*	0.16*	−0.02	−0.12*	0.43*	0.21*	0.27*	0.32*	0.69				
16. P_SR	4.22	0.65	−0.16*	0.22*	0.15*	0.03	0.08*	0.02	0.15*	0.17*	0.01	−0.21*	0.39*	0.29*	0.46*	0.26*	0.60*	0.85			
17. FoS	4.50	1.61	−0.12*	0.31*	−0.06	−0.05	−0.10*	−0.20*	−0.04	−0.02	−0.13*	0.14*	−0.03	−0.04	−0.08*	−0.16*	0.02	−0.01	0.69		
18. MA	5.18	1.79	−0.12*	−0.10*	0.47*	0.10*	0.21*	0.25*	0.59*	0.40*	−0.10*	−0.01	0.11*	0.04	0.05	0.15*	0.20*	0.12*	−0.03	0.81	
19. FS	7.42	1.27	−0.05	0.06*	0.15*	0.06	0.09*	0.06*	0.18*	0.15*	0.13*	0.04	0.26*	0.23*	0.22*	0.17*	0.32*	0.31*	0.11*	0.17*	0.88

S, Self-evaluation of personality; HH, Honesty–Humility; EM, Emotionality; EX, Extraversion; AG, Agreeableness; CO, Conscientiousness; OP, Openness to Experience; PA, physical attractiveness; SR, social resources; P, ideal partner report personality; FoS, fear of being single; MA, mate value; FS, forecasted satisfaction. Reliabilities are printed in a diagonal line.

*$p < 0.05$.

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TABLE 2 Partial similarity preference and higher similarity preference for Honesty–Humility and Openness to Experience.

Variable	Similarity after controlling for gender and age [95% CI]	Higher similarity preference for Honesty–Humility [95% CI]	Higher similarity preference for Openness to Experience [95% CI]
Honesty-Humility	0.62 [0.58, 0.65]	–	–
Emotionality	0.29 [0.24, 0.35]	9.36 [0.25, 0.39]	7.54 [0.20, 0.34]
Extraversion	0.21 [0.15, 0.27]	11.34 [0.34, 0.48]	9.88 [0.28, 0.42]
Agreeableness	0.31 [0.25, 0.36]	9.32 [0.24, 0.38]	7.37 [0.19, 0.33]
Conscientiousness	0.26 [0.20, 0.32]	10.19 [0.29, 0.42]	8.46 [0.23, 0.37]
Openness to Experience	0.56 [0.52, 0.60]	–	–
Physical attractiveness	0.31 [0.25, 0.36]	9.06 [0.24, 0.38]	7.59 [0.19, 0.32]
Social resources	0.19 [0.13, 0.25]	11.82 [0.35, 0.49]	10.24 [0.30, 0.44]

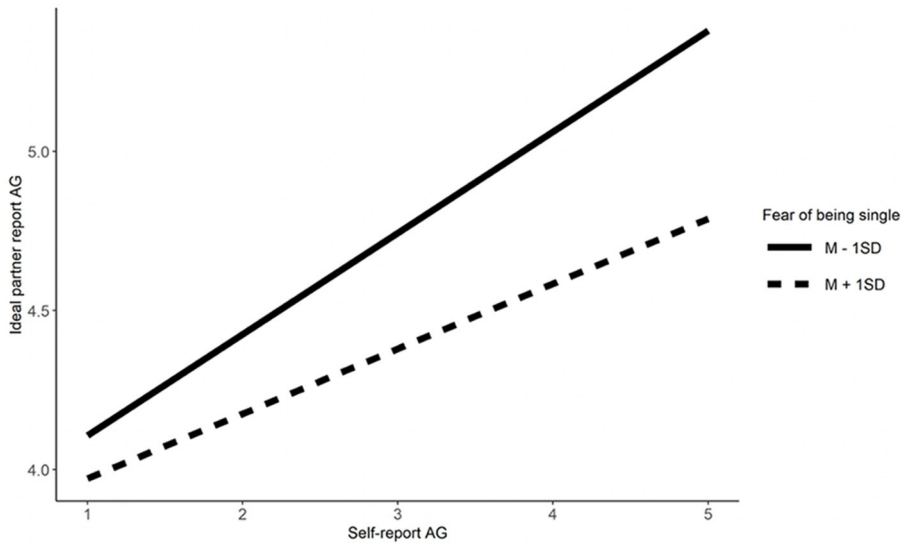

FIGURE 1
The moderation effect of fear of being single of agreeableness. AG, Agreeableness.

Extraversion, Conscientiousness, physical attractiveness, and social resources, indicating that singles high in mate value preferred their ideal partner to share higher similarity on these features. Finally, we examined the mediation effect of forecasted satisfaction on similarity preferences and found forecasted satisfaction mediated similarity preference for Extraversion, Conscientiousness, physical attractiveness, and social resources, indicating that expecting a good relationship in the future partially explained why people prefer similarity in these features with an ideal partner.

The results that singles prefer their ideal partner to share similarities in all the HEXACO traits perfectly mirror the conclusion from previous studies (Liu et al., 2018b; Liu and Ilmarinen, 2020). In addition, our results show that similarity preferences are present for physical attractiveness and social resources. Resonating suggestions from Almeida (2004) that people have principles when choosing a romantic partner, our results reflect that similarity between individuals and their ideal partner is one important principle concerning ideal criteria. However, even though it is critical for one to depict a similar partner in a hypothetical way, results from examining established couples have provided a quite mixed picture. Some studies show that couples indeed share similarities with each other (e.g., Watson et al., 2000; McCrae et al., 2008; Leikas et al., 2018), whereas other studies suggest the opposite (e.g., Watson et al., 2014; Liu et al., 2018a, 2022). The seemingly paradoxical phenomenon might be explained by the complication of real-life partner choice. This is because, except for ideal partner preference, there might be some other factors influencing one's actual partner choice, such as the availability of potential partners, family interference, and pursued relationship types. For example, when there are few potential partners available, people are very likely to settle down with partners that do not quite resemble themselves. Future studies could examine how these factors influence similarity preferences in an ideal partner and the relative importance of these factors together with similarity preference when visualizing one's potential future partner.

Furthermore, we found that the similarity preferences were particularly strong for Honesty–Humility and Openness compared

TABLE 3 Moderation effects of fear of being single and mate value on HEXACO traits, physical attractiveness, and social resources.

Predictors	Fear of being single				Mate value			
	b	*β*	*t*	*p*	*b*	*β*	*t*	*p*
Dependent Variable: P_HH								
S_HH	0.56	0.63	8.85	<0.001	0.53	0.59	8.17	<0.001
Moderator	0.01	0.02	0.14	0.887	−0.01	−0.04	−0.30	0.762
S_HH∗Moderator	−0.01	−0.07	−0.48	0.630	0	0.03	0.20	0.844
Dependent Variable: P_EM								
S_EM	0.30	0.35	4.42	<0.001	0.16	0.18	2.37	0.018
Moderator	0.03	0.11	0.66	0.507	−0.06	−0.20	−1.38	0.167
S_EM∗ Moderator	−0.01	−0.16	−0.80	0.422	0.02	0.21	1.34	0.179
Dependent Variable: P_EX								
S_EX	0.13	0.18	2.12	0.035	−0.09	−0.12	−1.54	0.125
Moderator	−0.01	−0.04	−0.26	0.794	−0.14	−0.51	−3.94	<0.001
S_EX∗ Moderator	0.01	0.06	0.39	0.694	0.05	0.76	4.34	<0.001
Dependent Variable: P_AG								
S_AG	0.43	0.49	5.71	<0.001	0.16	0.19	2.23	0.026
Moderator	0.12	0.39	2.28	0.023	−0.06	−0.22	−1.37	0.172
S_AG∗ Moderator	−0.04	−0.43	−2.31	0.021	0.02	0.28	1.51	0.132
Dependent Variable: P_CO								
S_CO	0.11	0.13	1.55	0.121	0.07	0.08	1.01	0.313
Moderator	−0.08	−0.25	−1.60	0.111	−0.09	−0.31	−2.01	0.044
S_CO∗ Moderator	0.02	0.27	1.60	0.110	0.03	0.40	2.17	0.031
Dependent Variable: P_OP								
S_OP	0.44	0.52	7.29	<0.001	0.36	0.42	5.35	<0.001
Moderator	−0.04	−0.11	−0.84	0.399	−0.07	−0.21	−1.63	0.104
S_OP∗ Moderator	0.01	0.08	0.63	0.528	0.02	0.30	1.84	0.067
Dependent Variable: P_PA								
S_PA	0.32	0.40	4.83	<0.001	−0.01	−0.01	−0.13	0.896
Moderator	0.07	0.20	1.65	0.10	−0.11	−0.34	−3.06	0.002
S_PA∗ Moderator	−0.02	−0.17	−1.22	0.224	0.04	0.62	3.77	<0.001
Dependent Variable: P_SR								
S_SR	0.34	0.38	4.52	<0.001	−0.13	−0.15	−1.91	0.056
Moderator	0.14	0.35	2.88	0.004	−0.13	−0.34	−3.19	0.001
S_SR∗ Moderator	−0.04	−0.35	−2.48	0.013	0.05	0.63	4.16	<0.001

S, Self-evaluation of personality; HH, Honesty–Humility; EM, Emotionality; EX, Extraversion; AG, Agreeableness; CO, Conscientiousness; OP, Openness to Experience; PA, physical attractiveness; SR, social resources; P, ideal partner report personality. Moderator refers to the fear of being single or mate value.

to the other four HEXACO traits, which perfectly replicate results from Liu et al. (2018b). Broadly speaking, similarities in Honesty–Humility and Openness can be explained by their close associations with personal values, and people expect to have close relationships with someone who shares their values (Lee et al., 2009). More related to intimate relationships, the emphasis on similarity in Honesty–Humility and Openness might be due to their association with relationship satisfaction and commitment, and people tend to believe that similarity in these two traits is beneficial to relationships (Liu et al., 2022). Furthermore, singles' similarity preferences for Honesty–Humility and Openness outweigh physical attractiveness and social resources, suggesting similarity is more important in key personality traits than more socially desirable features. Future research could use other methods to examine this idea. For example, researchers can use the budget allocation paradigm (e.g., Li et al., 2002) to ask participants to

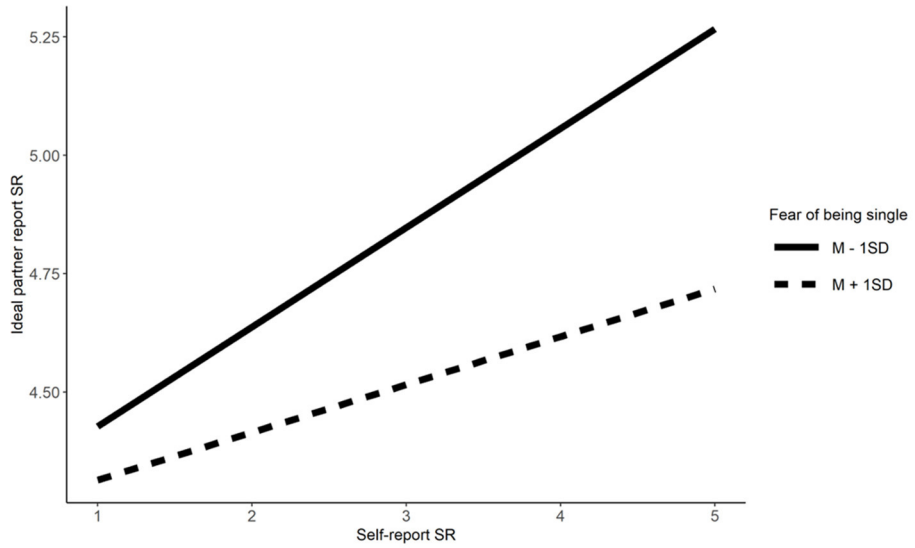

FIGURE 2
The moderation effect of fear of being single of agreeableness. SR, Social resources.

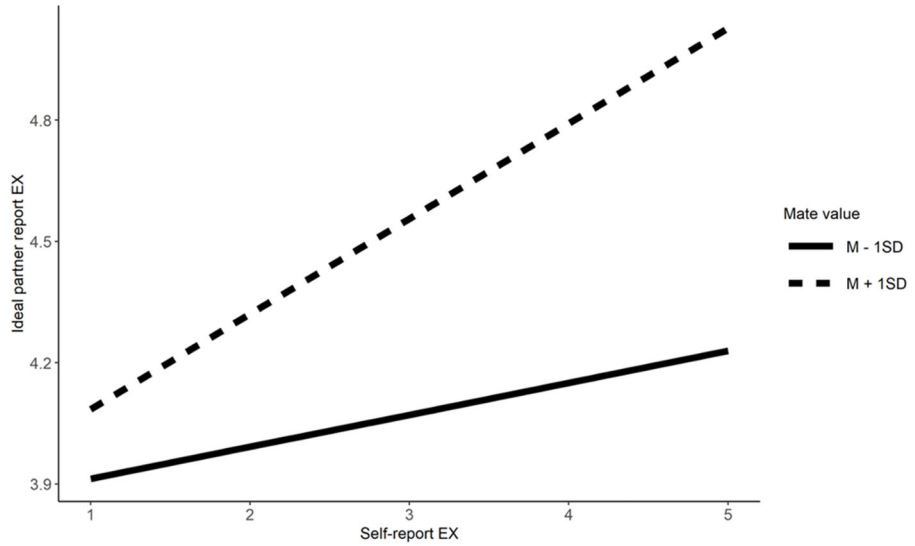

FIGURE 3
The moderation effect of mate value on similarity preference on extraversion. EX, Extraversion.

allocate a limited amount of money to indicate similarity preference for HEXACO traits, physical attractiveness, and social resources and observe what feature people allocate the largest portion of the money. Furthermore, it is unclear how individuals make a trade-off between competing preferences such as preference for similarity in certain traits and preference for an absolute level of various characteristics, such as physical attractiveness. Actually, similarity in personality in established heterosexual couples tends to be quite low, even in Honesty–Humility and Openness (Liu et al., 2018a, 2022). Accordingly, people may trade the similarity of these two traits with other individual features when choosing a real-life partner. It would be interesting to examine whether men tend to trade similarities in Honesty–Humility and Openness with physical attractiveness while women trade similarities in these two traits with social resources, as men and women are shown to emphasize different aspects in their future partner from evolutionary perspectives (Buss, 1989). Future studies could further explore these issues.

Though Liu et al. (2022) found that similarity in Honesty–Humility and Openness in intimate couples from China tends to be quite low, a recent study by Kandler et al. (2019) has shown the opposite. Indeed, Kandler et al. (2019) found that their participants, 228 German couples, presented quite a high similarity in Honesty–Humility (r =0.225) and Openness (r =0.277).

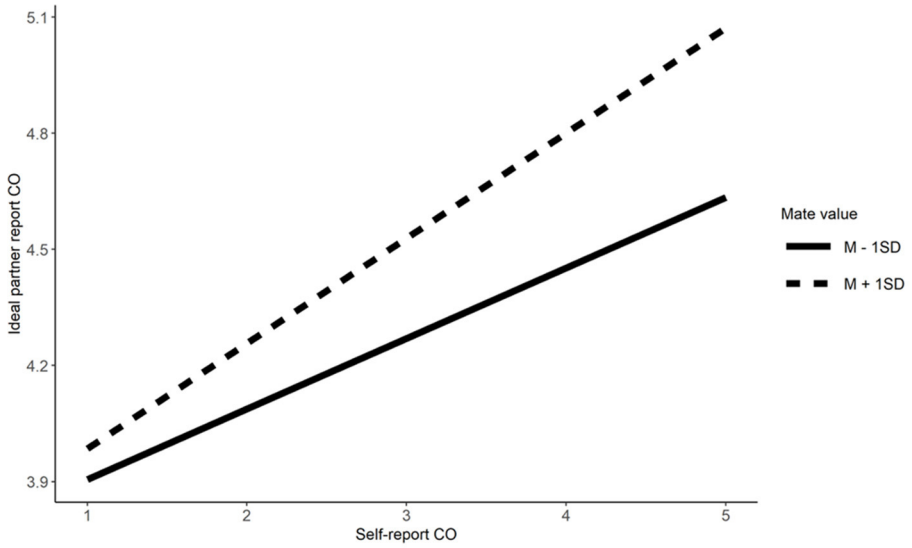

FIGURE 4
The moderation effect of mate value on similarity preference on conscientiousness. CO, Conscientiousness.

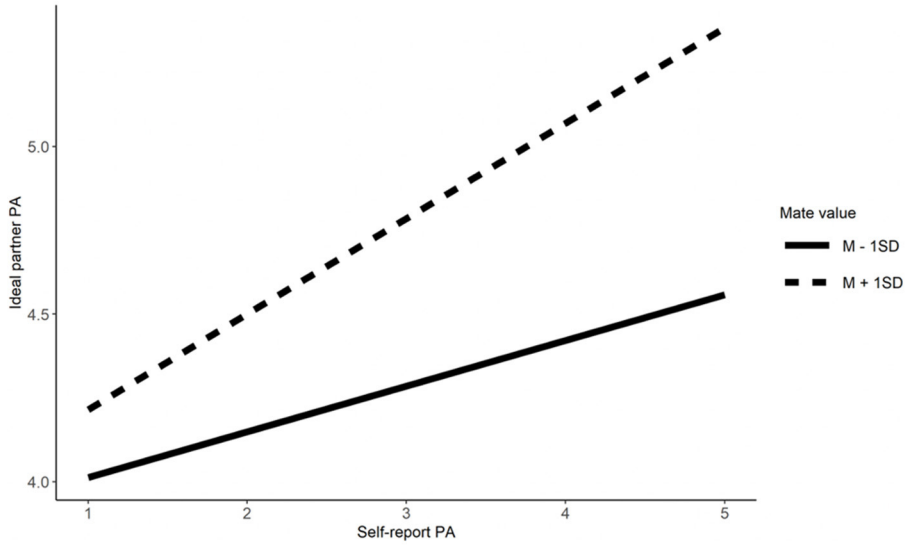

FIGURE 5
The moderation effect of mate value on similarity preference on physical attractiveness. PA, physical attractiveness.

Therefore, similarities in Honesty–Humility and Openness might be different depending on different relationship types (e.g., married vs. unmarried) and different cultures (e.g., collectivism vs. individualism). For example, it is possible that similarities in Honesty–Humility and Openness in married couples is more significant than in unmarried intimate couples. Future studies could further explore these possibilities.

We found that similarity preferences for Honesty–Humility and Openness was not moderated by fear of being single, and mate value also indirectly reflects the particular importance of similarity in these two traits. These results nicely echo the conclusion from Liu and Ilmarinen (2020) that similarity preferences for these two traits was not moderated by core self-evaluation. Together, these results indicate that singles' similarity preferences for Honesty–Humility and Openness are quite strong and immune from potential moderators relating to individual differences. Future research could examine whether social factors, such as the availability of potential partners and relational factors, such as relationship types (e.g., long-term vs. short-term relationships), have an influence on similarity preferences for these two traits.

The moderation hypotheses are only partially supported. Fear of being single and mate value had mixed moderation effects on Extraversion, Agreeableness, Conscientiousness, physical attractiveness, and social resources, but overall they suggest that

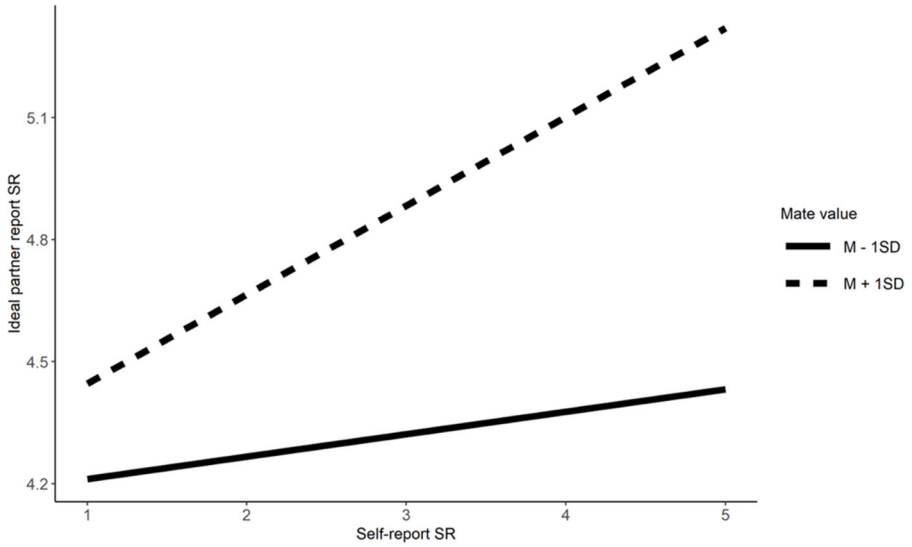

FIGURE 6
The moderation effect of mate value on similarity preference on social resources. SR, Social resources.

people low in fear of being single or high in mate value are more demanding concerning similarity preferences in an ideal partner. These results not only echoed the results from Liu and Ilmarinen (2020) that people with high self-evaluation tend to have high ideal standards but also confirmed that some personality traits (e.g., Extraversion, Agreeableness, and Conscientiousness) are more socially desirable.

The mediation effects of forecasted satisfaction were only supported by similarity preference for Extraversion, Conscientiousness, physical attractiveness, and social resources, indicating that expecting a satisfying relationship in the future is the reason why singles prefer a similar partner. This actually mirrors the main idea of niche construction theory that people are motivated to build an environment that is congenial, fluent, and low in conflict (Laland et al., 2001). In the setting of an intimate relationship, our study shows that the reason why people initially prefer to have a similar partner is because they presume that such a partner can help to form a satisfying relationship in the future. For example, if Sally is high in Extraversion, she would like to have a partner who is high in Extraversion; this is because she could easily imagine a happy relationship with such a partner, not only more pleasures and joys (e.g., going to parties together) but also fewer disagreements and conflicts (e.g., negotiating being alone vs. socially active) in future. However, since the partial mediation models suggest the existence of other mediators, future research could explore other potential mediators, such as intimacy, responsiveness, and commitment.

The current study also has some limitations. First, most participants in our study were female, which may prevent us from generalizing our conclusions to more gender-balanced samples. Future research should strive for a gender-balanced sample to further examine this topic. Second, our participants are relatively young, meaning our study is limited in its representation of older individuals. Future research could explore whether older singles still exhibit the same patterns. Third, we mainly used the method where a participant only reports information about themselves to collect our data. Accordingly, our results might be affected by some response biases, such as acquiescence response style, social desirability bias, and self-enhancement bias. For example, self-rated physical attractiveness might not be that objective due to self-enhancement bias, and people are likely to think of themselves as more attractive than they actually are (Epley and Whitchurch, 2008). Future researchers could combine self-rated and other-rated methods to measure these variables in a more comprehensive and objective way to further test these hypotheses. Finally, though the moderation and mediation effects in our study add some important insights to the current literature concerning similarity preference in an ideal partner, they are only partially supported. Future research could continue examining these moderation and mediation effects to further test their robustness.

Conclusion

Overall, this study examined singles' similarity preferences concerning their ideal partner's personality traits, physical attractiveness, and social resources, as well as potential moderators (fear of being single and mate value) and mediators (forecasted satisfaction). Our results show that singles had similarity preferences in their ideal partner for the HEXACO traits, physical attractiveness, and social resources. This preference was higher for Honesty–Humility and Openness to Experience relative to the other features. In addition, fear of being single, mate value, and forecasted satisfaction did not affect similarity preference for Honesty–Humility and Openness to Experience but had some mixed influence over similarity preferences for other features.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by IRB Board, Department of Psychology, School of Philosophy and Sociology, Jilin University. The patients/participants provided their written informed consent to participate in this study.

Author contributions

JL prepared the manuscript and performed the analyses. JL and YZ helped in interpreting the results and editing the manuscript. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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An everlasting love: The relationship of happiness and meaning

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Happiness is of great importance to people. Although *happiness* constitutes a central theme in psychology, the absence of a unifying theory and inconsistent terminology undermine scientific progress. The present article goes beyond attempting to define "types of happiness" or its contributing factors and addresses the role of *happiness* (i.e., embodied positive emotional patterns) as a function of a dynamic multisystem (i.e., an individual) and its relationship to *meaning* (i.e., ongoing bidirectional cognitive processes). As a dynamic multisystem, a person strives for stability as they move in physical space, and during their development, across time (i.e., dynamic balance). A primary requirement for dynamic balance is maintaining *consistency* by connecting the cognitive system to behavior. In psychological terms, such a connection is facilitated by meaning. The model suggests that happiness serves as a marker of a person's consistency and meaningful interpretations of their lived experience. The model points to a new research direction.

KEYWORDS

happiness, meaning, psychological balance, well-being, values, consistency

1. Introduction

> "What is the highest of all goals achievable by actions?… people...say it is happiness…but with regard to what happiness is they differ."
> *Aristotle (384 BC - 322 BC).*
> "Man cannot stand a meaningless life".
> Jung, 1959.

Happiness that is associated with overall positive emotions and a sense of satisfaction, is central to human experience (Rokeach, 1973; Alexander et al., 2021). Although there has been significant progress over the last 40 years in understanding the conditions that contribute to making people happy, a fundamental lack of clarity over what defines *happiness* and what researchers measure (Schimmel, 2013) remains. The philosophical term *eudaimonia* refers to a different type of happiness to *hedonia* (i.e., experiencing pleasure) and is associated with experiencing *meaning* (Waterman, 2022). *Meaning* or *meaning in life* is conceptualized as ongoing cognitive processes (Heine et al., 2006) comprising comprehension (i.e., making sense of experiences), purpose (i.e., personal goals), and mattering (i.e., having a sense of personal importance) (George and Park, 2017).

The present article places happiness and meaning within a coherent framework that seeks to provide a speculative insight into the nature of interaction between emotion, cognition, and behavior. Drawing on poignant findings across many fields of psychology and beyond, the model

seeks to explain the relationship between *happiness* and *meaning* as primary functions of a dynamic multisystem (i.e., an individual) that strives to balance. Maintaining *psychological balance* (i.e., alignment between cognition, emotion and behavior) requires *consistency*, which refers to the alignment between a person's behavior (i.e., response to external situations and to others) and their cognitive patterns (i.e., self-concept, beliefs, motivational orientation, values and goals) (Besika et al., 2021). The proposed model suggests that *happiness*, as the experience of embodied positive emotional patterns, serves as a marker of consistency and is facilitated by *meaning* (i.e., ongoing bidirectional cognitive processes that connect cognition, emotion and behavior). Meaning allows a person to make sense of their environment and assign personal relevance to their experience in line with their cognitive patterns (e.g., goals) and informed by their experience, adjust their cognitive patterns. The bidirectional movement of meaning makes an experience meaningful and generates positive emotions (King and Hicks, 2021). In contrast, negative emotions mark inconsistency and indicate low levels or absence of meaning movement between cognitive patterns and behavior. In a state of inconsistency, a person struggles to make sense of personal experience, which may be perceived as meaningless. Negative emotional patterns may serve to activate adaptive re-adjustments in behavior and/or cognition to restore consistency and balance (Higgins, 1987; Brandtstädter and Greve, 1994).

The first section of this article presents a conceptual argument in support of the view that distinguishing different types of happiness (i.e., *eudaimonia* and *hedonia*) presents a barrier in understanding its nature. The argument demonstrates that any comparison between *eudaimonia* and *hedonia* is a false dichotomy, as the two philosophical concepts are unrelated, and further obscures the investigation of happiness with conceptual and methodological ambiguities (Kashdan et al., 2008). Drawing on the Aristotelian idea that *balance* is the key to *happiness* and adopting a system dynamics perspective, the second section presents a theoretical model that explains *happiness* (i.e., embodied positive emotional patterns) and *meaning* (i.e., ongoing bidirectional cognitive processes) as primary functions of a dynamic multisystem (i.e., an individual). Meaning facilitates the alignment between cognitive, emotional and behavioral patterns (i.e., psychological balance; Besika et al., 2021), whereas happiness serves to signal their level of alignment (Figures 1A,B). Altogether, this work addresses the overarching question of how emotion and cognition contribute to maintaining well-being. In line with the definition of WHO (World Health Organization, 2021), well-being refers to a subjective positive state that includes the ability to contribute to the world with a sense of meaning and purpose. In this context, happiness and meaning are functional abilities that enable well-being.

1.1. Hedonia vs. Eudaimonia: A false dichotomy

In a large part of the literature, happiness is used interchangeably with the term *Subjective Well-Being* (SWB; Diener, 2009) (i.e., subjective affective and cognitive evaluations of life), as well as with a range of other terms including *psychological well-being* (Ryff et al., 1995), *wellness* (Cowen, 1991), *authentic happiness* (Seligman, 2002) or *positive orientation* (Oleś and Jankowski, 2018). Introducing *eudaimonia* in psychology research created a conceptual discrepancy since this broad concept did not match the prevailing conceptions of happiness. Waterman (2022) suggests that Ross (1956) wrongly translated *eudaimonia* into happiness in Aristotle's *The Nicomachean Ethics* and draws a sharp conceptual distinction between the two that reduces happiness to *hedonia* (i.e., seeking pleasure) and associating *eudaimonia* with meaning and optimal functioning (Waterman, 2022). These conceptual re-adjustments introduce a new psychological construct and overlook the philosophical background of the terms *hedonia* and *eudaimonia*.

1.1.1. Definitions and etymology

The dictionary of Modern Greek (Petrounias, 2018) defines eudaimonia, as a blissful state resulting from a continuous effort for moral perfection and achieving self-actualization, which can be evaluated at the end of one's life by others. This definition is in line with Aristotle's (384–322 BC) concept that refers to a normative way of living concerning the "activity of the soul in accordance with virtue" (Ross, 1956, Book 11, p. 12). In spite of the etymological interpretation of eudaimonia (i.e., "eu = good and daimon = demon") not making psychological sense (Kashdan et al., 2008), psychologists interpret eudaimonia as a type of happiness that involves subjective experiences of meaning (e.g., Vittersø, 2016). Given the absence of an equivalent English word, Ross's translation of eudaimonia into happiness served its purpose. However, considering the theory eudaimonia represents, self-reports are not appropriate for assessing the normative question of what makes life virtuous or the degree of a person's virtuousness. Should psychologist insist on using a Greek term for operationalizing happiness, eftehea (ευτυχία) is a more appropriate term, translating into a state of physical and mental satisfaction that derives from the achievement of goals (Petrounias, 2018), which is in line with the widely used term SWB (Diener, 2009). However, the plethora of terms and definitions generate confusion that undermines the scientific nature of studying outcomes as orphans of a comprehensive theoretical framework.

1.1.2. Philosophical background of hedonia and eudaimonia

Any comparison between *eudaimonia* and *hedonia* (e.g., Huta, 2018) as different types of happiness is a false dichotomy that seems to be rooted in misinterpretations of the teachings of Aristippus (435–356 BC) and Aristotle (384–322 BC). The two ancient philosophers set objective standards for living well. Aristippus promotes *hedonia* and striving to achieve the highest degree of physical pleasure and the satisfaction of basic instincts, at any cost: "Pleasure is the sole good...and…only one's own physical, positive, momentary pleasure is good, and is so regardless of its cause" (Tatarkiewicz, 1976, p. 317). In contrast, Aristotle who promotes *eudaimonia* as the ultimate good in life, considers eudaimonious a person "who is active in accordance with complete virtue and sufficiently equipped with external goods, not for some change period but throughout a complete life" (Ross, 1956, Book 10, p.16). The above quotes encapsulate the normative nature of the two philosophical teachings, which are concerned with the kind of life people should lead and not with their subjective experiences. Aristippus, who suggests setting hedonia as a top priority, speaks about pleasure and not about happiness. Aristotle promotes nurturing a good spirit as the "the ultimate good in life." Whether maximizing pleasure at any cost is better than striving for soul purification is a matter of personal choice. One may argue that both theories constitute extreme

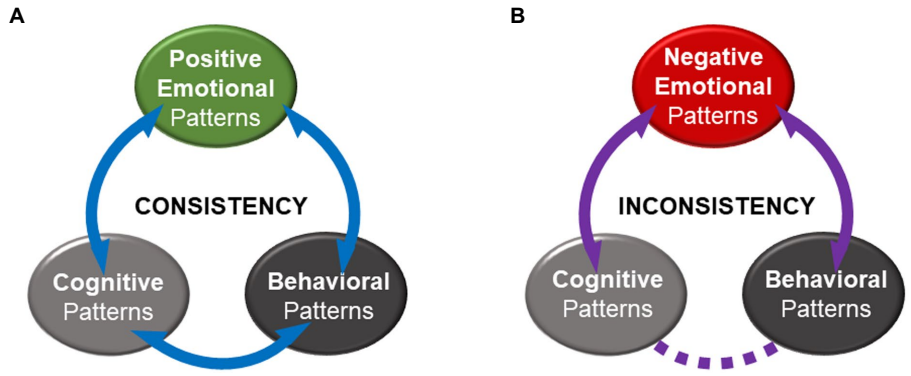

FIGURE 1
A model of Balance. **(A)** Positive emotional patterns indicate consistency, where meaning (i.e., ongoing bidirectional cognitive processes) connects behavior to cognition and emotion. **(B)** Negative emotional patterns indicate inconsistency, where there is interruption of meaning between cognition and behavior. Solid purple lines denote ongoing bidirectional cognitive processes that generate meaning. Dashed purple lines denote interruption in these processes.

approaches to life. However, such argument is beyond the scope of this article, which merely aims to emphasize that both philosophers make normative claims regarding standards of living and not regarding the subjective experience of happiness. In addition to methodological shortcomings (Kashdan et al., 2008), attempting to evaluate matters of the soul using self-reports is conceptually inappropriate and practically infeasible.

1.2. Happiness and meaning: An everlasting love

Happiness is a very complex concept (Kringelbach and Berridge, 2010) and research identifies a non-exhaustive list of factors associated with it, demonstrating the complexity of what it may entail. For example, physical factors (e.g., genetics; McCourt et al., 1999), personality traits (e.g., extraversion, neuroticism and temperament; Cowan, 2019), demographics (e.g., relationship status, gender, income, health and education; Lomas and VanderWeele, 2023), satisfaction of basic psychological needs (Feng and Zhong, 2021), social relationships (Bai et al., 2021), time perspective and forgiveness (Allemand et al., 2012), and many more. Research shows that meaning is strongly associated with happiness (Karataş et al., 2021) and it overlaps with hedonic pleasure (Huta, 2018). Evidence confirms that happiness may involve both meaningful and hedonic experiences, as people typically evaluate their happy experiences as meaningful (King and Hicks, 2021). Studies replicating Nozick's (1974) thought experiment test the hypothesis that people prefer to derive happiness from experiences that are meaningful (Hindriks and Douven, 2018). Participants chose among three hypothetical scenarios that would make them feel happy: (a) disconnecting from reality and connecting to a machine that simulates pleasant experiences, (b) taking a pill that induces pleasure, and (c) taking a pill that enhances functionality while remaining in touch with reality. The majority of participants preferred to take the pill that enhances daily functionality while remaining connected to reality. These results indicate that the need for engagement with the external world precedes the need for experiencing pleasure.

Neuroscience findings support the idea that the presence of meaning facilitates a person's connection to the external world. Meaning provides a sense of coherence that contributes to feeling safe and perceiving the world as predictable and controllable (Davis and Panksepp, 2011). Meaning is associated with a range of psychological benefits including, ability to cope better with adversity (Rose et al., 2023); enhancement of health and stress moderation (Schnell and Krampe, 2020); work enjoyment (Bonebright et al., 2000); high levels of self-esteem (Lew et al., 2020) and life satisfaction (Wolfram, 2022). In contrast, low levels of meaning are associated with a range of negative outcomes such as substance misuse (Csabonyi and Phillips, 2020), stress (Trzebiński et al., 2020), and suicidal ideation (Marco et al., 2020). When one feels depressed, it is difficult to experience meaning (King et al., 2006). In contrast, experiencing positive emotions and pleasure enhances the perception of life as meaningful, which in turn fosters happiness (King and Hicks, 2021). Life satisfaction arises from the coexistence of pleasurable and meaningful activities, such as personal involvement and personal expression (King and Hicks, 2021). In addition, meaningful interpretations of events generate positive affect (Reker and Wong, 1988; Wong et al., 2021) and over time such interpretations can establish a conceptual link between experience and emotion, forming the idea that life is meaningful (Clore and Palmer, 2009).

The plethora of research findings indicates an *everlasting love* between happiness and meaning; a reciprocal relationship where meaning (e.g., a sense of purpose, coherence and mattering) cannot exist without positive emotion and positive emotion cannot exist without meaning. Thus, distinguishing them as different routes to happiness (e.g., Huta, 2020; Waterman, 2022) presents a barrier in forming a unifying theoretical framework. In addition, maintaining a research focus on *what* makes people happy and *what* they find meaningful diverts research from investigating the universal mechanism that facilitates subjective experiences of happiness and meaning. Focusing on the functionality of happiness and meaning instead, and on their relationship can help understand *how* a person maintains well-being. Addressing questions such as, *how* do cognitive patterns interact with the environment, and *how* does the environmental context influence such interactions may lead to a nomothetic model that explains the functionality of happiness and meaning. It is inevitable that such an investigation will involve more than two or three variables (Sanbonmatsu and Johnston, 2019).

2. Toward a unifying theoretical framework

Despite the volume of references to Aristotle and suggestions that *balance* can serve as a guide in developing accounts of happiness (Grant and Schwartz, 2011), psychologists paid scant attention to Aristotle's "golden mean." Typically, "balance is used to describe the relationship quality between two dialectically related phenomena" (Lomas, 2021, p. 51). Although previous models acknowledge that balance is a unifying principle that pertains to all domains of well-being and "constitutes a cluster of conceptually related dynamics" (Lomas, 2021, p. 50), a model is yet to explain how a person maintains balance as an integral organism across all its levels of functioning (i.e., cognition, emotion, behavior). A combination of social psychology findings and of principles that govern dynamic systems leads to the hypothesis that the "golden mean" is a multifaceted psychological state and a prerequisite for happiness. Unlike previous models that provide a narrative categorization of the different contexts within which obtaining balance is important (e.g., Lomas, 2021), a parsimonious model explains that *consistency* across a person's multiple levels of functioning is a primary condition for maintaining psychological balance (Besika et al., 2021).

As a person comprises of multiple systems such as cognitive, emotional and physical that are subject to change over time, an individual constitutes a dynamic multisystem (Perone et al., 2021). The primary function of a dynamic system is its stability, which requires the alignment between the system's structure and its behavior (Schöner and Kelso, 1988; Ford, 1999). Drawing on the *Action Identification Theory* (Vallacher and Wegner, 1987) the model assumes that as well as a physical structure (e.g., body), a person's cognitive system (e.g., motivational, value and goal patterns) has a hierarchical structure that drives their behavior. *Consistency* (i.e., alignment between cognition and behavior) is identified as a primary requirement for an individual to balance psychologically (Besika et al., 2021). Meaning (i.e., ongoing bidirectional cognitive processes) is considered to facilitate consistency as it connects a person to their external environmental context by receiving feedback that informs their behavior, which in turn influences their cognitive system. Meaning and consistency are associated with happiness (Mason et al., 2019; King and Hicks, 2021). Being consistent, a person's cognitive patterns (i.e., their self-concept, beliefs, motivational orientation, values and goals), are aligned to their behavior. In such a state, an individual experiences overall positive emotions. In a state of inconsistency, a person's cognition is not aligned to their behavior and they experience overall negative emotions. Happiness or experiencing positive emotions indicates the presence of meaning that connects an individual to their environmental context (see Figure 1A), whereas negative emotions indicate an interruption in meaning and a disconnection between cognition and behavior (see Figure 1B). Thus, happiness, as embodied positive emotional patterns, signals consistency within the person. Heightened negative emotions serve to activate cognitive processes that generate meaning, which may lead to re-adjustments in cognitive patterns and/or behavioral patterns in aiming to restore consistency (Higgins, 1987). In this state of balance, a person perceives their experience as meaningful as they can relate to it (see Figure 1A).

2.1. Dynamic balance of a multisystem

2.1.1. Physical, cognitive, and emotional interactions

Research demonstrates dynamic interactions between a person's physical (i.e., biological), cognitive and behavioral levels of functioning. For example, biology research indicates that genotypes (i.e., the genetic makeup of human body) moderate children's sensitivity to maltreatment and the possibilities of developing antisocial behavior (Caspi et al., 2002). Moreover, research findings show that cognitive processes contribute to adapting physical movement to the environment and maintaining physical balance (Teasdale et al., 1993). These findings indicate that the system's balance relies on interactions between biological and cognitive processes.

Neuroscience findings confirm ongoing interactions between emotion and cognition. Research has long established that neurological circuits generate fleeting pleasure through sensory satisfaction (MacLean, 1978). Primary, pleasure emerges from emotion-generating circuits, whereas cognitive pleasure is generated by secondary brain activity, such as thoughts about how internal and external states relate. Complex processes arise from cognitive awareness regarding emotional states (Panksepp, 2003, 2005). Areas in the pre-frontal cortex of the brain enable higher levels of regulatory control and endow a person with the ability to form goals and abstract concepts, such as values and future planning (Rushworth et al., 2011). Moreover, neurobiological mechanisms, which are responsible for producing sensory pleasures, are involved in producing pleasure through activity engagement. For example, a meta-analysis of studies based on functional magnetic resonance imaging (fMRI) explains that sexual desire (i.e., physical pleasure) and love (e.g., emotional association) are both mental states of intense longing for union with others. The neural circuits that produce both bodily pleasure and love share a common set of brain areas (Cacioppo et al., 2012). Thus, it would be impossible to experience happiness without genetically encoded neural structures (Panksepp and Watt, 2011). In addition, happiness requires evaluation of actions and goals in relation to their mental representations (Davis and Panksepp, 2011).

It is a common understanding that people operate in a physical as well as in a cognitive environment and strive to adapt their behavior to changes that may occur both in physical space (e.g., situational changes) and across time (e.g., aging). The ability to adapt to spatio-temporal changes makes an individual a dynamic system that operates on many levels (e.g., physical, cognitive, emotional). Primarily, as a person moves in space and time they need to maintain physical balance, which requires physical *consistency* (i.e., alignment and coordination between the body parts) and physical *flexibility* (i.e., dynamic re-adjustments in the organization of the body parts) (Horak, 2006; Kwon et al., 2013). Drawing on the principles that apply to dynamic systems, the proposed model postulates that the primary functional requirement to maintain balance is equally relevant to a person's psychological functioning. In this regard, a person achieves psychological *consistency* through the alignment and coordination between their cognitive patterns (e.g., values) and their behavior (Besika et al., 2021). In addition, psychological *flexibility* (i.e., dynamic re-adjustments in the internal organization of either cognitive components or/and in behavior patterns) may rely on bidirectional ongoing cognitive processes that connect cognition to behavior and help a person make sense of their experience and the outside world.

2.1.2. Finding the "Golden mean"

2.1.2.1. Virtues are socially predefined

In the Nicomachean Ethics (Ross, 1956) Aristotle emphasizes that balance is the key to happiness and conceptualizes a virtue as the "golden mean" between excess and deficiency. For example, the virtue of *being friendly* is the "golden mean" of being slavish and being cranky. Each virtue is bound by the individual's capacity and their situational context, and it is not the mid-point in an *excess - deficiency* continuum. Aristotle names approximately 18 virtues and suggests manifesting as many virtues as possible, not in isolation but rather as an overall behavior that displays compassion toward others, may increase ability to function well. Therefore, striking a balance may entail a multifaceted "golden mean," or a cognitive pattern of values that may inform behavior.

Whereas Aristotle's virtues reflect ideals of his social context (e.g., magnificence), social psychology research identifies a set of universal values representing the current socially predefined virtues. Multicultural studies show that a set of value domains (i.e., Security, Power, Achievement, Hedonism, Stimulation, Self-Direction, Universalism, Benevolence, Conformity, and Tradition) serve as guiding principles within the social framework of all cultures and represent ideals that influence people's behavior (Schwartz, 1992; Schwartz and Cieciuch, 2021). Through socialization processes that occur within different settings (e.g., education, family, work), individuals integrate universal ideals to a different degree (Cieciuch et al., 2016; Besika, 2022). Recent evidence reveals that people cognitively integrate a shared pattern of universal values, with Power being at the lowest boundary and Benevolence forming the highest boundary of the pattern. The overall level of integration of this value pattern provides meaningful information regarding people's level of well-being. People with a high level of value orientation report higher levels of meaning and life satisfaction than those with a lower level of value orientation (Besika, 2022). Those with a higher level of association between their values and daily experiences report higher average levels of meaning and life satisfaction compared to those with a low level of association (Besika et al., 2022). These findings reflect earlier research that shows that not sharing group values is associated with overall low levels of well-being and physical health (Dressler and Bindon, 2000).

The above evidence supports the hypothesis that alignment between cognitive patterns (e.g., value pattern) and behavior is pertinent to happiness and well-being.

2.1.2.2. Virtues within a dynamic system

In line with the principle of bifurcation (i.e., division into parts) that governs dynamic systems (Arnold et al., 2013), beyond certain points of either excess or deficiency the value pattern may change from a pattern of virtues to a pattern of vices (Grant and Schwartz, 2011). Under certain conditions a dynamic system loses its coherence and degrades into a chaotic state and "...the slightest disturbance in the psychological as well as in the biological equilibrium may be detrimental..." (Jung, 1977, p. 451). As the present article is concerned with the primary psychological conditions that facilitate happiness, it is outside its scope to investigate the conditions under which a person's value patterns start becoming a threat to their psychological balance and happiness.

2.2. Happiness and meaning as functions of a dynamic multisystem

This section investigates the environmental contexts of an individual in aiming to explain the functionality of happiness and meaning within a dynamic multisystem (i.e., a person). A person's physical body has a universal structure (Hernandez et al., 2018). Is there a universal cognitive structure? An integration of psychology findings reveals that ongoing cognitive processes that facilitate psychological consistency by connecting a person's external to their internal environmental contexts, lead to the formation of primary cognitive components with a hierarchic structure. What is the role of emotion and how does it relate to these cognitive processes? Addressing such questions requires integrating knowledge from many domains (Schimmack, 2008).

2.2.1. The cognitive environment: A universal structure

2.2.1.1. Primary cognitive components

Throughout development, people are constantly engaged in making sense of their external environment and of themselves. Ongoing cognitive processes that generate meaning help them construct an identity in line with their social context and culture (Zittoun and Brinkmann, 2012). An individual constructs the primary cognitive component of a *self-concept* (i.e., mental self-representations in relation to the past, present and future) (Brandtstädter and Greve, 1994). As people continuously compare their self-perceptions of who they wish to be, who they ought to be and who they actually are with others' perceptions of them they construct *self* and *others* representations within their self-concept (Higgins, 1987). The *value pattern* constitutes another primary cognitive component that represents a person's social context (Rokeach, 1973). Longitudinal studies show that throughout their development, people integrate universal values at a different level of importance (Cieciuch et al., 2016; Coelho et al., 2019; Besika, 2022). Studies indicate that a person's values are characterized by an interest to either serve the *self* and/or *others*. In addition, a pattern of four motivational orientations (i.e., self-enhancement, conservation, self-transcendence, openness-to-change) underlies a person's values. Altogether, these cognitive components inform personal goals and influence behavior (e.g., Sortheix and Schwartz, 2017).

2.2.1.2. The organization

Through ongoing bidirectional cognitive processes (i.e., meaning-making processes) that encode the physical environment into symbols of personal significance, and in turn decode these symbols into meaningful information and experiences (Heine et al., 2006), a person develops primary cognitive components that represent their physical context. Research indicates that the cognitive components have a vertical hierarchy: (1) The *self-concept*, a cognitive pattern denoting the relationship of a person with themselves and with other people (Higgins, 1987). (2) The *motivational orientation pattern*, denoting ways an individual may perceive their relationship to the external world (i.e., conservation, openness to change, self-enhancement, and self-transcendence) (Schwartz, 1992). (3) The *value pattern*, denoting the way a person perceives the ideals of their socio-cultural context (Schwartz, 1992). (4) The *goal pattern*, denoting a person's desired

end-states that influences behavior (Vallacher and Wegner, 1987). Accordingly, behavior is meaningful when it serves a higher order goal. In line with the hypothesis that Aristotle's "golden mean" is multifaceted, additional studies indicate that the cognitive environment has a horizontal dimension and that an increased capacity for operating in multiple domains is positively associated with well-being (e.g., Marks and MacDermid, 2006).

2.2.2. Adaptive re-adjustments restore happiness

As any other dynamic system (Ford, 1999) a person needs to satisfy the requirements imposed by the law of dynamic balance (Kwon et al., 2013), which requires that the system maintains equilibrium by being consistent and flexible (Horak, 2006). The literature supports the idea that maintaining psychological balance requires consistency between a person's cognitive and physical environments and adaptive re-adjustments in response to change (e.g., Besika et al., 2021). Experimental research indicates that dynamic re-adjustments occur within the cognitive pattern components. For example, the dual pattern of *self* (i.e., the individual) and *others* (i.e., significant others or generally others) fluctuates systematically in response to change. When a situation requires placing more focus on the *self*, people shift their focus from *others* and vice versa (Gaertner et al., 2008). Moreover, longitudinal experiments report that a person's values behave as a dynamic system as they fluctuate systematically in response to life events. Increase of importance in one value follows decrease of importance in another and the degree of fluctuation positively correlates with the severity of the event (Bardi et al., 2009).

Typically, *self* and *others* are perceived as opposing ideas that generate cognitive dissonance. The suggestion that an increased capacity to tolerate cognitive dissonance could increase cognitive and emotional maturity (e.g., Wong et al., 2021) somehow conflicts with the idea of well-being. In contrast, the proposed model views the two mental representations of *self* and *others,* as complimentary cognitive patterns that their dynamic interaction facilitates adaptation to change. Adaptive re-adjustments may involve shifting importance from *self* to *others* or vice versa, (Gaertner et al., 2008), which may inform changes in value priorities (Bardi et al., 2009) and result in re-defining meaningful goals and/or changing behavior (Brandtstädter and Greve, 1994). For example, *John* who deeply cares for his family (e.g., prioritizes the value of *family*) and is committed to looking after them may decide to go on holiday as he finds himself feeling very tired. Hence, *John* shifts his focus from *others* to *self* and prioritizes the value of *health* in response to changes in his physical behavior, as he needs to maintain consistency. Thus, fluctuations in the importance a person places on either *self* or *others* in response to what the situation demands aim to maintain consistency across the different levels of functioning. Consistency across cognitive components (e.g., values and goals) is associated with *happiness* and *meaning* (Besika et al., 2021). In contrast, inconsistencies between the cognitive and physical environmental contexts of a person generate intense negative emotions, which may activate adaptive re-adjustments (Clore and Schnall, 2005; Clore and Ortony, 2008; Mason et al., 2019). Thus, the systemic behavior of the two seemingly contradictive mental contexts may facilitate dynamic re-adjustments that restore emotion.

2.2.3. Meaning-making processes

Aristotle suggests that finding balance is possible in any situation. For example, when dealing with anger, balance requires being angry at the right time, with the right people and for the right reason (Ross, 1956, in the *Nicomachean Ethics* translation). This implies an alignment between emotion, cognition and behavior as well as an alignment across the person's spatio-temporal context, which may include other people. Such an alignment relies on meaningful interpretation of events (Csikszentmihalyi, 1990), as meaning operates in the motivational, cognitive and affective levels of functioning (Reker and Wong, 1988). Bidirectional movement of meaning-making processes may lead a person to meaningful interpretations that allow them to make sense of a situation (Zittoun and Brinkmann, 2012) and translate emotion into information (King and Hicks, 2021). Hence, meaning facilitates psychological balance and fosters positive emotion (King et al., 2006; Heintzelman and King, 2014; Jamieson et al., 2018). Informed by the above, the proposed model assumes that meaning in the form of ongoing bidirectional cognitive processes a) provides information about emotion b) provides feedback regarding the impact of behavior on the environment, which includes other people, and c) facilitates comparisons between a person's cognitive patterns and their behavior, which may lead to adaptive cognitive and/or behavioral re-adjustments.

2.2.4. A negative feedback loop mechanism maintains emotional equilibrium

As change occurs in a person's physical and/or cognitive environmental contexts, an individual faces the ongoing challenge of making adaptive re-adjustments. Which mechanism facilitates adaptation? The *control theory of self-regulation* (Carver and Scheier, 2019) explains that a negative feedback loop mechanism reduces discrepancies between a person's cognitive states and physical environment as it aims to maintain a 'set point' of happiness (i.e., an individual homeostatic emotional equilibrium) (Heady and Wearing, 1992; Heady, 2006). Genetics mainly influence a person's emotional equilibrium (McCourt et al., 1999) and homeostatic processes keep it relatively stable at the individual's baseline (Heady, 2006). Meaning-making processes help a person make adaptive re-adjustments in response to change by providing feedback regarding their state of consistency and alignment to their physical environment. Detecting a mismatch generates emotional discomfort that may lead to cognitive and/or behavior re-adjustments. Processes within the negative feedback loop mechanism aim to restore emotion (e.g., Mason et al., 2019) and return a person to their 'set point' of happiness (Clore and Schnall, 2005; Heady, 2006; Heintzelman and King, 2014; Mason et al., 2019). Studies indicate that this "set point" is typically positive (Diener and Diener, 1996). Moreover, a study where multi-national participants ($N = 2{,}392$ and $N = 6{,}239$) ranked their ideal level of happiness on a continuum from 0 (*only sadness, no happiness ever)* to 100 (*only happiness, no sadness ever)* reports that the overall ratings do not exceed 80%. In the absence of all restrictions, people's ideal level of happiness hovers just below 70% in collectivist cultures and just above 70% in individualistic cultures (Hornsey et al., 2018). Below a certain level of positive emotion people experience homeostatic failure, which is an indication that external life circumstances have control over the regulatory mechanism (Cummins, 2003). The above empirical evidence suggests that happiness serves as a marker of consistency, which ensures that behavior is congruent with a person's values and goals.

2.2.5. Happiness, meaning, and balance

Emotion serves as an embodied reaction that informs a person regarding their state of consistency (Clore and Palmer, 2009). As cognitive processes are typically outside a person's awareness (Wegner, 2002), heightened emotion, whether negative or positive, provides information regarding the way an individual perceives their experience as personally relevant and meaningful or not (Clore and Schnall, 2005). Studies show that meaning generates positive emotions (King et al., 2006), whereas negative emotions signal low levels or absence of meaning (Wong et al., 2021). Negative affect can activate cognitive processes that may result in re-adjustments in the internal organization of the cognitive patterns (e.g., changes in value priorities) and/or on the behavioral level of functioning (Brandtstädter and Greve, 1994). Such processes aim to maintain consistency between cognitive and physical contexts and to restore emotion (Heady, 2006; Mason et al., 2019) by reducing perceived discrepancies between the individual's ideal states (e.g., cognitive environment) and actual states (e.g., physical environment). These findings support the hypothesis that emotion may serve as a signal regarding the connection of cognition to behavior through meaning.

In conclusion, emotion provides vital information that enables a person to make adaptive re-adjustments in response to change and maintain psychological balance and well-being. Such dynamic re-adjustments rely on a negative feedback loop mechanism (e.g., Carver and Scheier, 2019) that aims to reduce perceived discrepancies between a person's cognitive and physical environmental contexts and restore emotion.

3. Summary

Altogether, the present article introduces a model that demonstrates that happiness, as the experience of positive emotions, is a marker of well-being, whereas meaning, as ongoing cognitive processes, serves to maintain it. In this sense, happiness indicates the presence of meaning that allows people to make sense of themselves and feel connected to the outside world. Intense negative emotions indicate a state of inconsistency and aim to re-activate meaning and restore emotion. The model generates the hypothesis that meaningful interpretations of perceived discrepancies between a person's cognitive patterns (e.g., goals) and behavioral patterns (e.g., goal pursuit) may lead to adaptive re-adjustments that restore positive emotion and well-being. This hypothesis may be tested in future longitudinal studies.

3.1. Concluding remarks

Although the notion of happiness is expanding incrementally toward including meaning as one of its dimensions, the conceptualization of different types of happiness presents a barrier in understanding the functional psychological abilities that contribute to well-being. Instead of adopting a new term, psychologists may promote clear communication by describing what is measured (e.g., personal expressiveness as a marker of happiness) and by specifying the level of functioning under investigation (i.e., emotion, cognition, behavior).

As it may never be possible to measure everything that is associated with happiness (Huta, 2018), this article proposes moving beyond the concern of *what* makes a good life and instead, focus the research inquiry on the principles that facilitate the experience of happiness. As a step toward this direction, this article draws on existing knowledge and constructs a coherent framework that identifies consistency as the primary prerequisite for happiness, which relies on meaning to translate a state of consistency as positive emotion. Thus, an individual experiences happiness and meaning when their behavior manifests what is mostly important to them. The model of happiness celebrates psychological complexity and attempts to explain the psychological conditions of what it means to *feel good*. Keeping an open enquiry around the underlying mechanism that regulates functionality may lead to making a better sense of the overall human experience. Investigating the processes that underlie this kind of complex psychological phenomena can facilitate research progress and collaborations from different fields of psychology.

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Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Internalized homonegativity moderates the association between attachment avoidance and emotional intimacy among same-sex male couples

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Introduction: The present study aimed to examine dyadic associations between attachment insecurity and emotional intimacy in same-sex male couples, and to investigate whether and how each partner's internalized homonegativity (IH) moderated these associations.

Methods: The sample included 138 same-sex male couples. Both dyad members completed self-report measures of attachment insecurity, emotional intimacy, and IH. The actor-partner interdependence model with moderation analysis was applied.

Results: Indicated that higher levels of actor's and partner's attachment anxiety and attachment avoidance were associated with lower actor's emotional intimacy. IH moderated the partner effects of attachment avoidance on emotional intimacy. The partner's higher attachment avoidance was associated with one's own lower emotional intimacy at low (but not high) levels of one's own IH and at high (but not low) levels of the partner's IH.

Discussion: Findings suggest that the partner's attachment avoidance may differently affect one's own emotional intimacy depending on the IH levels of both dyad members. Helping partnered sexual minority men decrease attachment insecurity while recognizing their own and their partners' IH may promote relationship quality.

KEYWORDS

attachment anxiety, attachment avoidance, emotional intimacy, internalized homonegativity, same-sex male couples

1. Introduction

Same-sex male couples form and maintain their relationships in diverse and progressively changing socio-cultural contexts (Rostosky and Riggle, 2017). Although they have achieved more rights in recent decades, including the legal recognition of their unions, they are embedded in a culture that still privileges heterosexual relationships (ILGA-Europe, 2023). Noteworthy,

sexual prejudice and stereotyping and discrimination against LGBT individuals are still widespread even in most modern Western societies (Salvati et al., 2020).

Same-sex male couples face particular challenges related to the marginalized status of their relationships (Meyer, 2003; Pepping et al., 2018), a contextual element that is important to consider when studying relationship quality in this group (Rostosky and Riggle, 2017). Indeed, within the framework of minority stress theory (Meyer, 2003), the stigma that comes from being part of a sexual minority increases the risk of experiencing negative individual and relational outcomes among LGBT people (Meyer, 2003, 2015; Newcomb and Mustanski, 2010). In particular, the internalization of societal stigma and negative attitudes toward sexual minority individuals, a phenomenon referred to as internalized homonegativity (IH; Herek et al., 2009), has negative effects on couple relationship quality (Frost and Meyer, 2009; Cao et al., 2017; Feinstein et al., 2018; Pepping et al., 2018; Gonçalves et al., 2020). Although these effects are experienced by all sexual minority individuals in the LGBT community, studies indicate that gay and bisexual men are targets of more discrimination and hostile heterosexist attitudes than lesbian and bisexual women (Nierman et al., 2007; Barrientos and Cárdenas, 2013; Frost et al., 2016; Tsai et al., 2021), whereas no data are currently available for other sexual minority groups. Accordingly, there is evidence that sexual minority men internalize homonegativity at higher rates and experience more negative effects on their mental health because of a greater pressure to conform to heteronormative gender roles and the internalization of sexual prejudice (Bahamondes, 2016; Feinstein and Dyar, 2017; de Graaf and Picavet, 2018; Lee et al., 2022).

Within the theoretical formulations applied to understand couple relationship dynamics, attachment theory (Bowlby, 1979, 1980) plays a preponderant role. In this context, there is ample evidence that the degree of attachment insecurity is associated with different aspects of relationship quality (Li and Chan, 2012; Feeney, 2016; Mikulincer and Shaver, 2016), including emotional intimacy (Gabbay and Lafontaine, 2020). However, most studies have addressed the association between attachment and intimacy in different-sex couples, and we are not aware of studies in same-sex male couples.

Moreover, few studies have integrated these two widely supported perspectives (minority stress theory and attachment theory) regarding the impact of IH and attachment insecurity on intimacy of same-sex male couples. Such a gap in the literature would be explained by the notion that attachment processes unfold uniformly, regardless of sexual orientation.

Another gap in research on same-sex couple functioning is that studies have tended to privilege an individual over a dyadic approach, as highlighted in reviews on the effects of minority stressors (Rostosky and Riggle, 2017). The present study addresses these oversights by exploring the association between attachment insecurity and a key aspect of couple functioning, namely, emotional intimacy, using a dyadic approach where both partners' perspectives are considered, and if this association is moderated by IH.

The relevance of adopting a dyadic perspective in the study of couple relationships lies in the possibility of capturing the mutual influence between partners. Couple relationships are dynamic and reciprocal, as the attitudes, emotions, and behaviors of one partner influence and are influenced by those of the other partner (Mikulincer and Shaver, 2016). A dyadic modeling approach that allows to capture the interconnectedness and interdependencies in couples is the actor-partner interdependence model (APIM) proposed by Kenny et al. (2006). The APIM uses the couple as the unit of analysis and allows to simultaneously estimate actor and partner associations. Individual, within-partner associations between actors' predictors and their own outcome variables are referred to as actor effects, and cross-partner associations between partners' predictors and actors' outcomes are referred to as partner effects (Kenny et al., 2006).

1.1. Adult attachment theory as a conceptual framework for understanding emotional intimacy

Emotional intimacy is a relational process inherent to close relationships, defined by Sinclair and Dowdy (2005) as the perception of closeness that allows sharing of personal feelings, accompanied by expectations of understanding, affirmation, and demonstrations of caring. Emotional intimacy is a powerful predictor of psychological and physical well-being (Hook et al., 2003; Stadler et al., 2012), as well as of relationship satisfaction (Greeff and Malherbe, 2001; Laurenceau et al., 2005; Guschlbauer et al., 2019; Štulhofer et al., 2020; Guzmán-González et al., 2021).

Attachment theory, formulated by Bowlby (1979, 1980), is a privileged conceptual framework for understanding how people experience emotional intimacy in couple relationships. Hazan and Shaver (1987) were pioneers in this field by proposing the existence of a parallel between the infant-caregiver bond and romantic love, arguing that the need for comfort and security remains in adulthood, but is sought primarily in the partner rather than in the parents.

Attachment theory posits that early repeated experiences with significant others are internalized in a set of beliefs about self and others, called internal working models, which guide social interactions, especially in close relationships (Mikulincer and Shaver, 2016). These individual representations explain, at least in part, how partners behave with each other in their interactions and build their relational intimacy (Constant et al., 2021). From this perspective, a widely accepted notion is that romantic attachment can be described along two dimensions: attachment anxiety and attachment avoidance, which are associated with the model of self and others, respectively (Brennan et al., 1998; Mikulincer and Shaver, 2016). Attachment anxiety refers to the fear of abandonment in relationships and is based on a negative view of the self. People with high anxiety manifest an exaggerated need for approval, an exacerbation of protest reactions, and a constant search for emotional reassurance and closeness. Attachment avoidance refers to discomfort with closeness and dependence, reluctance to seek support, and a tendency to deactivate emotional needs, based on expectations of rejection due to a negative model of others (Shaver and Mikulincer, 2002; Mikulincer et al., 2003).

To understand emotional intimacy within this framework, attachment theorists propose that more securely attached individuals, who have positive models of self and others, feel comfortable with intimacy and closeness. Instead, people who are more anxiously or avoidantly attached experience more difficulties in negotiating issues related to closeness and distance (Pistole, 1994; Mikulincer and Shaver, 2016). Individuals with higher attachment anxiety experience unmet needs for love and closeness that make them more likely to demand intimacy in ways that can be intrusive, paradoxically facilitating distance or withdraw responses (Feeney and Noller, 1991;

Bradford et al., 2002), and they are more prone to sharing personal information in a non-constructive way (Bradford et al., 2002). Conversely, individuals with higher attachment avoidance tend to keep emotional distance from their partners and to exacerbate their independency, thereby reducing their own intimacy-promoting behavior and their responsiveness to the partner's intimacy needs. Moreover, their discomfort with intimacy makes them reluctant to disclosure of personal feelings (Shaver and Mikulincer, 2002; Mikulincer et al., 2003; Mikulincer and Shaver, 2016).

Accordingly, studies in this field reveal that the degree of attachment insecurity has a role in perceived emotional intimacy (Li and Chan, 2012; Feeney, 2016; Mikulincer and Shaver, 2016). Cross-sectional and longitudinal studies of individuals and couples in heterosexual relationships reported that higher attachment anxiety and attachment avoidance were associated with lower intimacy (Collins et al., 2002; Collins and Feeney, 2004; Pielage et al., 2005; Rholes et al., 2011; Dandurand and Lafontaine, 2013; Constant et al., 2021). A recent dyadic study of different-sex couples reported a negative actor effect of attachment anxiety on perception of intimacy, whereas actor's and partner's attachment avoidance were both related to actor's lower perceived intimacy (Gagné et al., 2021).

We are not aware of any studies exploring emotional intimacy in same-sex male couples, but an individual-based study about sexual intimacy in the context of same-sex relationships arrived at a similar conclusion that attachment insecurities are linked to lower sexual intimacy (Gabbay and Lafontaine, 2020). It is worth noting that a more consistent and strong association has been detected for attachment avoidance than for attachment anxiety (Pielage et al., 2005; Constant et al., 2021; Gagné et al., 2021).

1.2. The moderating role of IH in the association between attachment insecurity and emotional intimacy

The studies mentioned above provide support for the notion that actor's and partner's attachment insecurities are linked to one crucial aspect of relationship functioning such as emotional intimacy. However, an important question that has not been addressed yet is whether a minority stressor like IH represents a risk factor that might increase the strength of the dyadic associations between attachment and emotional intimacy in same-sex male couples.

Minority stress theory posits that being part of stigmatized minority groups is a source of stress that produces negative effects on individual and relational well-being (Meyer, 2003). Four minority stressors have been identified which are placed on a continuum from distal (i.e., external) to proximal (i.e., psychological): distal stressors include acute and chronic forms of discrimination and victimization and everyday discrimination (e.g., microaggressions); proximal stressors include expectations of rejection and discrimination (i.e., felt stigma); stigma concealment; and internalized homonegativity (Frost et al., 2022).

IH is manifested through negative attitudes and beliefs toward LGBT people, feelings of shame and rejection toward one's sexual orientation, concealment of interaction with other LGBT people, fear of public identification (Meyer, 2003; Tozer and Hayes, 2004; Berg et al., 2013), and more or less conscious negative appraisals of same-sex relationships (Lingiardi et al., 2012). IH has become a focus of research interest because it is argued that a large proportion of LGBT people experience at least some degree of IH, which increases the risk of experiencing mental health problems (Frost and Meyer, 2009; Szymanski and Ikizler, 2013; Denton et al., 2014). IH is also a predictor of lower relationship quality, and there is evidence that stressors of this type, which are more chronic and subtler than explicit events such as victimization episodes, are more likely to impair the quality of couple relationships (Randall and Bodenmann, 2009; Feinstein et al., 2018). Individuals with high IH are caught in the ambivalence of yearning and needing a partner relationship that goes against their beliefs or values, which can translate into shame about publicly exposing the relationship, less supportive and emotionally responsive behaviors in their couple relationships, as well as lower levels of intimacy (Mohr and Jackson, 2016). Noteworthy, there is evidence that discomfort with same-sex sexual intimacy is linked to the endorsement of sexist social attitudes, suggesting that the adoption of sexist standards may be associated with the belief that correct sexuality embraces roles and morality coherent with the normative heterosexual model (López-Sáez et al., 2020).

Consistent with this theoretical link, studies of LGBT individuals show that IH is negatively associated with relationship quality (Frost and Meyer, 2009; Calvillo et al., 2018; Pepping et al., 2018), including lower levels of closeness and emotional intimacy (Mohr and Daly, 2008; Szymanski and Hilton, 2013; Guschlbauer et al., 2019). Studies of dyads, rather than individuals, are still scarce in the context of same-sex relationships and focused on other aspects of relationship quality. However, their findings are consistent in suggesting a detrimental effect of IH for couples' functioning (Feinstein et al., 2018; Totenhagen et al., 2018; Li et al., 2022). Totenhagen et al. (2018) found that among same-sex couples, levels of actor's IH interacted with actor's daily stress levels, such that only individuals high in IH reported lower relationship quality on days of higher perceived stress. In another study of young same-sex male couples (Feinstein et al., 2018), higher actor's levels of minority stress were associated with lower actor's relationship quality, and higher levels of both actor's and partner's internalized stigma were linked to more actor's reported negative interactions. A more recent study of same-sex couples reported that higher levels of actor's IH were related to a higher probability of partner's psychological violence perpetration when actor's levels of commitment were low (Li et al., 2022). Hence, these dyadic studies suggest actor- and partner-level influences of IH on relationship functioning. Despite these advances, important gaps still exist.

Even though the impact of IH has been explored on different aspects of relationship functioning, its moderating role on the relationship between attachment and emotional intimacy from a dyadic perspective remains unclear. Karney and Bradbury (1995) vulnerability-stress-adaptation model posits that individual vulnerability factors (such as attachment insecurity) can especially impair relationship quality if combined with stressors (such as IH). Therefore, it offers theoretical support for a possible moderating role of IH in the link between attachment and emotional intimacy. Indeed, IH involves the materialization of most proximal minority stress processes, as it entails the internalization and application to the self of heterosexist and heteronormative societal attitudes (Frost and Meyer, 2009) which lead to negative self-appraisals and intrapsychic conflict (Herek, 2004). This may influence the activation of the attachment system, which aims to ensure safety in times when challenges to one's sense of well-being are most prominent (Bowlby, 1980).

Considering that attachment insecurity is particularly activated under situations of threat or stress (Feeney, 2016), it is likely that attachment insecurities have a more negative impact on emotional intimacy for couples where their members manifest higher levels of IH. Specifically, having higher levels of IH would intensify the detrimental effect of holding a negative view of self (one core aspect of attachment anxiety) on emotional intimacy through hyperactivating strategies, for example by favoring a focus on reducing fear of rejection rather than on sharing reciprocal intimacy and enjoyment (Gillath et al., 2016; Mikulincer and Shaver, 2016). A higher IH might also increase the negative effect of a negative view of others (a core aspect of attachment avoidance) on emotional intimacy through deactivating strategies such as emphasizing the need to place limits on closeness based on distrust in others. Similarly, having a partner who holds feelings of shame and rejection toward his sexual orientation might increase the negative effects of the partner's attachment anxiety and avoidance on one's own emotional intimacy. Indeed, this combination of factors (high IH with high attachment anxiety or high attachment avoidance) in one partner may favor defensive processes that interfere with the perception of responsiveness in the other partner, reducing his sense of intimacy and shared emotions (Mohr and Jackson, 2016).

1.3. The present study

The present study aimed to examine actor and partner associations between attachment insecurity and emotional intimacy in same-sex male couples, and to analyze whether IH moderated these dyadic associations.

With these objectives, we may contribute to expand previous research in several ways. To our knowledge, no study has explored associations between attachment insecurities and emotional intimacy in same-sex male couples. Second, this is the first study to explore the moderating role of a proximal minority stressor on the relationship between romantic attachment and a core aspect of relationship functioning like intimacy from a dyadic perspective. Third, our study integrates two sounded theoretical perspectives: attachment and minority stress theory. Most importantly, this study has potential relevance for theory and practice. At the theoretical level, it may clarify whether, among same-sex couples, attachment insecurity plays the same effects on aspects of relationship functioning as in different-sex couples, and provide preliminary evidence of the role of IH within the framework of attachment theory. Furthermore, elucidating the dyadic interactive effects of romantic attachment and IH on emotional intimacy among same-sex male couples might offer valuable insights for more-culturally competent, couple-based psychotherapeutic, and counseling practice (Scott et al., 2019).

Based on previous evidence and theoretical considerations, we hypothesized that actor's and partner's attachment anxiety and attachment avoidance would be negatively associated with actor's emotional intimacy. As for the moderating role of IH, we hypothesized that higher levels of IH, which constitutes a stressor that interacts with attachment insecurities facilitating the individual's deployment of the secondary strategies of the attachment system (hyperactivation or deactivation) (Karney and Bradbury, 1995; Feeney, 2016), will exacerbate the posited dyadic associations of attachment insecurities with lower emotional intimacy. Specifically, we hypothesized that one's own IH will moderate the actor effects of attachment insecurities on emotional intimacy, such that higher actor's IH would intensify the negative effects of both actor's attachment anxiety and actor's attachment avoidance on actor's emotional intimacy. Similarly, we hypothesized that partner's IH will moderate the partner effects of attachment insecurities on emotional intimacy, such that higher partner's IH would intensify the negative effects of both partner's attachment anxiety and partner's attachment avoidance on actor's emotional intimacy. Due to the paucity of previous research, we did not formulate hypotheses on the moderating role of partner's IH on actor-level associations nor on the moderating role of actor's IH on partner-level associations, which were analyzed in an exploratory way.

The above associations were tested using the actor-partner interdependence moderation model (APIMoM; Garcia et al., 2015), an extension of the APIM that incorporates moderation.

2. Materials and methods

2.1. Participants' characteristics

The sample included 138 same-sex male couples from Chile. The 276 partners were aged 18 to 76 years ($M = 32.75$, $SD = 9.89$), 61.6% ($n = 170$) had higher (technical or university) education, and 71.4% ($n = 197$) were employed. For the 138 couples, relationship length ranged from 6 months to 36 years ($M = 5.05$ years, $SD = 5.99$), and 70.3% of couples ($n = 97$) had been together for 1 to 4 years. Most couples (62.3%, $n = 86$) were cohabiting, and 15.1% of these ($n = 13$) were in a civil union. In 8% of couples ($n = 11$) one or both partners had children, in 76.1% ($n = 105$) one or both partners were highly educated, and in 87.7% ($n = 121$) one or both partners were employed.

2.2. Procedure

Data for the present study came from a larger project examining relationship quality in same-sex couples and were approved by the University Ethics Board. The recruitment process was carried out through a non-probabilistic sampling by quotas according to age and gender identity. Sample size was established with an *a priori* power analysis conducted with G*Power 3.1 (Faul et al., 2007), following sample size recommendations in multiple regression analysis (Kenny and Cook, 1999). The power analysis indicated that a minimum of 134 couples would be needed to detect small-to-medium-sized effects ($f^2 = 0.12$) with a power of 80% and an alpha of 0.05 for a multiple linear regression with eight predictors (four main effects and four interaction effects).

To take part in the study, partners had to be 18 years or older, be involved in a same-sex male couple relationship for at least 6 months, and both partners had to be willing to participate. Data collection was carried out through the SurveyMonkey platform. A team of research assistants from the main regions of Chile were in charge of recruiting potential couples *via* advertisements on social networks, dissemination in organizations of sexual diversity, personal contacts, and the snowball technique. If both members of a couple agreed to participate, the research assistant provided them a link to the online survey along with an ID code to match partners' responses. Participants were asked to independently enter the ID, read the instructions, declare their eligibility criteria (otherwise, they were not

able to continue the survey), sign the online consent form, and complete a series of questionnaires. They were instructed to answer the survey individually, and to not discuss the questions or answers with their partner. Upon completion, participants received a compensation for the time spent completing the survey, consisting in $25 USD. All research assistants were required to sign a confidentiality statement.

2.3. Measures

2.3.1. Sociodemographic information

Participants responded to a sociodemographic form asking for age, educational level, job status, length of relationship, and union (being in a civil union or not), cohabitation (cohabiting with the partner or not), and parental status (having children or not).

2.3.2. Romantic attachment

Attachment insecurity was evaluated with the Experiences in Close Relationship questionnaire (ECR, Brennan et al., 1998) in its Chilean validated 12-item version (Guzmán-González et al., 2020a). The ECR measures adult attachment on two dimensions: attachment anxiety (e.g., I worry that romantic partners will not care about me as much as I care about them; I worry a fair amount about losing my partner) and attachment avoidance (e.g., I do not feel comfortable opening up to romantic partners; Just when my partner starts to get close to me I find myself pulling away). Each item is rated on a 7-point scale from 1 (disagree strongly) to 7 (agree strongly). Higher scores indicate higher levels of attachment insecurity. In Chilean samples, Cronbach's alpha coefficient ranged from 0.72 to 0.83 for the anxiety subscale and from 0.78 to 0.89 for the avoidance subscale (Guzmán-González et al., 2020a). Reliability in the present sample was Cronbach's $\alpha = 0.81$ and 0.77 for attachment anxiety and attachment avoidance, respectively.

2.3.3. Emotional intimacy

It was assessed using the Emotional Intimacy Scale (EIS; Sinclair and Dowdy, 2005), in its Chilean validated version (Guzmán-González et al., 2021). This 5-item self-report scale measures perceptions of being validated (e.g., My partner completely accepts me as I am), understood (e.g., My thoughts and feelings are understood and affirmed by my partner), and cared for (e.g., My partner cares deeply for me). Items are rated on a 5-point scale from 1 (strongly disagree) to 5 (strongly agree), with higher scores reflecting greater emotional intimacy. The scale showed good reliability, with Cronbach's α coefficient of 0.88 and 0.90 for the original and Chilean validated version, respectively. Substantial evidence has been provided for construct and criterion-related validity of the EIS (Sinclair and Dowdy, 2005; Guzmán-González et al., 2021). Cronbach's α in the current study was 0.84.

2.3.4. Internalized homonegativity

IH was measured with the Revised Internalized Homonegativity Scale (IHS-R, Herek et al., 2009), Chilean version (Gómez et al., 2023). The IHS-R consists of five items rated on a 5-point scale (0 = never to 4 = often). Sample items include "If during the past year someone had offered you the opportunity to be completely heterosexual you would have accepted the offer" and "You have wished you were not gay/bisexual." Higher scores indicate higher levels of IH. Previous studies provided evidence of adequate reliability, with Cronbach's α from 0.79 (Huynh et al., 2020) to 0.82 (Herek et al., 2009). Reliability in this study was Cronbach's $\alpha = 0.74$.

2.4. Data analysis

Preliminary analyses included correlations between study variables at the individual and couple levels and testing of potential covariates to be included in the dyadic models. At the individual level, we computed correlations between different variables within partners (i.e., overall within-partner correlations). For couple-level correlations, we adopted a pairwise approach and computed intraclass correlations (ICCs) instead of standard interclass (Pearson) product–moment correlations (González and Griffin, 1997; Kenny et al., 2006), because partners in same-sex dyads are not distinguishable based on their sex and their designation as Partner 1 or Partner 2 is arbitrary. Following González and Griffin (1997), we computed pairwise ICCs for correlations between both partners' reports of the same variables to test for interdependence within dyads, and cross-ICCs for correlations between different variables between partners. A z-statistic was computed to test for the statistical significance of correlations while adjusting for the interdependence between dyad members' reports (González and Griffin, 1997). To test for the need to include covariates in the dyadic models, emotional intimacy and IH were correlated with relationship length and compared (ANOVA) across groups based on couple-level union, cohabitation, and parental status, education, and employment. Variables that were significantly associated with the outcome or moderator were included as covariates in the dyadic models.

To test for the dyadic relationships between attachment insecurity and emotional intimacy and the moderating role of actor and partner IH, we used the APIMoM for indistinguishable dyads with a mixed moderator which varies between and within dyads (Garcia et al., 2015). APIMoM analyses were conducted within a structural equation modeling (SEM) framework (Olsen and Kenny, 2006; Ledermann and Kenny, 2017), using maximum likelihood estimator. Two APIMOMs were estimated, one for each romantic attachment dimension. In addition to actor and partner main effects, four moderation effects were estimated and tested: (1) actor's IH moderating the relationship between actor's attachment insecurity and actor's intimacy (i.e., actor-moderated actor effect); (2) partner's IH moderating the relationship between actor's attachment insecurity and actor's intimacy (i.e., partner-moderated actor effect); (3) actor's IH moderating the relationship between partner's attachment insecurity and actor's intimacy (i.e., actor-moderated partner effect); and (4) partner's IH moderating the relationship between partner's attachment insecurity and actor's intimacy (i.e., partner-moderated partner effect). The moderation effects were obtained by creating interaction terms between the grand-mean centered predictor and the grand-mean centered moderator (Aiken and West, 1991). To test for the significance of the four moderation effects combined, a reduced model with no interaction terms was estimated and compared against the moderation model (Garcia et al., 2015). A significant χ^2 difference test ($\Delta\chi^2$) would reflect a significant decrease in fit in the reduced model relative to the moderation model, indicating the presence of a combined moderation effect and the need to inspect the interaction

effects. In case of nonsignificant interaction terms, the model was re-run including only the significant moderation effects for model parsimony. In case of a significant interaction effect, simple slopes analysis was conducted. In simple slope analysis, the relevant (actor or partner) simple effects of attachment insecurity on emotional intimacy were examined at low (1 *SD* below the mean) versus high (1 *SD* above the mean) levels of the (actor or partner) moderator (Preacher et al., 2006).

Because dyad members were indistinguishable, means, variances, intercepts, residual variances, and covariance matrices were constrained to be equal across partners, in addition to equal actor and partner effects (Olsen and Kenny, 2006; Peugh et al., 2013). Model fit was evaluated following the steps outlined by Peugh et al. (2013) to remove misfit due to arbitrary designation of dyad members as Partner 1 or Partner 2 (Woody and Sadler, 2005). We estimated null (i.e., all covariances fixed to zero), saturated (i.e., all covariances freely estimated), and analysis models (i.e., hypothesized associations freely estimated), and computed adjusted model fit indexes for the hypothesized analysis model. Model fit was considered acceptable if the χ^2 was nonsignificant, the root mean square error of approximation (RMSEA) was $\leq$0.08, and the comparative fit index (CFI) was $\geq$0.90 (Hu and Bentler, 1999).

Statistical significance was set at $p < 0.05$. For interpretation of effect size, ICCs and Pearson's *r* of 0.10 were considered small, 0.30 medium, and 0.50 large (Cohen, 1988). APIMoMs and simple slope analyses were performed using Mplus 7.2, and all other analyses using IBM SPSS 27.

3. Results

3.1. Preliminary analyses

Results of preliminary analyses are presented in Table 1. Pairwise ICCs were significant for emotional intimacy and IH, which were both positively associated between partners, with small-to-medium effect size. Attachment anxiety and attachment avoidance did not correlate between partners, consistent with previous research (Campbell et al., 2001; Barry and Lawrence, 2013). As indicated by overall within-partner correlations and cross-ICCs, attachment anxiety and avoidance were positively associated within partners, with small effect sizes, and there was a small positive correlation between one partner's attachment anxiety and the other partner's attachment avoidance. Both attachment anxiety and attachment avoidance were negatively associated with emotional intimacy, with small-to-medium effect sizes. Correlations between attachment insecurity and IH were nonsignificant, except for a positive, small correlation between attachment avoidance and IH at the individual within-partner level. Emotional intimacy and IH were not significantly associated.

None of the couple-level characteristics was significantly associated with emotional intimacy or IH. Therefore, no covariates were included in the APIMoMs.

3.2. The effect of attachment anxiety on emotional intimacy moderated by IH

For the dyadic model with attachment anxiety as the predictor, the reduced model showed no decrease in fit compared to the moderation model, $\Delta\chi^2(4) = 1.98$, $p = 0.74$, indicating no moderation effects of IH. The final model, with the nonsignificant effects removed, showed adequate fit, $\chi^2(2) = 3.26$, $p = 0.20$, RMSEA = 0.07, CFI = 0.96. As displayed in Table 2, actor and partner associations between attachment anxiety and emotional intimacy were both significant and negative, indicating that higher levels of actor's and partner's attachment anxiety were associated with lower actor's emotional intimacy.

3.3. The effect of attachment avoidance on emotional intimacy moderated by IH

For the dyadic model with attachment avoidance as the predictor, the reduced model showed a poorer fit than the moderation model, $\Delta\chi^2(4) = 13.83$, $p = 0.008$, indicating the presence of moderation effects. Inspection of interaction effects revealed significant actor-moderated, $b = 0.16$, $SE = 0.06$, $z = 2.81$, $p = 0.005$, 95% CI [0.05, 0.27], and partner-moderated, $b = -0.16$, $SE = 0.06$, $z = -2.85$, $p = 0.004$, 95% CI [−0.26, −0.05], partner effects. The nonsignificant actor-moderated, $b = -0.04$, $SE = 0.06$, $z = -0.76$, $p = 0.45$, 95% CI [−0.15, 0.07], and partner-moderated, $b = 0.10$, $SE = 0.06$, $z = 1.81$, $p = 0.07$, 95% CI [−0.01, 0.21], actor effects were removed for model parsimony and the APIMoM was re-run.

The final model, with the nonsignificant effects removed, showed adequate fit to the data, $\chi^2(2) = 3.37$, $p = 0.19$, RMSEA = 0.07, CFI = 0.99. As reported in Table 2, actor and partner effects were both significant and negative, indicating that higher actor's and partner's attachment avoidance were both associated with lower actor's emotional intimacy. As for the significant actor-moderated partner effect (Partner's avoidance x Actor's IH in Table 2), simple slope analysis showed that the negative associations of partner's attachment avoidance with actor's emotional intimacy was statistically significant at low, $b = -0.19$, $SE = 0.04$, $z = -4.65$, $p < 0.001$, 95% CI [−0.27, −0.11], but not high, $b = -0.06$, $SE = 0.04$, $z = -1.77$, $p = 0.08$, 95% CI [−0.13, 0.01], levels of actor's IH (Figure 1).

As for the partner-moderated partner effect (Partner's avoidance x Partner's IH in Table 2), analysis of simple slopes revealed that the negative association of partner's attachment avoidance with actor's emotional intimacy was statistically significant at high, $b = -0.20$, $SE = 0.04$, $z = -5.15$, $p = <0.001$, 95% CI [−0.27, −0.12], but not low, $b = -0.06$, $SE = 0.04$, $z = -1.45$, $p = 0.15$, 95% CI [−0.13, 0.02], levels of partner's IH (Figure 2).

4. Discussion

The present study aimed to fill a gap in the literature and examine whether IH moderated the association between attachment insecurities and emotional intimacy in same-sex male couples. By adopting a dyadic perspective, we examined the relationships of one's own and partner's attachment insecurities with one's own emotional intimacy, and the potential role of each partner's IH in moderating these dyadic associations.

Altogether, our findings reinforce the consideration of attachment theory as a conceptual framework that explains differences in the way closeness and intimacy are regulated within the couple relationship (Feeney, 2016; Mikulincer and Shaver, 2016). Indeed, as expected,

TABLE 1 Within- and between-partner correlations, covariate testing, and descriptive statistics.

	Attachment anxiety	Attachment avoidance	Emotional intimacy	IH
Attachment anxiety BP	**0.150**			
Attachment avoidance WP	0.232***			
Attachment avoidance BP	0.244***	**0.028**		
Emotional intimacy WP	−0.203***	−0.376***		
Emotional intimacy BP	−0.155**	−0.243***	**0.294*****	
IH WP	0.113	0.119*	−0.120	
IH BP	0.025	0.109	−0.021	**0.243****
Covariates				
Relationship length			0.015	−0.102
Cohabitation status			0.28	0.03
Union status			0.93	0.07
Parental status			2.04	2.68
Education			0.18	0.37
Job			0.01	0.49
M (*SD*)	21.95 (8.48)	12.79 (6.36)	22.70 (2.74)	7.04 (3.27)

IH, internalized homonegativity; WP, within-partner correlations; BP, between-partner correlations. Pairwise ICCs are in bold. Statistical significance of pairwise ICCs, overall within-partner correlations and cross-ICCs was calculated using z scores (González and Griffin, 1997). F statistics are displayed for all covariates except relationship length, for which Pearson's *r* is displayed. $^{*}p \leq 0.05$, $^{**}p \leq 0.01$, $^{***}p \leq 0.001$.

TABLE 2 Effects in the final dyadic models.

	b	*SE*	*z*	95% CI
Attachment anxiety				
Actor's anxiety	−0.18	0.06	−3.25**	[−0.30, −0.07]
Partner's anxiety	−0.13	0.06	−2.23*	[−0.24, −0.02]
Attachment avoidance				
Actor's avoidance	−0.37	0.05	−7.42***	[−0.46, −0.27]
Partner's avoidance	−0.24	0.05	−4.71***	[−0.35, −0.14]
Partner's avoidance × Actor's IH	0.13	0.06	2.40*	[0.03, 0.24]
Partner's avoidance × Partner's IH	−0.14	0.05	−2.61**	[−0.25, −0.04]

b = standardized estimate; SE, standard error; CI, confidence interval; IH, internalized homonegativity. $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

attachment insecurity was linked to lower emotional intimacy at both actor and partner levels, in line with previous dyadic studies of heterosexual people (Dandurand and Lafontaine, 2013; Gagné et al., 2021). Moreover, coherent with previous evidence, attachment avoidance was more strongly related to lower emotional intimacy than attachment anxiety (Pielage et al., 2005; Constant et al., 2021; Gagné et al., 2021).

For both attachment orientations, actor-level associations were not moderated by IH. Thus, regardless of one's own and the partner's IH levels, the one's own higher attachment anxiety and attachment avoidance were associated with one's own lower perceptions of being intimate and experiencing closeness. According to attachment theory, more anxiously attached individuals usually have important needs for reassurance, love, connection, and crave for proximity, along with the perception of low responsiveness and care from their partners (Feeney and Noller, 1991; Gagné et al., 2021; van Lankveld et al., 2021). These characteristics, typically anchored in the chronic activation of the attachment needs (hyperactivation strategies), can interfere with the possibility of experiencing emotional closeness and a deep connection in the romantic bond (Mikulincer and Shaver, 2016). As for avoidant attachment, the tendency of avoidantly attached individuals to keep emotional distance from others, their need of autonomy, and their negative model of others, may hinder their willingness to seek closeness and to be involved in a depth communication (Feeney, 2016; van Lankveld et al., 2021), thus contributing to the lower perceived/reported emotional intimacy/closeness within their couple. These characteristics are based on the deactivating strategies of the attachment needs typical in individuals with higher avoidance attachment (Mikulincer and Shaver, 2016). Therefore, both forms of individual attachment insecurities represent vulnerability factors in the perception of intimacy within the couple (Gagné et al., 2021), independently of individual and partner IH.

At the partner level, the partner's higher attachment anxiety was associated with one's own lower emotional intimacy, regardless of one's own and the partner's IH levels. It is possible that anxiously attached individuals, due to intrusiveness in their behavior and exacerbated needs of closeness and proximity that are translated into pursuing and protest behaviors, facilitate a distance/withdraw response pattern in their partners (Collins and Read, 1990; Feeney and Noller, 1991; Bradford et al., 2002).

Contrary to our expectations, actor's IH did not moderate the actor-level associations of attachment anxiety and attachment avoidance with emotional intimacy, and partner's IH had no moderating role on the partner-level association between attachment anxiety, attachment avoidance, and emotional intimacy. Although these results can be counterintuitive, it can be hypothesized that, at the individual level, the nature of the associations between attachment, emotional intimacy, and IH is different, for example, through a mediational model, in which actor's attachment insecurities are

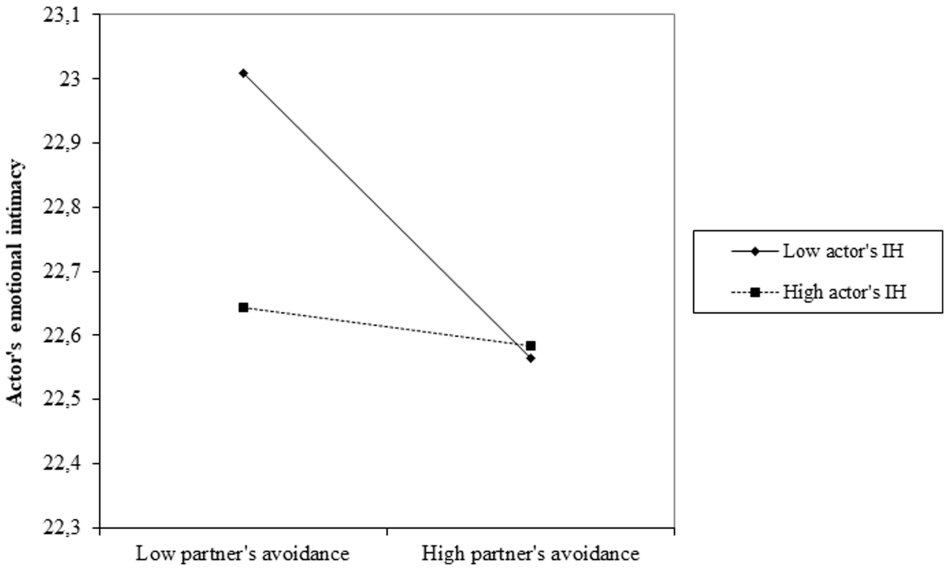

FIGURE 1
The association of partner's attachment avoidance with actor's emotional intimacy as a function of actor's internalized homonegativity (IH).

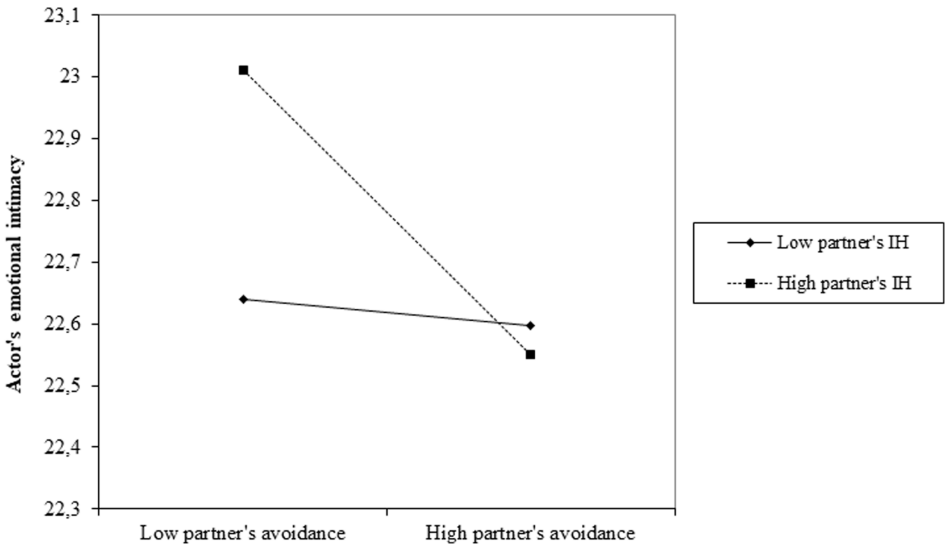

FIGURE 2
The association of partner's attachment avoidance with actor's emotional intimacy as a function of partner's internalized homonegativity (IH).

associated to higher levels of IH, which, in turn, decreases the perceived levels of emotional intimacy. Future studies, with appropriate designs (e.g., longitudinal studies), can elucidate this question. Another possible explanation in the case of attachment anxiety, is that the size of the effects of attachment anxiety on components of relationship functioning has been reported as low in previous research, and interaction effects are typically smaller than main effects (Blake and Gangestad, 2020). Therefore, it is possible that our study was underpowered to detect moderation effects for attachment anxiety. Further studies using larger samples are needed to clarify this issue.

We found significant actor- and partner-moderated partner effects for attachment avoidance. Thus, the association of the partner's attachment avoidance with one's own emotional intimacy was moderated by one's own and the partner's IH levels. Regarding the moderating role of individual IH, simple slope analysis revealed that only for individuals with low IH, their partner's higher attachment avoidance was associated with their own lower emotional intimacy. This suggests that if a dyad member has low IH, his emotional intimacy will be negatively affected by his partner's attachment avoidance. Being partnered with someone who has high attachment avoidance may especially frustrate one's own connection needs, leading to lower feelings of validation, caring, and acceptance by the partner, when one's own IH is low. Low IH entails more acceptance of the sexual orientation, less shame, and less efforts to conceal the

relationship from others, along with more positive attitudes toward LGBT people. Under these conditions, the avoidance of the partner seems to directly challenge the intimacy needs and perceptions of those men who are low in IH, and thus possibly more invested in same-sex relationships. Conversely, under conditions of high individual IH, the partner's attachment avoidance was unrelated to one's own emotional intimacy. Therefore, a high individual IH seems to buffer the negative effects of the partner's attachment avoidance on one's own perceptions of closeness and sharing of feelings and experiences. It is therefore likely that for those having a high IH, probably expressed in less positive attitudes toward one's own sexual orientation, the partner's avoidant behaviors corroborate their own negative relational disposition, with no negative consequences on their feelings of intimate connection.

Regarding the moderating role of partner's IH, results of simple slope analysis showed that, as hypothesized, higher partner's attachment avoidance was linked to actor's lower emotional intimacy only at high levels of partner's IH. Therefore, being partnered with someone who has high IH seems to heighten the negative effects of the partner's attachment avoidance on one's own emotional intimacy. Individuals high in IH are likely to show reduced relational trust and withdrawal from the romantic relationship (Doyle and Molix, 2015; Mohr and Jackson, 2016). Therefore, a high IH in avoidantly attached individuals, who are more emotionally detached and reluctant to self-disclosure, might accentuate their deactivating strategies in intimate relationships and make their partners feeling less connected and having more unmet needs of understanding, support, and affirmation. The association of partner's attachment avoidance with one's own emotional intimacy was instead nonsignificant at low levels of the partner's IH. Thus, for those men whose partners do not harbor negative views of their sexual orientation and express greater acceptance of their identity, their own perception of emotional connection and expectations of mutual caring is not affected by their partner's attachment avoidance.

Hence, expanding previous research, we identified that a proximal minority stressor like IH moderates the partner association between attachment avoidance and emotional intimacy. Notably, results from our study highlight that the holder of IH (actor or partner) is key to its moderating role. Specifically, whereas the partner's higher IH enhances the negative effects of the partner's avoidance on the actor's relational intimacy, the actor's higher IH inhibits it. The moderating role of the partner's IH was consistent with our hypothesis, but that of the actor's IH was unexpected. This latter result opens interesting avenues to understand the interplay of partners' IH and attachment avoidance in predicting emotional intimacy. For instance, it is possible that men who internalize homonegativity to a greater extent experience lower emotional intimacy altogether, and that this discomfort with their own sexual orientation makes the partner's avoidance irrelevant to their perceived emotional intimacy—that is, a high internalization of homonegativity by men involved in same-sex relationships may limit their ability to be affected by their partner's avoidance.

Our findings are in line with minority stress theory (Frost and Meyer, 2009), and expand previous research by demonstrating how one's own and the partner's levels of IH can reduce or enhance, respectively, the negative partner effects of attachment avoidance on emotional intimacy in same-sex male couples. In other words, IH of both dyad members moderates the effects of one partner's attachment avoidance on the other partner's emotional intimacy.

4.1. Limitations and future directions

Despite its contributions, the present study is not without limitations. First, the correlational design prevents from drawing any conclusion about causality. Longitudinal dyadic models of emotional intimacy over time should be tested to verify the temporal order of the associations of attachment insecurity and IH with emotional intimacy. However, assuming attachment as predictor of emotional intimacy and IH as a moderator is coherent with the notion that attachment insecurities represent an individual vulnerability whose effects can be enhanced in presence of stressors such as IH. Second, we exclusively considered self-reported attachment insecurity, IH, and emotional intimacy. Future research using both self- and partner-reports would deepen our understanding of the interplay between attachment insecurity and IH for the couple's functioning, besides reducing common method variance (Orth, 2013). Also, to assess IH, we used the Revised Internalized Homonegativity Scale, which provides a global IH score, because it has been validated for use with Chilean LGB individuals (Gómez et al., 2023). However, it would be interesting that future studies use other measures that consider different components of IH, such as public identification as a sexual minority and sexual and social comfort with sexual minority individuals (Currie et al., 2004; Morell-Mengual et al., 2017). This would enhance our understanding of how sexual minority stressors affect couple relationship dynamics, by elucidating whether and how different components of IH differently moderate the relationship between romantic attachment and emotional intimacy in same-sex male couples. Third, the great majority of couples in our sample were relatively recent (having been together for less than 5 years) and only a few couples were in a civil union, which may limit the generalizability of our findings. However, it is worth noting that in Chile a law allowing civil union between same-sex partners was only passed in 2015 (Biblioteca del Congreso Nacional de Chile, 2015), and that same-sex marriage was approved in 2021. Therefore, it would be interesting to investigate whether our findings are replicated in culturally and demographically diverse samples, such as long-term or married same-sex male couples. Fourth, we only included same-sex male couples in the current study. Thus, replication studies including other LGBT couples would be important to examine whether the same pattern of associations holds among other kind of LGBT couples. This would also be especially valuable in providing that all the groups that constitute the LGBTQ+ acronym are considered in the research domain, thus preventing that individuals from sexual minority identities other than gay and lesbian live a condition of double-invisibility (Salvati and Koc, 2022). Finally, we focused on the moderating role of IH, but other components of minority stress (i.e., discrimination experiences at the couple level, sexual orientation concealment) as well as relational variables, such as dyadic coping, might intervene to influence the dyadic associations between attachment insecurity and emotional intimacy among same-sex couples.

4.2. Implications and conclusions

The present study was the first study to investigate the dyadic interactive effects of attachment insecurity and IH on emotional intimacy among male same-sex couples. Our findings add to previous consistent evidence of the role of attachment insecurity for relationship

functioning, by showing that the same negative effects are observed in same-sex couples. Moreover, this was the first dyadic study conducted in a Latin American sample, which expands current knowledge to a culturally diverse sample. This is especially relevant as couple-based studies in the LGBT population are scarce in Latin America and Chile, with some exceptions (Guzmán-González et al., 2020b).

As for the clinical implications, our results revealed that IH constitutes a risk factor whose effect needs to be addressed when working with couples, providing insights of the importance of considering the specific needs and challenges faced by same-sex couples when designing couple interventions. Our empirical results, if replicated in more diverse LGBT couples, highlight the relevance of considering minority stressors for each partner. Thus, helping couples to recognize and handle the influence of minority stressors on their relationship might promote intimacy, an approach that may be especially relevant when one of the partners is more avoidantly attached.

Taking together, our results reveal that the integration of two theoretical frameworks, such as attachment theory and minority stress theory, represents a potentially fertile avenue for future research on LGBT couple functioning.

Data availability statement

The datasets analyzed during the current study are not publicly available due to privacy issues related to the participants, but are available from the corresponding author by reasonable request.

Ethics statement

The studies involving human participants were reviewed and approved by Comité Etico Científico Universidad Católica del Norte (CEC-UCN). The patients/participants provided their written informed consent to participate in this study.

Author contributions

MG-G: funding acquisition, project administration, conceptualization, methodology, writing-original draft preparation, and writing-review and editing. GC: methodology, formal analysis, interpretation of results, and writing-review and editing. FG: writing and editing. JoB, JaB, LG-R, and RE-T: writing-review and editing. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Relationship status and gender-related differences in response to infidelity

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Introduction: The sexual imagination hypothesis suggests that responses to a partner's infidelity emerge from the sociocultural factors that affect individuals' imagining of that occurrence irrespective of biological sex, including relationship status (i.e., the experience of a serious, committed relationship). Nevertheless, evolutionary psychological perspectives predict that responses to a partner's infidelity emerge from a sex-specific evolved innate mechanism.

Methods: A lower 2D:4D digit ratio is associated with more robust responses to a partner's sexual infidelity. In this study, participants (660 males and 912 females) were requested to measure finger lengths, reactions to their partners' sexual and emotional infidelity, and relationship status.

Results: A logistic regression and multiple regression analyses revealed that relationship status was uniquely associated with responses to a partner's sexual and emotional infidelity beyond the effects of sex and 2D:4D. Those in committed relationships were more upset or distressed over their partners' infidelity, particularly over sexual infidelity, than those not in committed relationships.

Discussion: The results supported the sexual imagination hypothesis indirectly, while evolutionary psychological perspectives were met with skepticism. Our findings implied that sex differences in jealousy result from relationship status, and that responses to partners' infidelity are more alike than different.

KEYWORDS

infidelity, jealousy, sexual imagination hypothesis, gender similarity, 2D:4D digit ratio, evolutionary psychology

Introduction

The research on sex differences in responses to a partner's infidelity (hereafter, jealousy), led and developed by evolutionary psychological perspectives, hypothesizes that sex differences in jealousy emerge owing to innate sex-specific mechanisms. Additionally, the empirical studies on sex differences in jealousy have provided crucial evidence supporting evolutionary psychology (Buss, 2018). However, sociocultural perspectives on sex differences (or similarities) in jealousy predict that sex differences (or similarities) arise through the acquisition of culturally sex-specific constructs, and have provided evidence for skepticism regarding evolutionary psychology perspectives. This conflict began to intensify around the 2000s and remains unresolved (Kato, 2022b). To facilitate understanding of our hypothesis, which is based on sociocultural perspectives and their findings, we will first describe the evolutionary psychological perspective.

Sex differences in responses to a partner's infidelity and 2D:4D digit ratio

According to the evolutionary psychological perspective, males are more sensitive to (upset or distressed by) their partners' sexual infidelity than females. In contrast, females are more sensitive to their partners' emotional infidelity than males (Buss, 2018). The sex differences in jealousy are rooted in human ancestry. Specifically, ancestral males were wary of their partners' potential sexual contact with other males. In contrast, ancestral females were free from the risk of maternal uncertainty. However, a partner's emotional infidelity poses a threat as it could lead to a loss of paternal investment and resources. These resources may be diverted to a rival female and her children (Buss, 2018). This evolutionary psychological perspective is the sex-specific evolved jealousy mechanism (EJM).

To test the EJM hypothesis, Buss and his colleagues (Buss et al., 1992) required college students to choose whether they would be more upset or distressed by their partner's sexual infidelity (i.e., enjoying passionate sexual intercourse with another person) or emotional infidelity (i.e., forming a deep emotional attachment to another person). The results revealed that 60% of male students opted for the sexual infidelity scenario, while 83% of female students chose the emotional infidelity scenario (Study 1). These findings supported the EJM hypothesis. Moreover, the EJM hypothesis has been repeatedly supported in studies performed worldwide employing Buss et al.'s (1992) paradigm (Buss, 2018). For instance, some evolutionary psychologists (Edlund and Sagarin, 2017) asserted that specific meta-analyses provided strong evidence for the sex differences in jealousy.

Nevertheless, these findings are only indirect evidence for the EJM hypothesis. According to the EJM hypothesis, sex differences in jealousy have biological origins. Therefore, the relationship between sex differences in jealousy and biological mechanisms must be examined to test the EJM hypothesis. Among these biological mechanisms, the 2D:4D digit ratio may be one. Although some studies have tested the EJM hypothesis using physiological responses as a marker of jealousy, such as heart rate, startle eyeblink, and brain activities, using functional magnetic resonance imaging (see Kato, 2022b), to our knowledge, no study has examined the relationship between sex differences in jealousy and biological mechanisms except the 2D:4D research. The second to fourth-digit ratio has been used to indicate prenatal androgen. This ratio is higher in females than males (Hönekopp and Watson, 2010). Furthermore, 2D:4D has been reported to be associated with behavioral traits, such as personality, cognitive abilities, sexual orientation, sports performance, and risk of illnesses (Leslie, 2019). Most 2D:4D studies were published in psychology departments (Voracek and Loibl, 2009). Furthermore, sex differences related to 2D:4D have been used as evidence to support specific evolutionary psychological perspectives (e.g., Gallup and Frederick, 2010, for a review).

Examining the relationship between 2D:4D and sex differences in jealousy may contribute to comprehending biological mechanisms' influence on it. Maner et al. (2014) proposed that, based on a psychological perspective called *fast life history strategies*, the masculinizing effects of prenatal testosterone bring early investment in reproduction and behaviors to compete directly with intrasexual rivals to ensure immediate reproductive access to potential mates. Consequently, greater exposure to prenatal testosterone (lower 2D:4D) might potentiate a heightened propensity to respond competitively and aggressively toward possible rivals, particularly when encountering the threat of infidelity. In addition, Maner et al. (2014) demonstrated that lower 2D:4D was associated with greater muscle flexion (representing oppositional and confrontational behaviors) when imagining one's partner's infidelity with an attractive rival (i.e., flirting with being intimate with another person at a party). Based on this, Fussell et al. (2011) hypothesized that individuals in lower 2D:4D might be more upset or distressed by their partner's sexual infidelity than emotional infidelity in both sexes; they tested this hypothesis in heterosexual undergraduates and postgraduates. Another study (Bendixen et al., 2015) on heterosexual undergraduates replicated their findings. However, only these two studies examined the relationship between 2D:4D and jealousy.

In conclusion, regarding the relationship between 2D:4D and jealousy, an evolutionary psychological perspective predicts that individuals in lower 2D:4D will be more upset or distressed by their partner's sexual infidelity in both sexes.

Relationship status and sex differences in jealousy

Some sociocultural perspectives exhibit skepticism regarding the EJM hypothesis (see Kato, 2022b), such as relationship status (i.e., the experience of a serious, committed relationship). According to the EJM hypothesis, sex differences in jealousy should be observed regardless of status. Sex differences by relationship status should be more significant for those who have experienced a serious, committed relationship than those who have not.

However, some studies (e.g., Becker et al., 2004; Guadagno and Sagarin, 2010; Kato, 2014a, 2021; Pazhoohi et al., 2019) found that sex differences in jealousy were due to the relationship status, but not innate mechanism (i.e., EJM); therefore, sociocultural perspectives regard this phenomenon as sex differences (similarities), instead of sex differences in jealousy. Kato (2014b) found no sex differences in jealousy among male and female college students who were or had been in a serious, committed relationship using a large sample ($n = 2{,}241$). Sex differences in jealousy were observed exclusively in college students who were not in serious, committed relationships (i.e., men were more upset over sexual infidelity, and women were more upset over emotional infidelity). Specifically, female college students in a serious, committed relationship were more upset or distressed over sexual infidelity than those who were not in a serious, committed relationship; in contrast, male college students in a serious, committed relationship were more upset or distressed over emotional infidelity than those who were not in a serious, committed relationship. For the former sample (i.e., female college students in a serious, committed relationship), the Type II error probability of falsely accepting an incorrect null hypothesis was low ($1-\beta = 0.956$, effect size partial $\eta^2 = 0.005$). This finding indicated that the probability that the null hypothesis (no sex differences) was accepted falsely was low. It implied that the result of no sex differences in jealousy is highly reproducible.

Kato (2014b) explained these findings that participants in a serious, committed relationship could imagine their partners' infidelity (especially sexual infidelity for female college students) more readily and vividly than participants who were not in a serious, committed relationship. As explained by Kato (2014b),

some studies (e.g., Becker et al., 2004; Kato, 2014a, 2021) found that individuals in a committed relationship more easily imagine their partners' infidelity than those who are not. This phenomenon is also observed when other sexual stimuli than sexual infidelity are used. Specifically, individuals in a committed relationship strongly respond to sexual stimuli regardless of sex than those who are not (see Kato, 2021). This phenomenon can explain by the sexual imagination hypothesis (Harris, 2000; Kato, 2014a, 2017, 2022b). According to the sexual imagination hypothesis, apparent sex differences in jealousy emerge owing to the differences in vivid imagination between men and women, but not the EJM. Therefore, the sex differences in jealousy are not observed when both men and women explicitly imagine their partners' infidelity, especially sexual infidelity. Generally, men can envision sexual infidelity more explicitly or easily than women, while women can envision emotional infidelity more explicitly or easily than men. More specifically, the former difference is recognized as significant (Kato, 2014a, 2022b). This phenomenon is also observed when other sexual stimuli than sexual infidelity are used (Kato, 2022a). Some studies (Harris, 2000; Kato, 2014a,b, 2021, 2022a) demonstrated this sexual imagination hypothesis. Based on Kato's (2014b) explanation described above, for example, the experience of being cheated on by a partner enhanced the imaging of sexual infidelity for those involved in serious, committed relationships. Frederick and Fales (2016) showed that individuals who experienced their partners' unfaithfulness were upset over sexual infidelity compared to those who had previously not experienced this life event.

Most studies (e.g., Becker et al., 2004; Guadagno and Sagarin, 2010; Kato, 2014b, 2021) demonstrated that relationship status could explain sex differences in jealousy using a continuous measurement paradigm. In contrast, only a few studies (e.g., Kato, 2014a) used a forced-choice measurement paradigm. The *forced-choice measurement paradigm* is the method proposed by Buss et al. (1992), in which participants choose the more upsetting or distressing of the infidelity types (sexual or emotional infidelity). The *continuous measurement paradigm* is a method in which participants rate the degree to which they were upset or distressed by each infidelity type. In studies without specific participants, those using a forced-choice measure were more likely to support the EJM hypothesis. Studies using a continuous measure were more likely to reject the EJM hypothesis. A meta-analysis ($k = 168$, $N = 125{,}698$; Kato, 2017) incorporating the largest sample among those showed that approximately 69.2% of the studies using forced-choice measurement supported the EJM hypothesis. In contrast, approximately 66.5% of the studies using continuous measurement provided evidence that the EJM hypothesis should be viewed skeptically (Kato, 2022b). Therefore, the present study tested the sexual imagination hypothesis and the EJM hypothesis using forced-choice and continuous measures.

Based on the sexual imagination hypothesis, we hypothesized that relationship status would be associated with jealousy beyond the effects of biological sex and 2D:4D on jealousy. Specifically, individuals in committed relationships would be more upset or distressed by their partner's infidelity than those not in a committed relationship, regardless of biological sex and 2D:4D. Such a trend would be strongly observed in a partner's sexual infidelity. Our study differs from many previous studies related to the sexual imagination hypothesis in that we attempted to demonstrate that the predictions based on it are valid for both forced-choice and continuous measurement paradigms. Our study also differs from previous studies related to the sexual imagination hypothesis in that we measured 2D:4D This measurement demonstrated a biological mechanism of sex differences in jealousy.

Methods

Participants and procedure

Participants were recruited through lectures at colleges in Japan. Participants comprised 660 males and 912 females (biological sex) aged 30 and younger (18 and 29 years, mean age = 19.88, SD = 1.40), who were heterosexuals and were recruited from colleges in Japan. We recruited heterosexuals exclusively because interpretations of sex differences in jealousy in homosexual individuals, in evolutionary psychological and sociocultural perspectives, differ from those in heterosexuals (see Kato, 2022b). Eleven students did not respond to questions about their biological sex or sexual orientation. The age of 30 years or younger is consistent with Bendixen et al.'s (2015) criteria, which was used in examining the relationships between sex differences in jealousy and 2D:4D to replicate the previous studies (Fussell et al., 2011; Bendixen et al., 2015). Additionally, participants reported being (or had been) in a serious, committed relationship; based on Kato's (2014a) classification, casual dating was excluded from a serious, committed relationship. According to the evolutionary psychological perspective, long-term mating strategies (used in serious, committed relationships) differ from short-term ones (used in casual dating).

After provided written informed consent, participants answered sociodemographic questions, including sex and age. They answered the questionnaire, and then their finger lengths were measured.

Measures

All instructions, questionnaires, and measures were provided in Japanese.

Responses to partner's infidelity (jealousy)

Jealousy was measured using forced-choice and continuous measures. The order in which these two paradigms were presented was random. In the forced-choice measurement paradigm, participants were required to select one of the following scenarios in which they would be more upset or distressed: (a) your partner forming a deep emotional attachment to that person (i.e., emotional infidelity) and (b) your partner enjoying passionate sexual intercourse with the other person (i.e., sexual infidelity). This method was identical to one proposed by Buss et al. (1992). The score calculated by the forced-choice measurement is referred to as the F-C jealousy score in this study.

In the continuous measurement paradigm, participants were required to rate the degree to which their partners' sexual and emotional infidelity would upset or distressed them, using six-point Likert-type scales ranging from 1 (not at all upset or distressed) to 6 (extremely upset or distressed). In this study, the scores calculated by the continuous measurement for sexual and emotional infidelity are referred to as the sexual and emotional jealousy scores, respectively.

2D:4D digit ratio

Based on Ribeiro et al. (2016) recommendations, participants' finger lengths were measured directly. Ribeiro et al. (2016) mentioned that direct 2D:4D tends to be greater than indirect. Furthermore, it is more strongly associated with target traits than indirect 2D:4D. In this study, a digital caliper (TDN-100, TRUSCO, Pro Tool, Japan), calibrated to the nearest 0.01 mm with instrumental error ± 0.003 mm, was used to measure finger length. Out of 1,572 participants, 1,426 were right-handed (90.7%). The final 2D:4D ratios were calculated by dividing 2D by 4D length.

Relationship status

Out of 1,572 participants, 983 reported being (or had been) in a serious, committed relationship at the time of this study (62.5%). The remaining 589 participants reported not being in a serious, committed relationship. Casual dating was excluded from a serious, committed relationship. Participants in committed relationships had a mean (SD) and median duration relationship of 12.10 (12.54) and 8 months, respectively.

Data analysis

To test our hypothesis, a logistic regression analysis on an F-C jealousy score was conducted with sex, 2D:4D, and relationship status scores (Step 1) and an interaction score between sex and relationship status scores (Step 2) as predictors of an F-C jealousy score. Second, hierarchical multiple regressions on each score of sexual and emotional jealousy were conducted with sex, 2D:4D, and relationship status scores (Step 1) and an interaction score between sex and relationship status scores (Step 2) as predictors of each score of sexual and emotional infidelity.

Results

Table 1 shows the frequencies of an F-C jealousy score, the means and standard deviations of a 2D:4D score, and sexual and emotional infidelity scores by sex and relationship status.

A logistic regression analysis on an F-C jealousy score, conducted to test our hypothesis, revealed that the model at Step 2 was significant (Table 2): $\chi^2(4) = 74.66$, $p < 0.001$, Nagelkerke $R^2 = 0.063$. In addition, the significant interaction ($B = 0.61$, $SE = 0.23$, Wald = 7.25, $p = 0.007$, odds ratio [OR] = 1.84, 95% confidence interval [CI] for OR = 1.18, 2.88) and the effect of exclusively relationship status ($B = 1.14$, $SE = 0.16$, Wald = 54.21, $p < 0.001$, OR = 3.13, 95% CI for OR = 2.31, 4.24) were found. The effect of relationship status indicated that participants in a serious, committed relationship were more upset or distressed over their partners' sexual infidelity than those not in one. Follow-up analysis of the interaction between sex and relationship status revealed that both male (47.9% vs. 35.4%; $\chi^2(1) = 9.63$, $p = 0.002$, $\varphi = 0.12$) and female (46.7% vs. 22.3%; $\chi^2(1) = 54.63$, $p < 0.001$, $\varphi = 0.25$) participants in committed relationships chose sexual infidelity as more upsetting or distressing than those not in one. Additionally, the effect of sex was significant only in participants not in committed relationships; males chose sexual infidelity as more upsetting or distressing than females (35.4% in males vs. 22.3% in females), and more females chose emotional infidelity than males (64.6% in males vs. 77.7% in females): $\chi^2(1) = 12.13$, $p < 0.001$, $\varphi = 0.14$. However, no significant effect of sex was found among participants in committed relationships (47.9% in males vs. 46.7% in females who chose sexual infidelity): $\chi^2(1) = 0.13$, $p = 0.722$, $\varphi = 0.01$.

A hierarchical multiple regression on a sexual jealousy score, conducted to test our hypothesis, revealed that the delta multiple correlation coefficient (ΔR) values at Step 2 were not significant (Table 3): $\Delta R^2 = 0.01$, ΔF (1,1567) = 2.63, $p = 0.105$, Cohen's $f^2 = 0.01$. However, the R value at Step 1 was significant: $R^2 = 0.13$, F (3,1568) = 78.87, $p < 0.001$, Cohen's $f^2 = 0.15$; the significant effect of only relationship status was found: $\beta = 0.36$, $t = 15.21$, $p < 0.001$, indicating that both males and females in committed relationships were more upset or distressed by their partners' sexual infidelity than those not in one. Figure 1 demonstrates the association of relationship status with sexual and emotional jealousy.

A hierarchical multiple regression on an emotional jealousy score revealed that the ΔR-value in Step 2 was not significant (Table 2): $\Delta R^2 = 0.01$, ΔF (1,1567) = 0.17, $p = 0.678$, Cohen's $f^2 = 0.01$. However, the R-value in Step 1 was significant: $R^2 = 0.09$, F (3,1568) = 53.59, $p < 0.001$, Cohen's $f^2 = 0.10$; the significant effect of only relationship status was found: $\beta = 0.31$, $t = 12.64$, $p < 0.001$, indicating that males and females in committed relationships were more upset or distressed by their partner's emotional infidelity than those not in one.

A χ^2-test on an F-C jealousy score, conducted to test the EJM hypothesis, showed that males chose sexual infidelity as more upsetting or distressing than females (43.3% vs. 37.4%; $\chi^2(1) = 5.64$, $p = 0.018$, $\varphi = 0.06$). A t-test on the sexual jealousy score also showed that males reported being more upset or distressed by their partner's sexual infidelity than females ($t(1570) = 2.16$, $p = 0.031$, $d = 0.11$). However, a t-test on the emotional jealousy score showed an insignificant sex difference.

A t-test conducted to determine the sex difference of right 2D:4D revealed that males' 2D:4D was lower than that of females ($t(1570) = 3.49$, $p < 0.001$, $d = 0.17$). Furthermore, t-tests on an F-C jealousy score, conducted to assess the hypothesis of evolutionary psychological perspective regarding the association between 2D:4D and jealousy, showed a non-significant difference between 2D:4D in participants who chose sexual infidelity as more upsetting or distressing and 2D:4D in those who chose emotional infidelity among both males ($t(658) = 1.15$, $p = 0.250$) and females ($t(910) = 0.19$, $p = 0.852$). Additionally, the correlations of a 2D:4D score with sexual and emotional jealousy scores were insignificant among males ($r = 0.05$, $p = 0.188$ and $r = -0.01$, $p = 0.756$) and females ($r = 0.04$, $p = 0.211$ and $r = 0.05$, $p = 0.160$).

Additional analyses extracting only participants in a serious, committed relationship found no significant effects of relationship duration on sex differences in jealousy (Table 3).

Discussion

We hypothesized that individuals in committed relationships would be more upset or distressed over their partners' infidelity, especially sexual infidelity, than those not in committed relationships. Furthermore, we hypothesized that relationship status would explain a unique variance in sex differences in jealousy beyond biological sex and 2D:4D. As expected, a logistic regression analysis revealed that relationship status predicted F-C jealousy in males and females,

TABLE 1 Means and standard deviations of imaginations and responses to partners' infidelity by sex and relationship status.

Variable	Frequency		Frequency		χ^2 value	*p* value	Effect size (φ)
	Emotional	Sexual	Emotional	Sexual			
Sex	Men (n = 660)		Women (n = 912)				
F-C jealousy	347	286	571	341	5.64	0.018	0.06
Relationship status	Presence (n = 983)		Absence (n = 589)				
F-C jealousy	519	464	426	163	58.58	<0.001	0.19
Variable	Mean	SD	Mean	SD	*t* value	*p* value	Effect size (d)
Sex	Men (n = 660)		Women (n = 912)				
Sexual jealousy	4.39	1.38	4.24	1.35	2.16	0.031	0.11
Emotional jealousy	4.54	1.25	4.53	1.25	0.14	0.889	0.01
Right 2D:4D	0.97	0.05	0.98	0.04	3.49	<0.001	0.17
Relationship status	Presence (n = 983)		Absence (n = 589)				
Sexual jealousy	4.68	1.24	3.67	1.32	15.19	<0.001	0.80
Emotional jealousy	4.83	1.09	4.04	1.35	12.68	<0.001	0.66
Right 2D:4D	0.98	0.04	0.97	0.05	−2.27	0.024	0.23

F-C jealousy is response in a partner's infidelity that scored using the forced-choice measure (score range = 1 or 2). Sexual and emotional jealousy are responses in a partner's sexual and emotional infidelity that scored using the continuous measure (score range = from 1 to 6), respectively. Presence and absence of relationship status are participants in a committed relationship and those not in one, respectively.

TABLE 2 Logistic regression analysis predicting the response to a partner's infidelity when using a forced-choice measure (N=1,572).

Predictor	B	SE	Wald	*p* value	Exp(B)	95% CI	
						LL	UL
Step 1							
Sex	−0.23	0.11	4.75	0.029	0.79	0.64	0.98
Right 2D:4D	−1.79	1.19	2.25	0.134	0.17	0.02	1.73
Relationship status	0.87	0.11	58.60	<0.001	2.38	1.91	2.97
$\chi^2(3) = 67.39$, $p < 0.001$, Nagelkerke $R^2 = 0.057$							
Step 2							
Sex	−0.03	0.13	0.06	0.804	0.97	0.75	1.25
Right 2D:4D	−1.90	1.20	2.53	0.112	0.15	0.01	1.56
Relationship status	1.14	0.16	54.21	<0.001	3.13	2.31	4.24
Interaction	0.61	0.23	7.25	0.007	1.84	1.18	2.88
$\chi^2(4) = 74.66$, $p < 0.001$, Nagelkerke $R^2 = 0.063$							

CI is confidence interval; LL and UL are lower and upper limits, respectively. Response to a partner's infidelity (emotional infidelity = 1 and sexual infidelity = 2). Sex (male = 1 and female = 2). Relationship status (participants in not a committed relationship = 1 and those in one = 2). Interaction is sex × relationship status.

indicating that both sexes in committed relationships chose their partners' sexual infidelity as more upsetting or distressing than those not in one. Hierarchical multiple regressions also showed that relationship status predicted both sexual and emotional jealousy even when controlling for the effects of sex and 2D:4D. This result indicated that males and females in committed relationships were more upset or distressed by their partners' sexual and emotional infidelity than those not in one. A series of these findings were consistent with previous studies (e.g., Becker et al., 2004; Guadagno and Sagarin, 2010; Kato, 2014a,b, 2021) and also supported our hypothesis concerning forced-choice and continuous measurements. These findings implied that sex differences in jealousy might emerge from relationship status.

Furthermore, our hypothesis that the effect of relationship status on jealousy would be observed, especially in sexual jealousy, was supported as the effect size of relationship status in sexual (large) was greater than that in emotional jealousy (medium). A discussion of these findings follows later in this paper.

2D:4D

The right 2D:4D in males was lower than that in females in the present study. This result was consistent with previous studies (see Hönekopp and Watson, 2010, for a review). However, the effect size in our study (d=0.17) was minimal compared to a meta-analysis (d=0.35; Hönekopp and Watson, 2010) on 2D:4D using direct measurement.

Surprisingly, the 2D:4D of participants in committed relationships was higher than those not in one. To our knowledge, no study has examined the association between 2D:4D and relationship status. This finding may be interpretable from an evolutionary psychological perspective. However, the effect size of the association between 2D:4D and relationship status was small in the present study. Thus, this association may be simply due to chance. Smoliga et al. (2021) study, published in the British Medical Journal, found a significant correlation between right 2D:4D in men and good luck (i.e., poker hand rank from randomly selected playing cards as a surrogate). Their finding was not meant to provide confirmatory evidence for the association between 2D:4D and good luck. Instead, it confirmed that the association was simply due to chance. This issue is also addressed in the limitations section.

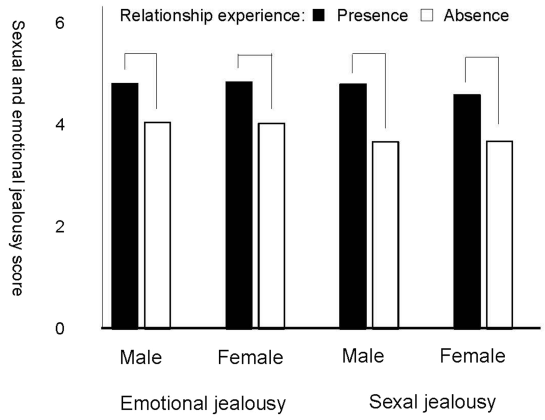

FIGURE 1
Sexual and emotional jealousy are responses in a partner's sexual and emotional infidelity that scored using the continuous measure (score range=from 1 to 6), respectively. Presence and absence of relationship experience are participants in a committed relationship and those in not one, respectively. The results of statistical tests are based on an 2 (sex)×2 (relationship experience)×2 (type of jealousy; sexual vs. emotional jealousy) analysis of variance; all significant levels are $p<0.001$.

TABLE 3 Hierarchical multiple regression analyses predicting responses to partner's sexual and emotional infidelity when using a continuous measure (N =1,572).

Predictor	B	95% CI		t value	p value
		LL	UL		
Sexual infidelity					
Step 1					
Sex	−0.12	−0.25	0.00	1.91	0.057
Right 2D:4D	−0.79	−2.14	0.55	1.15	0.249
Relationship status	1.01	0.88	1.14	15.21	<0.001
$R^2=0.13$, F (3,1568) = 78.87, $p<0.001$, Cohen's $f^2=0.15$					
Step 2					
Sex	0.01	−0.20	0.22	0.11	0.909
Right 2D:4D	−0.75	−2.09	0.60	1.09	0.277
Relationship status	1.35	0.92	1.79	6.07	<0.001
Interaction	−0.22	−0.48	0.05	1.62	0.105
$\Delta R^2=0.01$, ΔF (1,1567) = 2.63, $p=0.105$, Cohen's $f^2=0.01$					
Emotional infidelity					
Step 1					
Sex	0.01	−0.11	0.13	0.13	0.898
2D:4D	−0.36	−1.69	0.97	0.53	0.598
Relationship status	0.79	0.67	0.91	12.64	<0.001
$R^2=0.09$, F (3,1568) = 53.59, $p<0.001$, Cohen's $f^2=0.10$					
Step 2					
Sex	−0.03	−0.22	0.17	0.25	0.801
2D:4D	−0.37	−1.70	0.96	0.54	0.588
Relationship status	0.71	0.30	1.12	3.38	<0.001
Interaction	0.05	−0.20	0.30	0.42	0.678
$\Delta R^2=0.01$, ΔF (1,1567) = 0.17, $p=0.678$, Cohen's $f^2=0.01$					

CI is confidence interval; LL and UL are lower and upper limits, respectively. Sex (male = 1 and female = 2). Relationship status (participants not in a committed relationship = 1 and those in one = 2). Interaction is sex × relationship status.

The present study observed a slight sex difference in 2D:4D and an unexpected result regarding the association between 2D:4D and relationship status. However, it also may provide valuable data for 2D:4D research. Direct measurement used in the present study is more costly in terms of participant time than indirect measurement. Notably, many studies have used indirect measurement (Ribeiro et al., 2016). Nonetheless, our sample was relatively large comparing to those in most 2D:4D studies using direct measurement. To our knowledge, it was the largest among the 2D:4D studies at least in Japanese, including indirect measurement. Given our data's importance, statistics on sex differences in 2D:4D are provided in the Supplementary material.

EJM hypothesis and relationship status

The EJM hypothesis was supported only by a simple χ^2-test on a forced-choice measure. The effect size was negligible. According to the gender similarities hypothesis (Hyde, 2014), small effect sizes like this study's may indicate a similarity in jealousy instead of a sex difference. Additionally, a logistic regression analysis revealed that the sex difference in jealousy was not observed in participants in committed relationships. This finding was consistent with previous studies (e.g., Becker et al., 2004; Guadagno and Sagarin, 2010; Kato, 2014a,b, 2021).

Furthermore, in a continuous measurement paradigm, no sex differences were found in sexual and emotional jealousy. Our findings on a continuous measure were inconsistent with the predictions of the EJM hypothesis. However, the meta-analyses on sex differences in jealousy using a continuous measurement have replicated the different results from the predictions of the EJM hypothesis (see Kato, 2022b, for a review). Therefore, our findings on a continuous measurement are likely valid.

These findings on the EJM and our hypothesis suggest that sex differences in jealousy may emerge from sociocultural factors, such as relationship status, rather than innate mechanism. The gender similarities hypothesis (Hyde, 2014) proposes that males and females are similar in most psychological variable. Sex differences in jealousy may be one of these. Our findings, which cast doubt on the EJM hypothesis, may help clarify sex differences (or similarities) in jealousy. Moreover, they advance research on sociocultural factors regarding sex differences in jealousy. Research on sex differences in jealousy has been dominated by evolutionary psychological findings based on the EJM hypothesis. Furthermore, the EJM is a core hypothesis of evolutionary psychology. Findings based on EJM are crucial evidence for other

evolutionary psychology perspectives. Currently, evolutionary psychological perspectives continue to strongly influence research regarding sex differences in jealousy. Research on sex differences (or similarities) in jealousy using sociocultural perspectives has been conducted primarily by evolutionary psychology skeptics.

It should be noted that sex differences in jealousy might be explained by other sociocultural factors not measured in this study, as well as to relationship status. Furthermore, another sociocultural factor may explain sex differences in jealousy better than relationship status. For example, the sexual imagination hypothesis predicts that sex differences in jealousy are not observed when individuals can imagine explicitly and vividly their partners' infidelity (especially sexual imagination). On the other hand, relationship status is one factor enhancing their sexual and emotional imaginations (Kato, 2014a, 2022b). It is not a direct cause of sex differences in jealousy. Rather, it facilitates the emergence of sex differences in jealousy through being mediated by imagining a partner's infidelity. Further studies examining the association between relationship status and sexual (or emotional) imagination might elucidate the role of the sexual imagination hypothesis in sex differences (or similarities) in jealousy. In this instance, measuring sociocultural factors other than relationship status that may affect the imagination of a partner's sexual and emotional infidelity is required; for example, experiencing a partner's infidelity.

An evolutionary psychological perspective on 2D:4D

An evolutionary psychological perspective predicts that lower 2D:4D is associated with stronger sexual jealousy in males and females. However, our findings indicate that 2D:4D is not associated with sexual (or emotional) jealousy in both sexes. They were inconsistent with two previous studies (i.e., Fussell et al., 2011; Bendixen et al., 2015). This inconsistency may result from differences between the present investigation and two other studies. First, we measured finger lengths directly, while the previous studies measured them indirectly. Second, the effect size ($d = 0.17$) of the sex difference in right 2D:4D in our study was comparatively smaller than that (ds = 0.28 and 0.57) in the previous studies. However, replicating the findings of the two previous studies regarding the association between 2D:4D and jealousy will be difficult. The number ($N = 1{,}572$) of participants in our study is greater than that (Ns = 480 and 280) in previous studies. Furthermore, the direct measurement used in the present study is suitable for assessing 2D:4D. It is not appropriate for the indirect measurement used in the previous studies (Ribeiro et al., 2016). This concern is discussed below in the limitations section.

Limitations

This study has some other limitations. First, our hypotheses were formulated based on the sexual imagination hypothesis; however, the present study did not examine the association of relationship status with the sexual imagination hypothesis. Some studies (e.g., Becker et al., 2004; Kato, 2014a, 2021) found that individuals in committed relationships could imagine their partners' infidelity more vividly and easily, especially sexual infidelity, compared to individuals not in one. A more detailed examination of the association between relationship status and sexual imagination might help clarify how sex differences in jealousy depend on relationship status.

Second, our findings cast doubt on the EJM hypothesis. However, they do not completely debunk it. The present study was not designed to discredit the EJM hypothesis. However, such studies will eventually determine its validity.

Third, our study failed to detect an association between 2D:4D and jealousy. However, its results were inconsistent with two previous studies. However, in recent years, skepticism concerning the relationship between 2D:4D and psychological characteristics, such as personality, cognitive abilities, and behavioral traits, has been repeatedly raised (see Leslie, 2019). Additionally, even if there is any association between 2D:4D and jealousy, other interpretations from an evolutionary psychological perspective may exist. Therefore, the relationship between 2D:4D and jealousy must be interpreted cautiously. Moreover, further studies measuring, other biological mechanisms related to the EJM instead of 2D:4D may effectively test this hypothesis.

Fourth, though small, the effect size indicates an association between 2D:4D and relationship status. The present study did not test this association based on any hypothesis. No previous study has examined this association. The association might be due to chance, according to Smoliga et al. (2021). However, the present study's findings may be interpretable from an evolutionary psychological perspective, although we could not conceive of its interpretation. Further studies need to examine the association between 2D:4D and relationship status based on a reasonable hypothesis.

Finally, this study measured only relationship status as a sociocultural factor for sex differences in jealousy. However, multiple studies have supported sociocultural perspectives that differ in their theoretical backgrounds, such as those involving sex roles (Hupka and Bank, 1996), social cognitive (White and Mullen, 1989), and biosocial theories (Wood and Eagly, 2002). Further research adding these factors would contribute to our understanding of the causes of sex differences in jealousy.

Conclusion

Although our study has a few limitations, it confirms that individuals in committed relationships were more upset or distressed by their partner's infidelity, especially sexual infidelity, compared to those not in one. Moreover, relationship status explained a unique discrepancy in jealousy beyond biological sex and 2D:4D. These findings imply that sex differences in jealousy are influenced by sociocultural factors, such as relationship status, and responses to partners' infidelity are similar. Our findings contribute to advancing research on sex differences in jealousy from a sociocultural perspective. Furthermore, our findings supported the sexual imagination hypothesis indirectly and cast doubt on evolutionary psychological perspectives.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by the Graduate School of Sociology, Toyo University. The patients/participants provided their written informed consent to participate in this study.

Author contributions

TK: conceptualization, methodology, validation, formal analysis, investigation, visualization, supervision, project administration, and writing—original draft. NO: data curation, investigation, and writing—review and editing. All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2023.1158751/full#supplementary-material

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A comparative study of subjective well-being, interpersonal relationship and love forgiveness among Chinese college students before and after the COVID-19 epidemic

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During the period that COVID-19 pandemic outbreak, Chinese universities have adopted a new teaching method combining online and offline and banned students from entering and leaving campus at will in line with the epidemic prevention policy. As a result, college students' learning and life styles have been greatly changed. In order to explore how the epidemic and specific prevention policies have influenced the psychology and behavior of Chinese college students, this study used three questionnaires of college students' subjective well-being, interpersonal relationship and love forgiveness to collect the data after the epidemic and compared with the data of college students before the epidemic. The result showed that before and after the epidemic, college students had obvious changes in their level of interpersonal relationship, subjective well-being and love forgiveness. Relationships among the three variables had changed. Meanwhile, the demographic variables of college students had certain changes in the three questionnaires. College students with and without romantic experience also had significant differences in the three questionnaires. It can be seen that the epidemic and specific prevention policies have a certain impact on the physical and mental health of college students, and there is also a gap in the forgiveness level of college students with and without romantic experience. These findings remind relevant departments that it should give greater consideration to the physical and mental health of college students, provide some references for dealing with new outbreaks and formulating the epidemic prevention policies subsequently, and suggest psychological counselors to change the way of dealing with the intimate relationship of college students.

KEYWORDS

Chinese college students, the COVID-19 pandemic, interpersonal relationships, subjective well-being, love forgiveness

Introduction

The outbreak of COVID-19 pandemic has had diverse impacts on people's study, work and even life, and dealt a heavy blow to the physical and mental well-being of countless individuals (Talevi et al., 2020; Chen et al., 2021; Xie et al., 2022). The study of de Abreu et al. (2021) found that adolescents' fear of possible infection with the virus added their anxiety, which would lead to more serious emotional problems (Xie et al., 2020).

On 5 December 2022, China made an official announcement on the conclusion of the COVID-19 outbreak. During the epidemic, China had taken special epidemic prevention measures for 3 years. Chinese universities adopted a new teaching method combining online and offline, and closed campus gates and barred students from entering and leaving the campus as they please to reduce the possibility of the virus spreading at the universities. On the one hand, epidemic prevention measures have disrupted the existing educational form, mode and learning style of Chinese higher education (Sun et al., 2022), and also changed the lifestyle of students. In school, students not only face the uncertainty of when the pandemic will end, but also have to adjust to new learning methods (Eva et al., 2021). Engaging in online education reduces the level of interaction between students and teachers, resulting in heightened learning fatigue and provoking negative emotions like stress (Muslim, 2020). On the other hand, epidemic prevention measures may do harm to students' mental health. Evidences showed that the measures affect people's mental health in a negative way (Chew et al., 2020; Qiu et al., 2020; Rossi et al., 2020; Wang et al., 2020). Additionally, Krautter et al. (2022) found that college students were significantly affected by various restrictions imposed during the epidemic.

Yaremtchuk and Bakina (2021) argue that adolescents are among the most vulnerable groups and it is important to study their response during an epidemic. Studies have shown that the COVID-19 pandemic has influenced college students' mental well-being and behavioral pattern (Son et al., 2020; Gestsdottir et al., 2021; Li et al., 2021; Gadi et al., 2022; Zhu and Shen, 2022; Patin et al., 2023; Wu, 2023). Individuals' subjective well-being shows their life satisfaction, positive and negative emotional experience as well (Diener et al., 1999), which holds great importance in individuals' mental health (Steinmayr et al., 2019). Subjective well-being of college students can serve as an indirect indicator of their mental health (Eva et al., 2021). According to Zhang F. et al. (2021), undergraduates' subjective well-being in college during the epidemic period was at an above average level, which is consistent with the study results before the epidemic period. However, the study of Baetens et al. (2022) shows the pandemic does adversely affect undergraduates' subjective well-being in college. Chen and Ye (2023) found that compared with the period before the epidemic, undergraduates' subjective well-being in college had decreased significantly during the COVID-19. Krautter et al. (2022) found that during the epidemic, the subjective well-being of college students decreased.

College students' subjective well-being is associated with interpersonal relationship (Jiang and Tan, 2016; Cheng et al., 2021). Interpersonal relationship refers to the mode of contact and interaction between people (Ma, 2022). College students' interpersonal relationship is a kind of external expression of their behavior, revealing their behavioral patter. The epidemic has changed people's interpersonal relationships (Tribowo et al., 2021) and has multiple effects on interpersonal relationships in school (Herrmann et al., 2021). Zhang X. et al. (2021) investigated the relationships among Chinese college students' interpersonal relationships, school adjustment, mental resilience and social support in the period of pandemic. This study emphasized the role of interpersonal relationship and found a strong association between interpersonal relationship and school adjustment. Nevertheless, the study did not discuss the changes in college students' interpersonal relationships before and after the pandemic. At present, there is a lack of research on the changes of interpersonal relationship among undergraduates before and after the epidemic.

A romantic relationship is a special kind of human relationship. Love forgiveness refers to the forgiveness within a specific relationship and it pertains to an individual's inclination to forgive for his specific object of interpersonal relationship (Paleari et al., 2009; Zhang and Fu, 2014). This forgiving tendency includes emotion, cognition and behavior (Enright et al., 1992), involving both individual psychology and behavior. The level of love forgiveness of undergraduates can reflect their psychological health and behavioral pattern indirectly. The studies showed that interpersonal forgiveness is beneficial to individuals' mental health (Berry et al., 2005; Chen et al., 2017). Therefore, it is of certain significance to investigate the love forgiveness of undergraduates after the epidemic. Tribowo et al. (2021) investigated the relationships of married people in Indonesia and pointed out that the pandemic has changed the relationships of couples. Overall et al. (2021) also pointed out that the pandemic has a serious impact on couples' relationships. However, there is no evidence that the pandemic has changed relationships among college students. In addition, Love forgiveness in college students is correlated with subjective well-being (Cheng et al., 2021). Study has shown that individual's forgiveness is negatively correlated with negative emotional experience during the pandemic (Tilkeridou et al., 2021). The epidemic can increase individual's negative emotions (Genc and Arslan, 2021). Therefore, the epidemic may change the level of love forgiveness among university students. However, as far as we know, no researchers have investigated the undergraduates' love forgiveness after the pandemic.

Existing researches about the influence of the pandemic upon undergraduates' subjective well-being have shown inconsistent results. This problem needs more discussion. Meanwhile, to our knowledge, it is unclear whether college students' interpersonal relationships and love forgiveness have changed during the pandemic. Until now, no researchers have compared the three variables among Chinese university students before and after the pandemic period. A study comparing the three variables among Chinese university students before and after the time of the COVID-19 pandemic could be helpful for us to understand whether the COVID-19 pandemic have influenced Chinese university students and Chinese special epidemic prevention policies from both psychological and behavioral aspects. Firstly, this can provide some evidence from Chinese college students for relevant researches about the effects of COVID-19 epidemic and prevention policies. Secondly, this research is helpful for other researchers to know the current situation of students' well-being, interpersonal relationships and intimate relationships. Thirdly, the results of the study can provide some references for relevant departments to formulate policies conducive to individuals' mental health when dealing with the epidemic in the future.

The data collected before the epidemic were all from college students with romantic experience. To enhance the ecological validity of the research conclusions, this research tried to compare the differences in interpersonal relationship, subjective well-being and love forgiveness of undergraduates with and without romantic experience. The love forgiveness among university students without romantic experience is their imagined forgiveness. Comparing the love forgiveness between university

students with and without romantic experience can help researchers figure out the distinction between the imagined and the actual love forgiveness. At present, the research in this area is still relatively lacking. This article can not only enrich the research results in the field of intimate relationship and forgiveness, but also provide more possible ideas for improving individuals' mental health.

Overall, this article aims to explore the impact of COVID-19 and epidemic prevention policies in China on college students by comparing the subjective well-being, interpersonal relationship and love forgiveness before and after the epidemic. In addition, this study also explored the differences in the three variables among undergraduates with and without romantic experience. Therefore, our attention is directed toward these unexplored questions:

> *Research Question 1*: Do Chinese college students' love forgiveness, subjective well-being and interpersonal relationships change before and after the time of pandemic?
>
> *Research Question 2*: Have the three variables of Chinese college students of different genders changed before and after the pandemic?
>
> *Research Question 3*: Have the three variables of Chinese college students of different grades changed before and after the pandemic?
>
> *Research Question 4*: Have the three variables of Chinese college students of different regions changed before and after the epidemic?
>
> *Research Question 5*: Are there differences in three variables between college students with romantic experience and those without romantic experience?

Based on questions of the research, we put forward the related hypotheses below:

> *Hypothesis 1*: The subjective well-being, interpersonal relationship and love forgiveness among Chinese undergraduates will change significantly before and after the epidemic.
>
> *Hypothesis 2*: Chinese college students of different genders will show significant changes in the three variables before and after the epidemic.
>
> *Hypothesis 3*: Chinese college students of different grades will show significant changes in the three variables before and after the epidemic.
>
> *Hypothesis 4*: Chinese college students of different regions will show significant changes in the three variables before and after the epidemic.
>
> *Hypothesis 5*: There are significant differences between college students with romantic experience and those without romantic experience in three variables.

Materials and methods

Participants

Before the pandemic, we surveyed a group of Chinese college students who had a romantic relationship in 2016. After the pandemic, we surveyed a group of Chinese college students in 2023, who were divided into two categories: those who had a romantic relationship and those who did not. Due to the 7-year interval between the two surveys and the anonymous data collection method we used, the subjects of the two surveys were not the same group of college students, which should be emphasized.

In 2016, Chinese university students who have romantic experience were invited take part in the survey. We choose the subjects at random and distributed paper questionnaires in university across China, as well as online. The paper questionnaires were 761 and online questionnaires were 179. After excluding 109 invalid questionnaires, a total of 831 valid questionnaires were got; 412 questionnaires were from male and 419 from female; 286 data were from freshmen, 159 were from sophomores, 192 were from juniors, and 194 were from seniors. The data from urban areas and rural areas were, respectively, 468 and 363.

In 2023, Chinese college students were invited take part in the survey. We choose the subjects at random and the subjects were asked to fill out the questionnaires online. After excluding 160 invalid questionnaires, a total of 1,641 valid questionnaires were got; 976 students with romantic experience and 505 students without romantic experience. In terms of gender, the subjects included 601 males and 880 females. Regarding grade level, there were 423 freshmen, 444 sophomores, 315 juniors, and 299 seniors. Concerning geography, the data from urban areas and rural areas were, respectively, 697 and 784.

Measures

The study adopt three scales based on Chinese university students to explore the changes of Chinese undergraduates' subjective well-being, interpersonal relationship and love forgiveness before and after the COVID-19 epidemic, as well as the difference among undergraduates with and without romantic experience: the College Students' Love Forgiveness Questionnaire, College Students' Interpersonal Relationship Comprehensive Diagnostic Scale, and College Students' Subjective Well-being Questionnaire. For convenience, the three scales are abbreviated as CS-LFQ, CS-IRCDS, and CS-SWQ.

College students' subjective well-being questionnaire

Jiang and Yang (2008) compiled the CS-SWQ. The questionnaire is divided into 8 factors and includes 61 questions and some reverse questions. The score of the CS-SWQ is comprised of five levels, ranging from 1 which denotes complete inconsistency to 5 which represents complete consistency. The score is higher, the level of subjective well-being is higher. The CS-SWQ's Cronbach alpha coefficient is 0.959, and the alpha coefficient of each factor falls within the range from 0.765 to 0.916. The CS-SWQ had good content validity,

construct validity and calibration validity. The questionnaire was employed by Jiang and Bai (2009) and Jiang and Tan (2016), both of which got positive outcomes.

College students' interpersonal relationship comprehensive diagnostic scale

The CS-IRCDS was compiled by Zheng et al. (2005), which is divided into 4 dimensions. The questionnaire includes 28 questions, which has some reverse questions. The score for each question is either 0 or 1 (with 0 being non-conformity, 1 being conformity). Individuals with higher total scores tend to have better relationships. The cumulative score obtained from the questionnaire between 0–8, 9–14, and 15–28, respectively, indicates trouble getting along with friends, somewhat difficult to maintain relationships with friends, and minimal interpersonal troubles. The reliability indexes of each subscale of the questionnaire and the validity were all good. The scale's total score exhibited a high level of internal consistency with an alpha coefficient of 0.82. The questionnaire was employed by Cui et al. (2015) and Jiang and Tan (2016), which had good results.

College students' love forgiveness questionnaire

Zhang and Fu (2014) compiled the CS-LFQ, and set 27 questions. The questionnaire contain four dimensions, which are revenge, avoidance, forgiveness, and negative contemplation. The score of questionnaire is six levels, ranging from 1 which denotes complete consistency to 6 which represents complete inconsistency. The revenge, avoidance and negative contemplation are negative dimensions. The forgiveness is positive dimension and has reverse questions. After some questions are scored in reverse, a higher total score indicates a greater degree of forgiveness. The four dimensions of the scale demonstrated good internal consistency with alpha coefficients of 0.735, 0.862, 0.877, and 0.892, respectively. The total questionnaire showed excellent internal consistency with an alpha coefficient of 0.897, and exhibited strong structural and external validity. The CS-LFQ has been used by the studies of Liu (2017), Sun et al. (2018), and Yu (2019), which had good results.

Procedure

Before the pandemic, we surveyed a group of Chinese college students who had a romantic relationship in 2016. After the pandemic, we surveyed a group of Chinese college students in 2023, who were divided into two categories: those who had a romantic relationship and those who did not. Due to the 7-year interval between the two surveys and the anonymous data collection method we used, the subjects of the two surveys were not the same group of college students, which should be emphasized. The flow chart of the experimental procedure is shown in Figure 1.

In 2016, we bound the three questionnaires into a book and invited college students to respond at random. Initially, the participants were asked whether they had romantic relationships and their willingness to participate in the research. If the students had previous romantic involvement or were currently in a romantic relationship, and expressed their willingness to participate, they were subsequently requested to complete the scales. The survey process lasted for about 20 min and was carried out anonymously. Once the questionnaires were all gathered, it underwent a verification and screening process, and data from the valid questionnaires were entered.

In 2023, we combined the three questionnaires into one online questionnaire and invited college students to respond during their rest. Only after obtaining the consent of the subjects, we would ask them to complete the online questionnaire. If college students had no romantic relationship, according to the instructions in the questionnaire, they should complete the selection of relevant content with imaginary. The anonymous online survey of approximately 20 min in duration was carried out. Once questionnaires were all gathered, we checked and screened all the questionnaires.

Approval for this study was granted by the ethics committee at the School of Psychology, Nanjing Normal University and the ethics committee at the School of Educational Sciences, Huaiyin Normal University. We informed all subjects of the main purpose of the study and obtained their consent.

Statistical analysis of data

The data obtained in this study were statistically analyzed by SPSS27.0 and Mplus8.3 software, and the statistical methods used are mainly descriptive statistics: *t*-test, *F*-test, and a structural variance model.

Results

Descriptive statistics

Reliability analysis

In both 2016 and 2023, the internal consistency coefficients of the three questionnaires were all above 0.80. Therefore, the data were deemed to be reliable. We conducted a common method bias test on all the data from 2016 and 2023 by using SPSS27.0. The Harman's single factor test results showed that the first unrotated factor explained only 16.79% of the total variance, accounting for 40% of the total explanatory variance. Therefore, we believe that there is no severe common method bias present.

Difference analysis

The average scores and standard deviations of participants with romantic experience in three scales were presented in Table 1 for both the years 2016 and 2023. Multivariate analysis of variance was performed for the CS-LFQ, demographic variables and years. However, the result of homogeneity test of variance was significant ($F = 9.492$, $p < 0.001$), indicating that conducting this analysis would not be appropriate. By examination, a multivariate analysis of variance was also unsuitable for CS-IRCDS and CS-SWQ. Therefore, we conducted *t* tests on the data in 2016 and 2023. The data from 2 years were analyzed by using independent sample t-test through SPSS27.0. According to the results, there was a significant difference between the 2 years in terms of CS-SWQ ($t = 19.532$, $p < 0.001$, *Cohen's*

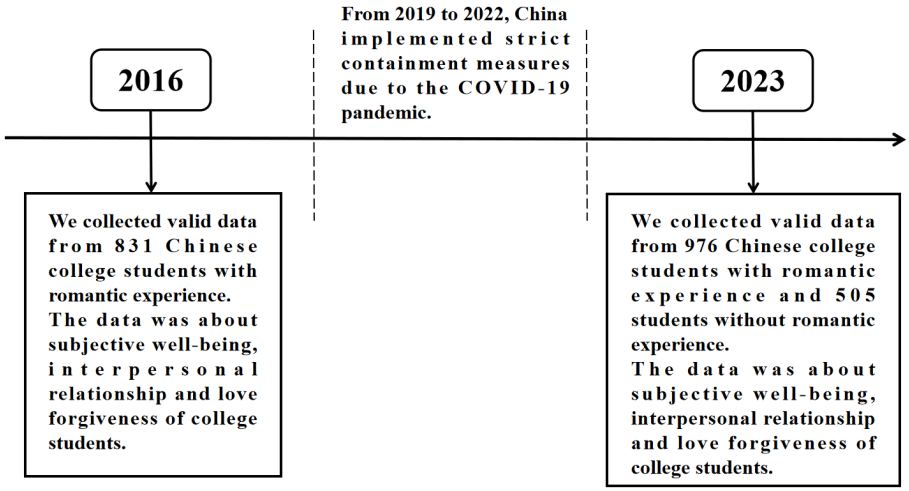

FIGURE 1
Experimental procedure flow chart.

TABLE 1 Mean and standard deviation of three questionnaires in 2016 and 2023.

	College students	SW	IRCDS	LF
2016	With romantic experience	221.079 ± 36.8547	19.110 ± 5.200	73.096 ± 14.552
2023	With romantic experience	193.105 ± 23.422	19.288 ± 6.345	66.809 ± 16.007
	Without romantic experience	187.812 ± 22.746	18.032 ± 6.615	68.633 ± 17.695

$d = 0.919$), CS-IRCDS ($t = -0.646$, $p < 0.001$, *Cohen's* $d = 0.031$), and CS-LFQ ($t = 8.674$, $p = 0.005$, *Cohen's* $d = 0.408$). The small *Cohen's d* values in the CS-IRCDS need to be given special attention. College students' average scores in the CS-IRCDS of 2 years were very close, but the standard deviation was not. The average scores became lower in both CS-SWQ and CS-LFQ in 2023. Therefore, it can be concluded that undergraduates' subjective well-being, love forgiveness, and interpersonal relationships changed significantly before and after the epidemic.

Table 2 presents the mean scores and standard deviations of students in the CS-SWQ across different dimensions in 2016 and 2023. We attempted to perform a one-way ANOVA on different dimensions across different years. However, the results of the homogeneity of variance test showed significance. Therefore, we conducted independent samples *t* tests for each dimension separately, and the results are presented in Table 2. Except for the dimension of positive emotions, the other 7 dimensions showed significant differences across different years. Due to reverse scoring, lower scores on negative emotions indicate more negative emotions. Comparing to 2016, college students in 2023 have more negative emotions and improved romantic relationships. However, there has been a decline in five other dimensions: evaluation of academic and life, sense of career and employment, self-evaluation, interpersonal communication and connection, and academic achievement and experience.

Table 3 displays the mean scores and standard deviations of students in the CS-IRCDS across different dimensions in 2016 and 2023. The results of independent samples *t* tests for each dimension are shown in Table 3. College students only show significant differences in the two dimensions of interacting with others and interacting with the opposite sex. College students in 2023 scored higher on the dimension of interacting with others and lower on the dimension of interacting with the opposite sex. It should be noted that in the CS-SWQ, the items related to romantic relationships and emotions dimension primarily focus on the quality of interactions with a romantic partner, while the items related to interacting with the opposite sex dimension in the CS-IRCDS primarily assess interactions with individuals of the opposite sex.

According to Table 4, the mean and standard deviation of demographic variables among college students with romantic experience in the years 2016 and 2023 are presented. The mean and standard deviation of scores were compared between different gender subjects in 2 years, respectively. Independent sample *T*-test results showed that males in the CS-SWQ ($t = 17.613$, $p < 0.001$, *Cohen's* $d = 1.311$) and the CS-LFQ ($t = 3.015$, $p = 0.003$, *Cohen's* $d = 0.212$) had significant differences in 2 years, but no significant differences in the CS-IRCDS; females in the CS-SWQ ($t = 9.145$, $p < 0.001$, *Cohen's* $d = 0.719$) and the CS-LFQ ($t = 9.909$, $p < 0.001$, *Cohen's* $d = 0.634$) had significant differences in years, but no significant differences in the CS-IRCDS. Cohen's d value of the CS-IRCDS is small, which should be noted. In 2023, males and females all had the lower scores in the CS-SWQ and CS-LFQ, and higher scores in the CS-IRCDS. In 2023, the average score of males in the CS-SWQ was lower than that of female students, while the average scores in the CS-IRCDS and CS-LFQ were higher than that of females. In 2016, the average scores in three questionnaires of males scored higher than females. Thus, the conclusion is that the three variables of males and females all changed before and after the epidemic.

We compared the mean score and standard deviation in three questionnaires for college students of different grades in 2016 and

TABLE 2 Mean, standard deviation, and *t*-test in different dimensions of CS-SWQ.

	2016	2023	*t*	*p*	*Cohen's d*
Negative emotion	54.490 ± 10.521	38.554 ± 12.215	29.441**	<0.001	11.467
Positive emotion	41.697 ± 7.903	41.310 ± 7.587	1.058	0.290	7.736
Evaluation of academic and life	32.460 ± 6.107	30.131 ± 4.220	9.535**	<0.001	5.174
Sense of career and employment	20.588 ± 4.711	18.598 ± 3.561	10.209**	<0.001	4.130
Romantic relationships and emotions	16.631 ± 5.294	18.63 ± 4.6597	−8.569**	<0.001	4.961
Self-evaluation	14.284 ± 3.102	11.809 ± 2.729	18.038**	<0.001	2.906
Interpersonal communication and connection	19.184 ± 3.704	16.778 ± 2.471	16.447**	<0.001	3.100
Academic achievement and experience	21.746 ± 4.135	17.287 ± 2.996	26.499**	<0.001	3.565

**$p < 0.01$.

TABLE 3 Mean, standard deviation, and *t*-test in different dimensions of CS-IRCDS.

	2016	2023	*t*	*p*	*Cohen's d*
Conversation and behaviors	4.563 ± 1.780	4.691 ± 2.014	−1.424	0.154	1.910
Interpersonal communication	4.197 ± 1.704	4.043 ± 2.160	1.665	0.096	1.964
Interacting with others	5.084 ± 1.455	5.539 ± 1.638	−6.191**	<0.001	1.556
Interacting with the opposite sex	5.242 ± 1.661	5.015 ± 1.839	2.728**	0.006	1.759

**$p < 0.05$.

2023 respectively, which are shown in Table 4. Independent sample *T*-test results showed that in the CS-SWQ, the scores of freshmen ($t = 12.600$, $p < 0.001$, *Cohen's* $d = 1.144$), sophomores ($t = 6.246$, $p < 0.001$, *Cohen's* $d = 0.729$), juniors ($t = 11.489$, $p < 0.001$, *Cohen's* $d = 1.417$), seniors ($t = 7.353$, $p < 0.001$, *Cohen's* $d = 0.789$) all had obvious differences in 2016 and 2023; in the CS-IRCDS, significant differences ($t = -2.914$, $p = 0.004$, *Cohen's* $d = 0.276$) was only observed in freshmen in 2016 and 2023; in the CS-LFQ, the scores of freshmen ($t = 4.815$, $p < 0.001$, *Cohen's* $d = 0.451$), sophomores ($t = 4.291$, $p < 0.001$, *Cohen's* $d = 0.411$), juniors ($t = 8.517$, $p < 0.001$, *Cohen's* $d = 0.879$) had significant differences in 2016 and 2023. In the CS-SWQ and CS-LFQ, the juniors had the highest average score in 2016, and seniors had the highest score in 2023. In the CS-IRCDS, the juniors had the highest average score in 2016, and freshmen had the highest score in 2023. Thus, the conclusion is that the three variables among the undergraduates of different grades changed before and after the epidemic.

We compared the mean score and standard deviation in three questionnaires for college students of different regions in 2016 and 2023, which are shown in Table 4. The results of independent sample T-test indicated that there were significant differences among urban undergraduates in years in the CS-SWQ ($t = 14.562$, $p < 0.001$, *Cohen's* $d = 1.070$) and CS-LFQ ($t = 6.216$, $p < 0.001$, *Cohen's* $d = 0.406$), but no significant differences in the CS-IRCDS; subjects in rural areas had significant differences in years in the CS-SWQ ($t = 12.131$, $p < 0.001$, *Cohen's* $d = 0.971$) and CS-LFQ ($t = 6.101$, $p < 0.001$, *Cohen's* $d = 0.416$), but no significant differences in the CS-IRCDS. The subjective well-being and love forgiveness among undergraduates from city and country all became lower in 2023. In the CS-SWQ, the mean score of city undergraduates was higher than country undergraduates in 2016, but lower than country undergraduates in 2023. Thus, the conclusion is that the three variables among the undergraduates of different regions changed before and after the epidemic.

The data collected in 2023 were analyzed. We compared the differences in the three questionnaires among college students with and without romantic experience, as shown in Table 1. Multivariate analysis of variance was employed to make a comparison between the scores among undergraduates with and without romantic experience in the questionnaires. The results showed that college students with and without romantic experience had significant differences in the CS-SWQ [F (1,1,480) = 17.335, $p < 0.001$, $\eta^2 = 0.012$], CS-IRCDS [$F(1,1,480) = 12.689$, $p < 0.001$, $\eta^2 = 0.009$] and CS-LFQ [$F(1,1,480) = 31.005$, $p < 0.001$, $\eta^2 = 0.021$]. College students with romantic experience had higher average scores than those without romantic experience in the CS-SWQ and CS-IRCDS, and had lower average scores than those without romantic experience in the CS-LFQ. Hence, we conducted an independent sample *t*-test for the four dimensions in the CS-LFQ between college students with and without romantic experience. The results are shown in Table 5. College students with and without romantic experience had significant differences in the four dimensions. Students with romantic experience scored the highest in forgiveness dimension, while those without romantic experience scored the highest in revenge dimension. Simultaneously, the average score in avoidance dimension was higher

TABLE 4 Mean and standard deviation of three questionnaires for demographic variables in 2016 and 2023.

	Year	Gender		Grade				Region	
		Male	Female	Freshman	Sophomore	Junior	Senior	City	Country
LF	2016	76.21 ± 15.25	70.03 ± 13.15	71.93 ± 12.27	70.55 ± 12.14	80.33 ± 12.21	69.75 ± 13.01	73.77 ± 16.19	72.23 ± 12.08
	2023	72.75 ± 17.72	62.38 ± 12.95	66.15 ± 14.65	64.47 ± 15.35	65.95 ± 15.37	70.73 ± 17.75	67.17 ± 16.31	66.47 ± 15.73
IRCDS	2016	19.72 ± 5.14	18.51 ± 5.21	18.75 ± 4.82	18.74 ± 4.89	20.03 ± 5.02	19.03 ± 6.05	19.25 ± 5.35	18.93 ± 5.01
	2023	19.53 ± 6.76	19.11 ± 6.02	20.15 ± 5.87	19.52 ± 6.83	19.52 ± 5.74	18.03 ± 6.45	19.79 ± 6.11	18.82 ± 6.53
SW	2016	228.57 ± 38.75	213.62 ± 33.39	221.08 ± 33.86	209.01 ± 30.89	236.15 ± 46.08	215.84 ± 30.06	222.92 ± 39.19	218.59 ± 33.58
	2023	188.20 ± 26.21	196.76 ± 20.37	190.49 ± 21.07	190.72 ± 26.93	194.40 ± 21.21	197.10 ± 22.56	192.71 ± 22.35	193.48 ± 24.40

TABLE 5 The difference of students with and without romantic experience in four dimensions of love forgiveness in 2023.

	Romantic experience	*N*	*Mean*	*SD*	*t*	*p*	*Cohen's d*
Revenge	With	976	2.617	1.239	−27.082**	0.000	1.408
	Without	505	4.476	1.279			
Avoidance	With	976	3.757	1.551	2.572*	0.010	0.134
	Without	505	3.532	1.693			
Forgiveness	With	976	4.051	1.332	−4.405**	0.000	0.229
	Without	505	4.373	1.331			
Negative meditation	With	976	3.629	1.370	−2.498*	0.013	0.130
	Without	505	3.821	1.460			

*$p < 0.05$, **$p < 0.01$.

among undergraduates with romantic experience than among those without romantic experience. However, in the other three dimensions, the average score was lower among undergraduates with romantic experience than among those without romantic experience. Thus, we conclude that college students with and without romantic experience had significant differences in love forgiveness.

Relationship research

Correlation analysis

Three questionnaires total scores were transformed into Z-scores and then analyzed for correlation using SPSS. The results showing in Table 6 indicated significant correlations between each pair of the three variables.

In 2016, there was a weak correlation between the CS-LFQ and the CS-IRCDS ($r = 0.365$); the correlation between the CS-LFQ and CS-SWQ ($r = 0.570$) was moderate, as were the CS-IRCDS and CS-SWQ ($r = 0.570$). In 2023, there was a weak correlation between the CS-LFQ and CS-IRCDS ($r = 0.0.257$); the correlation between the CS-IRCDS and CS-SWQ ($r = -0.305$) was weak and negative, as were CS-LFQ and CS-SWQ ($r = -0.063$), which need careful attention. After the pandemic, the relationship between the three variables has changed.

Intermediate inspection

In 2016, we employed Mplus 8.3 to evaluate the fitness level of a mediating effect model, which consisted of college students' love forgiveness, interpersonal relationships, and subjective well-being (for a review, see Cheng et al., 2021). Table 7 shows the fitting index result of the mediation model (Model 1). The results showed interpersonal relationships significantly mediated the relationship between subjective well-being and love forgiveness among undergraduates. The mediation effect explained 40% of the total relationship, as shown in Figure 2.

In order to compare with the mediation effect model in 2016, we used the data from 2023 to evaluate the fitness level of the mediation effect model again. According to the mediating effect test procedure introduced by Wen et al. (2004), we first tested the direct effect between love forgiveness and subjective well-being, and the effect was significant ($t = -10.871$, $p < 0.001$). In the next step, we added interpersonal relationship and test the mediation model. The fitting index result (Model 2) was shown in Table 7. However, the CFI and TLI values were below 0.9 and they were even lower than that of 2016. Additionally, the SRMR value exceeded 0.08. These data suggested that the fitting index was not ideal and the model setting had problems. It can be found that the model established in 2016 no longer applies to 2023. Figure 3 shows the pathway of the mediation effect.

Moderator inspection

Since the three variables mediation model is no longer applicable to the post-pandemic period, we tried to examine the relationship between love forgiveness and subjective well-being by using demographic variables as the moderating variables. However, the operation results of Mplus8.3 showed that in the model with gender (Model 3) and region (Model 4) as dichotomous moderating variables, the difference test were all not significant ($p > 0.05$), and the model

TABLE 6 Correlation analysis.

		Love forgiveness	Interpersonal relationship	Subjective well-being
2016	Love forgiveness	1		
	Interpersonal relationships	0.365**	1	
	Subjective well-being	0.570**	0.570**	1
2023	Love forgiveness	1		
	Interpersonal relationships	0.257**	1	
	Subjective well-being	−0.063**	−0.305**	1

**$p < 0.01$.

TABLE 7 The fitting index result of the mediation mode.

	Model 1	Model 2	Model 3	Model 4
X^2	1170.676	3038.453	2921.727	2816.099
df	101	101	126	126
p	0.000	0.000	0.000	0.000
RMESA	0.113	0.173	0.213	0.209
SRMR	0.060	0.133	0.180	0.162
CFI	0.852	0.632	0.054	0.537
TLI	0.824	0.563	0.481	0.515

data are shown in Table 7. We then also tested the model with grade as a moderating variable, and the difference test between any two grades was not significant.

Discussion

We investigated subjective well-being, interpersonal relationships, love forgiveness and the demographic variables of Chinese university students in 2016 and 2023, and compared the differences between the 2 years. We also compared the differences among college students with and without romantic experience in 2023. We found that before and after the COVID-19 pandemic, there was significant differences between three variables above among undergraduates, and there was also significant differences between the three variables of college students with and without romantic experience.

Theoretical implications

We discovered notable differences in Chinese university students' love forgiveness, interpersonal relationships, and subjective well-being between 2016 and 2023, the first hypothesis was valid. At first, compared with the period before the epidemic, undergraduates' subjective well-being decreased significantly after the epidemic, which corresponds with the findings in Baetens et al. (2022) and Chen and Ye (2023). Krautter et al. (2022) found that during the epidemic, the subjective well-being of college students obviously decreased. In our opinion, the decline in college students' subjective well-being can be attributed to two primary reasons. On the one hand, the epidemic has adverse effects on individuals' psychological well-being. Many studies have shown that COVID-19 has affected people's psychology to varying degrees (Bhattacharjee and Acharya, 2020; Chen et al., 2021). Studies from Japan highlighted the negative effect of COVID-19 on happiness (Shigemura et al., 2020). On the other hand, to minimize the likelihood of contracting the virus, during the epidemic, Chinese universities generally adopt closed-off management, that was, prohibited students from entering and leaving the school at will. Chinese universities also used the new forms of teaching that combining online and offline during the epidemic. However, the restriction of social distance (Esteves et al., 2021), activity limited to classroom and dormitory, and the new teaching form for a long time different from the tradition one brought by closed-off management may all have certain influence on students' psychological status (Si et al., 2020; Chang et al., 2021; Xu et al., 2021). At second, in contrast to the period before the epidemic, the whole level of college students' interpersonal relationships was slightly higher after the epidemic. The related researches showed that, the epidemic has changed people's interpersonal relationships (Tribowo et al., 2021), and multiply affected the interpersonal relationships in school (Herrmann et al., 2021). However, the difference between college students' interpersonal relationships became larger after the epidemic. This indicates that although college students' interpersonal relationship has little change after the epidemic, some college students' interpersonal relationship problems may be more serious. Why did the overall level of interpersonal relationship among Chinese college students not decrease but increase after the epidemic? Wang et al. (2021) pointed out that in Chinese collectivist culture-oriented environment, the fear and anxiety caused by the epidemic can trigger people's proactive response (e.g., seeking social support). According to the research conducted by Tang et al. (2022), individual interpersonal relationship is positively correlated with social support. People seek mutual social support to maintain their interpersonal relationship and thus enhance it. At third, the love forgiveness among university students in the post-pandemic era has decreased, which is different from the findings of Cheng et al. (2021) before the epidemic. The epidemic has affected the intimate relationships (Tribowo et al., 2021), and increased the vulnerability of partnerships (Overall et al., 2021). Salo et al. (2022) found that stress during the COVID-19 pandemic had a detrimental effect on romantic relationships and negatively affects relationship functioning. It can be seen that the epidemic has a certain impact on individual romantic relationships. In addition, Zhang (2020) pointed out that the novel coronavirus pandemic, a major public health emergency, had an impact on Chinese college students' concepts of love and marriage. During the epidemic,

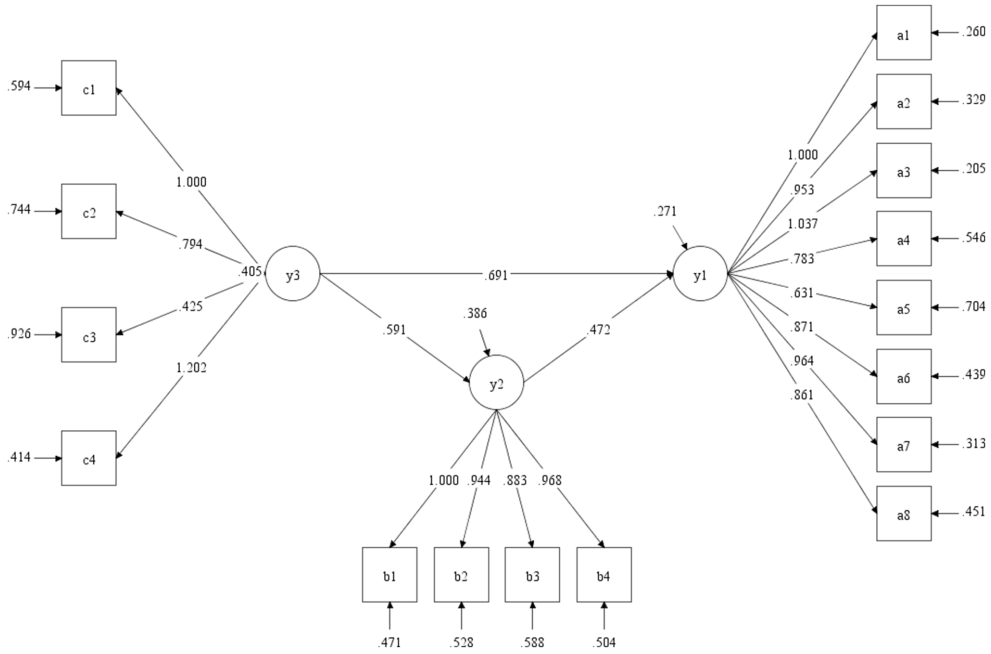

FIGURE 2
Mediating effect test in 2016.

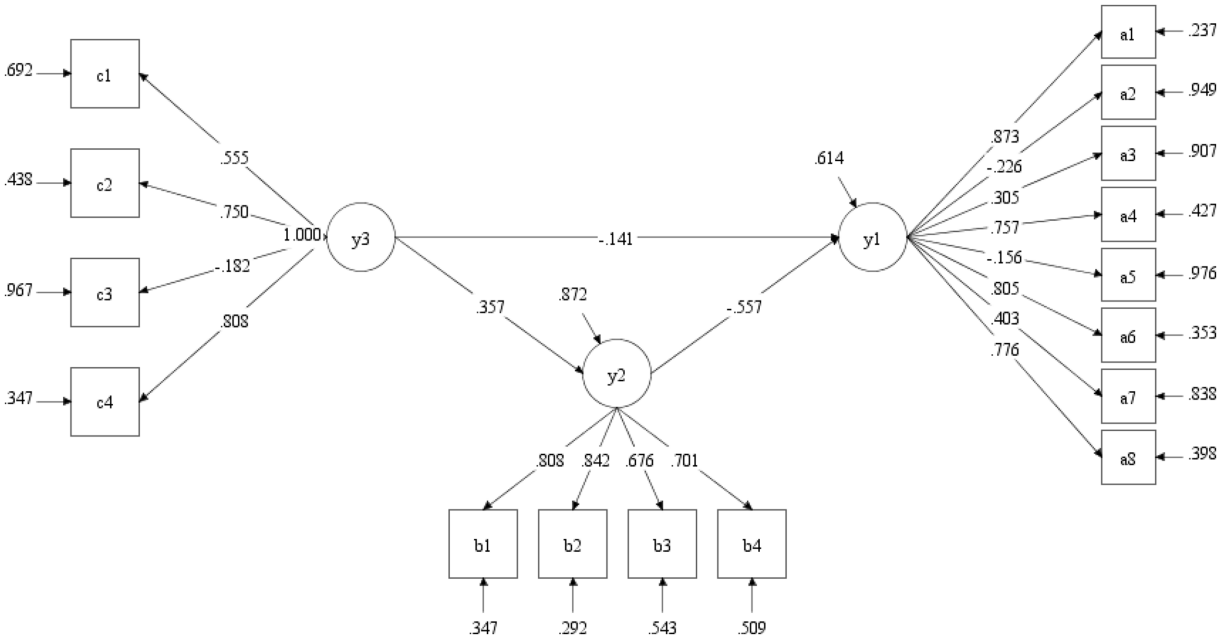

FIGURE 3
Mediating effect test in 2023.

Chinese special epidemic prevention policies have led to an increase in the demand for essential materials among college students. At the same time, the conflict between husband and wife during the epidemic has deepened college students' thinking about relationship maintenance. The changing views of love and marriage among undergraduates, coupled with a decline in the quality of the romantic relationships, could result in a lower level of love forgiveness.

We found that after the pandemic, undergraduates' negative emotions significantly increased. This result is consistent with previous research findings (Cooper et al., 2021; Gao et al., 2022). In addition, the epidemic and prevention policies have led to a deterioration in undergraduates' evaluation of themselves, their study, life and employment, and their feelings of getting along with others. The study by Krautter et al. (2022) showed that during the lockdown

period, undergraduates' satisfaction with life decreased. This indicates that the impact of the pandemic on individuals involves their learning, living, and work (Genc and Arslan, 2021). Besides, the behavior of undergraduates has been affected after the pandemic. Although the overall level of interpersonal interactions has improved, undergraduates reported a decline in their interactions with the opposite sex. This indicates that the impact of the pandemic on interpersonal interactions in schools is multifaceted (Herrmann et al., 2021). Further discussion is needed in the future regarding the effects on different interpersonal relationships in school.

We found that subjective well-being, interpersonal relationships, and loving forgiveness were positively correlated in 2016. However, love forgiveness was negatively correlated with subjective well-being, as were interpersonal relationships and subjective well-being in 2023. To be specific, after experiencing the pandemic, when undergraduates' love forgiveness and interpersonal relationship become higher, their subjective well-being become lower. This indicates that the effects of the epidemic and the measures implemented to prevent and control it on Chinese undergraduates are significant. During the epidemic, although college students still maintain interpersonal or romantic relationships, the recurrence and uncertainty of the epidemic has increased their feelings of uncertainty, insecurity, anxiety, panic and other emotions. In addition, Chinese special epidemic prevention policies in universities broke students' life rules and seriously affected their psychological health (Wu, 2023). All these resulted in a decrease in the subjective well-being among undergraduates.

We found that the subjective well-being and love forgiveness among university students of different genders were significantly different in 2016 and 2023, and hypothesis 2. was confirmed. At first, after the epidemic, undergraduates' the subjective well-being was still above the average level, and female students' subjective well-being was higher than male students. This finding conforms to the research of Zhang F. et al. (2021). Undergraduates exhibit favorable psychological traits, possess high resilience toward stress, and can readily acclimate to new surroundings (Xue et al., 2022). The study has shown that on the whole, Chinese undergraduates have a high level of mental toughness (Feng et al., 2016), which can effectively predict well-being (Wang and Wang, 2013). Meanwhile, female mental toughness was better than male (Li et al., 2022), so females' subjective well-being was higher than males. At second, before and after the epidemic, interpersonal relationships for male students have consistently been better than female students, which is consist with the results of Gao (2022) about Chinese middle school students. The study by Guo et al. (2022) revealed that male university students had better interpersonal relationships in dormitories compared to female students. The interpersonal relationships of male college students have worsened, while those of female college students have improved. This suggests that the pandemic may have had a positive impact on female university students' interpersonal relationships and a negative impact on female university students' interpersonal relationships. We consider that this may be due to the fact that, in the face of the pandemic, female tended to get help through interpersonal interaction and were more likely to receive help and support from others (Zou et al., 2021), thus having better interpersonal relationships. At third, after the epidemic, male students exhibited greater love forgiveness than female students, which is consistent with the results before the epidemic (Yu, 2019; Cheng et al., 2021). Due to the positive correlation between love satisfaction and love forgiveness (Liu, 2017) and male college students exhibited higher love satisfaction levels compared to female college students (Yu, 2019), so males' love forgiveness was higher than females.

We found that before and after the epidemic, students in four grades had noticeable differences in their levels of subjective well-being; freshmen showed obvious differences in their levels of interpersonal relationships; freshmen, sophomores and juniors had significant differences in love forgiveness. Hypothesis 3 was partly confirmed. At first, compared with the period before the epidemic, the subjective well-being of students in the four grades decreased after the epidemic. It can be seen that the epidemic has brought different detrimental effects on the subjective well-being among university students in the four grades. At second, after the epidemic, the interpersonal relationship of juniors and seniors decreased, while that of freshmen and sophomores increased. Among them, the lower grade students had the best interpersonal relationship, and the higher grade students had the worst interpersonal relationship. This is completely contrary to the results of the studies before the epidemic (Wang, 2015; Cheng et al., 2021), but is similar to the result of Zhang et al. (2022). We believe that the change of interpersonal relationship between different grades is mainly related to epidemic prevention policies. The study has shown that college students' interpersonal relationship is related to social support (Elliott and Gramling, 1990; Zhang X. et al., 2021). During the epidemic, according to Chinese epidemic prevention policy, universities generally adopted closed-off management, and college students received social support mainly from classmates and teachers. In middle schools, students can study at home and receive social support from peers, teachers and family members. Compared with lower grade students, higher grade students experienced longer close-off in college, had less social support, and hence may have more interpersonal problems. At third, after the epidemic, only the love forgiveness of seniors increased slightly, while that of the other three grades all decreased. Among them, seniors had the highest level of love forgiveness. This is inconsistent with the results before the pandemic (Li et al., 2010; Xu and Liang, 2013). Shen and Liu (2022) pointed out that at present, the difficulties young people encounter in romantic relationship can be summarized in two aspects: on the one hand, romantic relationship is not the most urgent pursuit of some college students, and they show an attitude of "everything goes with the wind" when facing their feelings; on the other hand, some college students are reluctant to pursue love due to personality and economic conditions, and their attitude toward love is "prefer not to love, rather than hurt." Affected by the epidemic, freshmen, sophomores and juniors have become more serious about romantic relationship. They are also more reluctant to forgive when faced with hurt in a relationship. As seniors are about to graduate, the problem of employment or admission is more troubling to them, and their attitudes toward romantic relationship become more spontaneous. Seniors may pay less attention to the hurt in romantic relationships than students in other grades, and thus are more likely to forgive. The differences of undergraduates' love forgiveness need to be discussed more in future studies.

We found that before and after the epidemic, college students in different regions had obvious differences only in love forgiveness and subjective well-being. Hypothesis 4 were partly confirmed. After the epidemic, the subjective well-being and love forgiveness among undergraduates from city and country decreased. But rural college students' subjective well-being was higher than urban college students,

which is different from the situation before the epidemic (Liu and Wang, 2012; Cheng et al., 2021). The study conducted by Guo et al. (2022) after the pandemic found no significant differences in subjective well-being among undergraduates in different regions. The epidemic did affect college students in different degrees and seemed to affect the students from the urban areas more. There are two reasons for this phenomenon: from one perspective, population in urban areas is more dense, and the risk of virus infection is greater. Students in city have experienced more anxiety during the epidemic, thus had lower subjective well-being; from another perspective, the management of Chinese rural areas were a weak spot for epidemic prevention due to the wide geographical area and poor economic foundation. Compared with urban areas, epidemic prevention policies in rural areas were relatively relaxed, and college students in rural areas were less affected. Therefore, rural college students' subjective well-being was higher than urban college students.

We found that college students without romantic experience and those with romantic experience had significant differences in three variables. Hypothesis 5 was confirmed. First of all, compared with the students with romantic experience, the students without romantic experience had lower subjective well-being lower interpersonal relationship, and higher love forgiveness. Undergraduates who have romantic experience had higher level of subjective well-being, which is consistent with the findings in existing researches on marriage. To provide an instance, studies have pointed out marriage can significantly improve individual subjective well-being (Lee and Ono, 2012; Hu et al., 2022). This result is similar to the findings of Guo et al. (2022). They found that college students in satisfying romantic relationships had higher levels of subjective well-being. Again, university students with romantic experience had higher interpersonal relationship, which is consist with the result of Luo et al. (2013). They found that military personnel in romantic relationships experienced less interpersonal distress compared to those who were not in relationships. However, Xiong and Liang (2020) pointed out that romantic relationships may lead to increased interpersonal distress among undergraduates. The more individuals value love and have higher expectations, the more likely they are to experience interpersonal distress (Luo et al., 2013). What is more, the love forgiveness of college students without romantic experience was higher than those with romantic experience. The love forgiveness of college students without romantic experience was their imagined forgiveness when facing the hurt in romantic relationship. This suggests that in actual romantic relationship, college students show a lower level of love forgiveness than they think. We think that this gap between imagination and reality may be affected by a variety of factors, such as love satisfaction, love psychological maturity and so on. More research is needed to discuss this. Last but not the least, we also found that in the four dimensions of the CS-LFQ, there are significant differences between college students with and without romantic experience. College students with romantic experience scored the highest on forgiveness and the lowest on revenge, while college students without romantic experience scored the highest on revenge and the lowest on negative meditation. Zhang and Fu (2013) found that Chinese college students with romantic experience are more inclined to meditate negatively than to retaliate. In other words, in imaginary relationships, college students are more likely to take revenge on other people and least willing to meditate negatively; in actual relationships, college students are more likely to forgive and least willing to revenge. The performance of college students in imagined romantic relationships may represent their implicit level of love forgiveness, while the performance of those with romantic experience show their explicit level of love forgiveness. The study has shown that implicit interpersonal forgiveness level and explicit interpersonal forgiveness level are two different constructs, and there is no correlation between them (Wen and Chen, 2022). Therefore, the differences in the dimensions of love forgiveness of undergraduates with and without romantic experience can be understood, but the reasons for the differences still need to be more discussed in the future.

Practical implications

Firstly, we found that the epidemic and prevention measures had an impact on the mental health and behavior of Chinese university students. This suggests that the Mental Health Departments should take the mental state and problems of college students into account, and take the physical and mental health of university students as indicators that must be considered in the formulation of epidemic prevention policies in universities in the future. The change in the indicators among university students also suggests that the Chinese government needs to attach importance to the physical and mental health of different groups in the post-epidemic era, and make timely intervention measures to maintain people's health.

Secondly, the decrease in subjective well-being and increase in interpersonal issues among university students suggest that universities need to give priority to students' mental health. They should provide more psychological counseling services and health education to guide students in adapting to campus life more effectively. Considering that there are differences in well-being and interpersonal relationships among students of different grades, regions, and genders, the universities must develop different strategies for providing counseling and education to different types of students.

Thirdly, college counselors need to change their previous work mindset when assisting students. Due to the changing relationship between subjective well-being and interpersonal relationships among university students, those with good interpersonal relationships may have lower subjective well-being. Therefore, counselors should not overlook those students with good interpersonal relationships when identifying those with lower subjective well-being. College students' forgiveness level in romantic relationships has decreased, indicating a shift in their beliefs and a greater likelihood of conflicts and issues arising. Counselors must strengthen their focus on college students in romantic relationships. At the same time, college students who lack romantic relationship experience tend to have lower subjective well-being and weaker interpersonal relationships, so counselors need to provide them with more social support.

Lastly, after experiencing the pandemic, undergraduates are more likely to choose forgiveness and avoidance rather than negative meditation when faced with hurts in romantic relationships. This suggests that they are changing their coping strategies in intimate relationships. Male university students tend to have higher levels of forgiveness in romantic relationships compared to females. When dealing with issues related to students' intimate relationships, counselors need to consider their gender and develop counseling plans that encourage students to confront the hurts in their romantic

relationships and guide them in better managing their love relationships.

Advantages and limitations

The advantages of this research are as follows: (1) By comparing the data before and after the epidemic, it found that the COVID-19 epidemic and Chinese special epidemic prevention policy had certain effects on university students' psychological and behavioral aspects, which provides evidence for the related researches on the effects of the epidemic. This can arouse social attention to the physical and mental health conditions of undergraduates, and also serve as a reminder for relevant departments to consider people's various indicators when formulating epidemic prevention measures in the future. (2) This study found differences in indicators among undergraduates in different grades, regions, and genders, which is beneficial for universities and other researchers to understand the basic conditions of different types of students after the epidemic. (3) This study found changes in the relationship between subjective well-being, interpersonal relationships, and love forgiveness among undergraduates, suggesting that other researchers should introduce new variables to examine the relationship between them. (4) This research also found college students with and without romantic experience had certain differences in subjective well-being and interpersonal relationship, and students' imagined level of love forgiveness is higher than their actual love forgiveness. This provides new ideas for other researchers in the following study.

Nevertheless, this research has certain limitations that need to be acknowledged: (1) The subjects of this study before and after the epidemic were not the same group of college students, and the survey was conducted over a period of 7 years. There must be some errors in the comparison results, which should be paid attention to. (2) All questionnaires distributed in 2023 were online, which is different from 2016. Research differences in how tools were distributed may affect the accuracy of the research. (3) The pandemic has changed people's lives. The functioning of young people has changed significantly over the past 7 years, and it is possible that this transition to online functioning has not affected changes in young people as much as it has in older people. This study was limited to college students, which cannot fully explain the impact of the epidemic on people. More researches on other age groups are needed in the future. (4) The subjects in 2016 and 2023 were mainly from economically developed regions of China. The representativeness of the sample cannot be guaranteed and the external validity of the research results has yet to be verified. (5) After the epidemic, the relationship between love forgiveness, subjective well-being, and interpersonal relationship among undergraduates has changed. Due to time constraints, this study did not explore other variables affecting the above relationship.

Directions for future research

First of all, interpersonal relationships no longer mediate between subjective well-being and love forgiveness among undergraduates. To explore the relationship between these three variables, it is necessary to consider the inclusion of other variables, such as relationship satisfaction, social support, psychological resilience and so on. Future research can delve deeper into the discussion. Secondly, Chinese special epidemic prevention policies indeed exhibited certain effects on university students' psychology and behavior. Future research can explore the impact of the pandemic on other age groups. Additionally, comparing the psychological and behavioral differences among college students in different countries can demonstrate the effects of different preventive policies. And then, this study did not specifically distinguish the group of college students with romantic experience. Future research can examine the level of love forgiveness among undergraduates with different numbers of romantic experiences and varying levels of relationship satisfaction. Finally, the difference between undergraduates' imagined and actual level of love forgiveness is worth further discussion by researchers. What factors contribute to the variation in levels of love forgiveness? Is this variation present within the same individual? Future research can adopt a longitudinal approach to delve into the mechanisms of changes in love forgiveness.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by Ethics Committee of Huaiyin Normal University. The patients/participants provided their written informed consent to participate in this study.

Author contributions

TC was responsible for contacting the subjects, handing out questionnaires, processing data, and writing the article. LQ participated in the research design, provided specific ideas for the paper writing, and made constructive comments on the data analysis process. HF put forward many constructive suggestions for the revision of the article. All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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What's love got to do with jealousy?

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Romantic love and jealousy seem antagonistic, but the expression of both emotions have evolutionary functions that can go in the same direction of maintaining a relationship. Considering natural selection designed adaptations to solve the problems surrounding reproduction, then love and romantic jealousy are emotions aimed at staying cooperative for a period of time, where love solves the adaptive challenges of promoting pair bonding, cooperation, and protecting offspring; and jealousy is triggered by a threat or the loss of a valuable cooperative relationship, either on behalf of descendants in need of resources, or a close romantic bond. Consequently, understanding love and romantic jealousy points in the same adaptive functional domain of protecting a romantic pair bond. Specifically, love can be comprehended in two different ways and in regard to jealousy. First, conceiving love as the attachment to significant others one develops throughout lifetime, and secondly, it contemplates affective dependence. Results from a sample of single and committed individuals (n = 332) show the predicted positive correlation between attachment and jealousy as stable traits, consistent with previous literature. In addition, there is a non-significant and low correlation, respectively, between attachment and love as a measure of dependence. Furthermore, in the single participants group, jealousy was associated with love. The discussion emphasizes the need for expanding a functional account of love and jealousy as complementary emotions of our human affective endowment. Finally, it would be informative to study attachment as a relational trait and love as a specific affection for a romantic partner that could be manipulated to elucidate the functional design of jealousy.

KEYWORDS

affect, pair bonds, evolution, attachment, mating

1. Introduction

The study of love encompasses different perspectives from diverse disciplines, such as anthropology, genetics, biology, neurobiology, and psychology (De Boer et al., 2012; Carter and Porges, 2013; Cacioppo and Cacioppo, 2015; Tobore, 2020; Langeslag, 2022). There is general agreement in describing love as a complex emotion, having multiple expressions (Hatfield and Sprecher, 1986) and favoring long-term mating (Sorokowski et al., 2017). However, the experience of love is so broad that several lines of research are needed to understand its origin, function, and the mechanisms underlying this phenomenon. Love has numerous functions such as contributing to mate choice, courtship, sex and pair bonding (Bode and Kushnick, 2021), among others, and one of the most relevant is that it uniquely endows our species with evolutionary advantages (Frank, 1988; Gonzaga and Haselton, 2008; Durante et al., 2016).

Indeed, love functions as a commitment mechanism that facilitates pair bonding (Miller and Todd, 1998; Fletcher et al., 2015; Ein-Dor and Hirschberger, 2016).

Pair bonding is a crucial process associated with love, which has been described as a functional feature present in most mammals, with specific neuroendocrine activation, along with the promotion of mother-infant attachment (Harlow, 1958; Bales et al., 2021). To better understand the engagement function of love and pair bonding from an evolutionary perspective, the neurophysiological maturation of the mammalian brain exhibits a phylogenetic link to social involvement and attachment behaviors (Porges 1998; Cacioppo et al., 2015). Additionally, there are biochemical mechanisms of social engagement regulation, where molecules such as oxytocin and/or vasopressin are directed to facilitate pair bonding (Porges 2011; Carter and Porges, 2013; Perry-Paldi et al., 2019), which has also been described as a mechanism underlying human attachment (Feldman, 2016).

Attachment theory (Bowlby, 1982; Fraley, 2019; Thompson et al., 2022) explains how the pair bond established with a primary caregiver early in life influences one's future relationships with the world, including interactions with others and the quality of affective relationships, such as engagements in couples (Hazan and Shaver, 1987). In general, research on romantic love in adults highlights and captures most of the adaptive characteristics of mother-infant attachment when adults establish a romantic pair bond (Hazan and Shaver, 1987; Shaver and Hazan, 1988; Fisher, 1998). According to Fletcher et al. (2015), romantic love can be conceived as an "evolved commitment device" with the ultimate function of motivating the potential reproductive partner to maintain sexual exclusivity long enough to procreate and raise offspring (Hazan and Diamond, 2000). Thus, kindness, empathy, care and feelings of warmth, which are typical of early pair bonding, are also present in romantic attachment (Fraley, 2019); but romantic bonding also compromises the lust or sexual attachment system (Shaver and Hazan, 1988; Fisher, 1998). Therefore, the study of attachment has become very relevant to understanding the nature, building of, and maintenance of couple bonds (Mikulincer and Shaver, 2007). Consequently, the formation of a pair bond may be linked to the origin of love, as it serves as an ubiquitous commitment mechanism.

The empirical evidence suggests that romantic love conveys diverse proximate components and is influenced by individual factors (Perry-Paldi et al., 2019). Elements such as intimacy, passion and commitment are universal influences of the love experience (Finkel et al., 2017; Sorokowski et al., 2017; Neto, 2023). On the other hand, individual differences, such as gender, age, and cultural modernization, can impact the experience of romantic love (Feybesse and Hatfield, 2019; Sorokowski et al., 2023). The significance of relationship satisfaction, effective communication, and mutual support (Yoo and Joo, 2021), indicates that romantic love is a multifaceted phenomenon involving multiple constituents, social and individual factors (de Munck et al., 2016).

In the search for a better comprehension of love, it has been suggested that this emotion can be described as feelings of affection, dependence, liking and caring - "a state of intense longing for union with another" (Hatfield et al., 2012, p. 144), with several theories aiding to understand love, such as attachment theory (Bowlby, 1982), the triangular theory of love (Sternberg, 1986), and interdependence theory (Baumeister and Vohs, 2007), to name a few main ones. Consequently, commitment and dependence on one another is a factor that was first identified in the conception of investment and exchange of benefits as crucial components of love (Kelley and Thibaut, 1978; Joel et al., 2013), as well as the perception of the loved one as part of the self (Aron et al., 2022). In this context, measures of love have been based on observational strategies, implicit associations through correlations of scales, and self-reports of the different hypothesized components of love (Graham, 2011), for example. So far, the methods used to assess love have relied on self-reported measures encompassing various definitions, such as lifelong attachment, intimacy, compassion, and dependence (Fabella, 2023). Nonetheless, when defining love as attachment, Hudson and Fraley (2017) suggests diverse levels of perceived intimacy and dependence are associated with attachment styles, which may hinder functional hypotheses about this emotion. Overall, there is no consensus on the measures employed to evaluate love, and how we quantify this emotion relies on the theoretical framework employed (see Hatfield et al., 2012, for example).

Attachment has a direct influence on the cognitive control of dyads in love, enhancing their ability to regulate primary emotions and thoughts (Langeslag and van Steenbergen, 2019). Studies looking at individual differences in attachment styles when assessing characteristics like dependence or closeness, have found that individuals with anxious attachment tend to require more time and affection to perceive they are loved by a partner (Hudson and Fraley, 2017). Similarly, Barbaro et al. (2021) reported certain attachment orientations (for example, anxious or avoidant) are related to mate-retaining behaviors, like controlling the partner across time. Individuals who develop security in their attachment, tend to have more satisfying interpersonal relationships and romantic partners, while "the most emotionally powerful experiences that people have in their lives derive from the development, maintenance, and disruption of attachment relationships" (Fraley, 2019, p. 419).

Following this same line of assessing the function of love and attachment, jealousy has been studied as an emotion that motivates the protection of a valued relationship (Mathes, 1986; Buunk, 1997; Neal and Lemay, 2014). Romantic jealousy has been conceived as an affective reaction specifically designed for the protection of close attachment bonds (Fernández, 2017; Fernández et al., 2022), and as far as romantic relationships are concerned, it is an emotion aimed at the protection of pair bonds (Fletcher et al., 2015).

However, much of the research on romantic and sexual jealousy has mainly been based on the use of hypothetical scenarios (Buss, 2018) and retrospective accounts of infidelity (Schützwohl, 2008). For example, using scenarios present imaginary situations of romantic betrayal (Buss et al., 1999; Sagarin et al., 2012; Bendixen et al., 2015), and methods like movie watching (Fernández, 2012) and reading stories about infidelity (Sabini and Silver, 2005) have been employed. In general, fictional scenarios allow participants to mentally recreate extradyadic partner involvement, which are then linked to forced-choice questions. These accounts present two fictional cases, such as sexual or romantic infidelity, and the subjects are forced to choose which situation generates more jealousy (Harris, 2004). Thus, the ecological validity of these experiments depends on variables that may not be controlled for in the experimental designs. For instance,

experiencing partner infidelity in real life can significantly influence the experience of jealousy (Buunk and Fernandez, 2020), and watching movies or reading stories may elicit a specific jealousy response when subjects do or do not engage with the situation (Strout et al., 2005).

In general, research on jealousy has focused on identifying sex differences between emotional and sexual types of infidelity, while contextual differences in terms of partner investment and sample type have been looked at more seldom (Scelza et al., 2019). Exploring cultural differences in jealousy helps understanding jealousy as an adaptive reaction to changes in resource diversions in a given environment. Therefore, current work supports the importance of considering other variables, such as parental investment and paternity uncertainty, which are associated with an enhanced jealousy response (Edlund et al., 2019).

Along these lines, the study of jealousy has been linked to improved measurement of sex differences between sexual and emotional infidelity, using methodological innovations. For example, using economic games to examine if the allocation/reception of resources from a rival evokes this emotion (Barbato et al., 2018), and the presentation of spatial arrangements between the subject, his or her partner and a potential rival to assess jealousy, through certain threats (Schützwohl et al., 2011). Therefore, a similar approach to study love may aid in the precision of its measurement and assessment.

From an evolutionary perspective, cognitive biases in the form of adaptive design were shaped by natural selection to solve reproductive problems (Cosmides and Tooby, 2013), as there are biological and reproductive costs associated with exclusive resource allocation for offspring rearing (Buss, 2013; Fernández, 2017). In this regard, the design of love and jealousy may be linked to the creation of a mechanism for encouraging dependence and protection of the benefits that commitment and romantic engagements bring about (Conroy-Beam et al., 2015; Fletcher, 2015). In other words, love could serve as a promoter of altruistic prosocial behaviors associated with the bonding partner, resulting in high benefits to a dyad (Buss, 2007; Fletcher et al., 2015), while jealousy enables the retention and monopolization of the bond in potential infidelity scenarios (Buss et al., 1992; Harris, 2003).

Consequently, the pair bonding present in romantic love aids in the provision of psychological resources advocating care and reproductive success (Buss, 2019). Indeed, romantic love is a bond conveying the provisioning of resources which brings about an implicit assumption of exclusivity, through sexual and emotional fidelity toward the partner. In this sense, it is posited that for there to be a commitment triggered by romantic love the reproductive success of the individual in a potentially procreative bond requires an interdependence of fitness; where the ability to promote the genes of one person depends on the other one (Aktipis et al., 2018). The maintenance of long-term benefits through the commitment promoted by romantic love, implies that each partner must push the other to obtain benefits from acts of reciprocity for their common reproductive goals, and achieving a reciprocal balance (Cosmides and Tooby, 2013; Conroy-Beam et al., 2015). Hence, there is not only the commitment triggered by the emotion of romantic love, but there may be other emotions such as jealousy, which ensure that the benefits achieved by the initial commitment, are maintained over the long term. For this reason, from an evolutionary point of view suspicion about the probability of losing benefits or commitment by the cooperating partner must be paramount for maintaining the valued bond (Buss and Haselton, 2005; Foster et al., 2014). So, understanding love and jealousy is in the same adaptive functional direction of protecting human pair bonding.

According to attachment theory, affectionate bonding and distinctive valuation of significant others emerges throughout the life cycle, expanding from the internalization of childhood experiences into friendships and romantic attachment (Bohn et al., 2023). Early infant bonding facilitates adaptive fitness by motivating caring and safety of infants, generating an affectionate engagement prompting the child to seek proximity, sensory contact, and comforting from the primary caregiver (Bowlby, 1982; Thompson et al., 2021). Indeed, "the attachment system evolved to protect infants from danger by keeping them close to the mother" (Hazan and Shaver, 1987, p. 512), particularly in the ancestral environment (Hrdy, 2009). Attachment brings enormous psychosocial advantages to humans (Harlow, 1958; Hazan and Diamond, 2000), generating an emotional base of felt security, love and dependence, and reducing anxiety in times of distress (Fraley, 2019).

Attachment also plays a crucial role in regulating stress and promoting emotional well-being among individuals. It facilitates co-regulation within dyads, fostering a sense of security, reducing separation distress, and fulfilling the need for affectionate physical contact (Zeifman, 2019), which has been recently evidenced cross-culturally (Sorokowski et al., 2023). This emotional system, connected to social defense theory, has biochemical characteristics that enable individuals to navigate complex social environments and enhance their survival (Ein-Dor and Hirschberger, 2016). Furthermore, romantic attachment brings about dyadic benefits by serving as a mechanism for mate choice and fostering courtship attraction. It is an integral part of the adult attachment system, ensuring that parents stay together to raise their offspring effectively (De Boer et al., 2012). In this way, attachment not only promotes individual well-being, but it also contributes to the stability of romantic relationships.

It is worth noting the connection between attachment and jealousy has been extensively documented, with attachment anxiety being a strong predictor of jealousy (Rodriguez et al., 2015; Barbaro et al., 2016; Güçlü et al., 2017). Specifically, individuals with an anxious attachment style are more prone to experiencing anxious jealousy, while those with an avoidant attachment style are more likely to experience reactive jealousy (Buunk and Fernandez, 2020).

Attachment in general, can be conceived as a promoter of commitment, providing emotional security and satisfying affective needs in romantic partners (Ein-Dor and Hirschberger, 2016; Feldman, 2016; Buss, 2017). Attachment styles contribute to individual differences in the formation of feelings of security, creating a bond of dependence and fear of loss (Attridge, 2013). Jealousy, in this sense, plays an important role in understanding the protection of this affective bond (Buss, 2018; Buunk and Fernandez, 2020). From an evolutionary perspective, jealousy arises in response to the suspicion of losing a partner to a rival, considering the important benefits of long-term attachment (Schmitt and Buss, 2001; Buss and Haselton, 2005; Foster et al., 2014). Furthermore, attachment theory provides valuable insights for recognizing jealousy, particularly in relation to individuals with anxious attachment who express higher levels of trait jealousy compared to

those with secure attachment (Marshall et al., 2013; Richter et al., 2022). Hence, attachment and jealousy are directed at the same end of facilitating romantic engagement. But, as Fernández (2017) revised, jealousy is specifically aimed at avoiding the diversion of partner resources that are beneficial in terms of fitness for both members of a romantic dyad.

In the present study, attachment was assessed, as well as love with independent measures of affective dependence. These were then correlated with subjective indicators of jealousy. Considering the functions of love and jealousy described in the literature, which suggest a common evolutionary purpose of promoting commitment, it was predicted that the function of love and jealousy go in the same direction of maintaining the benefits of a romantic relationship.

Accordingly, it was specifically anticipated that:

- In general, behaviors that trigger higher levels of jealousy are typically associated with the perceived risk of losing the bond and potential resources. Therefore, anxious attachment would be positively correlated with jealousy, as individuals seek to protect their romantic bond. In consequence, levels of jealousy and attachment will exhibit a positive correlation, stemming from their shared adaptive function.
- On the other hand, measures of love related to dependence would reflect characteristics of this emotion that may be associated with functions other than being a key to resource commitment. As a result, jealousy should not correlate with these particular characteristics. So, it was anticipated that levels of jealousy and the measure of love would not correlate, given they represent different facets within the domain of love and interpersonal relationships. Hence, while both variables may share certain commonalities, they also represent distinct aspects of attachment and interpersonal relationships.

2. Materials and methods

2.1. Participants

The complete research involved 332 Chilean people, who were recruited through social networks and took part in two studies. The first sample included 123 individuals (M age = 27.9, SD = 9.92, 67% female), with 47.2% of them indicating that they were not involved romantically. The second sample comprised 209 committed individuals (M age = 25.9, SD = 5.87, 67% female).

2.2. Measures

Jealousy was assessed by a single self-report question asking "how jealous you are?" (not jealous at all) to 7 (morbidly jealous), which has been previously used by Massar and Buunk (2010) and our laboratory in Chile (see Fernández et al., 2022). In an experimental sample of 48 participants (see Barbato et al., 2018), this item had a partial correlation with Buunk's (1997) 15-item jealousy scale, of $r = 0.46$, $p < 0.001$ for reactive, $r = 0.41$, for anxious, and $r = 0.58$ for preventive jealousy ($ps < 0.001$, large effect size).

Brief Spanish version of the experiences in close relationships, ECR (Guzmán et al., 2020), is a widely used measure of anxious and avoidant romantic attachment with an observed reliability of Mcdonald's $\omega = 0.82$ and $\omega = 0.84$, respectively.

Attachment anxiety (Fernández and Dufey, 2015) was measured using only the dimension of anxiety of Collins's (1996) adult attachment scale revised (Mcdonald's $\omega = 0.89$).

Dependance (Attridge et al., 1998), is the degree of psychological and emotional dependence expressed toward the current partner, which was conceived as a measure of "love," reaching an observed reliability of Mcdonald's $\omega = 0.90$.

2.3. Procedure

Participants were recruited through social networks. The samples completed the measures online. All participants signed an informed consent according to the ethical principles of APA, and responded to a sociodemographic questionnaire, measures of jealousy, attachment anxiety (Collins's and ECR, in the singles and committed sample, respectively), love (dependence). Each study was approved by the Institutional Ethics Committee of the author's University.

2.4. Data analyses

Descriptive statistics, correlations and regression analyses between the variables were estimated using Jamovi (2021).

3. Results

Our first prediction was partially supported (see Table 1) with a significant positive association between attachment and jealousy in both samples, and a non- significant correlation of love and attachment found for the single sample. The correlation of love and anxious attachment was low but significant.

Secondly, multiple regression analysis yielded jealousy, as the only significant predictor of love ($t = 2.13$, $p = 0.035$) in the single sample ($F_{2,120} = 3.54$, $p = 0.032$, $r^2 = 0.048$). While anxious attachment ($t = 2.35$, $p = 0.020$) uniquely predicted love ($r^2 = 0.050$) in the committed sample ($F_{2,206} = 5.45$, $p = 0.005$).

TABLE 1 Descriptive statistics and correlations by sample.

	Mean	SD	2	3
Sample 1 (*n*=123)				
1. Jealousy	2.71	0.95	0.24**	0.22*
2. Attachment anxiety	3.01	1.11		0.14
3. Love	4.84	0.83		
Sample 2 (*n*=209)				
1. Jealousy	3.33	1.53	0.57***	0.16*
2. Anxious attachment	3.56	1.53		0.22**
3. Love	4.39	0.51		

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

4. Discussion

The assessment of the adaptive function of love and jealousy was studied by examining if specific traits associated with love, such as attachment were correlated to jealousy. It was predicted that romantic love could underlie attachment and jealousy, having the evolved function of protecting attachment from situations or rivals that may pose a threat to a reproductive bond (Buunk, 1997; Buss, 2018).

The first prediction was confirmed as anxious attachment was associated with jealousy. More specifically, in the single sample, the dimension of anxiety was associated with jealousy, and in the committed individuals, attachment anxiety and jealousy were positively correlated. These findings support the idea that attachment and jealousy might operate in conjunction, sharing a similar adaptive function.

Furthermore, contrary to our second prediction, a positive association between jealousy and love emerged in the single participants' sample. Despite this, no significant correlation was found between attachment and love, suggesting the existence of unequivocal elements within love, conceived as dependence, which may be immersed in the experience of love. In general, these outcomes reinforce the notion that love and jealousy operate in tandem, reflecting a shared functional logic centered around close relationship protection. Moreover, these results align with traditional research that links love to indicators of jealousy, alongside psychological factors such as insecurity and low self-esteem (Mathes and Severa, 1981; White, 1981; Richter et al., 2022).

However, when looking at the prediction of love from attachment anxiety and jealousy, we had different results for the single and committed samples. Jealousy was the only variable that predicted love in the first sample, and attachment was the only predictor of love for the second sample. This may be indicative, that when people imagine, but do not have an actual committed romantic bond, they may attribute more jealousy to feelings of love, independent of their anxious attachment. But when committed individuals report on their romantic bond to an actual partner, anxious attachment does explain love, above and beyond jealousy.

Furthermore, characteristics such as romantic dependence describe alternative ways of experiencing love which do not appear to involve jealousy, and may be idealized in people that are not actually in a committed relationship.

Along these lines, it has been reported that the closer the relationship, such as being single versus being married or in committed relationships, reduces the report of jealousy (Demirtaş and Dönmez, 2006). In the case of dependence, research found its association primarily with reactive jealousy (Rydell and Bringle, 2007). This may be because this type of jealousy depends on specific contextual factors (Buunk, 1997), rather than being measured solely by an individual's perception of their subjective experience.

Our interpretation of love based mainly on interpersonal dependence can be viewed as romantic love, without triggering the feelings of real loss or a potential threat commonly experienced in jealousy. But, as research since Bowlby's (1982) seminal work predicts and supports across time, jealousy is a response strongly related to attachment (Richter et al., 2022). And it is anxious attachment that appears to capture the affective traits that most likely mobilize jealousy.

Drawing on the conceptualization of romantic relationships as a collaborative effort, it has been proposed that members of a dyad face incentives, in evolutionary terms, where resources invested increase the individual fitness of both partners. Common resources can be viewed as benefits resulting from the cooperation with each other (Buss, 2003). The basic idea is that the resources of the couple together are greater than the resources of the individuals alone (Kaplan and Lancaster, 2003; Conroy-Beam et al., 2015).

In general, within this framework, jealousy could resolve discrepancies between actual and expected investment in a relationship, and love plays a role in motivating individuals to maintain commitment, invest time and psychological resources on the other, and allocating reproductive resources necessary for adaptive fitness in cooperative relationships (Conroy-Beam et al., 2015).

One important limitation of the current research is the evaluation of love and jealousy as trait measures, as well as the reliance on a single self-report question about how jealous an individual is. For future research it would be ideal to include an actual relationship jealousy and love scales.

Finally, it would be recommended that further research specifically focus on differentiating the potential protective function of jealousy in regard to a specific partner and the levels of love or interpersonal dependence between them. It would also be expected that manipulating or varying relationship satisfaction should have an effect on jealousy, and possibly on love as well.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by Comite de Etica, Universidad de Santiago de Chile. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

AF and MB contributed to conception and design of the study. AF, MB, and BC organized the database and conducted the statistical analysis. BC and YA wrote sections of the manuscript. All authors contributed to manuscript revision, read, and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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Trust in relationships: a preliminary investigation of the influence of parental divorce, breakup experiences, adult attachment style, and close relationship beliefs on dyadic trust

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Introduction: Trust is essential for establishing stable and fulfilling romantic relationships between partners. Development of trust, however, can be assumed to depend on many factors related to an individual's earlier experiences and relationship-related beliefs. This study aimed to investigate how adult attachment style (anxious, avoidant), experiences about parents' divorce and breakdown of one's own romantic relationship, and relationship beliefs are related to the level of dyadic trust in romantic relationships.

Methods: The present study included 131 Turkish undergraduate university students (55.7% women) from different faculties. The research instrument had questions about parents' and respondents' own relationship status, Dyadic Trust Scale (DTS), Experiences in Close Relationships Inventory-Revised (ECR-R), and Inventory of Close Relationship Beliefs (ICRB), in addition to background questions. The data were analyzed using descriptive statistics, *t*-tests, Pearson correlations, regression analyses and mediation analyses.

Results: Respondents whose parents had divorced or who had experienced a relationship breakdown had lower dyadic trust scores than those without these experiences. The trust scores correlated negatively with anxious and avoidant attachment styles and positively with relationship belief scales, although the correlations to "external factors" were not statistically significant. In regression analysis, anxious and avoidant attachment styles explained 42% and relationship beliefs 25% of the variance in trust. The only significant predictor among beliefs was "individuality." Mediation analysis showed that the effects of anxious attachment style on trust were fully mediated by the relationship belief in "individuality." The avoidant attachment style had a direct relationship to trust.

Discussion: The results show that anxious attachment style influences trust via relationship beliefs, while avoidant attachment style has a strong direct effect on trust as well as weaker effects via beliefs. The results are discussed in the context of Turkish culture and horizontal collectivism.

KEYWORDS

romantic relationships, attachment styles, close relationship beliefs, dyadic trust, mediation

1. Introduction

Trust is a key factor in successful romantic relationships. Trust evolves throughout the various stages of dating, flirting, engagement, and marriage (Aron et al., 1995), encompassing concepts such as intimacy, attachment, self-respect, and love. The crucial role of trust in romantic relationships has been reported particularly during adolescence and young adulthood, influenced by various personal and relational factors, including the attachment style (Mikulincer and Shaver, 2007; Kim et al., 2017). Trust plays a pivotal role in maintaining functional and fulfilling romantic relationships, deepening intimacy, and providing continuity (Larzelere and Huston, 1980; Kemer et al., 2016). Lack of trust can lead to negative reactions, lying, low relationship quality perception, and attachment anxiety, negatively impacting relationships (Simpson, 2007; Campbell et al., 2010; Uysal et al., 2012; Laborde et al., 2014; Towner et al., 2015; Gabbay and Lafontaine, 2020). On the other hand, trust positively affects relationship satisfaction in close romantic relationships (Büyükşahin and Hovardaoglu, 2007).

Baldwin et al. (1996) found attachment-style differences in response to trusting a partner and, thus, showed that the attachment style of an individual might be related to the trust they have in their partner. This is understandable because attachment styles, as explained, significantly influence the formation of trust bonds within romantic relationships (Ainsworth, 1991). These attachment styles are shaped by an individual's psychological development, maturity, and mental wellbeing (Carter et al., 2013). Research on attachment styles has revealed that securely attached individuals are more comfortable and facilitating in the early stages of relationships, while anxious individuals fear rejection and avoidant individuals distance themselves (Mikulincer and Shaver, 2007). Secure individuals expect a more positive response from a trusted partner compared to insecure individuals (Baldwin et al., 1996). Avoidant attachment style is associated with individuals who struggle to develop trust and exhibit less effort and discomfort in close relationships. Conversely, anxiety is linked to individuals who experience anxiety about rejection, often leading to short-lived relationships (Carter et al., 2013). Anxious individuals struggle to maintain trust and fear rejection or abandonment, while avoidant individuals have difficulty establishing intimate relationships (Hazan and Shaver, 1987; Feeney and Noller, 1990; Mikulincer and Erev, 1991; Brennan and Shaver, 1995). However, some researchers argue that individuals with anxious attachment may show greater love and commitment due to seeking reassurance (Duemmler and Kobak, 2001). In summary, individuals with anxious attachment tend to enter relationships quickly but struggle to maintain them, while those with avoidant attachment generally engage in short-lived relationships due to lower commitment and trust (Ehrenberg et al., 2012).

Close relationship beliefs play a pivotal role in romantic relationships as they are influenced by past experiences, memories, and cognitive structures. Fletcher and Kininmonth (1992) developed the Relationship Belief Scale (RBS) to measure the dimensions of intimacy, individuality, passion, and external factors that shape romantic beliefs and contribute to the development of trust in the success of long-term close relationships. "Intimacy" focuses on beliefs concerning interpersonal attitudes and interactions related to the development of intimacy and closeness. The second factor, "External Factors," includes beliefs related to the importance of external factors or problems. The third factor, "Passion," contains topics related to sex and vitality. The fourth factor, "Individuality," combined independence and equity (Fletcher and Kininmonth, 1992). Within these four main factors, the RBS measures 18 different facets reflecting different aspects of relationships (e.g., respect, love, children, gender, and equity). The RBS has been used earlier in cross-cultural settings, showing that Chinese (from Taiwan) respondents prioritized ideals denoting financial resources and extended family to a greater extent than European Americans (Lam et al., 2016). It can be assumed that relationship beliefs are closely related to trust because beliefs are used to form expectations and often unwritten norms for the behavior of the partner or spouse.

It can be assumed that relationships between people, such as friendship networks, family relations, and romantic relationships, reflect cultural values. The present study was conducted in Turkey, which is characterized by "horizontal" collectivism rather than "vertical collectivism" or Western individualism. Vertical collectivism is characterized by a sense of service and sacrifice for the in-group and an acceptance of the benefits of inequality and rank, while the horizontal dimension includes a sense of social cohesion and oneness with members of the in-group and a valuation of similarity on most attributes across individuals, especially on status (Singelis et al., 1995; Çukur et al., 2004). The three-generation study among Turkish grandmothers, mothers, and grandchildren by Kagitçibaşi and Ataca (2005) showed that Turkish families desire close relations rather than individualistic separation and that this Turkish "autonomous-related self" is different from both the (autonomous) separate self typical to the Western individualistic family pattern and the (heteronomous) related self typical to the traditional collectivistic family pattern. This "autonomous-related self" typical of contemporary Turkish culture can be reflected in beliefs and expectations related to romantic relationships. It should be noted that Turkey has undergone a rapid change from a rural collectivistic society to a more urban and individualistic one (Kagitçibaşi and Ataca, 2005), which might be reflected in relationship beliefs among men and women. For instance, Kemer et al. (2016) found that married Turkish men were more emotionally jealous than women. Those who distrusted their partners displayed heightened cognitive jealousy and behavioral reactions, potentially leading to controlling behaviors. This control could manifest in the form of restrictions placed on a wife or girlfriend. Hence, it's plausible that such tendencies might impact how Turkish individuals perceive the "Individuality" aspect of the RBS.

In addition to attachment style and beliefs related to close relationships, previous experiences of relationship breakdown or parents' divorce might influence the level of trust the young adults experience in their relationships (Roth et al., 2014). Earlier research shows that women who have experienced parental divorce in childhood or adolescence tend to distrust others (Størksen et al., 2006; Oldehinkel et al., 2008; Viršilaite and Bukšnyte-Marmiene, 2021). In the present study, young adults'

experiences with relationship breakdown and parents' divorce history were measured.

Given that heterosexual romantic relationships are based on a sexual relationship between different genders, we could assume that it is necessary to investigate gender differences in adult attachment, relationship beliefs and dyadic trust, although exact gender differences could not be hypothesized for all study variables and for this sample. While the classic attachment theory that focuses on children does not assume gender differences in attachment style (Del Giudice, 2019), a meta-analysis of gender differences in adult romantic attachment reported higher avoidance and lower anxiety for men than for women. Although these differences varied across geographic regions, the largest gender differences were observed in Europe and the Middle East (Del Giudice, 2011, 2019). Moreover, earlier studies have highlighted gender differences in dyadic trust (Çetinkaya et al., 2008; Kemer et al., 2016) and relationship beliefs (Frazier and Esterly, 1990). In the present study, the gender differences were tested, and gender included in analyses when possible.

The aim of the study was to investigate how adult attachment style (anxious, avoidant), experiences about parents' divorce and breakdown of one's own romantic relationship, and relationship beliefs influence the level of dyadic trust in romantic relationships. Since heterosexual romantic relationships are very much based on sex and gender roles, we expected that there might be differences between men and women in relationships between attachment, relationship beliefs and dyadic trust. We hypothesized the following relationships:

1. Participants who had experienced parental divorce or had separated themselves from a close relationship would score lower in trust than those whose parents are married or who have not experienced a breakdown of a romantic relationship.
2. An anxious and avoidant attachment style would have a negative relationship with interpersonal trust.
3. Positive relationship beliefs would have a positive relationship with interpersonal trust.
4. The effects of attachment style would be at least partly mediated by relationship beliefs, i.e., attachment style would influence the beliefs, which, in turn, would be related to interpersonal trust.

2. Method

2.1. Participants and procedure

The sample size estimation was conducted with G*power (effect size = 0.30; power = 0.95; one-tailed). The estimated sample size was n=111. The sample consisted of 131 undergraduate students of various majors (mean age = 21.64, SD = 1.93), of whom 55.7% were women. The participants were student volunteers who completed a 20-min survey during their class hour. The participants did not receive any benefit from participating in the study. Participants were informed of their rights to voluntary participation and the option to stop answering at any time.

Ethical approval was obtained from the Near East University Ethical Committee and the University of Kyrenia Ethical Committee (protocol number: YDU/SB/2020/615).

2.2. Instruments

2.2.1. Demographic information form

The demographic information form included questions about gender (woman, man), age (full years), relationship status of the parents (married with each other, divorced, or living separately, widowed, or single) and relationship status of the respondent (in a relationship, separated, not having had a romantic relationship). Most parents (n = 105, 80.2%) were married to each other, 21 (16.0%) were divorced or living separately, and two (1.5%) were widows or single parents not having been married. Since the number of widows or single parents was low, they were excluded from the analysis related to parental relationship status. Most participants reported being in a romantic relationship (n = 64, 48.9%), 46 (35.1%) reported being single because of a breakdown of a relationship, and 21 (16.0%) reported never having been in a romantic relationship.

2.2.2. Dyadic Trust Scale (DTS)

The Dyadic Trust Scale (Larzelere and Huston, 1980) is a one-dimensional seven-point scale (response alternatives ranging from "never" to "always") used to assess trust in marriage and romantic relationships. A high score in DTS indicates high trust in the relationship. The Turkish translation by Çetinkaya et al. (2008) was applied in the present study. While the original DTS contains eight items, the 6th item was excluded from the Turkish scale because of low item loading in the adaptation study, resulting in a 7-item scale (Çetinkaya et al., 2008). The alpha coefficient for the scale was 0.94.

2.2.3. Experiences in Close Relationships Inventory-Revised (ECR-R)

The Experiences in Close Relationships Inventory-Revised (ECR-R), developed by Fraley and Shaver (2000), measures anxious and avoidant attachment styles. The respondents evaluate the statements with a seven-point Likert scale, with response alternatives varying from "do not agree at all" (1) to "totally agree" (7). The scale was translated into Turkish and validated in Turkey by Selçuk et al. (2005). A high score denotes a high level of anxious or avoidant attachment style. The alpha coefficients were 0.87 and 0.91 for anxious and avoidant attachment styles, respectively.

2.2.4. Inventory of Close Relationship Beliefs (ICRB)

The Inventory of Close Relationship Beliefs, developed by Fletcher and Kininmonth (1992), measures beliefs associated with a successful close relationship. The ICRB was translated into Turkish and adapted to the Turkish population by Öztekin (2016). The scale includes statements (six-point response scale) related to 18 different aspects of a good relationship (e.g., respect, support, personal security, gender, independence). These 18 facets form sub-scales

of intimacy, external factors, passion, and individuality. The alpha reliability coefficients were 0.90, 0.75, 0.79, and 0.74, thus indicating sufficient internal consistency.

2.3. Data analysis

IBM SPSS 28.0 was used for calculating descriptive statistics, *t*-tests, reliability statistics, correlations and regression analyses. JASP was used for mediation analysis.

3. Results

3.1. Descriptive statistics of the study variables and mean differences between men and women

Since gender is an important factor in adult heterosexual relationships, gender differences were calculated for the two attachment styles, the four relationship belief scales, and the dyadic trust scores. The tests of gender differences were considered exploratory and therefore direction of gender differences was not specified; consequently, two-tailed *t*-tests were used. The only hypothesis (H1) was that a gender difference occurs in the variable concerned.

The descriptive statistics separately for men and women and *t*-tests for gender difference are presented in Table 1. Table 1 lists the means (M) and standard deviations (SD) for men and women on study variables, as well as the independent means *t*-test values for gender differences. Men scored higher than women in anxious attachment style, while women scored higher on the individuality scale of the ICRB. Women seem to value individuality (independence, equity) in relationships more than men. No gender difference was found in the other variables.

3.2. Parental divorce, breakdown of one's own relationship and interpersonal trust (hypothesis 1)

An independent samples *t*-test was employed to investigate the mean difference in trust between respondents with parents who had divorced or separated and those with parents who remained together. Respondents with married parents scored higher ($M = 5.65$, $SD = 1.86$) on the Dyadic Trust Scale than those with divorced parents ($M = 4.54$, $SD = 1.98$), $t_{(22.93)} = 2.46$, $p = 0.011$, Cohen's $d = 0.82$. This suggests that experiencing parental divorce might be associated with reduced trust in relationships. However, it's essential to note that the sample size for respondents with divorced parents was small ($n = 21$), which limits the generalizability of the results. These results confirmed Hypothesis 1, that respondents having experienced parental divorce experienced less trust in relationships.

In addition to parental divorce, respondents also provided information about their current relationship status, choosing from the options: no relationship, relationship ended, or in an ongoing romantic relationship. A one-way ANOVA revealed a statistically significant main effect of relationship status, $F_{(2,130)} = 9.82$, $p < 0.001$, $\eta^2 = 0.13$. Bonferroni corrected pairwise comparisons indicated that respondents in an ongoing relationship had higher trust scores ($M = 6.01$, $SD = 1.03$) than both those who had ended a relationship ($M = 4.96$, $SD = 1.64$), $p < 0.001$, and those who had never been in a romantic relationship ($M = 5.10$, $SD = 1.19$), $p = 0.019$. There was no statistically significant difference in trust scores between respondents who had ended their relationship and those who had never been in one. These results suggest that positive experiences in a romantic relationship may bolster interpersonal trust. Moreover, it can be inferred that respondents who had never been in a romantic relationship based their trust responses on their beliefs about romantic relationships in general. These results confirmed Hypothesis 1, which posited that respondents who had experienced a relationship breakdown would have less trust in relationships. No hypothesis was formed about not having been in a romantic relationship and trust.

3.3. Correlations between attachment styles, relationships beliefs and trust (hypotheses 2 and 3)

Correlations among study variables are displayed in Table 2. Age had significant negative correlations with anxious and avoidant attachment style and a positive correlation with the passion scale of the ICRB. Male gender correlated positively with anxious attachment style and individuality scale of the ICRB. Trust correlated negatively with anxiety and avoidance but positively with passion, individuality, and intimacy but not with external factors scale of the ICRB. In general, ICTRB scales correlated negatively with anxious and avoidant attachment styles. These findings confirmed hypotheses 2 (negative relationship between anxious and avoidant attachment style and trust) and 3 (positive relationship between positive relationship beliefs and trust).

3.4. Mediation effects of individuality on attachment—trust relationship (hypothesis 4)

Hypothesis 4 proposed that the effects of attachment style on dyadic trust would be at least partly mediated by relationship beliefs. Consequently, Figure 1 describes a mediation model in which individuality was assumed to mediate the relationship between attachment styles and interpersonal trust. This model assumed that attachment style influences both the development of close relationship beliefs and interpersonal trust. Since the regression analysis results (Table 3) showed that only the individuality beliefs were statistically significantly related to trust, only individuality was included in the final mediation analysis as the mediator. Mediator analyses with the other three RBS scales (intimacy, external factors, passion) as mediators were conducted, too, but no significant relationship between the mediator and trust was found. JASP mediation analysis (Figure 1) showed a statistically significant ($p < 0.001$) direct effect of avoidant attachment style

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TABLE 1 Descriptive statistics and *t*-tests.

Variable	Men		Women		*t*-test	Cohen's d
	M	SD	M	SD		
Trust	5.47	1.48	5.52	1.32	−0.20	0.04
Anxiety	3.99	1.21	3.61	1.02	1.99*	−0.35
Avoidance	2.89	1.18	2.87	1.09	0.10	−0.02
Passion	4.59	0.98	4.32	1.05	1.54	−0.27
Individuality	4.47	0.89	5.19	0.73	−5.07**	0.89
Intimacy	4.87	0.72	4.95	0.57	−0.75	0.13
External factors	4.03	0.69	3.89	0.71	1.15	−0.20

*$p < 0.05$; **$p < 0.001$. df = 129.

TABLE 2 Correlations between study variables.

	1	2	3	4	5	6	7	8
1. Age	1.00							
2. Gender	0.09	1.00						
3. Trust	0.16	−0.02	1.00					
4. Anxiety	−0.20*	0.17*	−0.47***	1.00				
5. Avoidance	−0.23**	0.01	−0.62***	0.51**	1.00			
6. Passion	0.18*	0.13	0.31***	−0.14	−0.48***	1.00		
7. Individuality	0.08	−0.41***	0.45***	−0.41**	−0.39**	0.28**	1.00	
8. Intimacy	0.15	−0.07	0.38***	−0.16	−0.56**	0.55***	0.55***	1.00
9. External factors	0.06	0.10	0.16	0.13	−0.12	0.51***	0.07	0.42***

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

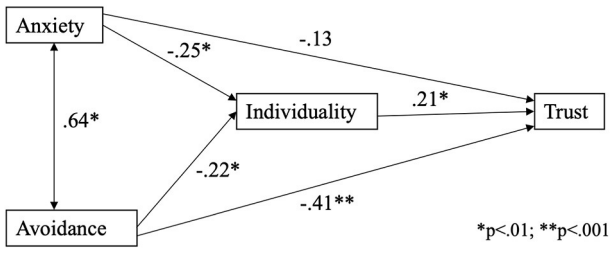

FIGURE 1
Attachment style, relationship beliefs, and dyadic trust: the mediation model.

on trust, whereas the direct effect of anxious attachment style on trust was not statistically significant ($p = 0.054$). The indirect effect of anxiety on trust via individuality was statistically significant (estimate = −0.05, z = −2.13, $p = 0.033$). Similarly, the indirect effect of avoidance on trust via individualism was statistically significant (estimate = −0.05, z = −2.10, $p = 0.046$). The total effects of both anxiety (estimate = −0.19, z = −2.70, $p = 0.007$) and avoidance (estimate = −0.46, z = −6.68, $p < 0.001$) on trust were statistically significant. The model explained 46% of the variance in trust scores.

The mediation model results show that the effects of anxious attachment on trust were fully mediated by individuality, whereas the direct effect of avoidant attachment style on trust was stronger than the mediation effect of individuality. We can, therefore, conclude that Hypothesis 4 was confirmed.

When evaluating the results of the mediation analysis, it should be borne in mind that these analyses are based on a theoretical model, and no causal relationships can be confirmed based on cross-sectional data.

4. Discussion

This study aimed to investigate how attachment style (anxious, avoidant), experiences about parents' divorce and breakdown of one's own romantic relationship, and relationship beliefs are related to the level of dyadic trust in romantic relationships. The findings were consistent with previous research showing that experiencing one's own relationship breakdown (Roth et al., 2014) or parental divorce or separation can reduce dyadic trust in relationships (Størksen et al., 2006; Oldehinkel et al., 2008; Viršilaite and Bukšnyte-Marmiene, 2021). Similarly, our findings among Turkish students highlighted the significance of relationship beliefs (intimacy, individuality, passion, and external factors) and attachment styles (avoidant, secure) in dyadic trust (Campbell and Stanton, 2019). A recent meta-analysis of 53 articles revealed that both anxious and avoidant attachment dimensions were negatively, concurrently, and longitudinally associated with interpersonal trust

TABLE 3 Hierarchical regression analysis predicting trust scores.

Model	Variable	B	Std. error	Beta	t	CI95%	
1	Passion	0.20	0.14	0.15	1.48	−0.07	0.47
	Individuality	0.58	0.15	0.36	3.85**	0.28	0.87
	Intimacy	0.19	0.24	0.09	0.80	−0.28	0.67
	External factors	0.06	0.19	0.03	0.30	−0.31	0.42
2	Anxiety	−0.26	0.10	−0.21	−2.67*	−0.45	−0.07
	Avoidance	−0.64	0.10	−0.52	−6.60**	−0.83	−0.44

*$p < 0.01$; **$p < 0.001$.

(Bao et al., 2022). While a person's own attachment style seems to influence the trust felt in relationships, the partner's attachment style can have an impact on trust, too. Notably, while an individual's attachment style can shape trust in relationships, their partner's attachment style can also exert influence on trust experienced in a relationship. Kane et al. (2007) demonstrated this dynamic in a study of 305 couples, finding that men were less satisfied when their female partners exhibited higher attachment anxiety, and women were less satisfied when their male partners displayed increased avoidance (Kane et al., 2007). Unfortunately, our study focused solely on one's own attachment style, and therefore, we did not measure experiences related to the partner's attachment style.

Gender did not play a significant role in trust scores, although previous research has reported higher trust scores among men than women (Çetinkaya et al., 2008). While no gender difference was found in the level of trust in the present study, men scored lower than women in their belief in individuality in relationships and higher in anxious attachment style. As the mediation model shows, anxious attachment style was related to individuality, which, in turn, was related to lower trust. If Turkish men are more prone to have an anxious attachment style than women, they can be expected to value individuality less in relationships, which would have a negative effect on trust. The difference between men and women in emphasizing individuality might reflect the difference between traditional and (post)modern views of romantic relationships, which can be observed in Turkish society. Women may place greater emphasis on individuality (i.e., independence and equity) in romantic relationships compared to men due to the potential imposition of traditional female gender roles on women.

In the present study, age groups did not differ significantly in trust scores, which might be related to a relatively small variance in the age of the respondents. In their study among 34 couples, Norona et al. (2017) did not find any age effect on trust level. However, trust scores were significantly lower among students with divorced or separated parents, indicating the influence of parental relationships (King, 2002). In addition, trust scores varied significantly based on personal experiences related to romantic relationships, aligning with Larzelere and Huston (1980), who reported higher trust scores in long than short relationships. These findings show that experiences of relationships breaking down because of either parental divorce or the end of one's own romantic relationship can reduce the experienced trust. These negative experiences are lived through examples of the vulnerability inherent in romantic relationships. Interestingly, participants who had never been in a romantic relationship scored lower in trust compared to those in ongoing romantic relationships. However, their trust scores did not differ from those who had ended a relationship. This suggests that dyadic trust and positive beliefs about romantic relationships develop over time within the context of a trustworthy relationship. It's also possible that attachment insecurities have a stronger impact on trust beliefs in individuals without romantic relationship experience compared to those who have built trust in past or present relationships. Hence, attachment style may influence both the expectations and beliefs before entering a romantic relationship as well as the level of trust experienced within a relationship while positive experiences about trust may alleviate the effects of attachment insecurities.

Correlation and regression analysis results showed that both anxious and avoidant attachment styles were negatively related to dyadic trust, which is in line with earlier results by Mikulincer (1998), Kim et al. (2017), and (Bao et al., 2022). The negative effect of anxious and avoidant attachment styles on trust is understandable: a person with an anxious attachment style does not trust that the relationship continues, while a person with an avoidant attachment style keeps a distance from the romantic partner and, thus, does not let the interpersonal trust develop. Trust means confidence in the continuation of the relationship and willingness to share one's feelings with one's romantic partner. Positive correlations were found between trust scores and relationship belief factors, individuality, intimacy, passion, and external factors, which confirms the early findings of Fletcher et al. (1994). This could be expected because all four belief scales measure positive beliefs related to relationships. People having positive beliefs about relationships are obviously readier to trust their partners than people with negative beliefs.

Anxiety attachment showed a negative correlation with close relationship belief scores except with external factors, which was also reported by Stackert and Bursik (2003). Similarly, as in Hadden et al. (2014), avoidant attachment style showed a negative correlation with all four close relationship beliefs, although the correlation to external factors was not statistically significant. These correlations show the distinct character of the external factors scale. The external factors include such facets as personal security, important others, finance, commonality, and children, i.e., the material and practical aspects of a close relationship. Other aspects of relationship beliefs tangle with more emotional and personal aspects, such as passion, intimacy, and individuality. It is understandable, therefore, that the attachment style has a stronger relationship to those three more emotional beliefs. In the regression analysis, only individuality appeared as a significant predictor of

trust, which is partly due to intercorrelations among the four belief scales. Individuality as the only predictor of trust might be specific to the close relationships in the Turkish context. Turkish culture is characterized by horizontal collectivism, in which the self is perceived as an equal member of the collective, such as the family (Singelis et al., 1995; Çukur et al., 2004). In the Turkish family context, the families of both spouses often intervene in the couple's life, and an individual's wishes might not be respected as much as in individualistic countries in which personal autonomy and independence are emphasized. The positive relationship between individuality as a relationship belief and trust means that young Turkish educated students see that respect for equity in marriage or in a relationship indicates trust.

While the sample size was too small to conduct separate path analyses for men and women, the results showed that the only relationship belief dimension correlated with being female was individuality. Mean comparisons showed that men scored lower in individuality than women. These findings suggest that young, educated Turkish men and women have differing perceptions regarding the importance of independence. A large study conducted among students in 16 universities in Turkey revealed that gender plays a more potent role in predicting attitudes toward women than does the degree of masculinity-femininity. Participants from politically conservative regions, as well as those with a pronounced inclination toward vertical collectivism (characterized by societal hierarchy and inequality), demonstrated more conventional perspectives compared to their counterparts from less conservative locales and those with less vertical collectivism tendencies (Bugday et al., 2021). Furthermore, the influence of vertical collectivism on attitudes toward women was markedly more pronounced among male participants than among females (Bugday et al., 2021). In another study involving Turkish university students, significant gender differences were observed in perceptions related to honor killings of women. Turkish men tended to attribute less responsibility to the assailant and suggested milder punishments compared to Turkish women. Conversely, Turkish women assigned less responsibility to the victim in instances of alleged adultery than did their male counterparts (Caffaro et al., 2014). These studies, including our own, suggest that a woman's independence and her perceived equality with her spouse might lead to disagreements and potentially reduce trust in romantic relationships. Whereas Turkish men tend to uphold more traditional roles for women, Turkish women are generally more inclined to expect equality between spouses.

The mediation model indicated that the path from anxious attachment style to trust was fully mediated by individuality, while the direct relationship from avoidant attachment style to trust was stronger than the mediated relationship. An anxious attachment style reduces the belief in individuality and, hence, leads to lower trust. It seems that people with anxious attachment styles perceive a romantic partner's need for independence as a threat to the relationship. Avoidance is directly related to lower trust because, for an avoidant person, trust is simply not important in the relationship. In this manner, the mediation model illustrates two distinct pathways through which attachment style is related to trust.

The study has some limitations. Firstly, it was based on volunteer participation. This might lead to self-selection bias, whereby participants scoring high in avoidant attachment style might also avoid participating. However, since the study was conducted during class hours and not online, the potential for self-selection bias should be less than in internet-based studies. Moreover, the issue of self-selection is inherent in all attachment studies based on self-reports, as participation in psychological studies must always be voluntary. In addition to possible self-selection, it should be noted that attachment in adult romantic relationships might be lower that the attachment theory suggests (Fraley et al., 2011), which would lead to less stable relationships between attachment, relationship beliefs and trust. If the attachment style can change within time and in context, also the relationships between attachment style and relationship outcomes could vary. The second shortcoming relates to the small sample size. While the sample size was deemed sufficient when estimated with a sample size calculator, much larger samples are necessary for more complex sub-group analyses. The results indicated that relationship-related independence beliefs particularly divided men and women and potentially highlighted one of the most crucial factors in romantic relationships among Turkish couples, namely, beliefs related to a woman's role in the relationship. Disagreements about a wife's or girlfriend's equality with her spouse or partner might be among the primary challenges in Turkish romantic relationships, leading to a lack of dyadic trust, relationship breakdown, and, in extreme cases, violence. Unfortunately, the small sample size, resulting from the data collection strategy (paper-and-pencil questionnaires distributed during lectures) and a lack of resources, prevents separate analyses and structural equation modeling for men and women. The mediation model should be tested separately for both genders and different groups based on relationship status. In addition, other mediator models than relationship beliefs could be tested. It is also important to bear in mind that such causal models as mediator models are always based on theoretical assumptions in cross-sectional studies such as ours. True causality can be established only in experimental or follow-up studies, which, on the other hand, are not feasible when studying this topic. Thirdly, the generalizability of the results is limited not only by the small sample size but also by the sample characteristics. The sample was comprised of young, educated university students who do not fully represent the Turkish population, even though a carefully collected non-internet-based classroom sample might closely resemble Turkish students. Given that more liberal views are typical among educated youth, future studies should include participants whose education is restricted to obligatory schooling, i.e., 8 years. Finally, the findings might predominantly represent contemporary perspectives of young, educated Turkish adults. Therefore, additional research in more collectivistic and individualistic cultures is necessary to further explore the role of relationship beliefs as mediators between adult attachment style and dyadic trust.

5. Implications to further research and practice

This study offers a preliminary examination of the mechanisms by which anxious and avoidant attachment styles may influence dyadic trust through relationship beliefs. It is noteworthy that beliefs about independence seem to play a pivotal role in dyadic

trust, with these beliefs holding different degrees of importance for men and women. This observation, which might be particularly relevant for Turkish and other semi-collectivistic cultures, has profound implications for couple therapists and counselors. Divergent views between spouses regarding a woman's role and equality within relationships can lead to reduced trust, heightened emotional and behavioral jealousy, and, tragically, to relationship breakdowns and instances of domestic violence. As such, our initial findings should catalyze further extensive research and alert family therapists and couple counselors to this issue. If independence proves to be a cornerstone in building dyadic trust, it is imperative to communicate this insight to the broader public. Fostering mutual understanding between partners about a woman's role in marriage might enhance trust and overall relationship quality, especially in societies where collectivistic perspectives on marriage and relationships prevail.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by Near East University Ethical Committee and the University of Kyrenia Ethical Committee. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

TL: Conceptualization, Formal analysis, Methodology, Writing—review & editing. CDY: Conceptualization, Data curation, Investigation, Methodology, Writing—original draft. MJMS: Writing—review & editing.

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Relational needs frustration: an observational study on the role of negative (dis)engaging emotions

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The present study aimed to explore the role of partners' negative engaging and disengaging emotions in dealing with the frustration of autonomy and relatedness needs during conflict. In an observational study, partners from 141 heterosexual couples participated in a conflict interaction task followed by a video-mediated recall procedure during which they reported their level of relational need frustration and their emotions experienced at different moments during the interaction. Results showed that in partners, more autonomy frustration, experienced at the beginning of the conflict, was accompanied by more concurrent negative disengaging emotions (anger, irritation), whereas more relatedness frustration was accompanied by more negative engaging emotions (hurt, sadness, disappointment). Additionally, the concurrent association between partners' relatedness frustration and their experience of negative engaging emotions was negatively moderated by their own relatedness relationship beliefs (as assessed by background questionnaires), indicating that for individuals who considered relatedness to be less important, relatedness frustration and negative engaging emotions were more strongly linked than for people with high relatedness beliefs. Finally, negative engaging emotions – assessed at the beginning of the conflict – were associated with more relatedness frustration at a subsequent time point in the interaction in men, but not in women. This study contributes to our understanding of how partners' negative emotions and the frustration of important relational needs are intertwined.

KEYWORDS

intimate relationships, emotions, relational needs, relationship conflict, observational study, video-mediated recall

1 Introduction

When we think about past interactions within our intimate relationships, it is hard to judge our experience without also considering how we felt. Indeed, emotions reflect how well our relationships are going, whether we get what we need within our relationship, or whether our desires are frustrated (Bloch et al., 2014; Yoo et al., 2014; Overall et al., 2015; Vanhee et al., 2018).

Although there is theoretical consensus about the fact that emotions serve a social and goal-directed function within our intimate relationships (Hofer and Hagemeyer, 2018; Algoe et al., 2020), many questions remain unanswered. For instance, how does the frustration of important relational needs, such as the need for autonomy and relatedness seep through into a couple's emotional life? Can emotions actually help partners to fix their frustrated relational needs? More specifically, do feelings of anger and irritation help to disengage from one's partner and to achieve or restore a sense of independence in the relationship? Similarly, do feelings of sadness and hurt help to mutually engage relationship partners and increase their feeling of

connectedness within the relationship? Given the lack of rigorous examination of these interesting and clinically relevant questions, the current study investigated the function of partners' negative engaging and disengaging emotions in order to deal with the frustration of their need for autonomy and relatedness during conflict.

1.1 The socially (dis)engaging function of emotions

Most theoretical perspectives on emotions assert that emotions are primarily experienced, expressed, and regulated in response to other people, thus serving a *social function* (Parkinson and Manstead, 2015; Tamir, 2016; Keltner et al., 2019). In the existing literature, different social functions of emotions have been proposed. For instance, Barret and Nelson-Goen (1997) argue that emotions serve social regulatory functions such as signifying the importance of certain relationships and helping to maintain and restore these relationships when the need arises. In their literature review, Keltner and Kring (1998) listed informative, evocative, and incentive social functions of emotions. Gruenewald et al. (2007) suggested that emotions serve the function of protecting one's self-evaluation from social threats. More recently, Keltner and Lerner (2010) identified emotions to have a social function at the individual, dyadic, group, and cultural level as they foster social interaction and social problem-solving.

Within the emotion domain, socially engaging and socially disengaging emotions constitute two different dimensions of emotions that map onto different poles of a so-called social engagement continuum of emotion (Kitayama and Markus, 1990; Markus and Kitayama, 1991b, 1994; Kitayama et al., 2000, 2006).

Disengaging emotions consist of emotions that increase the social distance between self and others (Boiger et al., 2022a,b). These emotions have also been defined as ego-focused (Markus and Kitayama, 1991a), autonomy-promoting (De Leersnyder et al., 2015), and distancing (Fischer and Manstead, 2008). Positive disengaging emotions, such as pride and feelings of superiority, highlight positive internal and self-defining attributes, thereby affirming the identity of the self as independent and disengaged from others (Vansteenkiste et al., 2020). Negative disengaging emotions (e.g., anger, irritation), that typically result from blocking one's goals or needs, impose a threat to the sense of the self as an independent entity, motivate the person to eliminate this threat and to restore and assert the self's independence (Fischer and Roseman, 2007; King et al., 2018; Roth et al., 2019). This motivational tendency toward independence affirms the sense of the self as an independent and interpersonally disengaged entity (Gillison et al., 2019; Vansteenkiste et al., 2020).

Engaging emotions consist of emotions that connect the self with others (Boiger et al., 2022a,b). These emotions have also been defined as other-focused (Markus and Kitayama, 1991a), relatedness-promoting (De Leersnyder et al., 2015), and affiliating (Fischer and Manstead, 2008). By experiencing positive engaging emotions (e.g., communal feelings, feelings of respect), people highlight their social interdependence, facilitating reciprocal well-intended behaviors that, in turn, provide a significant form of self-validation. Negative engaging emotions, such as sadness and being hurt, result most typically from one's failure to participate fully in an ongoing relationship or to otherwise live up to the expectations of intimate others (Boiger and Mesquita, 2012; Rothman and Magee, 2016; Williams et al., 2018), therefore posing a threat to one's sense of self as a fully interdependent entity (Kitayama et al., 2000). These emotions, in turn, motivate the person to eliminate the threat by restoring harmony or unity in the relationship and reaffirming one's sense of self as an interdependent and interpersonally engaged entity (Roseman, 2011).

This distinction is also congruent with both clinical theory and research regarding the types of emotion that occur during conflicts in couples. For instance, an approach to couple's therapy bearing substantial empirical support makes a difference between hard and soft emotions (Backer-Fulghum et al., 2018; Luginbuehl and Schoebi, 2020). Hard emotions are defined as emotions associated with asserting power and control that motivate people to protect themselves against partners who are perceived as harmful or neglectful, while soft emotions are pro-social emotions associated with experiencing or expressing vulnerability that lead to behaviors associated with closeness and relationship repair (Sanford, 2012).

Emotions play also a crucial role in interpersonal relationships, functioning not only as individual experiences but also as powerful communicative tools that shape interpersonal dynamics and establish recurring cycles of interaction (Butler and Randall, 2013). They serve as important signals and expressions of one's internal states, needs, and intentions, conveying valuable information to others within the relational context (Barrett, 2017). Within intimate relationships, emotions create a ripple effect within interpersonal exchanges, influencing the emotional experiences and behaviors of both partners. When an individual expresses emotions, it can elicit corresponding emotional responses in their partner, initiating a reciprocal cycle of emotional exchanges that can either escalate or regulate the emotional climate between partners (Feeney and Fitzgerald, 2019). For instance, disengaging emotions communicate to the partner that the individual's goals or needs are not met, serving as a cue for the partner to respect the expresser's need for personal space and self-assertion (Boiger et al., 2022a,b). Contrarily, engaging emotions play a communicative role by signaling a desire for interpersonal closeness and serving as social signals to indicate the willingness to foster mutual and cooperative actions (Gilbert, 2022).

1.2 Goals and needs in intimate relationships

Given their high level of closeness, romantic partners have many opportunities to facilitate or obstruct each other's goal pursuits within everyday interactions (Berli et al., 2018; Leung and Law, 2019; Brownhalls et al., 2021) and many relational need/goal theories have been proposed in the literature. For instance, the *Self-Expansion Model* highlights the centrality of relationship partners' self-expansion and self-improvement goals in relationships (Aron et al., 2022). Additionally, relationship researchers have identified emotional involvement, companionship, security, intimacy, and sex, as essential relational goals in romantic relationships (Birnbaum and Reis, 2019; Brandão et al., 2020; Kluwer et al., 2020). Alongside these theories, it is important to acknowledge other therapeutic approaches that expand the understanding of relational needs. *Emotionally Focused Couple* therapists (EFT-C) consider the need for attachment, or one's need for security and connection, as the most central need in intimate

relationships (Johnson, 2004, 2009). Exploration and regulation of emotions are considered as a means to address underlying attachment and relational needs (Greenberg, 2004; Greenberg and Goldman, 2008). Within the relationship, partners should create an emotionally attuned and validating environment in which they can explore and address their psychological needs. Similarly, *Couples Schema Therapy* emphasizes the role of schema dynamics and underlying core psychological needs in shaping relationship patterns and interactions (Martin and Young, 2010). This approach recognizes that individuals bring core emotional and psychological needs, such as the need for love, safety, and validation, that can influence partners' behavioral patterns within the couple dynamic. While each theory has unique characteristics, the focus on goals, needs, motivations, or values as central to the functioning of the romantic relationship is general.[1]

Within the broader psychological literature, one of the most prominent approaches to the conceptualization of basic psychological needs is *Self Determination Theory* (SDT; Ryan and Deci, 2022). According to SDT, individuals need to feel that their actions are self-directed and freely chosen (self-determined) rather than feeling forced by others, highlighting *autonomy* and *relatedness* as two fundamental psychological needs (besides the need for *competence*[2]) in people's individual and relational well-being.

In romantic relationships specifically, the need for autonomy is defined as the need for a full personal endorsement of one's own actions without feeling coerced or guilty toward the partner; a self-focused experience of volition and willingness within the couple (Deci and Ryan, 2014). Autonomy satisfaction in relationships results from partners being empathetic and supportive towards one another (Anderson, 2020). The need for relatedness in romantic relationships refers to the desire to form a meaningful relationship, care for the other, and to feel cared for by the other (Ryan and Deci, 2022). Relatedness satisfaction results from a genuine communication of care, interest, focus, and non-contingent support from one's partner, and experiencing a successful stable bond with the partner in which one feels loved (Deci and Ryan, 2014; Knee et al., 2014).

Empirical evidence points at the importance of satisfying autonomy and relatedness needs in romantic relationships, for partners' individual as well as relational well-being (Demir and Özdemir, 2010; Vandercammen et al., 2014; Wouters et al., 2014; Vanhee et al., 2016). However, while partners can be supportive towards each other relational needs, they can also frustrate their partners' needs. SDT makes an explicit distinction between need satisfaction and *need frustration* in romantic relationships as they are regarded as separate concepts instead of opposites ends of a continuum (Bartholomew et al., 2011; Vansteenkiste and Ryan, 2013). Relational need frustration involves more actively and directly undermining a partner's needs, as compared to more passively not satisfying one's needs. As delineated by La Guardia and Patrick (2008), the frustration of relational needs occurs when partners feel controlled or pressured to behave in a certain way (autonomy frustration) or feel rejected and abandoned by their partner (relatedness frustration). In recent work, frustration of the need for autonomy and relatedness is documented to be associated with negative relationship outcomes (e.g., less relationship satisfaction, more conflict; see Vanhee et al., 2018).

1.3 Relational need frustration and emotions

In emotion science, *Appraisal theory* defines emotions as episodes in which the evaluation of an event in light of one's needs – for instance, the evaluation of an event as frustrating one's needs – leads to a cascade of changes (Scherer and Ellsworth, 2009; Moors et al., 2013; Moors, 2020). Thus, emotions act as *alarms* when people's needs are incompatible or interfere with other people's needs (Oatley and Johnson-Laird, 1987; Moors, 2007; Robinson, 2018; Sander et al., 2018).

In romantic relationships, this means that unmet or frustrated needs are expected to elicit specific emotions (Berscheid and Ammazzalorso, 2001). According to the SDT, negative emotions such as anxiety, grief, and anger are theorized to be typical responses to need frustration (Ryan and Deci, 2000). Indeed, there is some evidence that specific emotions result from partners' needs being unmet or frustrated (Cupach et al., 2011; Diamond, 2014; Verhofstadt et al., 2020). Specifically, previous studies have documented the occurrence of sadness, anxiety, and anger when partners' relational needs such as intimacy and belonging are unmet (Mikulincer and Shaver, 2007; Parrott, 2014). Direct empirical evidence for an association between relational need frustration and partners' negative emotions (sadness, fear, and anger) was found in a recall study by Vanhee et al. (2018). Sadness was predicted by relatedness frustration in men and by autonomy frustration in women, whereas fear was only predicted by relatedness frustration in men. For anger, the results were comparable for men and women, with higher levels of autonomy frustration being associated with higher levels of anger.

In addition to their signal function, emotions have also a *communicative function*: they signal to the partner that needs are being frustrated within the relationship (Mazzuca et al., 2019; Benita et al., 2020; Cowen et al., 2021). In particular, it is theorized that emotions provide information about the expresser's state, which can then result

1 Relational goals and needs are interconnected and complementary concepts within the field of psychology and interpersonal relationships. Goals represent the desired outcomes or objectives individuals aim to achieve in their relationships, encompassing emotional, cognitive, and behavioral aspects, whereas needs refer to the fundamental psychological requirements individuals seek to fulfill within their relationships for their well-being and satisfaction (Collins et al., 2006; Denzinger et al., 2018). Since our study relies on SDT, throughout this manuscript the term need is used to analyze and explore the multifaceted nature of human relationships, incorporating aspirations and fundamental psychological requirements.

2 According to SDT, people also have the need to feel competent and effective at what they do (Deci and Ryan, 2014). However, competence appears to be a less central predictor in intimate relationships (Patrick et al., 2007; Vanhee et al., 2018). People often have ways to feel competent that are not within their intimate relationships, such as in work, school, or leisure (La Guardia et al., 2000). Furthermore, the need for autonomy and relatedness better capture the two poles of the social engagement continuum of emotion, thus allowing us to have a clear theoretical argument for our prediction. Given the specific focus of our research on emotional experiences within intimate relationships, focusing on autonomy and relatedness enables a more comprehensive understanding of the emotional dynamics in this context. For these reasons, we did not include a measure of competence in our research (interested readers can find the results of these analyses in the Supplementary Tables S3–S6).

in different behaviors from the partner, such as being supportive and thereby reducing the expresser's need frustration, or being affected by the expresser's emotions in turn creating an escalation of frustration for both members of the couple (Van Kleef, 2009).

Previous studies indeed suggest that the expression of emotions varies in order to communicate specific needs. Disengaging emotions have been theorized to be expressed in the pursuit of ego-focused needs, while engaging emotions have been theorized to be expressed when individuals foster other-focused needs (Kitayama et al., 2006; Fischer and Manstead, 2008; Van Kleef et al., 2011). The implication might be that engaging and disengaging emotions differ from each other in terms of their underlying needs. Socially engaging emotions promote the achievement of what is best for the relationship with others (interdependent needs). Socially disengaging emotions foster the need of achieving what is best for an individual self (independent needs). However, to date, there is no empirical evidence to support these speculations, because studies on socially disengaging and socially engaging emotions have – to the best of our knowledge – never measured interdependent versus independent relational needs explicitly.

1.4 Romantic beliefs in intimate relationships

Existing literature showed that individuals enter romantic relationships with pre-existing beliefs about what those relationships should be like, which features make them satisfying or frustrating, and which relational needs should guide their behaviors as partners (Stackert and Bursik, 2003; Zagefka and Bahul, 2021). Such *relationship beliefs* make emotional responses to situations more fast as they suggest which cues are most important, the meaning of these stimuli, and the likely consequence of various courses of action (Baldwin, 1992; Crick and Dodge, 1994).

Partners' responsiveness to each other's relationship beliefs plays a crucial role in understanding emotional experiences during conflict. When partners fail to recognize or validate each other's beliefs or the significance they attribute to particular relational needs, it can lead to a breakdown in mutual understanding and exacerbate emotional responses (Reis et al., 2004; Reis, 2012; Overall et al., 2015). For instance, if one partner highly values autonomy and seeks independence during conflict, but the partner fails to respect this need, it may intensify the emotions experienced, such as anger or resentment. Similarly, if one individual prioritizes relatedness, but the partner disregards or dismisses the importance of relatedness, it may heighten negative emotions, such as sadness or loneliness.

Relationship beliefs serve also as cognitive filters that shape how individuals perceive and interpret events within their relationship (Honeycutt and Cantrill, 2014). When individuals highly value a specific need, they tend to be more attentive and attuned to situations or behaviors that are relevant to that need. As a result, they may be more sensitive to detecting instances where the need is being threatened or unfulfilled, leading to heightened emotional responses when such frustration occurs (Vansteenkiste and Ryan, 2013). Furthermore, individuals who strongly believe in the importance of a particular need may have higher expectations for its satisfaction and may invest more effort in pursuing and maintaining it (Li and Fung, 2011). Consequently, when the need is frustrated, individuals might experience a greater sense of discrepancy between their desired state and the actual state of their relationship, leading to more intense emotional reactions.

It could thus be expected that relationship beliefs – how important for instance autonomy and relatedness are considered to be by relationship partners – may impact the partners' emotional experience when these needs are unmet in their intimate relationship.

1.5 The present study

Despite the theoretical assumptions regarding emotions' social function in the achievement of partners' relational needs (Powers et al., 2011; Baker et al., 2014; Tracy, 2014), little is known about this association empirically. The available evidence for these arguments can be described as largely indirect and to our knowledge, a rigorous and interaction-based examination of the association between partners' need frustration and their experience of (dis)engaging emotions is lacking from the current literature. Our study aims to contribute to the current literature by empirically exploring this association. We will do so during relationship conflict, a social context assumed to elicit relational need frustration, as it is defined as a situation in which partners interfere with each other's needs (Bradbury et al., 2001; Whiting and Cravens, 2016).

We relied on a large sample of couples providing questionnaire data, and participating in a conflict interaction and video-mediated recall task, allowing us to assess both partners' general as well as interaction-based level of autonomy and relatedness frustration, as well as the level of negative (dis)engaging emotions experienced during the interaction.

With regards to negative disengaging emotions, we expect that partners whose need for autonomy is frustrated during conflict, will experience more negative disengaging emotions. In turn, as negative disengaging emotions serve the social function of motivating people to eliminate threats to their need for autonomy and to restore and assert the self's independence, we expect that partners' negative disengaging emotions during conflict will lead to a decrease in their autonomy frustration. This means that partners' reports of negative disengaging emotions during conflict will predict a decrease in their autonomy frustration at the next moment.

> H_1: Partners experiencing higher levels of autonomy frustration during conflict will report more negative disengaging emotions.

> H_2: Partners' reports of negative disengaging emotions during conflict will predict a decrease in their autonomy frustration at the next moment.

With regards to negative engaging emotions, we expect that partners whose need for relatedness is frustrated will experience more negative engaging emotions. As these emotions motivate individuals to eliminate the threat to their need for relatedness by restoring the harmony and unity in the relationship, we expect that partners' experience of negative engaging emotions will consequently lead to a decrease in their relatedness frustration.

> H_3: Partners experiencing higher levels of relatedness frustration during conflict will report more negative engaging emotions.

> H_4: Partners' reports of negative engaging emotions during conflict will predict a decrease in their relatedness frustration the next moment.

It is important to acknowledge that the relationship between emotions and need frustration is bidirectional. Need frustration can lead to the experience of negative emotions, while the experience of negative (dis)engaging emotions can also impact the levels of need frustration. By exploring these bidirectional dynamics, we aim to contribute to the understanding of emotional regulation and conflict resolution processes within intimate relationships.

Finally, we predict that relational need frustration will more strongly predict negative (dis)engaging emotions when these needs are particularly important for people, meaning that they are aligned with their relationship beliefs. More specifically, we expect the experience of negative (dis)engaging emotions – resulting from partners' relational need frustration – to vary as a function of their relationship beliefs, that is the importance partners assign to these needs in relationships in general.

> H_5: The association between partners' autonomy frustration and negative disengaging emotions will be positively moderated by their own autonomy relationship beliefs.

> H_6: The association between partners' relatedness frustration and negative engaging emotions will be positively moderated by their own relatedness relationship beliefs.

In order to test hypotheses 1 and 2 (and 5–6), we will examine partners' concurrent levels of relational need frustration and emotions as experienced at a specific moment (i.e., near the beginning) in the conflict interaction. To test hypotheses 3 and 4, the cross-temporal association between partners' emotions (experienced near the beginning of the conflict interaction) and relational need frustration experienced at a subsequent moment (i.e., near the end of the conflict interaction) in the interaction will be examined.

Emotional experiences often unfold in ways that highlight not only our own but also the partner's involvement; as social interactions progress, we act and react to behaviors and feelings of our partners, as much as they react to our behaviors and feelings in turn (Butler, 2011). For this reason, the current study also aims to explore cross-partner effects. This means that we exploratively tested if people's need frustration was associated with the emotions their partner experienced during the interaction.

2 Methods

The data used for this study was part of a larger national study, and has been used to investigate unrelated questions. Resulting publications can be found on osf.io/r732h. Materials used, relevant code, and data to conduct the reported analyses are available at https://osf.io/cuvj8.

2.1 Participants

A twofold recruitment strategy was used to collect data for this study: (1) a campaign was spread via posters in public places and via social media recruiting couples that were willing to participate in a research project on intimate relationships and (2) a team of research assistants recruited participants by means of a snowball-sampling technique. Couples that expressed interest in the study were informed about the project and evaluated for their eligibility to participate. To be eligible, couples had to be heterosexual, partners had to have been together for at least 1 year, and also living together for at least 6 months.

The final sample comprised 282 partners of 141 Belgian couples (aged 19–76 years, M = 36.34, SD = 13.93), with a range in relationship duration between 1 and 47 years (M = 12.91, SD = 11.99). More than half of the couples (51.1%) had at least one child, and 87.2% were married. In terms of educational level, the majority of the participants (42.9%) completed up to secondary school, 31.9% held a bachelor's degree, 24.8% held a master's degree, and 0.4% held a doctoral degree. The study procedures received positive advice from the Ethical Committee of the Faculty of Psychology and Educational Sciences of Ghent University.

2.2 Procedure

After providing their informed consent, participants were asked to independently complete an internet-based survey at home. To ensure the correct administration of the questionnaire, participants were provided with clear instructions and were encouraged to complete the survey independently at home. The survey allowed participants to respond to the items at their own pace. Additionally, participants were informed about the importance of providing accurate and honest responses to ensure the reliability and validity of the data collected. Thereafter, each couple was contacted in order to schedule an appointment in our lab for the observational part of the study. The laboratory session was composed of an 11-min videotaped conflict interaction task similar to the ones used in previous observational studies on couple conflict (Gottman and Levenson, 2002; Roberts et al., 2007), followed by a video-mediated recall task. At the end of this session, the couple took part in a debriefing with the responsible researcher and was compensated with 20 Euros for their participation in the study.

2.2.1 Conflict interaction task

In the observational part of the study, the couples were asked to participate in a conflict discussion task that was similar to those used in previous laboratory studies on relationship conflict (Fletcher and Thomas, 2000; Simpson et al., 2003; Verhofstadt et al., 2005). The laboratory was set up as a living room and equipped to videotape the couples' interactions. Before starting the interaction task, couples were asked to provide their written informed consent to be filmed. Next, both partners were separately asked to choose a salient relationship problem, from a provided list of conflict topics in romantic relationships, in which they had a

desire for change. The topics (e.g., excessive demands or possessiveness, lack of equality in the relationship, frequent physical absence) were derived from previous work on sources of conflict within intimate relationships (Kurdek, 1994). After this topic selection had occurred, partners were randomly assigned to one of two conditions: *initiator* or *not initiator*. The conflict issue selected by the designated initiator was the one that the partners would discuss during their upcoming video-recorded interaction. The initiator was instructed to introduce the topic to the partner so that they could discuss this problem together. Both partners were instructed to discuss as much as they would do at home when experiencing a similar situation.

2.2.2 Video-mediated recall task

At the end of the conflict interaction task, both partners separately completed a video-mediated recall task (Hinnekens et al., 2016). Partners viewed the video of their interaction on a laptop and were asked to re-experience the interaction. Every minute and a half, the video was automatically stopped (thus resulting in 7 stops) (Hinnekens and Kimpe, 2014), and partners were instructed to answer a range of questions about the interaction (e.g., write down the specific content of their thought at that specific point in time). Participants had the option to re-observe the last 10 s before the stop if they felt this would facilitate them to answer the questions.

2.3 Measures

2.3.1 Interaction-based emotions

Interaction-based emotions were measured at the second stop (T_2; after 3 min of interaction) and at the fifth stop (T_5; after 7.5 min of interaction) during the video-mediated recall task. Using specific items from the Emotion Terms subscale of the CoreGRID instrument (Scherer et al., 2013), participants indicated the extent to which they felt irritated, angry, sad, disappointed, and hurt. Response options ranged from 1 = *completely untrue* to 7 = *completely true*. In line with previous literature (Markus and Kitayama, 1991b; Sanford and Rowatt, 2004), the following two scales were computed: (1) a *Negative Engaging Emotions* scale by averaging participants' responses for the negative engaging emotion items (sad, disappointed, hurt; $\alpha_{men} = 0.76$, $\alpha_{women} = 0.86$), and (2) a *Negative Disengaging Emotions* scale by averaging participants' responses for the negative disengaging emotion items (irritated, angry; $\alpha_{men} = 0.72$, $\alpha_{women} = 0.82$). Higher scores reflect higher levels of self-reported negative engaging and disengaging emotions, respectively.

2.3.2 Interaction-based need frustration

At the second (T_2) and fifth stop (T_5) during the video-mediated recall task, participants were also asked to indicate the extent to which they at that specific time, experienced frustration of their need for autonomy (e.g., "At this moment, I was experiencing a lack of freedom of choice") and relatedness (e.g., "At this moment, I was experiencing a lack of relatedness with my partner") by means of a 7-point Likert-type scale (1 = *completely untrue* to 7 = *completely true*). Based on the SDT literature (Ryan and Deci, 2000; Deci and Ryan, 2014), each item was complemented with examples of each specific need frustration.

2.3.3 Relationship beliefs

Participants' beliefs regarding the importance of autonomy and relatedness in intimate relationships in general were assessed using two adapted items from the Need Satisfaction in Relationship Scale (La Guardia et al., 2000), which were included in the internet-based survey couples had completed at home. Using a 6-point scale (1 = *totally disagree* to 6 = *totally agree*) participants had to indicate their agreement with the following two statements: "In the best relationships, partners feel free to be who they are" and "In the best relationships, partners should feel connected to each other."

2.3.4 Global need frustration

Participants' general levels of relational need frustration (autonomy, relatedness) were assessed using the Autonomy Frustration and Relatedness Frustration subscales of the Basic Psychological Need Satisfaction and Frustration Scale, adapted for use within intimate relationships (BPNSFS; Chen et al., 2015). The 8 items were scored on a 5-point Likert-type scale, ranging from 1 (*completely untrue*) to 5 (*completely true*). Each subscale consists of four items and measures respondents' frustration of their need for autonomy (e.g., "In the relationship with my partner, I feel forced to do many things I would not choose to do") and need for relatedness (e.g., "In the relationship with my partner, I feel that s/he is distant towards me"). Participants' subscales scores were computed by averaging the responses for all items included in the specific subscale, with higher scores reflecting higher levels of need frustration. The internal consistencies for the autonomy and relatedness frustration scales were 0.75 and 0.71 for men, and 0.70 and 0.74 for women.

2.4 Data-analytic strategy

To investigate our research questions, we analyzed the data using multilevel Actor-Partner Interdependence Models (APIM; Kenny, 1996; Kenny et al., 2006). APIMs are used to study dyadic level data in which partners' responses are non-independent. A person's variable score is predicted by both his or her own predictor variable score (actor effect) and his or her partner's predictor variable score (partner effect). Because we were working with partners that were distinguishable by gender, we first fitted models in which the effects of interest and variances could differ across gender, and compared these models with models for indistinguishable dyads (Kenny et al., 2006). Since the fit (as assessed by BIC/AIC[3] values) improved significantly for the distinguishable models, we report the findings for these models.

First, we investigated the association between interaction-based need frustration (autonomy, relatedness) and participants' concurrent experience of negative disengaging emotions (H_1) and negative engaging emotions (H_3). In model 1a, negative disengaging emotions

3 The Bayesian Information Criterion (BIC) and the Akaike Information Criterion (AIC) are goodness-of-fit measures that are corrected for model complexity (Field, 2009). Models with smaller BIC and AIC values provide a better fit-complexity balance.

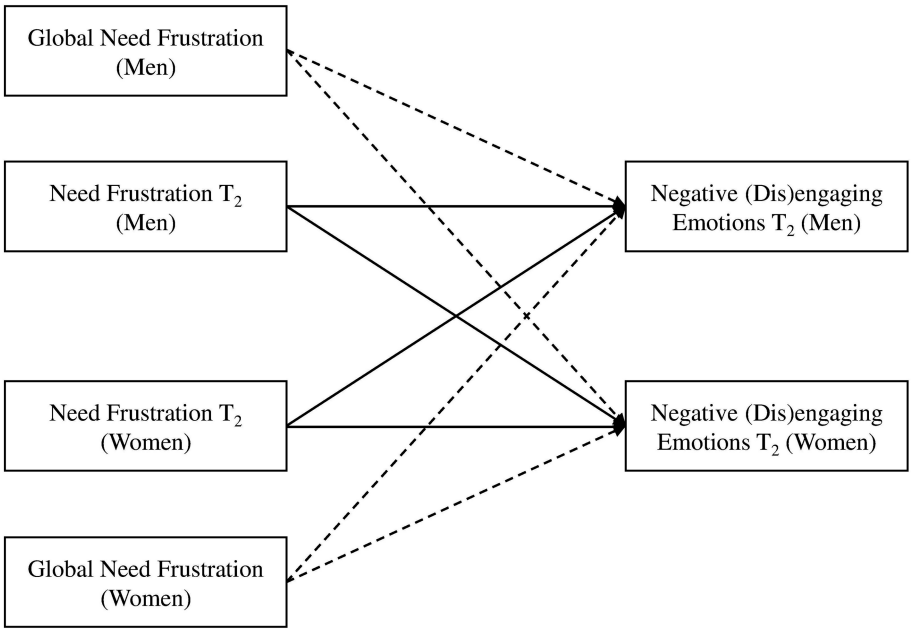

FIGURE 1
Actor-partner interdependence model used to assess the cross-concurrent associations between relational need frustration (autonomy, relatedness) at T_2 and negative emotions (disengaging, engaging) at T_2. The main paths are in black, while control paths are dashed.

at T_2 were predicted by autonomy frustration at the same time point. In model 1b, negative engaging emotions at T_2 were predicted by relatedness frustration at the same time point (Figure 1). We controlled for participants' global level of autonomy and relatedness frustration to ensure that any observed effects were specifically attributed to the interactional needs frustration experienced during the conflict, rather than participants' pre-existing global levels of frustration for these needs.

Second, we investigated the effects of negative (dis)engaging emotions on participants' subsequent autonomy frustration (H_2) and relatedness frustration (H_4). In model 2a, autonomy frustration at T_5 was predicted by negative disengaging emotions at a previous time point (T_2) controlling for autonomy frustration at T_2. In model 2b, relatedness frustration at T_5 was predicted by negative engaging emotions at a previous time point (T_2), controlling for relatedness frustration at a previous time point (T_2) to account for participant's initial levels of relational needs frustration during the interaction, and examine the unique contribution of their emotions in predicting subsequent change in frustration of autonomy and relatedness (Figure 2).

Third, we investigated the role of partners' relationship beliefs in the association between relational need frustration and (dis)engaging emotions (H_5 and H_6). In models 3a and 3b, we tested whether participants' relationship beliefs (importance of autonomy and relatedness in intimate relationship) moderated the association between interaction-based autonomy and relatedness frustration (T_2) on participants' concurrent experience of negative disengaging emotions (H_5) and negative engaging emotions (H_6), respectively, controlling for participants' global level of needs frustration (Figure 3). This control was not applied in models that investigated the relationship between emotional experience and subsequent interactional needs frustration (models 2a and 2b), because here we already explicitly captured change, by controlling for initial level of need frustration.

3 Results

Table 1 shows the descriptive statistics of the key variables, along with paired sample t-tests for possible gender differences in these variables, and Pearson correlation coefficients between all the key variables (Table 2).

Since the two scales for negative engaging emotions and negative disengaging emotion were highly correlated ($r_m = 0.63$; $r_w = 0.68$), we verified possible collinearity through the analysis of the Variance Inflation factor (VIF), which showed no significant collinearity between these two (with a VIF = 1.79, following the guidelines that a VIF > 4 indicates reasons for concern, and a VIF > 10 indicates serious multicollinearity; Brauner and Shacham, 1998; Belsley et al., 2005).

3.1 Model 1a: autonomy frustration (T_2) on negative disengaging emotions (T_2)

Results showed significant associations between autonomy frustration at T_2 and negative disengaging emotions at T_2 (actor effect), for both men and women, controlling for participants' global level of autonomy frustration (Table 3). In line with our hypothesis (H_1), participants who experienced higher levels of autonomy frustration during conflict interactions, also reported more concurrent negative disengaging emotions. None of the partner effect between

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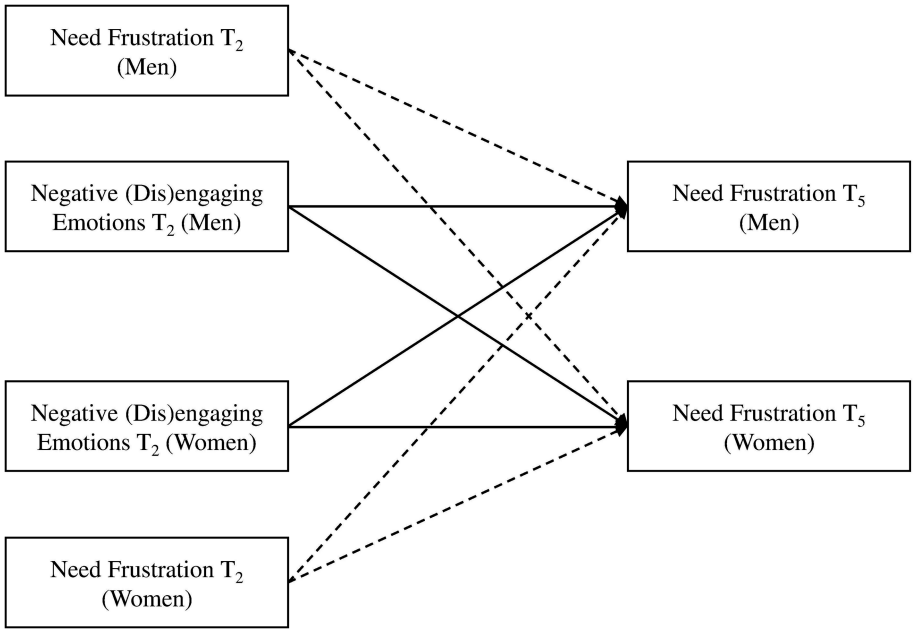

FIGURE 2
Actor-partner interdependence models used to assess the temporal associations between negative emotions (disengaging, engaging) at T_2 and relational need frustration (autonomy, relatedness) at T_5. The main paths are in black, while control paths are dashed.

autonomy frustration (global, interaction-based) and negative disengaging emotions at T_2 were statistically significant.

3.2 Model 1b: relatedness frustration (T_2) on negative engaging emotions (T_2)

Results indicated that the association between relatedness frustration at T_2 and negative engaging emotions at T_2 (actor effect), controlling for participants' global relatedness frustration, was statistically significant for both men and women (Table 3). This was in line with our hypothesis (H_3). People who experienced higher levels of relatedness frustration during conflict interactions, also reported more concurrent negative engaging emotions. There were no partner effects between interaction-based relatedness frustration and negative engaging emotions at T_2.

3.3 Model 2a: negative disengaging emotions (T_2) on autonomy frustration (T_5)

Results disconfirmed our hypothesis (H_2) that negative disengaging emotions at T_2 would predict a decrease in autonomy frustration at a successive time point (T_5), controlling for autonomy frustration at T_2, as no effects were found for men or women (Table 4). Moreover, none of the partner effects of negative disengaging emotions (T_2) on autonomy frustration at a later time point (T_5) were significant.

Due to the high correlation between negative disengaging emotions and negative engaging ones, we performed follow-up analyses, controlling for negative engaging emotions at T_2 alongside autonomy frustration at T_2. These analyses revealed similar results (Supplementary Table S1).

3.4 Model 2b: negative engaging emotions (T_2) on relatedness frustration (T_5)

In contrast to our hypothesis (H_4) that negative engaging emotions at T_2 would predict a decrease in relatedness frustration in the next moment, results showed that the actor effects of negative engaging emotion at T_2 on relatedness frustration at a successive time point (T_5) was statistically significant only for men, but in the opposite direction of what was expected. Men who reported more negative engaging emotions at the beginning of the interaction reported higher levels of relatedness frustration later on in the interaction. For women, no effect was found. Moreover, none of the partner effects of negative engaging emotions (T_2) on relatedness frustration at a later point (T_5), were found to be significant.

Again, we performed follow-up analyses, controlling for negative disengaging emotions at T_2 alongside relatedness frustration at T_2, to look at the unique effect of negative engaging emotions (T_2) on relatedness frustration (T_5). Results indicated that the actor effects of negative engaging emotion at T_2 on relatedness frustration at a successive time point (T_5) were now significant for men and women (Supplementary Table S2). Specifically, higher levels of negative engaging emotions at T_2, were predictive of more relatedness frustration at T_5. Again, there were no partner effects.

3.5 Model 3a and 3b: moderating role of relationship beliefs

Lastly, we tested whether relationship beliefs about autonomy and relatedness moderated the actor and partner effects of autonomy frustration (T_2) and relatedness frustration (T_2) on negative disengaging (T_2) and engaging emotions (T_2), respectively (models 3a

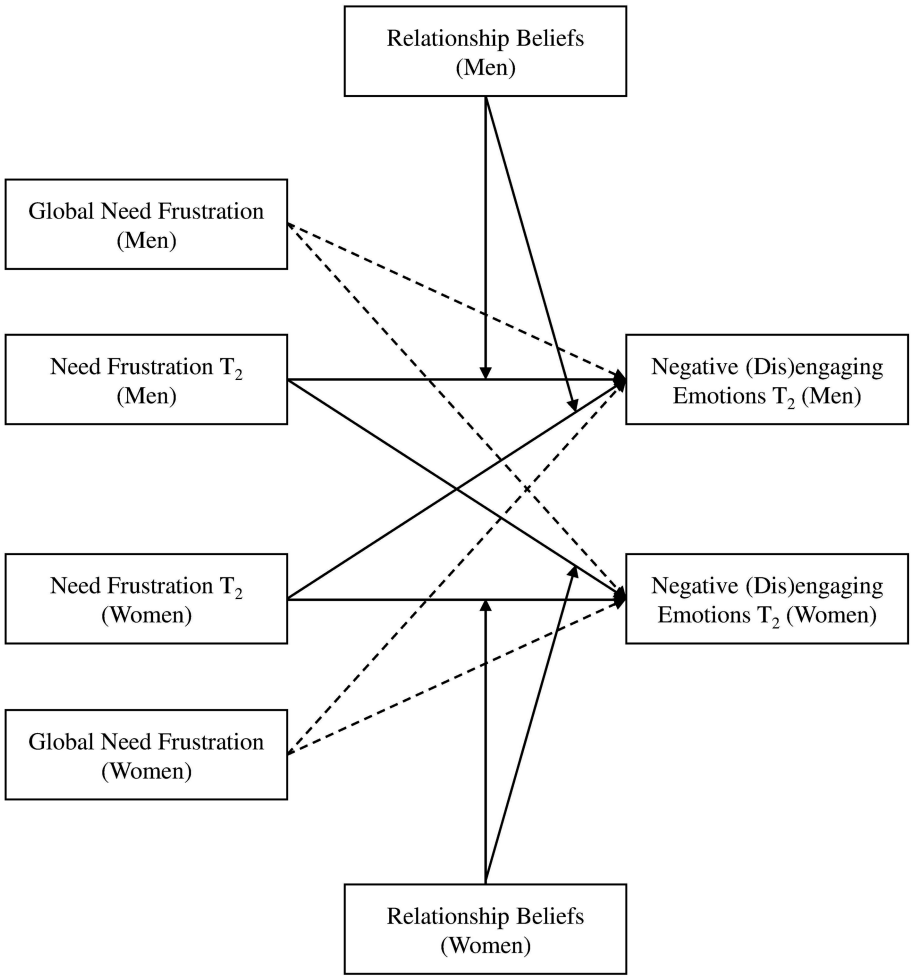

FIGURE 3
Moderated actor-partner interdependence models used to assess the cross-concurrent associations between relational need frustration (autonomy, relatedness) at T_2 and negative emotions (disengaging, engaging) at T_2. The main paths are in black, while control paths are dashed.

and 3b) by including relationship beliefs as main and interaction effects. Results of these analyses are presented in Table 5.

In contrast to our hypothesis (H_5), results indicated that autonomy relationship beliefs did not moderate the association between autonomy frustration (T_2) and negative disengaging emotions (T_2) for both genders. Similarly, autonomy relationship beliefs were not a significant moderator of the partner effects neither for men, nor women.

Results disconfirmed our hypothesis (H_6) that the association between participants' relatedness frustration and negative engaging emotions would be positively moderated by their own relatedness relationship beliefs. Surprisingly, we found a negative moderating effect of relatedness relationship beliefs, indicating that relatedness frustration and negative engaging emotions were more strongly linked for individuals who considered relatedness to be less important than for people with high relatedness beliefs. This was the case for both men and women.

Simple slopes analyses revealed that the positive association between relatedness frustration and negative engaging emotions at low levels of relatedness beliefs was positive and significant for men ($B = 2.93$, SE = 1.24, $p < 0.05$) and women ($B = 0.96$, SE = 0.29, $p < 0.01$). For high levels of relatedness beliefs, the associations between relatedness frustration and negative engaging emotions was positive and significant for men ($B = 1.27$, SE = 0.23, $p < 0.001$) but not for women ($B = 0.78$, SE = 0.40, $p = 0.060$). These analyses implied that individuals with high relatedness beliefs, reported less negative engaging emotions when experiencing higher levels of relatedness frustration than people who were high in frustration, and that attributed less importance to this relational need (Figure 4). Relatedness relationship beliefs were not a significant moderator of the partner effects for men or women.

4 Discussion

The current findings provide initial support for our hypothesis that partners' emotional experiences during conflict can be – at least in part – understood from the frustration of some of their core relational needs. More specifically, we found that both men and women experienced more negative disengaging emotions – anger and irritation – when their autonomy needs were frustrated during conflict. Similarly, men and women experienced more negative

TABLE 1 Descriptive statistics for key variables and results of paired sample t-tests comparing men and women.

	Men ($N = 141$)		Women ($N = 141$)		t	95% CI
	M	SD	M	SD		
Variables						
Global autonomy frustration	1.92	0.72	1.85	0.69	0.882	[−0.09; 0.24]
Global relatedness frustration	1.40	0.53	1.34	0.52	0.939	[−0.06; 0.18]
Autonomy relationship beliefs	5.19	0.74	5.35	0.69	−1.923	[−0.33; 0.00]
Relatedness relationship beliefs	5.31	0.71	5.43	0.66	−1.481	[−0.28; 0.04]
Autonomy frustration T_2	2.43	1.60	2.10	1.49	1.850	[−0.02; 0.70]
Relatedness frustration T_2	1.92	1.38	1.91	1.47	0.083	[−0.32; 0.35]
Negative disengaging emotions T_2	1.94	1.21	2.20	1.54	−1.587	[−0.59; 0.06]
Negative engaging emotions T_2	1.99	1.20	2.33	1.54	−2.064*	[−0.67; −0.02]
Autonomy frustration T_5	2.38	1.52	2.14	1.53	1.288	[−0.12; 0.59]
Relatedness frustration T_5	1.99	1.40	2.03	1.59	−0.198	[−0.39; 0.32]

*$p < 0.05$.

TABLE 2 Correlations between key variables.

		1	2	3	4	5	6	7	8	9	10
Principal variables	1. Autonomy frustration T_2	0.379**	0.595**	0.367**	0.446**	0.553**	0.407**	0.128	−0.077	0.110	0.200*
	2. Relatedness frustration T_2	0.418**	0.200**	0.332**	0.458**	0.433**	0.707**	−0.024	−0.018	0.200*	0.310**
	3. Negative disengaging emotions T_2	0.525**	0.338**	0.242**	0.683**	0.270**	0.182*	−0.050	−0.092	0.285**	0.244**
	4. Negative engaging emotions T_2	0.463**	0.454**	0.625**	0.404**	0.441**	0.410**	038	0.040	0.274**	0.280**
	5. Autonomy frustration T_5	0.539**	0.417**	0.300**	0.263**	0.271**	0.492**	0.020	−0.097	0.050	0.198*
	6. Relatedness frustration T_5	0.238**	0.621**	0.258**	0.471**	0.350**	0.048	−0.016	−0.087	0.165	0.390**
	7. Autonomy relationship beliefs	−0.059	−0.154	−0.070	−0.174*	−0.039	−0.116	0.274**	0.211*	−0.216**	−0.284**
	8. Relatedness relationship beliefs	−0.139	−0.202*	−0.163	−0.319**	−0.030	−0.228**	0.419**	0.076	−0.107	−0.092
Control variables	9. Global autonomy frustration	0.252**	0.243**	0.185*	0.199*	0.351**	0.132	−0.298**	−0.340**	0.244**	0.430**
	10. Global relatedness frustration	0.072	0.182*	0.108	0.216*	0.095	0.083	−0.417**	−0.363**	0.528**	0.220**

Correlations for women are presented above the diagonal, while correlations for men are presented below the diagonal. Correlations between men and women are presented on the diagonal.
*$p < 0.05$; **$p < 0.01$.

engaging emotions – sadness, hurt, disappointment – when their relatedness needs were frustrated during conflict. These findings were in line with our predictions and suggest that the kind of negative emotions partners experience during relationship conflict is associated with the specific relational need that is frustrated, suggesting that different emotions may indeed serve as alarms when specific relational needs are unmet.

Although we found evidence for the association between partners' level of autonomy/relatedness frustration and the concurrent experience of negative (dis)engaging emotions during conflict, we did not find evidence that these emotions predicted a decrease in relational frustration over the course of the conflict. We hypothesized that partners' experience and expression of disengaging emotions towards one another, potentially would foster social distancing behaviors and restore self-independence, thereby reducing autonomy frustration. By the same token, we expected that engaging emotions, would foster mutual cooperative behavior, promoting and/or restoring a sense of closeness and harmony, thereby reducing relatedness frustration. On the contrary, we found – at least for men – that higher levels of negative engaging emotions, as reported at the beginning of the conflict, were predictive of more relatedness frustration near the end of the interaction.

Three possible explanations for these finding arise. First, in our study we assessed partners' experienced emotions, not the expressed ones. It is possible that the emotions experienced by male participants were not the same as those expressed and therefore perceived by the partners. In Western cultures, men often adhere to traditional masculine ideals that discourage the open expression of emotions (Fischer and Manstead, 2000; Fischer et al., 2004). Speculatively, men might be more likely to suppress or downplay their emotional experiences during conflict interactions, leading to a discrepancy between their internal emotional state and what is outwardly expressed. This mismatch could have influenced the communication regarding the frustration of one's relational needs to the partner who consequently did not enact behaviors to meet them, thereby increasing their frustration. Second, negative (dis)engaging emotions might only be predictive of a decrease in frustration during conflict when these needs are frustrated to a significant degree or for a significant period of time. In our sample, the level of interaction-based need frustration was rather low and the research design focused on a limited time

TABLE 3 Results for the APIMs predicting negative disengaging and engaging emotions (T_2) from men's and women's autonomy and relatedness frustration (T_2), controlling for global relational need frustration.

	Estimate	SE	*p*	95% CI
Model 1a parameters				
Intercepts				
Men	1.88	0.09	0.000	[1.71; 2.06]
Women	2.26	0.12	0.000	[2.02; 2.49]
Actor effects				
Autonomy frustration$_{mT2}$ → Disengaging emotions$_{mT2}$	0.39	0.06	0.000	[0.27; 0.51]
Autonomy frustration$_{wT2}$ → Disengaging emotions$_{wT2}$	0.33	0.09	0.000	[0.16; 0.50]
Global autonomy frustration$_{m}$ → Disengaging emotions$_{mT2}$	0.09	0.13	0.762	[−0.22; 0.29]
Global autonomy frustration$_{w}$ → Disengaging emotions$_{wT2}$	0.48	0.18	0.007	[0.13; 0.83]
Partner effects				
Autonomy frustration$_{mT2}$ → Disengaging emotions$_{wT2}$	0.03	0.06	0.657	[−0.10; 0.15]
Autonomy frustration$_{wT2}$ → Disengaging emotions$_{mT2}$	0.03	0.08	0.729	[−0.13; 0.19]
Global autonomy frustration$_{m}$ → Disengaging emotions$_{wT2}$	0.21	0.13	0.114	[−0.05; 0.47]
Global autonomy frustration$_{w}$ → Disengaging emotions$_{mT2}$	0.30	0.17	0.084	[−0.04; 0.64]
Model 1b parameters				
Intercepts				
Men	1.98	0.09	0.000	[1.81; 2.16]
Women	2.35	0.12	0.000	[2.12; 2.57]
Actor effects				
Relatedness frustration$_{mT2}$ → Engaging emotions$_{mT2}$	0.36	0.07	0.000	[0.22; 0.49]
Relatedness frustration$_{wT2}$ → Engaging emotions$_{wT2}$	0.41	0.08	0.000	[0.25; 0.58]
Global relatedness frustration$_{m}$ → Engaging emotions$_{mT2}$	0.29	0.18	0.104	[−0.06; 0.63]
Global relatedness frustration$_{w}$ → Engaging emotions$_{wT2}$	0.40	0.24	0.097	[−0.07; 0.88]
Partner effects				
Relatedness frustration$_{mT2}$ → Engaging emotions$_{wT2}$	0.06	0.07	0.377	[−0.07; 0.19]
Relatedness frustration$_{wT2}$ → Engaging emotions$_{mT2}$	0.12	0.09	0.158	[−0.05; 0.30]
Global relatedness frustration$_{m}$ → Engaging emotions$_{wT2}$	0.08	0.19	0.689	[−0.30; 0.45]
Global relatedness frustration$_{w}$ → Engaging emotions$_{mT2}$	0.04	0.23	0.872	[−0.41; 0.48]

window. The short time frame may have limited the opportunity for participants to receive feedback and to engage in iterative processes. Effective emotion and frustration regulation involve continuous monitoring and adjustment, based on feedback from one's own emotions and the reactions of the partner (Yuan et al., 2015; Naragon-Gainey et al., 2017). With only a short period of time that was assessed, participants may not have had sufficient feedback from their partner or time to adapt their regulation strategies and responses, which hindered us to capture the complete unfolding of the regulatory process. Third, it is also possible that individual differences, such as attachment style, might impact how partners emotionally react when their or their partner's relational needs are frustrated during conflict. Previous studies showed how partners with anxious attachment styles, characterized by heightened emotional sensitivity and a strong desire for closeness, may be more vulnerable to experiencing emotional distress when their relational needs are unmet (Benson et al., 2013; Gökdağ, 2021). This heightened emotional reactivity, in turn, could contribute to elevated need frustration as they experience intensified negative emotions when their relational needs go unmet (Imran and Jackson, 2022). In contrast, individuals with avoidant attachment styles, who prioritize emotional self-sufficiency and independence, may exhibit emotional distancing when their needs go unmet (Kirby et al., 2005; Domingue and Mollen, 2009). This emotional distancing could intensify their sense of autonomy need frustration, as their emotional self-sufficiency may be hindered by the perceived emotional demands of their partner. Future studies should take into consideration the role of attachment styles in shaping the emotions-frustration association to provide a more nuanced understanding of the emotion dynamics within romantic relationships.

We found that a person's relatedness beliefs play a role in the experience of negative engaging emotions due to relatedness frustration during conflict. For people who considered relatedness to be important, negative engaging emotions were not so strongly associated with relatedness frustration as for people low on relatedness beliefs. This was not in line with our prediction, but might result from the fact that individuals who place more importance on relatedness within their relationship, might cope better – and more constructively – with their relatedness frustration, enacting self-regulatory

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TABLE 4 Results for the APIMs predicting autonomy and relatedness frustration (T_5) from men's and women's negative disengaging and engaging emotions (T_2), controlling for autonomy and relatedness frustration at previous time during the interaction (T_2).

	Estimate	SE	*p*	95% CI
Model 2a parameters				
Intercepts				
Men	2.35	0.11	0.000	[2.13; 2.58]
Women	2.22	0.11	0.000	[1.99; 2.44]
Actor effects				
Disengaging emotions$_{mT2}$ → Autonomy frustration$_{mT5}$	0.04	0.11	0.672	[−0.16; 0.25]
Disengaging emotions$_{wT2}$ → Autonomy frustration$_{wT5}$	0.07	0.08	0.376	[−0.08; 0.21]
Autonomy frustration$_{mT2}$ → Autonomy frustration$_{mT5}$	0.45	0.08	0.000	[0.28; 0.61]
Autonomy frustration$_{wT2}$ → Autonomy frustration$_{wT5}$	0.51	0.08	0.000	[0.34; 0.67]
Partner effects				
Disengaging emotions$_{mT2}$ → Autonomy frustration$_{wT5}$	−0.12	0.08	0.120	[−0.27; 0.03]
Disengaging emotions$_{wT2}$ → Autonomy frustration$_{mT5}$	0.05	0.11	0.674	[−0.17; 0.26]
Autonomy frustration$_{mT2}$ → Autonomy frustration$_{wT5}$	0.20	0.08	0.018	[0.03; 0.36]
Autonomy frustration$_{wT2}$ → Autonomy frustration$_{mT5}$	0.06	0.08	0.500	[−0.11; 0.22]
Model 2b parameters				
Intercepts				
Men	2.05	0.09	0.000	[1.97; 2.32]
Women	2.00	0.10	0.000	[1.81; 2.20]
Actor effects				
Engaging emotions$_{mT2}$ → Relatedness frustration$_{mT5}$	0.32	0.09	0.001	[0.14; 0.50]
Engaging emotions$_{wT2}$ → Relatedness frustration$_{wT5}$	0.13	0.07	0.093	[−0.02; 0.27]
Relatedness frustration$_{mT2}$ → Relatedness frustration$_{mT5}$	0.54	0.07	0.000	[0.39; 0.68]
Relatedness frustration$_{wT2}$ → Relatedness frustration$_{wT5}$	0.71	0.07	0.000	[0.56; 0.85]
Partner effects				
Engaging emotions$_{mT2}$ → Relatedness frustration$_{wT5}$	−0.05	0.07	0.454	[−0.19; 0.09]
Engaging emotions$_{wT2}$ → Relatedness frustration$_{mT5}$	−0.06	0.10	0.566	[−0.24; 0.13]
Relatedness frustration$_{mT2}$ → Relatedness frustration$_{wT5}$	−0.08	0.07	0.242	[−0.22; 0.06]
Relatedness frustration$_{wT2}$ → Relatedness frustration$_{mT5}$	0.02	0.08	0.751	[−0.13; 0.18]

mechanisms that do not elicit such a strong emotional experience of negative engaging emotions, and prevent distancing (Rusbult et al., 1991; Harper and Welsh, 2007; Buck and Neff, 2012). Moreover, it is possible that individual differences such as heightened awareness and attunement to relational dynamics, and adaptive and constructive interpersonal skills, might also moderate gender differences found. Investigating these individual differences in future studies could shed light on whether men who hold more beliefs valuing relatedness may exhibit enhanced abilities in utilizing emotion as information, expressing their emotions, and engaging in self and co-regulation processes.

Finally, the absence of significant partner effects in the frustration-emotion association might be explained by the fact that rather than the actual values of frustration and specific emotions as auto-reported by partners, an individual's "perception" of partners' needs frustration and emotions matters. Partners may have experienced specific levels of relational frustration and emotions, but not expressed them, making it hard for the other partner to perceive them. For example, if an individual perceived that the partner was experiencing a low level of relational need frustration or specific emotions, this perception may have influenced how the individual responded emotionally during the conflict situation, even if the partner did report high levels of need frustration or that specific emotional experience themselves. Taken together, our findings suggest that the association between emotions and need frustration is – at least in the short term – mainly determined by one's own experiences during conflict.

4.1 Limitations and future research

Being the first study that directly investigates the association between partners' interaction-based need frustration and the experience of (dis)engaging emotions in partners, several limitations should be considered. First, due to the set-up of the study, interaction-based need frustration and emotional experience were assessed only twice during the video-review task, and within a time-interval of 5 min. It is possible that relevant degrees of need frustration and emotions occurred that were not captured at these two points (T_2 and

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TABLE 5 Results for the moderated APIMs predicting negative disengaging and engaging emotions (T_2) from the men's and women's autonomy and relatedness frustration (T_2), controlling for global relational need frustration.

	Estimate	SE	*p*	95% CI
Model 3a parameters				
Intercepts				
Men	1.89	0.09	0.000	[1.71; 2.07]
Women	2.28	0.13	0.000	[2.03; 2.52]
Main effects				
Actor effects				
Autonomy frustration$_{mT2}$ → Disengaging emotions$_{mT2}$	0.39	0.06	0.000	[0.26; 0.51]
Autonomy frustration$_{wT2}$ → Disengaging emotions$_{wT2}$	0.36	0.09	0.000	[0.17; 0.55]
Autonomy beliefs$_{m}$ → Disengaging emotions$_{mT2}$	−0.02	0.13	0.870	[−0.28; 0.24]
Autonomy beliefs$_{w}$ → Disengaging emotions$_{wT2}$	−0.07	0.19	0.729	[−0.45; 0.31]
Global autonomy frustration$_{m}$ → Disengaging emotions$_{mT2}$	0.05	0.13	0.707	[−0.21; 0.32]
Global autonomy frustration$_{w}$ → Disengaging emotions$_{wT2}$	0.47	0.18	0.011	[0.11; 0.83]
Partner effects				
Autonomy frustration$_{mT2}$ → Disengaging emotions$_{wT2}$	0.03	0.09	0.637	[−0.14; 0.19]
Autonomy frustration$_{wT2}$ → Disengaging emotions$_{mT2}$	0.03	0.06	0.730	[−0.10; 0.16]
Global autonomy frustration$_{m}$ → Disengaging emotions$_{wT2}$	0.21	0.14	0.127	[−0.06; 0.48]
Global autonomy frustration$_{w}$ → Disengaging emotions$_{mT2}$	0.28	0.18	0.123	[−0.08; 0.63]
Interaction effects				
Actor effects				
Autonomy beliefs$_{m}$*autonomy frustration$_{mT2}$ → Disengaging emotions$_{mT2}$	0.09	0.08	0.316	[−0.08; 0.25]
Autonomy beliefs$_{w}$*autonomy frustration$_{wT2}$ → Disengaging emotions$_{wT2}$	−0.09	0.15	0.551	[−0.39; 0.21]
Partner effects				
Autonomy beliefs$_{m}$*autonomy frustration$_{mT2}$ → Disengaging emotions$_{wT2}$	−0.04	0.08	0.657	[−0.21; 0.13]
Autonomy beliefs$_{w}$*autonomy frustration$_{wT2}$ → Disengaging emotions$_{mT2}$	0.01	0.11	0.942	[−0.23; 0.24]
Model 3b parameters				
Intercepts				
Men	1.94	0.09	0.000	[1.77; 2.11]
Women	2.34	0.12	0.000	[2.11; 2.57]
Main effects				
Actor effects				
Relatedness frustration$_{mT2}$ → Engaging emotions$_{mT2}$	0.30	0.07	0.000	[0.17; 0.43]
Relatedness frustration$_{wT2}$ → Engaging emotions$_{wT2}$	0.45	0.09	0.000	[0.28; 0.62]
Relatedness beliefs$_{m}$ → Engaging emotions$_{mT2}$	−0.24	0.13	0.069	[−0.49; 0.02]
Relatedness beliefs$_{w}$ → Engaging emotions$_{wT2}$	0.08	0.17	0.647	[−0.26; 0.42]
Global relatedness frustration$_{m}$ → Engaging emotions$_{mT2}$	0.17	0.18	0.334	[−0.18; 0.52]
Global relatedness frustration$_{w}$ → Engaging emotions$_{wT2}$	0.37	0.24	0.127	[−0.11; 0.85]
Partner effects				
Relatedness frustration$_{mT2}$ → Engaging emotions$_{wT2}$	0.13	0.09	0.134	[−0.04; 0.30]
Relatedness frustration$_{wT2}$ → Engaging emotions$_{mT2}$	0.08	0.06	0.187	[−0.04; 0.21]
Global relatedness frustration$_{m}$ → Engaging emotions$_{wT2}$	0.07	0.18	0.713	[−0.30; 0.42]
Global relatedness frustration$_{w}$ → Engaging emotions$_{mT2}$	0.03	0.23	0.898	[−0.42; 0.48]
Interaction effects				
Actor effects				

(Continued)

TABLE 5 (Continued)

	Estimate	SE	*p*	95% CI
Relatedness beliefs$_{m}$*relatedness frustration$_{mT2}$ → Engaging emotions$_{mT2}$	−0.19	0.08	0.015	[−0.34; −0.04]
Relatedness beliefs$_{w}$*relatedness frustration$_{wT2}$ → Engaging emotions$_{wT2}$	−0.24	0.12	0.038	[−0.47; −0.01]
Partner effects				
Relatedness beliefs$_{m}$*relatedness frustration$_{mT2}$ → Engaging emotions$_{wT2}$	0.08	0.08	0.337	[−0.08; 0.24]
Relatedness beliefs$_{w}$*relatedness frustration$_{wT2}$ → Engaging emotions$_{mT2}$	0.05	0.11	0.676	[−0.17; 0.26]

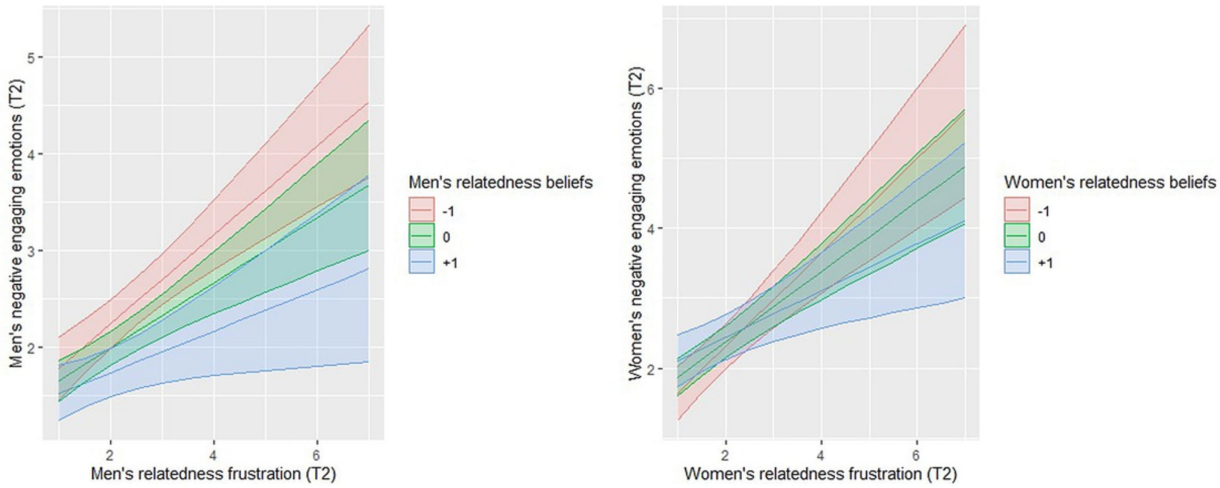

FIGURE 4
The interaction effects of relatedness beliefs with relatedness frustration on negative engaging emotions for both genders. Note: Lines represent the simple slopes of low (−1 SD) and high (+1 SD) relatedness beliefs. Analyses were conducted with unstandardized coefficients. The colors represent the 95% confidence intervals.

T_5). It would be therefore valuable to replicate these findings using continuous measures assessing longer time spans in order to better capture the interaction's dynamics. Such measurements would also allow to more properly investigate the temporal characteristics of the frustration-emotion association. Second, the present study was set in a laboratory environment in which couples discussed negative topics regarding their couple relationship and thereafter performed a video-mediated recall task. However, this paradigm has been shown in previous research to often elicit limited emotional responses in participants (Ickes et al., 2000; Gordon and Chen, 2014). Future studies with different methods, such as experience sampling methods, are needed to generalize our findings across different types of interpersonal situations and naturally occurring interactions. Third, while a range of conflict topics common in romantic relationships was examined, the current study did not pre-test for nor differentiated between these conflict topics based on partners' perceived severity of the conflict. Consequently, the potential influence of conflict severity on partners' needs frustration, and emotional responses remains unexplored. Future observational research should aim to deal with this limitation. Finally, our study was based on a convenience sample of western, middle-class, and heterosexual couples, thereby limiting the generalizability of the results. Consequently, future research is needed to replicate these findings with more heterogeneous samples and with cross-cultural validation, especially in cultures varying in the importance of in (ter) dependence relational needs and (dis)engaging emotions (Mesquita et al., 2017; Schouten et al., 2020).

5 Conclusion

The present study provides first direct evidence that partners' emotional experience varies according to the frustration of their own relational needs during conflict. While autonomy frustration in partners concurred with the experience of more negative disengaging emotions such as anger and irritation, relatedness frustration went together with experiencing more negative engaging emotions such as hurt, sadness, and disappointment. The importance that partners attribute to relatedness within relationships in general, influenced the experience of negative engaging emotions resulting from the frustration of this particular need, whereas this did not apply to the importance that partners attribute to autonomy with regard to the association between autonomy frustration and the experience of negative disengaging emotions. Furthermore, the experience of negative disengaging emotions did not influence the frustration of the need for autonomy during the conflict, while the experience of negative engaging emotions positively predicted relatedness frustration during the interaction, but only for men. Although future research should uncover further nuances, our findings provide

promising insight into how emotional experience may vary as a function of intimate relationship needs. This knowledge can increase the awareness of couple therapists in adopting a needs perspective during the case-formulation and intervention stages of therapy as it may allow them to focus on more covert underlying relational issues.

Data availability statement

The datasets presented in this study can be found in online repositories. The names of the repository/repositories and accession number (s) can be found at: osf.io/cuvj8.

Ethics statement

The studies involving humans were approved by Ethical Committee of the Faculty of Psychology and Educational Sciences of Ghent University. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

DP: conceptualization, validation, formal analysis, data curation, writing – original draft, and visualization. LS: conceptualization, methodology, validation, formal analysis, review and editing, and supervision. LV: resources, review and editing, supervision, project administration, and funding acquisition. All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2023.1232125/full#supplementary-material

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The psychology of romantic relationships: motivations and mate preferences

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Introduction: This study investigates motivations to engage in romantic relationships. We examine the structure of romantic motivations and their connections with personal values and mate preferences.

Method: The study was conducted in Israel among young men and women looking for a romantic partner (n = 1,121, 40% male, age 18–30).

Results: Data analysis demonstrated that basic romantic motivations form a circumplex that may be partitioned into four higher-order romantic motivations: love and care, family and children, status and resources, and sex and adventure. The romantic motivations formed a meaningful pattern of connections with higher-order values, thus confirming that context-specific motivations are derived from general motivational goals expressed in values. Personal value preferences and romantic motivations predicted the sought-after partner characteristics over and above sociodemographic variables. Values were indirectly (through romantic motivations) and directly connected to mate preferences.

Discussion: The study advances our understanding of romantic relationships among young people and opens new directions for research and counseling.

KEYWORDS

romantic relationships, romantic motivations, personal values, mate preferences, adolescents and young adults, Israel, Jews, Arabs

> *There are so many books on how to get married and not one on why. Anonymous*

Introduction

This study focuses on the motivational aspects of romantic relationships. We define romantic relationships as those based on the emotional and physical attraction that could lead to long-term intimate relationships. We focus on young people looking for romantic relationships, i.e., those who presently have no romantic partner but are interested in finding a boy/girlfriend. We strive to understand what motivates young people to engage in romantic relationships, how their romantic motivations are related to the general motivational goals reflected in their value preferences, and whether romantic motivations and values can predict the sought-after characteristics of the partner.

Our study is based on the theory of human values (Schwartz et al., 2012; Schwartz, 2017). This general psychological theory presents a comprehensive system of human motivations corroborated as near-universal across different cultures (Schwartz et al., 2012; Sagiv and Schwartz, 2022). Numerous studies have demonstrated that values affect human cognition, emotions, and behavior (Schwartz, 2017; Sagiv and Roccas, 2021). However, they have rarely been applied to the study of romantic relationships.

Motivations for romantic relationships

Previous studies on pre-marriage romantic motivations focused on motivations to engage in sexualized relationships – "hookups" (Uecker and Stokes, 2008; Townsend et al., 2020; Weitbrecht and Whitton, 2020; Thorpe and Kuperberg, 2021) and dating motivations (Rempel et al., 1985; Jones, 1993; Smiler, 2008; Keramat et al., 2013; Bryant and Sheldon, 2017; Timmermans and Alexopoulos, 2020). These studies assumed that people have numerous motivations to engage in romantic relationships. Thus, considering motivations for sexualized romantic relationships (hookups), researchers mention getting an experience, sexual experimentation, physical pleasure, fun, excitement, feeling attractive, escaping loneliness, increasing social status, answering social expectations, and following a social script (Uecker and Stokes, 2008; Weitbrecht and Whitton, 2020; Thorpe and Kuperberg, 2021). The list of dating motivations included social status, approval from others, new opportunities, sex, emotional support, adventure, curiosity, love, companionship, a step to marriage, care, and empathic concern (Rempel et al., 1985; Bryant and Sheldon, 2017). Several researchers clustered basic romantic motivations into higher-order motivations. One partition distinguished between autonomous (e.g., fun) and non-autonomous motivations (e.g., fulfilling others' expectations) (Townsend et al., 2020). Another classification distinguished between extrinsic (e.g., social status), instrumental (e.g., emotional support), and intrinsic (e.g., mutual comfort) romantic motivations (Rempel et al., 1985).

Other researchers focused on marriage motivations. (Eekelaar, 2007; Park and Rosén, 2013; Czyżkowska and Cieciuch, 2020). Thus, in a qualitative study conducted among women in the UK, the participants reported that marriage provided them with reproductive, financial, and legal security (Carter, 2018). Specifically, they noted that marriage raised their social status, provided them with economic resources, and increased the security of their children. Moreover, many women connected marriage with tradition. They also said marriage is desirable because it is traditional, natural, and "normal"; not marrying is undesirable, abnormal, and socially unacceptable. Another qualitative study in the UK demonstrated that some people marry because they comply with the convention, i.e., follow religious rules or prescriptions, social or cultural practices, and their parents' wishes (Eekelaar, 2007).

A quantitative study conducted in the US found six reasons for marriage: romance, respect, trust, finances, meaning, and physical (Park and Rosén, 2013). A 2010 Pew Research Center survey investigating the reasons to marry in the US found that love, indeed, wins all, followed by companionship, having children, and financial stability. Answering the question about the advantages of being married over single, respondents mentioned having a fulfilling sex life, being financially secure, finding happiness, getting ahead in a career, and having social status (Cohn, 2013).

Studies conducted in Russia distinguished between biological, sociocultural, economic, and psychological motives of marriage (Fedoseeva and Ivanova, 2018). Among the most common motives were an escape from parents, a sense of duty, an escape from loneliness, and following a tradition. Love, prestige, and the search for material wealth took the last places in this ranking. In addition, the following reasons were mentioned: understanding, psychological support, being an authentic self, self-realization, and having and raising children. Finally, a study conducted in Nigeria found that when considering marriage, people consider parental pressure and social norms, economic survival, connection with wealthy and powerful individuals, domestic help, guaranteed support, and reproductive tasks (James, 2010).

The literature review demonstrates that in most studies, romantic motivations were used as a list of non-related entities; they remained unsystematized (for exemptions, see Rempel et al., 1985; Jones, 1993; Townsend et al., 2020), and the connections between them remained unclear (Eekelaar, 2007; James, 2010; Cohn, 2013; Park and Rosén, 2013; Hurt, 2014; Carter, 2018; Fedoseeva and Ivanova, 2018; Thorpe and Kuperberg, 2021). Most existing studies on romantic motivations are not theory-driven. Therefore, we need a theory that will permit us to systematize numerous motivations for romantic relationships into a meaningful structure and explain connections between them and other variables.

Theory of human values

Values are cognitive constructs defining desirable trans-situational goals and ordered by importance; they represent people's motivations and provide a basis for attitudes and behavior (Schwartz, 2006). The present study is based on Schwartz's theory of values (Schwartz et al., 2012; Schwartz, 2017). In its most recent formulation, the theory specifies a comprehensive set of 19 motivationally distinct values: power (dominance and resource), achievement, hedonism, stimulation, self-direction (thought and action), universalism (nature, concern, and tolerance), benevolence (caring and dependability), humility, tradition, conformity (rules and interpersonal), security (personal and social), and face (Schwartz et al., 2012).

The theory assumes the existence of dynamic relations between the values in that the pursuit of each value has consequences that may conflict or may be congruent with the pursuit of other values. The conflicts and congruities among basic values yield an integrated structure of four higher-order value types arrayed along two orthogonal dimensions: self-transcendence vs. self-enhancement and openness to change vs. conservation. Openness to change values (including self-direction and stimulation) emphasize readiness for new ideas, actions, and experiences. They contrast with conservation values (including conformity, tradition, and security) that emphasize self-restriction, order, and preserving the status quo. Self-enhancement values (including power and achievement) emphasize pursuing one's interests. They contrast with self-transcendence values (including universalism and benevolence) that emphasize transcending one's interests for the sake of others. Three values overlap between two higher-order value types: face (conservation and self-enhancement), hedonism (openness and self-enhancement), and humility (self-transcendence and conservation) (Schwartz et al., 2012).

Researchers assume that personal value preferences affect the individual's attitudes, behavior, and emotions because values express general motivational goals in human life (Schwartz, 2017). Several psychological mechanisms explaining the effect of values have been suggested; however, the valence mechanism is probably the most crucial (Hitlin, 2003; Sagiv and Roccas, 2021). This mechanism assumes that people choose specific attitudes, behaviors, and emotions to attain the general motivational goals reflected in their value preferences (Schwartz, 2017). The existence of the valence mechanism has been confirmed in numerous studies regarding a wide range of

behaviors and emotions (Tamir et al., 2016; Sagiv and Roccas, 2021); however, it has not been investigated in the context of romantic relationships.

Conceptualization of romantic motivations

We assume that general motivational goals expressed in personal value preferences provide a foundation for all other motivations in human life. We further assume that people formulate (or may formulate) specific motivational goals they strive to achieve in each context. The context-specific goals are derived from general motivational goals reflected in values. The connection of context-specific to general goals is twofold. First, the content of each context-specific goal is related to the corresponding general motivational goal (or several such goals). Second, the structure of context-specific goals (the commonalities and contradictions between them) parallels (probably, with some exemptions) the values' structure. That means that basic context-specific motivations constitute a circumplex that may be divided into higher-order motivations that parallel higher-order values. Finally, we assume that general motivational goals affect attitudes and behaviors directly and indirectly through their connections with context-specific motivations. The idea of context-specific motivations connected to values has been recently suggested for investigating copying with COVID-19 and the energy crisis (Liscio et al., 2022), artificial intelligence (Masso et al., 2023), and marriage (Czyżkowska and Cieciuch, 2020). In the present study, we apply the concept of context-specific motivations to the investigation of romantic motivations.

Developing the concept of romantic motivations, we assumed that when looking for a partner, people aspire to attain motivational goals that are attainable in romantic relationships. We further assumed that individuals derive their romantic motivational goals from their general motivational goals expressed in their value preferences. Therefore, romantic relationships are a vehicle for attaining specific motivational goals that express general motivational goals in the context of romantic relationships. Thus, romantic motivational goals may have different importance across individuals following their value preferences. Finally, we assumed that the choice of a romantic partner depends on the motivational goals of the individual, i.e., people look for a partner who will best help them attain their motivational goals.

Building the romantic motivations scale

We built the scale measuring romantic motivations in several steps. First, we collected romantic motivations mentioned in the research literature and, when required, reformulated them to fit the situation of looking for a boy/girlfriend. In addition, we conducted interviews with about 80 young people from different ethno-religious groups in Israel, asking them about their motivations for seeking a girl/boyfriend. Thus, we created a comprehensive list of romantic motivations. After that, with a group of students applying the inter-judges' agreement, we discarded repeated items and reformulated some items to make them clearer (Taherdoost, 2016). Then, we used the inter-judges' agreements with a colleague researcher, an expert in value theory, to decide to which basic motivation each item belongs and to which higher-order motivational cluster each basic romantic motivation belongs, paralleling the values' circumplex (Schwartz et al., 2012; Czyżkowska and Cieciuch, 2020). Thus, we formulated 14 basic motivations people pursued in their quest for romantic relationships and generated a list of items measuring each motivation. We did not find romantic motivations related to security (social), conformity (rules), humility, and universalism values. Motivational goals represented in these values are probably unattainable in romantic relationships. Table 1 lists values, general motivational goals, and basic romantic motivations. Appendix Table A1 presents basic romantic motivations and the corresponding scale items.

Based on the similarities between romantic motivations and general motivational goals reflected in values, we hypothesized that basic romantic motivations form a circumplex paralleling the values' circumplex, which might be partitioned into four higher-order romantic motivations (clusters of basic romantic motivations), each related to a higher-order value (H1):

1. A cluster related to openness to change values includes the following romantic motivations: psychological growth, independence from parents, escape from loneliness, and sexual satisfaction.
2. A cluster related to self-enhancement values includes the following romantic motivations: social advancement, control over the other, economic benefits, and gaining respect.
3. A cluster related to conservation values includes obligations to raise a family, finding a partner for childbearing and childrearing, resolving social pressure to find a partner, finding emotional support, and feeling loved.
4. Care for the other through romantic relationships is related to self-transcendence values.
5. Romantic motivations derived from opposing higher-order values are located on opposite sides of the circumplex: the first and third motivational clusters oppose each other, as well as the second and fourth clusters.

The effect of socio-demographic variables on romantic motivations

Several studies have investigated the effects of socio-demographic variables on romantic motivations. When reporting on their motivation for hookups and other sexualized romantic relationships, women placed a greater emphasis on love, commitment, and initiating or solidifying relationships, while men were more likely to endorse pleasure, self-affirmation, status, and peer conformity as their motives (Smiler, 2008; Weitbrecht and Whitton, 2020; Thorpe and Kuperberg, 2021). The gender differences in marriage motivations indicated that women more than men marry for economic security and religious reasons, while men more often than women seek the satisfaction of sexual needs (Blakemore et al., 2005; Spivey, 2010; Gittins, 2017; Carter, 2018).

Data regarding ethnic and racial differences in romantic motivations is scarce. In one study, men and women of color in the US reported a stronger motivation for sex in hookups (Uecker et al., 2015). However, when considering marriage, black women reported a stronger economic motivation than white women, and both genders reported more religious motivations for marriage than whites (Bulcroft and Bulcroft, 1993; Edin, 2000; Hurt, 2014).

TABLE 1 Values, general motivational goals, and basic romantic motivations.

Values	General motivational goals	Basic romantic motivations
Self-direction	Freedom to cultivate one's ideas and abilities and determine one's actions	Psychological growth
		Independence from parents
Stimulation	Excitement, novelty, and change	Escape from loneliness
Hedonism	Pleasure and sensuous gratification	Sexual satisfaction
Achievement	Success according to social standards	Social advancement
Power	Exercising control over people and resources	Control over the other
		Economic benefits
Face	Maintaining one's public image and avoiding humiliation	Respect
Security (Personal)	Safety in one's immediate environment	Receiving emotional support
		Feeling loved
Tradition	Maintaining and preserving cultural, family, or religious traditions	Starting a family
		Childbearing and childrearing
Conformity (Rules)	Avoidance of upsetting or harming other people	Avoiding social pressure
Benevolence	Being a reliable and trustworthy member of the group devoted to the welfare of group members	Care for the other

The motivation to create a family was stronger among young religious dating people than non-religious people (Fuller et al., 2015). At the same time, highly educated and non-religious young people reported stronger marriage motivations related to sex, pleasure, and mutual care (Eekelaar, 2007; Hurt, 2014; Fedoseeva and Ivanova, 2018).

Previous studies applied evolutionary and biosocial role theories to explain the effects of socio-demographic variables on romantic motivations (Bulcroft and Bulcroft, 1993; Eekelaar, 2007; Smiler, 2008). In the present study, we applied the values theory to formulate our hypotheses on the effect of socio-demographic variables on romantic motivations (Schwartz, 2017). As explained above, we assumed that romantic motivations are derived from general motivational goals expressed in personal value preferences. Therefore, we assumed that connections of socio-demographic variables with romantic motivations parallel their connections with values. The connections between socio-demographic variables and values are well-studied (Sagy et al., 2001; Schwartz et al., 2012; Schwartz, 2017; Walsh and Tartakovsky, 2021; Tartakovsky, 2023). At the level of higher-order values, a higher preference for openness to change and a lower preference for conservation values are associated with a younger age, being a male, a higher level of education, a lower level of religiosity, and being Jewish vs. Arab Israeli. A higher preference for self-transcendence and a lower preference for self-enhancement values is associated with an older age, being a female, being Jewish vs. Arab Israeli, and having a higher level of education. In line with the results of previous studies, we formulated the following hypotheses related to the connections between socio-demographic variables and romantic motivations:

> *H2*: A higher preference for romantic motivations related to openness to change values and a lower preference for romantic motivations related to conservation values are associated with a younger age, being a male, a higher level of education, being a Jewish Israeli, and a lower level of religiosity.
>
> *H3*: A higher preference for romantic motivations related to self-transcendence values and a lower preference for romantic motivations related to self-enhancement values are associated with an older age, being a female, being a Jewish Israeli, and a higher level of education.

Mate preferences

Most existing studies on mate preferences have focused on the issues of universality in the ranking and gender similarities and differences (Buss et al., 2001). The results of these studies have been unequivocal: Both genders prefer a mate who is kind, intelligent, and healthy; however, there are cross-cultural gender differences related to the resources and fertility characteristics of the mate. Women, more than men, prefer long-term partners with the ability to acquire and confer resources, while men, more than women, prefer partners with high reproductive value, indicated by attractiveness and relative youth (Walter et al., 2020). Two theories explain the gender differences in mate preference. The evolutionary theory states that gender differences result from women facing a larger reproductive investment than men. Biosocial role theory claims that gender differences result from the behaviors that men and women cultivate based on societal expectations of gender roles (Buss et al., 2001; Thompson and O'Sullivan, 2012).

Another universal finding regarding mate preferences relates to assortative mating: In all cultures and social groups, individuals prefer partners similar to them (Thompson and O'Sullivan, 2012; Cooperman and Waller, 2022). Moreover, couples of similar spouses are more stable and happier in relationships (Buss et al., 2001; Luo, 2017). Different socio-psychological mechanisms explaining assortative mating have been suggested, including personal preferences, mating market operation, social homogamy, and convergence (Luo, 2017). No gender differences in assortative mating have been assumed, and we found no empirical studies on this issue. However, one study demonstrated that higher education was associated with a higher importance of similarity in the partner (Whyte and Torgler, 2017).

Few studies have focused on interpersonal differences in mate preferences and psychological theories explaining them. One such study applied attachment theory; however, it found that differences in

attachment styles are not related to mate preferences (Cohen and Belsky, 2008). Another study investigated the connection between self-monitoring, dating motivations, and mate preferences (Jones, 1993). It found that high self-monitoring individuals (those who are attentive to the situation and interpersonal cues for appropriate behavior) preferred partners with high social status, sex appeal, and physical attractiveness, while low self-monitoring individuals (those who based their behavior on their attitudes, feelings, and beliefs) preferred partners high on honesty, loyalty, and similar believes and values. In addition, high self-monitoring individuals expressed more extrinsic motivations for dating, while low self-monitoring individuals expressed more intrinsic motivations for dating. Finally, one study applied Schwartz's values theory (Goodwin and Tinker, 2002). This study has demonstrated that personal value preferences can explain individual differences in mate preferences. Specifically, the higher importance of conservation vs. openness to change values was associated with higher preferences for a partner who is a good earner, from a good family, healthy, a good housekeeper, and religious. The higher importance of self-enhancement vs. self-transcendence values was associated with preferences for a partner who is attractive, healthy, from a good family, wants children, is a good earner, a university graduate, and a good housekeeper. The present study investigates the connections between mate preferences and motivational goals, general (expressed in values) and context-specific (expressed in romantic motivations).

The present study focuses on three characteristics of the potential partner: socioeconomic status, physical attractiveness, and similarity. We chose these characteristics because they have been well-studied from the perspective of group differences/similarities, while the individual-level factors affecting them have rarely been investigated. In the present study, we assumed that individuals derive their mate preferences from their romantic motivations, i.e., they look for a partner to help them attain their romantic motivational goals. Individual mate preferences might also be connected to personal value preferences since the correctly chosen partner may help to attain one's general motivational goals (Goodwin and Tinker, 2002).

We assume that romantic relationships with a high-status partner may permit individuals to raise their social status and achieve social dominance and control over resources by using the partner's status and resources (Cohn, 2013; Gittins, 2017). Thus, seeking a high-status partner should be compatible with romantic motivations associated with self-enhancement values – dominance over others, control over resources, and demonstrating social success (Schwartz, 2017).

The partner's physical attractiveness must be important for individuals seeking a romantic partner to satisfy sexual needs (Thompson and O'Sullivan, 2012; Gittins, 2017). In addition, people looking for social challenges and obtaining a new experience may also prefer a good-looking partner because it is more challenging to develop relationships with such a partner (Cohen and Belsky, 2008; Park and Rosén, 2013). Thus, the partners' physical attractiveness may be compatible with romantic motivations associated with openness to change values.

Finally, having a partner similar to oneself is socially normative and promotes the preservation of the existing social order and tradition (Luo, 2017). It may also increase the individual's sense of security (Schwartz C. R., 2013). Therefore, looking for a similar partner should be compatible with romantic motivations associated with conservation values (Schwartz, 2017; Czyżkowska and Cieciuch, 2020). Based on these assumptions, we formulated the following hypotheses related to connections between romantic motivations and mate preferences:

> *H4*: The higher importance of social status in the romantic partner is connected to romantic motivations associated with self-enhancement values.
>
> *H5*: The higher importance of physical attractiveness in a romantic partner is connected to romantic motivations associated with openness to change values.
>
> *H6*: The higher importance of similarity in the romantic partner is connected to romantic motivations associated with conservation values.
>
> *H7*: Romantic motivations partly mediate the connections between values and mate preferences, i.e., values are connected to mate preferences directly and indirectly through their connection to the corresponding romantic motivations.

Methods

Participants and procedures

This study used a community convenience sample of 1,121 participants (40% males). The mean age was 24.3 ($SD = 3.11$, range = 18–30). 79% of the participants had a tertiary degree or studied for such a degree. 70% of the participants were Jewish, 24% were Muslim, 5% were Christian, and 1% were Druze. 56% were secular, 29% were traditional (following some religious traditions and practices), and 16% were religious. Immigrants constituted 5% of the sample. Compared to the sociodemographic characteristics of young people reported by the Israeli Central Bureau of Statistics (2023), the following groups were slightly (10% or less) overrepresented in the sample: women, secular, highly educated, and Israeli-born. At the time of the study, all participants had no romantic partner; however, about 2/3 of them had such a partner in the past.

The Tel-Aviv University Review Board approved the study. Undergraduate students who participated in a senior research seminar (a third-year BA course) distributed the questionnaires as a part of the course requirements. Students participating in the seminar lived in different areas of the country, ensuring a geographically heterogeneous sample. Adults aged 18–30 who did not have a girl/boyfriend but would like to find one were invited to participate in the study. The anonymity of the participants was ensured, and all participants signed an informed consent form. The questionnaires were distributed using Google Forms through WhatsApp, Facebook, and e-mail. The participants did not receive compensation for completing the questionnaires. The study was conducted in Hebrew.

Measures

Personal value preferences

Personal value preferences were measured using the Portrait Values Questionnaire, PVQ-R (Schwartz et al., 2012). This

questionnaire consists of 57 items. Each item portrays an abstract person describing their goals, aspirations, and wishes that indicate the importance of a specific value. Respondents indicate how similar the described person is to them on a 6-point scale, from 1 (*not like me at all*) to 6 (*very much like me*). Item example (Conformity): "It is important to him/her to avoid upsetting other people." Cronbach's alphas of the four higher-order values were high: self-enhancement – 0.86, openness to change – 0.84, conservation – 0.86, and self-transcendence – 0.88. The higher-order values on the axes' poles were strongly negatively correlated: $r = -0.67$ for openness to change – conservation and $r = -0.61$ for self-transcendence – self-enhancement. To avoid the multicollinearity problem, we used axes' scores in all multivariate analyses, built by subtracting the scores of one pole of an axis from the other. This approach was suggested in several previous studies (Goodwin and Tinker, 2002; Abramson et al., 2018; Sverdlik and Rechter, 2020).

Romantic motivations

The scale measuring romantic motivations was created for the present study. The scale included 73 items allocated into 14 basic romantic motivations. Thus, each motivation was measured using 3–9 items. The participants were asked to what extent each motivation was important in their search for a girl/boyfriend. They answered on a 6-point scale, from 1 – *not important at all* to 6 – *very important*. Example items: "To feel loved." "To avoid boredom." "To have somebody who will buy me things." "To satisfy my parents' expectations." The internal consistency of all 14 subscales measuring romantic motivations was high (Cronbach alphas 0.84–0.95). Appendix Table A1 presents romantic motivations and scale items with Cronbach alphas for each scale.

Mate preferences

We measured the importance of three characteristics of the potential partner: social status, physical attractiveness, and similarity. Mate preferences in status (4 items) and attractiveness (3 items) were measured using items from Buss et al. (2001). Items measuring similarity (5 items) were adopted from Buss et al. (2001), Schwartz (2013), and Luo (2017). The participants were asked how important it is to them that their girl/boyfriend would have specific characteristics. They answered on a 6-point scale, from 1 – *not important at all* to 6 – *very important*. Example items: "Has a high social status." "Looks good." "Has interests similar to yours." To test for the structural validity of the scale, we conducted Exploratory Factor Analysis (EFA) separately for men and women. We used the Principal Component Extraction Method, Oblimin Rotation with Kaiser Normalization, and a fixed number of factors to extract. The results confirmed the scale's structure. The total variance explained by the three-factor solution was 64% for men and 61% for women. As required, all first-factor loadings were higher than 0.40, with no second-factor loading higher than 0.30. Appendix Table A2 presents the EFA results. Internal consistency of the mate preference subscales measured by Cronbach's α was high (men/women): 0.84/0.83 for status, 0.77/0.72 for physical attractiveness, and 0.80/0.76 for similarity.

As recommended in previous studies (Schwartz et al., 2012; Strus and Cieciuch, 2017; Czyżkowska and Cieciuch, 2020), to correct for individual differences in using the response scales, each participant's responses were centered on their mean for all scales used in the present study. The mean of all items included in the scale was subtracted from each subscale score. For instance, the mean of all 57 value scores was subtracted from each higher-order value score.

Data analysis

We tested connections among basic romantic motivations in the entire sample and separately for men and women. The analysis was conducted in two steps. First, we calculated the scores for each of the 14 basic romantic motivations as means of the corresponding items. Second, we tested the hypothesized circular structure of romantic motivations by applying multidimensional scaling (MDS) to the 14 basic romantic motivations. We used MDS because this analytical approach is useful for testing circumplex models. For such models, exploratory or confirmatory factor analyses are inappropriate because of the expected strong intercorrelations between variables (Schwartz et al., 2012; Cieciuch, 2017; Czyżkowska and Cieciuch, 2020). We used the Multidimensional Scale module in SPSS (Alscal Procedure Options) to conduct MDS.

We tested connections between values, romantic motivations, and mate preferences using Structural Equation Modeling in Mplus (Muthén and Muthén, 2012). Full information maximum likelihood estimation with robust standard errors was used to deal with missing data (Little and Rubin, 2019). The covariance structure of the model was evaluated using multiple fit indexes, and the following values were regarded as indicating a good fit: $\chi 2/df < 3.0$, $CFI > 0.95$, $TLI > 0.95$, and $RMSEA < 0.05$ (Geiser, 2012; Kelloway, 2014). The mediation effect of romantic motivations is corroborated when the indirect effect of values on mate preferences through romantic motivations is significant. Mediation is considered complete when the indirect effect of values on mate preferences is significant, and the direct effect of values on mate preferences is not significant. Mediation is considered partial when both the indirect and direct effects of values on mate preferences are significant. According to modern statistical literature, using SEM for testing mediation has numerous advantages over the method suggested by Baron and Kenny (Bollen and Pearl, 2012; Gunzler et al., 2013; Kelloway, 2014).

Results

The structure of romantic motivations

Figure 1 presents the MDS configuration for the entire sample. Appendix Figures A1, A2 present the MDS graphs separately for men and women. The configurations obtained separately for the two genders and the entire sample were similar. The MDS goodness of fit indexes demonstrated an excellent fit (the entire sample/men/women): Young's stress = 0.024/0.023/0.026; Kruskal's stress = 0.043/0.046/0.054.

The results confirmed our hypothesis that basic romantic motivations form a circumplex that may be partitioned into four clusters (higher-order romantic motivations): Love and Care, Sex and Adventure, Status and Resources, and Family and Children. The love and care cluster included three motivations: care for the other, feeling loved, and receiving emotional support. The sex and adventure cluster included three motivations: sexual satisfaction, escape from loneliness,

and psychological growth. The status and resources cluster included six motivations: social advancement, control over the other, economic benefits, respect, independence from parents, and avoiding social pressure. Finally, the family and children cluster included two motivations: starting a family and finding a partner for childbearing and childrearing.

Comparing the obtained romantic motivations circumplex with our hypotheses, we found that 11 out of 14 motivations were in their hypothesized clusters, and no romantic motivation was in the cluster opposite the hypothesized. However, three basic motivations were not in the hypothesized but in an adjacent cluster: Independence from parents was in the status and resources, not the sex and adventure cluster; avoiding social pressure was in the status and resources, not the children and family cluster; and care for the other was in the love and care cluster, with two other basic romantic motivations of feeling loved and receiving emotional support. Therefore, the obtained results mainly corroborated the hypothesized structure of romantic motivations.

Connections between romantic motivations and values

To test the connections between romantic motivations and values, we first calculated scores of four higher-order romantic motivations as means of the corresponding basic romantic motivations. After that, we calculated Pearson correlation coefficients between the four higher-order romantic motivations and four higher-order values. Table 2 presents the obtained results separately for men and women. For both genders (men/ women), Status and Resources romantic motivations were positively correlated with self-enhancement values (0.35/0.34) and negatively correlated with self-transcendence values (−0.23/−0.35). In addition, they were negatively correlated with openness to change values among men and women (−0.13/−0.09) and positively correlated with conservation values among women (0.12). For both genders, Love and Care motivations were positively correlated with self-transcendence (0.27/0.40) and openness to change values (0.14/0.08), and negatively correlated with self-enhancement (−0.33/−0.39) and conservation (−0.10/−0.13) values. For both genders, Family and Children motivations were positively correlated with conservation values (0.14/0.16). In addition, for men, they were positively correlated with self-transcendence (0.17) and negatively correlated with self-enhancement values (−0.19). Finally, for both genders, Sex and Adventure motivations were positively correlated with openness to change (0.21/0.21) and negatively correlated with conservation values (−0.12/−0.25). In addition, among women, these motivations were positively correlated with self-transcendence values (0.13). These findings corroborated our hypotheses regarding the pattern of connections between romantic motivations and values.

We conducted linear regressions to test the connections between values' axes scores and romantic motivations while controlling for sociodemographic variables (Table 3). Status and resources romantic motivations were negatively associated with self-transcendence vs. self-enhancement ($\beta = -0.30$) and openness to change vs. conservation values ($\beta = -0.09$). Love and care motivations were positively associated with self-transcendence vs. self-enhancement ($\beta = 0.35$) and openness to change vs. conservation values ($\beta = 0.09$). Sex and

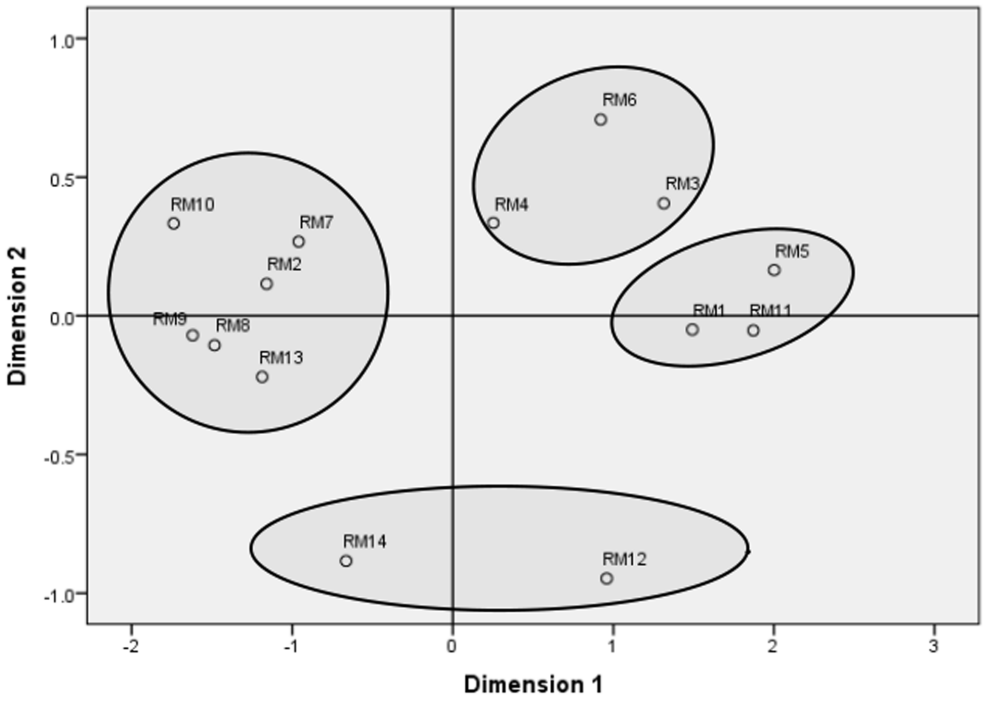

FIGURE 1
Multidimensional scaling configuration derived in two dimensions: the entire sample. RM 1, care for the other; RM 2, independence from parents; RM 3, psychological growth; RM 4, escape from loneliness; RM 5, feeling loved; RM 6, sexual satisfaction; RM 7, social advancement; RM 8, control over the other; RM 9, economic benefits; RM 10, respect; RM 11, emotional support; RM 12, childbearing and childrearing; RM 13, avoiding social pressure; RM 14, starting a family.

TABLE 2 Higher-order romantic motivations and values: Pearson correlation coefficients, means, and standard deviations.

Variables	SR	LC	FC	SA	O2CH	SENH	CONS	SETR	M(SD)
SR	1	−0.805**	0.167**	−0.303**	−0.093*	0.340**	0.119**	−0.351**	−1.30 (0.63)
LC	−0.834**	1	−0.216**	−0.009	0.078*	−0.386**	−0.127**	0.404**	1.08 (0.62)
FC	0.121*	−0.170**	1	−0.423**	−0.033	−0.023	0.158**	−0.070	−3.22 (1.31)
SA	−0.361**	0.068	−0.418**	1	0.205**	−0.022	−0.249**	0.129**	0.34 (0.62)
O2CH	−0.128**	0.144**	−0.091	0.207**	1	−0.027	−0.671**	0.072	0.25 (0.53)
SENH	0.354**	−0.331**	−0.186**	−0.063	0.062	1	−0.206**	−0.605**	−0.63 (0.69)
CONS	0.019	−0.100*	0.141**	−0.119*	−0.678**	−0.335**	1	−0.343**	−0.21 (0.50)
SETR	−0.231**	0.268**	0.170**	0.029	0.073	−0.618**	−0.274**	1	0.42 (0.42)
M(SD)	−1.29 (0.61)	1.26 (0.65)	−3.56 (1.28)	0.48 (0.61)	0.43 (0.55)	−0.61 (0.76)	−0.27 (0.53)	0.34 (0.47)	1

Women's data are above the diagonal; men's are below. SR, status and resources; LC, love and care; FC, family and children; SA, sex and adventure. O2CH, openness to change; SENH, self-enhancement; CONS, conservation; SETR, self-transcendence. *$p < 0.05$, *$p < 0.01$.

adventure motivations were positively associated with openness to change vs. conservation values ($\beta = 0.15$). Finally, family and children motivations were positively associated with self-transcendence vs. self-enhancement values ($\beta = 0.11$). Values' axes scores predicted romantic motivations over and above sociodemographic variables; the proportion of variance explained was 14–21%. The results corroborated our hypothesis that romantic motivations are associated with general motivational goals expressed in values when controlling for socio-demographic variables.

Considering the effect of socio-demographic variables on romantic motivations, we found that age and education were not related to romantic motivations. Compared to men, women reported higher importance of family and children ($\beta = 0.08$) and lower importance of love and care ($\beta = -0.12$) and sex and adventure ($\beta = -0.06$) motivations; no gender difference in status and resources motivations was found. Comparing Israeli Arabs and Jews, we found that Arabs reported higher importance of status and resources ($\beta = 0.25$) and family and children ($\beta = 0.12$) and lower importance of sex and adventure ($\beta = -0.30$) and love and care ($\beta = -0.15$) romantic motivations. Finally, the level of religiosity was positively associated with family and children ($\beta = 0.29$) and negatively associated with sex and adventure ($\beta = -0.10$) and love and care ($\beta = -0.08$) romantic motivations. Thus, our hypotheses regarding the effects of socio-demographic variables on romantic motivations were partly corroborated.[1]

Connections with mate preferences

First, we calculated two romantic motivations axes scores – love and care vs. status and resources and sex and adventure vs. family and children – subtracting one pole score from the other. We further calculated Pearson correlation coefficients separately for men and women to test the connections between values and romantic motivations axes scores and mate preferences (Table 4). The pattern of connections was similar for the two genders, with several exceptions (men/women). The importance of the romantic partner's status was correlated with love and care vs. status and resources (−0.31/−0.28), sex and adventure vs. family and children (−0.07, ns/−0.22), openness to change vs. conservation (−0.21/−0.27), and self-transcendence vs. self-enhancement (−0.26/−0.41). The importance of the romantic partner's physical attractiveness was correlated with love and care vs. status and resources (0.09, ns/ 0.12), sex and adventure vs. family and children (0.30/0.22), openness to change vs. conservation (0.23/0.17), and self-transcendence vs. self-enhancement (−0.17/−0.01, ns). Finally, the importance of the mate's similarity was correlated with love and care vs. status and resources (−0.30/−0.30), openness to change vs. conservation (−0.12/−0.16), and self-transcendence vs. self-enhancement (−0.17/−0.18). Thus, our hypotheses regarding the connections of mate preferences with values and romantic motivations were mostly corroborated.

We conducted linear regressions to test the connections between romantic motivations and values axes scores and mate preferences while controlling for sociodemographic variables (Table 5). Status was connected to the openness to change vs. conservation ($\beta = -0.19$) and self-transcendence vs. self-enhancement value axes ($\beta = -0.26$). In addition, it was connected to love and care vs. status and resources romantic motivations ($\beta = -0.11$). Attractiveness was connected to the openness to change vs. conservation ($\beta = 0.13$) and self-transcendence vs. self-enhancement values axes (−0.13). In addition, it was connected to sex and adventure vs. family and children romantic motivations ($\beta = 0.17$). Finally, the similarity was connected to the openness to change vs. conservation values axis ($\beta = -0.13$) and love and care vs. status and resources romantic motivations ($\beta = -0.24$). Values predicted mate preferences over and above sociodemographic variables and romantic motivations predicted mate preferences over and above sociodemographic variables and values, corroborating our hypotheses.

Considering the effect of socio-demographic variables on mate preferences, we found that age was significantly connected with the importance of attractiveness ($\beta = 0.15$) and similarity ($\beta = -0.06$) but not with status. Women ascribed higher importance to the

1 We found significant differences in value preferences between Israeli Jews and Arabs. Jews reported higher preferences for openness to change [$M(SD)_J$=0.35(0.58) vs. $M(SD)_A$=0.25(0.45), t(1106)=2.94, p=0.003] and self-transcendence values [$M(SD)_J$=0.45(0.46) vs. $M(SD)_A$=0.25(0.36), t(1108)=7.92, p<0.001]. In addition, Jews reported lower preferences for conservation [$M(SD)_J$=−0.25(0.55) vs. $M(SD)_A$=−0.17(0.41), t(1104)=−2.80, p=0.005] and self-enhancement values [$M(SD)_J$=−0.73(0.46) vs. $M(SD)_A$=−0.39(0.36), t(1104)=−7.98, p<0.001].

TABLE 3 Linear regressions: sociodemographic variables and value axes scores predicting higher-order romantic motivations.

Predicting variables	Status and resources		Love and care		Sex and adventure		Family and children	
	Stage I	Stage II	Stage I	Stage II	Stage I	Stage II	Stage I	Stage II
Sociodemographic variables								
Age	0.023	0.017	−0.049	−0.042	0.037	0.028	−0.007	−0.003
Gender (1-m, 2-f)	−0.036	−0.021	−0.106***	−0.124***	−0.077**	−0.062*	0.085**	0.077**
Education	0.008	0.003	−0.018	−0.012	0.038	0.037	0.040	0.042
Ethnicity (1-Jews, 2-Arabs)	0.321***	0.246***	−0.235***	−0.149***	−0.289***	−0.296***	0.090**	0.119***
Level of religiosity	0.022	−0.003	−0.102**	−0.077*	−0.158***	−0.104**	0.290***	0.290***
Value axes scores								
O2CH – CONS		−0.089**		0.091**		0.153***		0.006
SETR – SENH		−0.303***		0.347***		−0.009		0.113***
R^2	0.10	0.20	0.09	0.21	0.15	0.17	0.13	0.14
Adjusted R^2	0.10	0.19	0.09	0.21	0.15	0.17	0.12	0.13
F	$F(5;1,055) = 24.6$; $p < 0.001$	$F(7;1,053) = 36.4$; $p < 0.001$	$F(5;1,055) = 21.8$; $p < 0.001$	$F(7;1,053) = 40.2$; $p < 0.001$	$F(5;1,055) = 37.2$; $p < 0.001$	$F(7;1,053) = 30.9$; $p < 0.001$	$F(5;1,055) = 30.0$; $p < 0.001$	$F(7;1,053) = 23.8$; $p < 0.001$
$F_{\Delta R^2}$		$F(2;1,053) = 59.1$; $p < 0.001$		$F(2;1,053) = 78.2$; $p < 0.001$		$F(2;1,053) = 12.8$; $p < 0.001$		$F(2;1,053) = 7.32$; $p = 0.001$

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$. O2CH – CONS, openness to change vs. conservation axis score; SETR – SENH, self-transcendence vs. self-enhancement axis score. The table presents standardized regression coefficients.

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TABLE 4 Mate preferences, romantic motivations, and values axes scores: Pearson correlation coefficients, means, and standard deviations.

Variables	LC – SR	SA – FC	O2CH – CONS	SETR – SENH	Status	Attractiveness	Similarity	*M*(SD)
LC – SR	1	0.215***	0.119**	0.429***	−0.277****	0.116**	−0.300***	1.19 (0.59)
SA – FC	0.202***	1	0.172***	0.036	−0.223**	0.215***	−0.067	3.57 (1.67)
O2CH – CONS	0.113*	0.166***	1	0.028	−0.266***	0.174***	−0.158**	0.45 (0.94)
SETR – SENH	0.354***	−0.135***	−0.067	1	−0.408***	−0.013	−0.179***	1.06 (0.99)
Status	−0.306***	−0.065	−0.206***	−0.257***	1	−0.052	−0.065	4.06 (1.08)
Attractiveness	0.086	0.301***	0.225***	−0.173***	−0.186***	1	−0.269***	4.63 (0.93)
Similarity	−0.303***	−0.018	−0.118*	−0.172***	−0.071	−0.167***	1	3.91 (1.06)
M(SD)	1.28 (0.61)	4.04 (1.64)	0.69 (0.99)	0.95 (1.11)	3.32 (1.22)	4.51 (1.10)	3.55 (1.16)	1

Women's data are above the diagonal; men's are below. O2CH – CONS, openness to change vs. conservation axis score; SETR – SENH, self-transcendence vs. self-enhancement axis score. LC – SR, love and care vs. status and resources axis score; SA – FC, sex and adventure vs. family and children axis score. *$p < 0.05$, *$p < 0.01$, *$p < 0.001$.

status of their partners than men ($\beta = 0.27$), but there were no significant gender differences regarding other mate preferences. Education was positively connected with similarity ($\beta = 0.11$). Compared to Jews, Arabs ascribed higher importance to status ($\beta = 0.09$) and similarity ($\beta = 0.13$) and lower importance to attractiveness ($\beta = -0.16$). Taken alone, a higher level of religiosity was associated with higher importance of status ($\beta = 0.12$) and lower importance of attractiveness ($\beta = -0.09$); however, both effects of religiosity disappeared after including values and romantic motivations in the regression, and the connection with similarity became significant ($\beta = -0.09$).

Direct and indirect effects of values on mate preferences

Figure 2 presents the hypothesized model that includes the following variables: two values axes (openness to change vs. conservation and self-transcendence vs. self-enhancement), two romantic motivations axes (love and care vs. status and resources and sex and adventure vs. family and children), and three mate characteristics (status, attractiveness, and similarity). After the model's goodness-of-fit was established, aiming for the most parsimonious model, the initial research model was "trimmed," i.e., all not significant paths were excluded (Kelloway, 2014). The trimmed model demonstrated an excellent fit: $\chi^2(2) = 2.77$, $p = 0.250$; *RMSEA* (*CI*) = 0.019 (0.000; 0.065); *CFI* = 0.999; *TLI* = 0.992. The proportion of variance explained was significant for all mate preferences: status (21%), attractiveness (11%), and similarity (11%). Figure 3 presents connections between variables in the trimmed model. As predicted, connections between romantic motivations and mate preferences were significant: Sex and adventure vs. family and children motivations were connected to status ($\beta = -0.13$) and attractiveness ($\beta = 0.22$); love and care vs. status and resources motivations were connected to status ($\beta = -0.13$), attractiveness ($\beta = 0.09$), and similarity ($\beta = -0.27$). In addition, direct connections between values and mate preferences were significant: Openness to change vs. conservation values were connected to status ($\beta = -0.23$), attractiveness ($\beta = 0.15$), and similarity ($\beta = -0.11$), and self-transcendence vs. self-enhancement values were directly connected to status ($\beta = -0.26$), attractiveness ($\beta = -0.11$), and similarity ($\beta = -0.07$). Finally, values were indirectly (through romantic motivations) connected to mate preferences: Openness to change vs. conservation values were indirectly connected to status ($\beta = -0.040$, $p < 0.001$), attractiveness ($\beta = 0.050$, $p < 0.001$), and similarity ($\beta = -0.034$, $p < 0.001$), and self-transcendence vs. self-enhancement values were indirectly connected to status ($\beta = -0.050$, $p < 0.001$), attractiveness ($\beta = 0.034$, $p = 0.008$), and similarity ($\beta = -0.105$, $p < 0.001$). These results corroborated the mediating hypothesis, indicating that romantic motivations partly mediate the connections between values and mate preferences.

Discussion

Structure of romantic motivations

In this study, we revealed a structure of romantic motivations. We found that 14 basic romantic motivations form four motivational clusters or higher-order motivations. The first cluster, *love and care*, includes three romantic motivations: caring for the other, feeling loved, and receiving emotional support. This motivational cluster expresses the desire to give and receive love and emotional support. The combination of giving and receiving motivations in one cluster is unusual because promoting one's interests usually opposes caring for others (Schwartz, 2017). However, in romantic relationships, these motivations are complementary. Thus, romantic relationships differ from other interpersonal relationships in that they permit individuals simultaneously to care for each other and be cared for. We found that love and care is the most important motivation for seeking romantic relationships among young men and women. This finding indicates that the primary motivational goal of romantic relationships for both genders is giving and receiving love and emotional support, caring for the other, and being cared for. This finding corroborates the results of previous studies on the primacy of love in romantic relationships (Cohn, 2013).

The second cluster, *sex and adventure*, includes three romantic motivations: psychological growth, escape from loneliness, and sexual satisfaction. This romantic motivation reflects a desire to find a new experience, including a sexual one, that may lead to personal growth. The sex and adventure motivations are ranked second in importance among young men and women. The sex and adventure romantic motivations are compatible with love and care motivations, thus indicating that love and care usually accompany sex when people engage in romantic relationships (Townsend et al., 2020; Sorokowski et al., 2021; Thorpe and Kuperberg, 2021).

TABLE 5 Linear regression analysis: sociodemographic variables, values, and romantic motivations axes scores predicting mate preferences.

	Status			Attractiveness			Similarity		
Predicting variables	Stage I	Stage II	Stage III	Stage I	Stage II	Stage III	Stage I	Stage II	Stage III
Sociodemographic variables									
Age	−0.035	−0.034	−0.037	0.160***	0.147***	0.147***	−0.060	−0.056	−0.064*
Gender (1-m, 2-f)	0.273***	0.276***	0.265***	−0.088**	−0.065*	−0.047	0.014	0.010	0.000
Education	−0.005	−0.010	−0.012	0.005	0.002	0.006	0.115***	0.113***	0.112***
Ethnicity (1-Jews, 2-Arabs)	0.199***	0.129***	0.093**	−0.126***	−0.117***	−0.163***	0.197***	0.168***	0.127***
Level of religiosity	0.124***	0.058*	0.035	−0.092**	−0.039	0.009	−0.039	−0.090**	−0.088**
Values									
O2CH – CONS		−0.206***	−0.192***		0.145***	0.131***		−0.153***	−0.132***
SETR – SENH		−0.295***	−0.264***		−0.130***	−0.134***		−0.131***	−0.046
Romantic motivations									
LC – SR			−0.110***			0.058			−0.237***
SA – FC			−0.068*			0.171***			0.041
R^2	0.17	0.28	0.29	0.08	0.12	0.15	0.07	0.10	0.14
Adjusted R^2	0.16	0.27	0.29	0.08	0.11	0.14	0.06	0.09	0.14
F	$F(5;1,054) = 41.8$; $p < 0.001$	$F(7;1,052) = 58.1$; $p < 0.001$	$F(9;1,050) = 48.7$; $p < 0.001$	$F(5;1,054) = 19.3$; $p < 0.001$	$F(7;1,052) = 20.3$; $p < 0.001$	$F(9;1,050) = 20.4$; $p < 0.001$	$F(5;1,054) = 14.7$; $p < 0.001$	$F(7;1,052) = 16.6$; $p < 0.001$	$F(9;1,050) = 9.33$; $p < 0.001$
$F_{\Delta R^2}$		$F(2;1,052) = 82.6$; $p < 0.001$	$F(2;1,050) = 11.5$; $p < 0.001$		$F(2;1,052) = 21.0$; $p < 0.001$	$F(2;1,050) = 18.4$; $p < 0.001$		$F(2;1,052) = 20.1$; $p < 0.001$	$F(2;1,050) = 21.0$; $p < 0.001$

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$. O2CH – CONS, openness to change vs. conservation axis score; SETR – SENH, self-transcendence vs. self-enhancement axis score. LC – SR, love and care vs. status and resources axis score; SA – FC, sex and adventure vs. family and children axis score. The table presents standardized regression coefficients.

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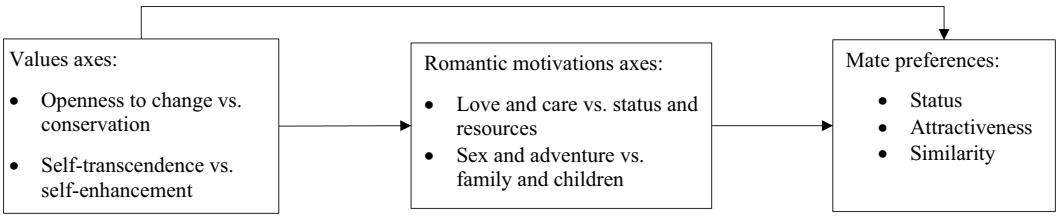

FIGURE 2
Path analysis: the hypothesized model.

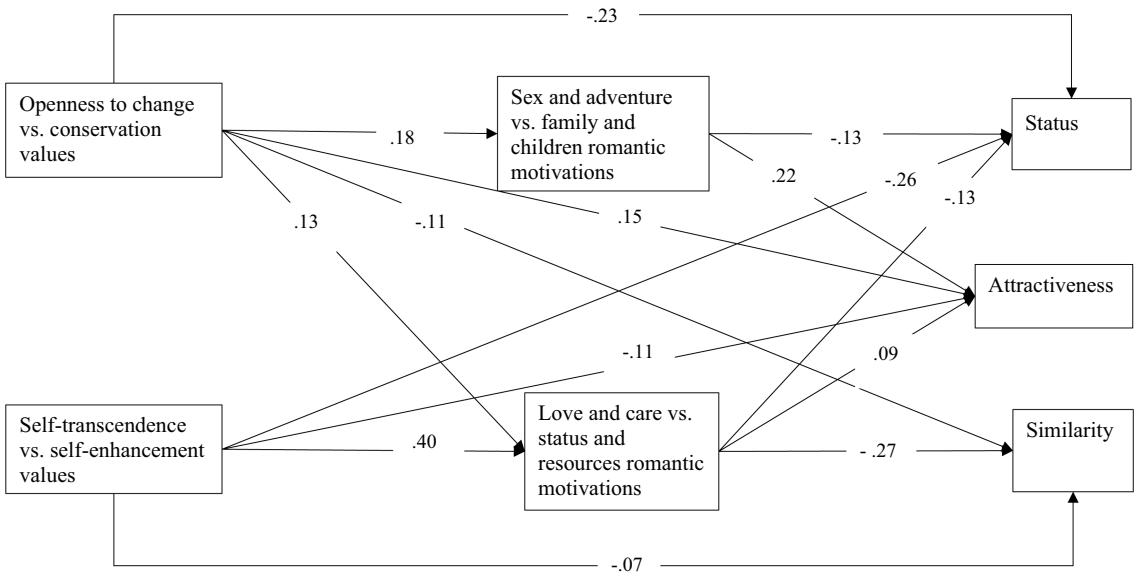

FIGURE 3
Path analysis: the trimmed model.

The third cluster *status and resources*, includes six romantic motivations: independence from parents, avoiding social pressure, social advancement, economic benefits, control over the other, and respect. These romantic motivations reflect the motivational goals of promoting one's social status and obtaining resources through romantic relations. This cluster was ranked third in importance by both men and women. It strongly contradicted love and care romantic motivations among young men and women, thus indicating that these two motivations are incompatible. These findings indicate that an individual usually cannot give and receive love and care and simultaneously use a romantic partner to strengthen one's social status and improve one's economic conditions. These findings corroborate previous studies on social exchange theory that demonstrated the incompatibility of love and material resources exchange in interpersonal relationships (Mitchell et al., 2012).

The fourth cluster, *family and children*, includes motivations to raise a family and find a partner for childbearing and childrearing. This motivation is the least important among young men and women looking for a romantic partner. This finding is surprising, given the pronatalist character of the Israeli state (Waldman, 2006). However, it may be explained by the fact that family and children motivations relate to a distant future, whereas romantic relationships are mostly present-oriented. The family and children's motivation strongly contradicted the sex and adventure motivation among both men and women, indicating that these motivations are incompatible in romantic relationships.

The system of compatibilities and conflicts between higher-order romantic motivations discovered in the present study indicates that romantic motivations exist in a two-dimensional space: one dimension running between love and care and status and resources poles, another – between sex and adventure and family and children's poles. These dimensions are not orthogonal but rather slightly positively correlated. It means that people who are high on love and care motivations tend to be also high on sex and adventure motivations; thus, these motivations express compatible motivational goals. The same applies to status and resources and family and children motivations. This system of romantic motivations' compatibilities and conflicts is similar among men and women. These findings are important because they demonstrate that romantic motivations constitute a meaningful system of congruencies and conflicts, not a unidimensional construct assumed in some previous studies (Eekelaar, 2007; Cohn, 2013; Park and Rosén, 2013; Carter, 2018). Thus, people cannot simultaneously achieve all possible motivational goals in romantic relationships and must trade between conflicting goals.

Romantic motivations and values

In this study, we assumed that romantic motivations express general motivational goals in the context of romantic relationships. We corroborated this assumption by finding a meaningful pattern of connections between romantic motivations and personal value preferences. We found that love and care romantic motivations in both genders are associated with a preference for self-transcendence vs. self-enhancement values and, to a lesser degree, with a preference for openness to change vs. conservation values. Thus, love and care romantic motivations express the general motivational goals of caring for others and transcending one's interests for the sake of others. In a more general sense, love and care motivations express general motivational goals of psychological growth and development and might be found more often in people with a relatively low level of anxiety (Schwartz et al., 2012).

Sex and adventure romantic motivations are associated with a high preference for openness to change vs. conservation values in both genders. Thus, sex and adventure romantic motivations express the general motivational goals of growth and self-actualization through looking for new experiences. In addition, among women but not men, sex and adventure motivations are associated with a high preference for self-transcendence values. This finding indicates that sex and adventure romantic motivations have different meanings for men and women, being more other-focused among women. These findings corroborate previous studies on gender differences in sexual relationships that demonstrated that women more often use sex to express caring for their partner (Petersen and Hyde, 2011). The present study provides a motivational explanation for the previous findings, indicating that sex for women may be a way of caring for others (Thompson and O'Sullivan, 2012).

Status and resources romantic motivations were associated with a high preference for self-enhancement vs. self-transcendence and a high preference for conservation vs. openness to change values for both genders. Therefore, these romantic motivations express anxiety avoidance and self-protection as general motivational goals in romantic relationships. They might be more important among people with a higher level of anxiety and a history of traumatization (in the family, previous romantic relationships, or in general). However, this hypothesis needs testing in further research.

Family and children's romantic motivations were associated with a higher preference for conservation vs. openness to change values for both genders. However, it was also associated with a higher preference for self-transcendence vs. self-enhancement values for men. These findings shed light on the gender differences in romantic relationships. Men who aim to find a romantic partner to raise the family and children tend to be more ready to transcend their interests for the sake of others. However, no such tendency exists among women who seek romantic relationships to establish a family and raise children. These findings may reflect different social norms related to raising families and children. Men may perceive family and children as requiring them to give up some of their interests and care more for others, while women may perceive raising family and children as serving their own interests and the interests of the other (Buss et al., 2001; Hurt, 2014; Gittins, 2017).

Values, romantic motivations, and mate preferences

Romantic motivations and values predicted mate preferences over and above sociodemographic variables. Specifically, the importance of the partner's social status was associated with status and resources romantic motivations in both genders and with family and children's romantic motivations among women. Thus, people whose goal in romantic relationships is to elevate their social status and resources are looking for a partner with high social status. The difference between men and women in the connection between the partner's status and the family and children's romantic motivation corroborates the previously found gender differences in the meaning of family and children for the two genders, with women preferring a more resourceful partner for raising a family and giving birth to children (Buss et al., 2001; Thompson and O'Sullivan, 2012). Finally, the importance of the social status of the romantic partner was associated with self-enhancement and conservation values among men and women. These findings indicate that romantic relationships with high-status partners enhance individuals' social status and control over resources. In addition, more conservative people probably tend to choose a high-status partner because it matches social expectations (Walter et al., 2020; Cooperman and Waller, 2022).

The importance of physical attractiveness in the romantic partner was associated with sex and adventure romantic motivations among both genders and with love and care motivations among women. These findings indicate that men and women seeking sexual satisfaction prefer an attractive partner. However, it also indicates that women, but not men, who are seeking love in romantic relationships prefer an attractive partner. It indicates that women, but not men, find it easier to love and care for an attractive partner. These findings are interesting and require further investigation. The importance of the partner's physical attractiveness was associated with openness to change values in both genders and self-enhancement values among men. These findings indicate that an attractive partner permits both genders to obtain new experiences more easily. However, our findings also demonstrate that an attractive partner is a status symbol for men but not women, as shown in some previous studies (Hurt, 2014; Gittins, 2017).

We expected that the preference for similarity in a romantic partner would be connected to romantic motivations associated with conservation values, i.e., family and children motivations. However, we found that the similarity in mate preference contradicts love and care motivations and is associated with status and resources romantic motivations in both genders. This finding indicates that individuals looking for love and care in romantic relationships may be happy with a partner different from themselves. However, those seeking romantic relationships to increase their status and resources feel more confident with a similar partner. The importance of similarity in the romantic partner is also associated with conservation and self-enhancement values in both genders. This is probably because having a partner similar to oneself is socially normative, preserves the existing social order and status quo, and is compatible with obtaining resources and dominating other people. These findings indicate that individuals are more confident with and feel less threatened by a partner similar to them, probably because self-enhancement and conservation values are associated with a high level of anxiety (Schwartz, 2017). The present study findings highlight the

interpersonal differences in assortative mating and reveal their motivational roots. Thus, they advance the previous studies that focused on the universal aspects of assortative mating (Buss et al., 2001; Thompson and O'Sullivan, 2012; Luo, 2017; Cooperman and Waller, 2022).

Our study confirmed that romantic motivations partly mediate the connection between personal value preferences and the sought-after partner's characteristics. This finding indicates that in romantic relationships, people seek a partner whose characteristics help them attain general motivational goals expressed in value preferences and specific motivational goals relevant to romantic relationships. This finding is important because it not only reveals the context-specific mechanism related to romantic relationships but also advances our understanding of the valence mechanism in general (Hitlin, 2003; Sagiv and Roccas, 2021), demonstrating that general motivational goals may affect attitudes and behavior indirectly through their effect on context-specific motivational goals.

The effect of sociodemographic variables on romantic motivations and mate preferences

We found significant effects of several socio-demographic variables on romantic motivations. Love and care and sex and adventure motivations were more important to men, while family and children motivations were more important to women. The higher importance of sex for men and long-term relationships for women is a long-established finding (James, 2010; Carter, 2018). However, the higher importance of love and care motivations for men in the present study is surprising. Our findings may reflect a culturally specific phenomenon (Lavee and Katz, 2003; Bystrov, 2012) or indicate the changes in modern youth (Gittins, 2017). In any case, this phenomenon requires further research.

We found that ethnicity is an important factor related to romantic motivations. Comparing the two ethnic groups, Arab Israelis reported higher importance of status and resources and family and children motivations, while Jews reported higher importance of love and care and sex and adventure motivations. Previous studies show that, compared to Israeli Jewish culture, Arab Israeli culture is characterized by higher preferences for conservation and self-enhancement values (Sagiv & Schwartz, 1995; Sagy et al., 2001). Similar results have been obtained in our study. Thus, the differences in romantic motivations reflect differences in values between the two main ethnic groups in Israel. However, it is important to note that the ranking of romantic motivations was similar among Jewish and Arab Israelis, which may indicate the existence of universal aspects of romantic motivations. Further cross-cultural studies are required to test the external validity of our findings.

A higher religiosity level was associated with higher importance of family and children motivations and lower importance of sex and adventure and love and care motivations. The strong positive connection between conservative values and religiosity may explain these findings (Schwartz, 2017). Neither age nor education was related to romantic motivations. However, it is possible that we could not detect the connections with these variables because our sample was restricted in both age (18–30) and education (3/4 post-secondary education).

We found several significant connections between socio-demographic variables and mate preferences. The partner's physical attractiveness is more important for older people. Status is more important to women as compared to men. Similarity is more important to more educated people. Compared to Jews, status and similarity are more important to Arabs, while the partner's physical attractiveness is more important to Jews. These findings corroborate previous ones on mate preferences in individualistic vs. collectivistic cultural groups, and they may be explained by social norms and values existing in each culture (Reneflot, 2006; Gassanov et al., 2008; Carter, 2018).

Men's and women's mate preferences have several similarities and differences. Physical attractiveness is the most important characteristic of the partner for both men and women. However, similarity is the second most desirable characteristic for men, while the partner's status is the second most important characteristic for women. The rank differences in mate preferences between men and women were identical among Jewish and Arab Israelis. Our findings regarding gender differences in the importance of physical attractiveness for men and women in the present study differ from previous studies that found that the partner's physical attractiveness was more important for men than women (Buss et al., 2001). However, our findings corroborate the results of studies on this issue that used the Implicit Association Test (Thompson and O'Sullivan, 2012). Our findings may be culture-specific or indicate changes in the present generation (Twenge, 2013). Further cross-cultural studies of this issue are required.

Limitations and suggestions for further research

Several limitations of the study must be considered. First, it was correlational; therefore, causal inferences cannot be drawn from the results. Future longitudinal research would represent a significant advancement in the current findings. The second limitation of the present study is its sample, which was large but not random. The lack of control over the sample may raise generalizability issues. Further research should be based on representative samples. The third limitation relates to the research population. The suggested theoretical model was tested only in one country – Israel. Testing it in other countries would be essential to its generalization. The fourth limitation of the present study is that we focused on individual-level factors and did not investigate the macro and mezzo-level factors that might affect romantic motivations and mate preferences. Finally, the present study focused on young people with no girl/boyfriend. Further studies may investigate changes in motivations and mate preferences in different stages of romantic relationships: before their beginning, with a boy/girlfriend, during cohabitation, and after marriage.

Conclusion

In this study, we investigated the motivational aspects of romantic relationships. We conceptualized romantic motivations as context-specific motivations derived from general motivational goals reflected in personal value preferences. We revealed a system

of affinities and conflicts between romantic motivations and confirmed the existence of four clusters of romantic motivations: love and care, family and children, status and resources, and sex and adventure. We demonstrated that romantic motivational clusters form a meaningful pattern of connections with higher-order values. Thus, we could assemble many romantic motivations into a limited number of higher-order motivations and relate them to general motivational goals expressed in values. Finally, we demonstrated that values and romantic motivations predict mate preferences – the sought-after characteristics of the romantic partner. The results obtained in the present study allow us to understand interpersonal differences in romantic motivations and mate preferences. The study's findings advance the values theory and our understanding of the valence principle, unveiling the connections between general motivations, context-specific motivations, and context-specific attitudes and behavior. Thus, our findings provide a solid basis for further research on general and context-specific motivations in interpersonal relationships. A better understanding of romantic motivations and their connections with mate preferences will be helpful in youth counseling to promote satisfactory decisions regarding dating and ongoing relationships. It will also allow helping professionals to develop interventions facilitating the psychological adjustment of young people in the context of romantic relationships.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by Tel Aviv University institutional review board. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

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The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2023.1273607/full#supplementary-material

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Can a kiss conquer all? The predictive utility of idealized first kiss beliefs on reports of romantic love among U.S. adults

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Research indicates that idealized romantic expectations and the extent to which they are met, are important predictors of relationship outcomes (e.g., love). However, no studies have investigated the impact of idealized beliefs associated with specific behaviors (e.g., kissing) on reports of romantic love. Thus, the two studies comprising this research assessed the association between idealized beliefs related to one's first romantic kiss with their current partner, unmet first kiss expectations, and reports of romantic love. Romantic attachment was also examined as a moderator. In Study One, the First Kiss Beliefs Scale was created and the results from 208 adults revealed that increased endorsement of idealized first kiss beliefs was associated with greater romantic love (r = 0.25). Romantic attachment also moderated this relationship, such that idealized first kiss beliefs significantly predicted love for those high in attachment anxiety and low in avoidance (β = 0.68 and β = 0.18, respectively). In Study Two, the First Kiss Beliefs Scale was modified to assess outcomes and expectations to capture unmet expectations. The results from 234 adults indicated that idealized first kiss beliefs predicted a greater proportion of the variance in romantic love (sr^2 = 0.10) than did unmet expectations (sr^2 = 0.07). A three-way interaction was also detected such that, among those low in attachment anxiety, the relationship between kissing beliefs and love was positive for those high in attachment avoidance and negative for those low. These results indicate that idealized first kiss expectations with one's current romantic partner are important predictors of love (beyond whether these expectations were met), particularly for those high in attachment insecurity. Implications are discussed for practitioners and those in the primary stages of romantic relationships.

KEYWORDS

idealized kissing beliefs, romantic love, romantic attachment, romantic kissing, romantic beliefs

Introduction

Romantic love has been conceptualized as having a lasting duration (i.e., commitment), an intense desire for physical and emotional union, as well as empathy and concern for a partner's well-being (Gottschall and Nordlund, 2006). Additionally, in Sternberg's (1986) groundbreaking work, romantic love is described as the interplay of intimacy, commitment, and passion. Furthermore, romantic love is characterized by a range of cognitive, affective, behavioral, social, and physiological activity (e.g., Aron et al., 2005; Acevedo et al., 2012; Fletcher et al., 2015; Sternberg and Sternberg, 2018). Researchers have argued that romantic love serves a variety of

functions related to mate selection/pair-bonding and also as a prerequisite for relationship longevity and satisfaction (Dion and Dion, 1996; Willi, 1997). As a result, romantic love has been associated with greater feelings of self-fulfillment, self-expression (Dion and Dion, 1991), self-esteem, subjective well-being (Acevedo and Aron, 2009), and relationship satisfaction (e.g., Hendrick et al., 1988; Morrow et al., 1995; Vedes et al., 2016; Moore and Campbell, 2020).

Idealized romantic beliefs and relationship outcomes

Although romantic love is a near-universal phenomenon (e.g., Buss, 2019; Sorokowski et al., 2021), empirical studies indicate that it manifests differently cross-culturally (Karandashev, 2015), particularly beliefs regarding what constitutes love in an ideal romantic relationship (i.e., romantic beliefs; Sprecher and Metts, 1989, 1999). For example, some research indicates that individuals from more individualistic cultures more commonly endorse overidealized romantic beliefs (akin to fairy tales), whereas individuals from collectivistic cultures tend to perceive passionate overidealized love as an illusory and expect it to come to an end as more "realistic/enduring" love sets in (e.g., de Munck et al., 2011).

Although these romantic beliefs pertaining to love have been investigated for decades (e.g., Hobart, 1958) pioneers in the field, Sprecher and Metts (1989), were the first to comprehensively conceptualize and assess these beliefs among individuals in Western cultures. In fact, in 1989, Sprecher and Meets developed and validated the Romantic Beliefs Scale, which included items derived from several pre-existing romanticism scales. The resulting scale revealed that romantic beliefs were comprised of several components including resiliency amidst relationship obstacles, beliefs that there is only one true love, and that love can be accomplished at first sight.

From this work, the romantic belief ideology has been used to understand relationship, courtship, and romance scripts (i.e., cognitive structures that contain information relating to the key events that take place in romantic relationships; Ginsburg, 1988). In fact, many relationship scripts include elements related to "love at first sight," "love can conquer all" and/or "love is blind," all of which are commonly held romantic beliefs. It is posited that these scripts serve as a tool to guide behavior, particularly in times of uncertainty (Rose and Frieze, 1993). Thus, research reveals that relationship scripts predict one's own thoughts and behaviors as well as those of their romantic partner(s) (Sprecher and Metts, 1989, 1999; Driesmans et al., 2016).

Consequently, scholars using the romantic belief framework and the relationship script framework have determined that these scripts (commonly containing over-romanticized beliefs) contribute to various relationship outcomes. Specifically, endorsing idealized romantic beliefs to a greater extent has been associated with overlooking a partner's negative qualities (Murray and Holmes, 1997; Karandashev, 2019), maintaining the relationship for a longer duration (Ogolsky et al., 2017), seeing less decline in marital satisfaction over time (Murray et al., 2011), and reporting greater relationship satisfaction and commitment (Vannier and O'Sullivan, 2017). Additionally, Sprecher and Metts (1999) found that participants who reported more romantic love for their partner also endorsed idealized romantic beliefs to a greater extent.

Idealized romantic kissing beliefs

Although various studies have examined the endorsement of idealized romantic beliefs (e.g., Vannier and O'Sullivan, 2017), no research has explored idealized beliefs toward specific intimate/romantic behaviors, such as romantic kissing. Romantic kissing (defined as "lip-to-lip contact that may or may not be prolonged between two individuals in a sexual, intimate setting;" Thompson et al., 2017, p. 1) is often the first sexual behavior that an individual engages in, with many individuals having their first romantic kiss before graduating high school (Regan et al., 2004). Additionally, romantic kissing is the most frequently engaged in sexual behavior (Welsh et al., 2005) with most romantic couples reporting kissing at least once each day (Busby et al., 2022). Thus, resulting from the high frequency of romantic kissing (Welsh et al., 2005) as well as Sprecher and Metts' (1999) findings that idealized romantic belief endorsement positively predicted romantic love, it is reasonable to expect that idealized beliefs related to one's first romantic kiss with their current romantic partner would increase reports of romantic love toward that partner.

Evolutionary psychologists argue that kissing plays an important role in successful reproduction, as kissing can provide insight into whether a potential partner is genetically fit for reproduction (Wlodarski and Dunbar, 2014). As partners kiss, olfactory cues (e.g., partner's scent) provide insight into a partner's health (Durham et al., 1993) and reproductive status (Fullagar, 2003; Wlodarski and Dunbar, 2013). Furthermore, romantic kissing plays a role in love and commitment such that kissing during a sexual experience is associated with sexual satisfaction and orgasm consistency (Busby et al., 2022), whereas kissing frequency has been associated with relationship and sexual satisfaction (Welsh et al., 2005; Wlodarski and Dunbar, 2013).

In addition to romantic kissing serving as a mate selection tool (e.g., Wlodarski and Dunbar, 2014), it has been argued that a first kiss can serve as a catalyst for romantic relationship initiation and solidification. Specifically, one study conducted by Wlodarski and Dunbar (2013) found that participants overall reported that a first romantic kiss has altered their feelings of romantic attraction toward a partner. Moreover, participants who more highly rated their partners as "good" kissers reported higher sexual frequency and relationship satisfaction than participants who provided lower ratings. Taken together, it is possible that first kisses that meet or exceed expectations (i.e., the partner was a "good" kisser), result in higher-quality relationships. However, despite the influential role of a first kiss experience on romantic attraction, the impact of idealized first kiss expectations on other areas of a relationship functioning, such as romantic love for one's partner, has yet to be assessed. Thus, the current research developed a novel measure of idealized first romantic kiss beliefs and used this measure to assess whether these beliefs predicted reports of romantic love for one's current romantic partner.

The role of romantic attachment

Given that there is no existing literature regarding the impact of idealized first kiss beliefs on romantic love, the role of romantic attachment has yet to be explored. Romantic attachment was derived from Attachment Theory, which was first proposed by Bowlby (1958) to explain the emotional bond in a caregiver-child relationship and has since been extended to the study and understanding of romantic

relationships (Hazan and Shaver, 1987; Fraley and Shaver, 2000; Simpson and Rholes, 2017). Attachment Theory posits that the physical proximity and attentiveness of a childhood attachment figure will result in the formation of a subsequent attachment style (e.g., secure, insecure-avoidant, or insecure-anxious; Bowlby, 1958, 1969; Ainsworth et al., 1978).

Romantic attachment was first conceptualized by Hazan and Shaver (1987), which deemed that attachment styles are relatively stable across the lifespan, in which affectional bonds with romantic partners are formed in similar ways to those between infants and their caregivers. These attachment styles have been proposed to differ according to how romantic love is experienced, establishing two broad dimensions: secure and insecure. There are two types of insecure attachment styles: anxious and avoidant (in which individuals can be high or low in one or both dimensions). First, those scoring high on anxious attachment tend to report relatively high levels of negative emotion, feel dependent on romantic partners, and fear abandonment. They have also been shown to experience romantic love through their tendency to overestimate threats within their relationships more than individuals scoring low in anxious attachment (Hazan and Shaver, 1987; Brewer and Forrest-Redfern, 2022). Second, those scoring high on avoidant attachment often display low levels of emotionality and experience romantic love through self-reliance to a greater extent than individuals scoring low in avoidant attachment (Sanford, 1997). On the contrary, those scoring low on both attachment avoidance and anxiety are referred to as "secure" and have regularly been found to experience romantic love through more happiness, trust, and friendship (Hazan and Shaver, 1987).

Research on relationship outcomes had indicated that those insecurely attached (i.e., scoring high on attachment anxiety and/or avoidance) report lower relationship satisfaction than do those scoring high in attachment security (e.g., Candel and Turliuc, 2019; Vollmann et al., 2019; Londero-Santos et al., 2020). Thus, researchers have investigated the extent to which those adopting insecure attachment styles adopt idealized romantic beliefs (e.g., Feeney and Noller, 1991; Hart et al., 2012, 2013; Jin and Kim, 2015). The results of these studies found that higher scores in attachment anxiety were positively associated with idealized romantic belief endorsement, whereas higher scores in attachment avoidance were negatively associated with idealized romantic belief endorsement. Furthermore, in a qualitative study conducted by Feeney and Noller (1991), participants gave verbal descriptions of their current romantic partners. Within these descriptions, romantic attachment was assessed via the coding of spontaneous references to attachment-related issues (e.g., commitment) and a one-item measure from Hazan and Shaver (1987). Their results revealed that those high in attachment anxiety scored the highest in idealized romantic beliefs, whereas those high in attachment avoidance scored the lowest in idealized beliefs.

Thus, because of the association between romantic attachment (particularly anxious attachment) and idealized romantic beliefs, it is also possible that romantic attachment is associated with idealized first kiss beliefs. This body of research reveals the possibility that those higher in attachment anxiety would endorse idealized first kiss beliefs to a greater extent, subsequently increasing their reported romantic love for their current partner. Conversely, those higher in attachment avoidance would endorse idealized first kiss beliefs to a lesser extent, subsequently decreasing their reported romantic love for their current partner. Furthermore, because romantic love has been operationalized as a multidimensional attachment process (Hazan and Shaver, 1987), the current program of research examined the relationship between idealized first kiss beliefs, romantic attachment, and reports of romantic love for one's current partner.

The current research

In sum, this program of research was designed to (1) develop a novel scale assessing idealized first romantic kissing beliefs, (2) examine the relationship between idealized first romantic kiss beliefs and romantic love, and (3) to assess the impact of romantic attachment on the endorsement of idealized first romantic kiss beliefs and romantic love. Because of the well-documented associations between romantic beliefs, romantic attachment, and relationship outcomes, the moderating role of romantic attachment in the relationship between idealized first kiss beliefs and romantic love was also investigated for exploratory purposes. Based on the romantic belief theoretical framework (Sprecher and Metts, 1989), existing literature, and Attachment Theory (Hazan and Shaver, 1987; Fraley and Shaver, 2000), the following hypotheses were generated:

> *H1*: Adults who endorse idealized first romantic kiss beliefs to a greater extent were expected to report greater romantic love for their current partner as compared to those who endorsed idealized first romantic kiss beliefs to a lesser extent.

> *H2*: Adults who scored higher on anxious attachment were expected to endorse idealized beliefs to a greater extent, whereas adults who scored higher on avoidant attachment were expected to endorse idealized beliefs to a lesser extent.

Study One

The purpose of Study One was to develop a scale assessing idealized first romantic kissing beliefs and to assess the extent to which scores on this scale were associated with romantic love and romantic attachment (H1 & H2).

Method

Participants

A total of 300 U.S. adults were recruited from Amazon's Mechanical Turk (MTurk). However, 48 were removed due to failing to complete the survey in its entirety and an additional 31 were omitted because of incorrect responses to attention check items. Finally, 13 participants were removed due to not being in a romantic relationship (11 single, 1 divorced, 1 widowed). Thus, the final sample was comprised of 208 participants (134 men, 73 women, and 1 "prefer not to disclose"). Participants reported a mean age of 35.28 ($SD = 10.24$) and an average relationship length of 57.02 months ($SD = 84.41$), or roughly 4.75 years. A total of 67.3% of participants were married, 14.4% were dating, 10.1% were in a monogamous relationship, 5.3% were in an open relationship, 2.4% were cohabiting,

and 0.5% were in a polyamorous relationship. The majority of participants identified as White (61.1%), followed by Asian (30.8%), African American (4.3%), American Indian or Alaska Native (1.9%), and lastly multiple races (1.4%). In addition, many identified as heterosexual (80.3%), followed by bisexual (16.8%), gay (1.9%), and pansexual (0.5%). On average adults in Study One reported a mean relationship length of 51.86 months ($SD = 69.55$), or just over 4 years.

Measures

First Kiss Beliefs Scale

The First Kiss Belief Scale (FKBS) was developed for the purposes of Study One. In doing so, undergraduate and graduate research assistants were responsible for developing a list of items that captured idealistic beliefs related to one's first romantic kiss with their current romantic partner. After doing so, an initial list of 21 items were piloted using a sample of 20 undergraduate students in which difficult-to-comprehend items or those that did not fit were removed. Finally, pilot participants were asked to generate items that may have been missing. In sum, nine items were removed and two were added to the initial list.

The final draft of the FKBS included 14 items, all of which assessed the extent to which participants endorsed idealized kissing beliefs via a 7-point Likert scale, ranging from (1) not at all, to (7) very much. Participants received the following instructions "below are a series of questions asking about your expectations related to your first romantic kiss with your current romantic partner. When responding to each item, please reflect on your first romantic kiss with your partner (defined as lip-to-lip contact with someone of a sexual or romantic nature). If you have more than one romantic partner, please reflect on the partner you spend the most time with." Sample items consisted of "to what extent should your first kiss turn you on?" and "to what extent should your first kiss give you 'butterflies'?" with higher scores reflecting a greater endorsement of idealized kissing beliefs.

Experiences in Close Relationships Scale (ECR Scale)

The ECR Scale (Brennan et al., 1998) is a 36-item scale (divided into two subscales) that assessed insecure (anxious and avoidant) romantic attachment. The ECR Avoidance subscale contained 18 items that assessed discomfort with closeness (e.g., "I try to avoid getting too close to my partner"), whereas the ECR Anxiety subscale contained 18 items that assessed concern with abandonment (e.g., "I worry that my romantic partner will not care about me as much as I care about them"). Responses were assessed using a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree), with higher scores reflecting greater insecure attachment. Both anxiety and avoidance subscales demonstrated adequate discriminant validity ($r = 0.17$; Wei et al., 2007, p. 191), test–retest reliability (0.70; Wei et al., 2007), and internal consistency (Anxiety: $\alpha = 0.91$, Avoidance: $\alpha = 0.94$; Brennan et al., 1998). In Study One, the Avoidance ($\alpha = 0.85$) and Anxiety subscales ($\alpha = 0.96$) both demonstrated great internal consistency.

Demographics questionnaire

Participants provided information about their race/ethnicity, gender, age, sexual identity, relationship status, relationship length, and kissing history. They were also required to report on the extent to which they loved their partner via a 4-point response scale, ranging from 1 (not at all) to 4 (a lot).

Procedure

Upon Institutional Review Board (IRB) approval, participants were recruited to complete this study from a recruitment message on MTurk. Eligible participants (at least 18 years of age, English-speaking, had experience with romantic kissing, and currently in a relationship) were given an electronic consent form that outlined further details of the study (e.g., estimated time of completion, compensation information, IRB/PI contact information). Participants were then instructed to complete the FKBS and the ECR Scale, followed by a series of demographic questionnaires (in that order). Upon completion, participants were given an electronic debriefing form and were thanked for their participation. The study took 20 min to complete, and participants were compensated $2.00 USD into their MTurk accounts.

Data cleaning and preparation

Using the 10 participants-per-item guideline (Everitt, 1975), the sample size was considered adequate for performing an exploratory factor analysis. Approximately 3.7% of data was missing at the participant level and missing values were treated using mean substitution via the factor analysis command in SPSS. Although no outliers were identified on any of the FKBS items, the majority of items did demonstrate significant skew and the results should be interpreted with caution. Following initial data cleaning, a maximum likelihood exploratory factor analysis was computed with a promax rotation. The results produced from the scree plot and parallel analysis revealed that a single-factor solution was best and accounted for 52.39% of the variance. To determine which items to retain, factor loadings were reviewed. No items failed to load at 0.50 or higher, thus all 14 items were retained (see Table 1 for descriptive statistics for all items). To assess the internal consistency of the FKBS, Cronbach's alpha was calculated. The results revealed that the FKBS had excellent scale reliability ($\alpha = 0.93$).

After finalizing the FKBS, outliers and skew were assessed for all scales and items of interest. Although no outliers were identified, the two subscales on the ECR Scale demonstrated significant skew (computed by dividing the skew statistic by the skew standard error). The skew on these variables was resolved via a square root and a logarithmic transformation. It is worth noting that all descriptive statistics are reported below in raw values.

To ensure sufficient power to conduct the exploratory moderation model, a sensitivity analysis using G*Power 3.1 (Faul et al., 2009) was conducted. The results revealed that the moderation analysis was sufficiently powered (80%) to detect a small-to-medium effect ($f^2 = 0.05$; $F = 2.65$) with an p value of $= 0.05$. Finally, exploratory analyses were conducted to assess the relationships between all primary variables and some demographic items (e.g., age, gender, relationship length). The results revealed that the demographic variables were not significantly correlated with idealized kissing beliefs or reports of romantic love ($ps > 0.05$).

Results

Descriptive results

Preliminary descriptive analyses revealed that people reported a mean FKBS score of 5.39 ($SD = 1.05$) which indicates that participants reported fairly idealized or over-romanticized beliefs pertaining to

TABLE 1 Means and standard deviations for the items in the First Kiss Beliefs Scale.

FKBS scale items	*M* (SD)
To what extent do you believe your first kiss should be a memorable event?	5.65 (1.34)
To what extent should you feel a lot of chemistry in your first kiss?	5.58 (1.29)
To what extent should your first kiss give you "butterflies?"	5.55 (1.48)
To what extent do you believe your first kiss is very important?	5.53 (1.44)
To what extent should your first kiss turn you on?	5.52 (1.30)
To what extent do you believe your first kiss needs to be exciting?	5.50 (1.32)
To what extent do you believe your first kiss is a really big deal?	5.48 (1.32)
To what extent should you feel "fireworks" from your first kiss?	5.46 (1.47)
To what extent does your first kiss need to have a spark?	5.43 (1.39)
To what extent do you believe your first kiss needs to be magical?	5.29 (1.51)
To what extent should your first kiss leave you speechless?	5.27 (1.52)
To what extent should your first kiss take your breath away?	5.25 (1.47)
To what extent do you believe you should feel electricity from your first kiss?	5.22 (1.46)
To what extent should you feel the whole world blur around you during your first kiss?	5.08 (1.58)

$N = 208$.

TABLE 2 Correlation coefficients for the FKBS, love item, and ECR subscales for Study One.

Study variables	Pearson-product moment correlation coefficients			
	FKBS scores	Love scores	ECR-anxiety scores	ECR-avoidance scores
FKBS scores	--	--	--	--
Love item scores	0.25***	--	--	--
ECR-anxiety scores	0.21**	−0.17*	--	--
ECR-avoidance scores	0.32***	0.15*	0.65***	--

$N = 208$. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

their first romantic kiss with their current partner. Scores on the ECR Scale suggest that the sample endorsed avoidance items to a greater extent than anxious items, with a mean score of 4.75 ($SD = 0.93$) on the Avoidance subscale and 3.92 ($SD = 1.57$) on the Anxiety subscale. Finally, scores on the items assessing the extent to which participants "loved their partner" revealed that nearly everyone in the sample was at least somewhat in love with their current romantic partner, as can be seen by a mean of 3.35 ($SD = 0.81$) on a 4-point scale. In fact, 116 participants (52.5%) reported a value of 4 or that they loved their partner "a lot."

Correlational results

To assess H1 and H2, Pearson-product moment correlation coefficients were computed using the scores on the FKBS, the love item, and the two subscales of the ECR Scale (see Table 2). These results support our H1, that those scoring higher on the FKBS reported being in love with their current partner to a greater extent than those scoring lower. In addition, H2 was partially supported such that those high in both anxious and avoidant attachment scored higher on the FKBS than did those scoring lower. Meanwhile, these results contrast with our prediction that those scoring high in avoidant attachment would yield lower FKBS scores. To explore whether romantic attachment moderated this relationship, a moderated moderation analysis was conducted using Andrew Hayes' PROCESS macro (Model 3; Hayes, 2013). In the analysis, FKBS scores were entered as the predictor variable, scores on the love item as the outcome variable, and ECR subscale scores as the moderators.

The results revealed that (in addition to a significant association between anxious attachment and love; $\beta = -0.43$, $p = 0.002$) the interaction between FKBS scores and anxiety scores accounted for a significant amount of the variance in scores on the love item ($\beta = 0.15$, $p < 0.001$). To probe the interaction term further, a simple slopes analysis was conducted by examining the nature of the relationship between FKBS and romantic love scores separately for those high and low in anxious attachment. The results indicated that the relationship between idealized first kiss beliefs and romantic love was significantly stronger for those high in anxious attachment ($\beta = 0.68$, $p < 0.001$) than it was for those low in anxious attachment ($\beta = 0.18$, $p = 0.02$). The interaction between FKBS scores and avoidance scores also accounted for a significant amount of the variance in scores on the love item ($\beta = -0.21$, $p = 0.01$). To probe the interaction term further, a simple slopes analysis was conducted by examining the nature of the relationship between FKBS and romantic love scores separately for those high and low in avoidant attachment. The results of a second simple slopes analysis indicated that, the relationship between idealized first kiss beliefs and romantic love was significant for those low in avoidant attachment ($\beta = 0.30$, $p < 0.001$) but not for those high ($\beta = 0.01$, $p = 0.91$). See Figure 1 for a visual depiction. It is worth noting that the interaction between anxious and avoidant attachment ($\beta = 0.09$, $p = 0.25$) nor the three-way interaction ($\beta = -0.11$, $p = 0.09$) were statistically significant.

Discussion

Given that idealized first kiss beliefs had yet to be assessed prior to this study, the first objective was to develop a scale measuring idealized first kiss beliefs. As expected, participants did endorse idealized first kiss beliefs to a high extent, which is indicated by a mean score of 5.39 on a scale from 1 to 7. This finding is supported by and extends past literature, which has revealed that individuals also commonly endorse idealized romantic beliefs to a high extent (e.g., Vannier and O'Sullivan, 2017). Proponents of the Romantic Beliefs Scale's reliability and validity could potentially argue that idealized first kiss beliefs were a previously unknown, but salient subtype of idealized romantic beliefs, given the high endorsement of items that entail feelings of love arising from a first kiss (e.g., "To what extent should you feel a lot of chemistry in your first kiss."). In particular, proponents may suggest that the FKBS could serve as an extension to the "love at first sight" dimension of the Romantic Beliefs Scale (i.e., love at first kiss).

Moreover, consistent with H1, the results from Study One indicated that those who endorsed idealized first kiss beliefs to a greater extent also reported being more in love with their current romantic partner than those endorsing these beliefs to a lesser extent.

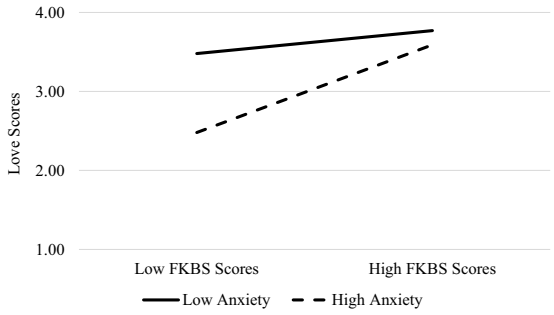

FIGURE 1
The relationship between FKBS scores and Love for those high and low in anxious attachment for Study One. Low anxiety = *M* − 1SD. High anxiety = *M* + 1SD.

This relationship aligns and extends existing literature that has identified an association between idealized romantic belief endorsement and higher relationship satisfaction (Vannier and O'Sullivan, 2017; Kretz, 2019), which has been positively associated with love (Hendrick et al., 1988; Morrow et al., 1995; Vedes et al., 2016; Moore and Campbell, 2020).

As expected (H2), higher scores in attachment anxiety predicted endorsement of idealized first kiss beliefs to a greater extent. This finding is consistent with existing literature that states that those high in attachment anxiety are most likely to endorse idealized romantic beliefs (e.g., Feeney and Noller, 1991; Hart et al., 2012, 2013). Contrary to H2, however, higher scores in attachment avoidance predicted heightened endorsement of idealized first kiss beliefs, rather than a decreased endorsement. Although these results are surprising, they align with work conducted by Dinkha et al. (2015) indicating a positive association between attachment avoidance and parasocial relationships (defined as a one-sided relationship that an audience member fashions with a television personality). In particular, adults scoring high in attachment avoidance tend to form relationships with media characters in an effort to circumvent feelings of emotional closeness with their current partners. Additionally, individuals reporting more parasocial relationships tend to endorse romantic beliefs more strongly than those reporting fewer parasocial relationships (Jin and Kim, 2015). Thus, because those high in attachment avoidance are more inclined to participate in parasocial relationships and these relationships result in the endorsement of more overromanticized beliefs, the same is likely true for the endorsement of idealized first kiss beliefs.

For exploratory purposes, the moderating role of romantic attachment was assessed with regard to the association between idealized first kiss beliefs and reports of romantic love. The results revealed that the relationship between idealized first kiss beliefs and romantic love was stronger for those high in attachment anxiety as compared to low. It is possible that the endorsement of idealized beliefs could compensate for the overestimation of relationship threat and underestimation of the partner's commitment (Brewer and Forrest-Redfern, 2022) that those with high attachment anxiety experience. Results also found that the relationship between idealized kissing beliefs and romantic love was stronger for those lower in attachment avoidance as compared to high. Since those high in attachment avoidance conceptualize intimacy as threatening and their partners as more undependable (Hazan and Shaver, 1987; Hart et al., 2013), a stronger relationship between idealized kissing beliefs and romantic love could be justified for those low in attachment avoidance as compared to high. In particular, those high in attachment avoidance could place less emphasis on the value of a first romantic kiss in an effort to distance themselves from the potential intimacy that could result.

Although Study One helped to progress literature on romantic love and idealized romantic beliefs, some limitations should be noted. First, a one item-measure was used to assess romantic love, which could have led to questionable reliability and validity (Diamantopoulos et al., 2012). Thus, Study Two incorporated a multi-item scale to assess love, as multi-item scales show stronger predictive validity than single-item scales.

Second, we do not know the extent to which unmet first kiss expectations predict romantic love. In fact, it is possible that hyper-romanticized beliefs contribute to more unrealistic romantic expectations (Spaulding, 1970; Glenn, 1991; Galician, 2004), resulting in relationships that fail to meet expectations and inevitably poor relationship outcomes (Vannier and O'Sullivan, 2017, 2018). Research reveals that unmet expectations have been associated with lower levels of sexual satisfaction, as well as higher levels of sexual distress and relationship conflict (Rosen et al., 2022). Additionally, unmet expectations have been identified as better predictors of decreased relationship satisfaction and commitment as compared to idealized romantic beliefs alone (Vannier and O'Sullivan, 2017). Thus, research is needed to explore the impact of unmet kissing beliefs on reports of romantic love.

Study Two

To address limitations associated with the previous study, Study Two was designed to explore the extent to which unmet first kiss expectations predicted reports of romantic love (using a validated multi-item measure) in comparison to idealized first kiss beliefs. With this in mind, the following novel hypothesis was generated.

> *H3*: Unmet first kiss expectations were expected to predict a greater proportion of the variance in reports of romantic love in comparison to idealized first kiss beliefs.

Method

Participants

A total of 250 participants were recruited through Prolific ®. However, 10 were removed due to responding incorrectly to any of the attention check items, four due to duplicate IP addresses, and one more for not meeting the eligibility criteria. Thus, the sample was composed of 235 U.S. adults. Participants reported an average age of 39.49 years (*SD* = 12.37). A majority of participants identify as men (50.20%) followed by women (48.09%). In addition, 78.30% of participants reported being White, followed by Asian (9.79%) and Black or African American (8.94%). In total, 83% of participants reported identifying as heterosexual followed by bisexual (9.4%), gay (4.3%), pansexual (3.4%), lesbian (1.3%), queer (0.9%), asexual (0.4%), and 0.4% reported not

knowing their sexual identity. Additionally, 59.6% of participants were married, 19.6% were in a monogamous relationship, 14.9% were cohabitating, 4.7% were in dating relationships, and 1.3% indicated a relationship status other than the previous. On average, adults in Study One reported a mean relationship length of 171.55 months ($SD = 132.08$), or approximately 14 years. Participants' average age of their first romantic kiss with their current partner was 25.22 years ($SD = 8.52$).

Measures

First Kiss Beliefs Scale

The First Kiss Beliefs Scale (FKBS) was used to assess first kiss expectations in Study Two. The results of a second maximum likelihood EFA confirmed that a single-factor structure best portrayed the data (accounting for 64.78% of the variance). All items loaded at 0.65 or higher on the factor and items in the FKBS demonstrated great internal consistency, as evidenced by Cronbach's alpha of 0.96.

First Kiss Outcome Scale (FKOS)

The First Kiss Outcome Scale (FKOS) was developed for the purpose of Study Two by revising the FKBS to assess the extent to which their first kiss met their expectations. Similar to the FKBS, it was composed of 14 items all rated on a 7-point Likert scale, ranging from (1) not at all to (7) very much. Sample items include "To what extent did you feel the whole world blur around you during your first kiss?" and "To what extent was your first kiss magical?"

Another maximum likelihood EFA was conducted to explore the factor structure of the FKOS. The results of a parallel analysis and visually inspecting the scree plot indicated that only one factor was needed to best summarize the data (accounting for 68.38% of the variance). All items loaded at 0.58 or higher and the FKOS proved to be internally consistent ($\alpha = 0.96$).

Experiences in Close Relationships Scale (ECR Scale)

The ECR Scale (Brennan et al., 1998) was once again used in Study Two, with both scales demonstrating adequate internal consistency, Avoidance ($\alpha = 0.82$) and Anxiety ($\alpha = 0.94$).

Romantic Love Scale (RLS)

Romantic love (Rubin, 1970) was measured using the Romantic Love Scale (RLS), which is composed of 13 items on a 9-point Likert scale, ranging from (1) not at all true to (9) definitely true. Participants were instructed to think about their romantic partner while completing the measure. Sample items include "I find it easy to ignore my partner's faults." and "I would do almost anything for my partner." The items in the RLS have a Cronbach's alpha of 0.89, indicating the items to be internally consistent.

Demographics questionnaire

Similar to Study One, participants provided information about their race/ethnicity, gender, age, sexual identity, relationship status, relationship length, and kissing history.

Procedure

Upon Institutional Review Board (IRB) approval, participants were recruited for this online study through a recruitment message on Prolific®. Eligible participants (at least 18 years of age, from the United States, and in a current romantic relationship) were given an electronic consent form that further outlined specific study details. Participants then completed the FKBS, the Kissing Outcome Scale, the Romantic Love Scale, and a demographics questionnaire (in that order). Following study completion, participants were given an electronic debriefing form and thanked for their time. The study took approximately 10 min to complete, and participants were compensated with a $2.00 USD deposit to their Prolific accounts.

Data cleaning and preparation

To ensure sufficient power to conduct the exploratory moderation model, a sensitivity analysis was conducted for Study Two. The results revealed that the moderation analysis was sufficiently powered (80%) to detect a small-to-medium effect ($f^2 = 0.04$; $F = 2.64$) with a p value of = 0.05. Approximately 0.9% of data was missing at the participant level, thus missing values were dealt with using listwise deletion. Although there was only one outlier on the Anxiety subscale of the ECR Scale, the Avoidance subscale of the ECR Scale, and the FKBS, all outlier values were reported by the same participant. Thus, this individual was removed from all analyses, resulting in a final sample size of 234 participants. After reviewing the distributions for the variables of interest, the RLS and the Anxious subscale of the ECR Scale demonstrated significant skew. That said, the skew was resolved for both scales using a logarithmic transformation. Once again, all descriptive statistics are reported below in raw values.

In order to assess the extent to which participants idealized first kiss beliefs were unmet, difference scores (i.e., D_{kiss} scores) were computed by subtracting FKOS scores from FKBS scores. Consequently, negative D_{kiss} scores indicate unmet expectations, positive D_{kiss} scores indicate exceeded expectations, and D_{kiss} scores approaching 0 suggest one's first kiss expectations were met. Finally, age, gender, and relationship length were not significantly correlated with idealized kissing beliefs or reports of romantic love ($ps > 0.05$).

Results

Descriptive results

Consistent with Study One, descriptive analyses indicated a mean FKBS score of 5.03 ($SD = 1.30$), confirming that participants reported fairly over-romanticized first kiss beliefs. Again, the sample endorsed avoidance items to a greater extent than anxious items, with a mean score of 4.44 ($SD = 0.57$) on the Avoidance subscale and 2.79 ($SD = 1.13$) on the Anxiety subscale. With regard to our new measure of romantic love, a mean score of 7.05 ($SD = 1.32$) out of 9 suggested that participants were very in love with their current romantic partner. Scores on the FKOS revealed that participants' expectations were likely met (even exceeded in some cases), as evidenced by a mean score of 5.07 ($SD = 1.49$). Finally, the mean D_{kiss} score was 0.03 ($SD = 0.99$), revealing that participants' first kiss expectations were fairly consistent with their first kiss outcomes.

Correlational and predictive results

Pearson-product moment correlation coefficients were once again used to assess H1 and H2. Consistent with Study One, the results indicated that FKBS scores were positively associated with RLS scores. In addition, FKBS scores were positively associated with both the Avoidance and Anxiety subscales of the ECR Scale.

Interestingly, D_{kiss} scores were positively associated with RLS scores, but to a lesser extent than FKBS scores (See Table 3).

To assess H3 (whether unmet expectations were a better predictor of romantic love than idealized first kiss beliefs) a hierarchical linear multiple regression was conducted with unmet expectations entered as the predictor variable in block one and idealized beliefs in block two. The results indicated that, in block one, the D_{kiss} scores predicted a significant amount of the variance is RLS scores, $R^2 = 0.05$, $F(1, 232) = 11.38$, $p < 0.001$. When the FKBS scores were entered on block two, they also predicted a significant amount of the variance in RLS scores, $R^2 = 0.15$, $F_{change}(1, 231) = 27.91$, $p < 0.001$. In fact, contrary to our expectations (H3), an examination of the semi-partial correlations revealed that FKBS scores predicted a greater proportion of unique variance in RLS scores ($\beta = 0.33$, $sr^2 = 0.10$, $p < 0.001$) than did the D_{kiss} scores ($\beta = 0.27$, $sr^2 = 0.07$, $p < 0.001$).

Finally, to examine the moderating role of romantic attachment on the relationship between FKBS scores and RLS scores, another moderated moderation analysis was conducted. Again, FKBS scores were entered as the predictor variable, scores on the RLS as the outcome variable, and ECR subscale scores as the moderators. In addition to the significant associations between kissing beliefs ($\beta = 0.20$, $p < 0.001$), anxious attachment ($\beta = -0.12$, $p = 0.04$), avoidance attachment ($\beta = -0.16$, $p = 0.001$) and romantic love, the results revealed that the interaction between FKBS scores and anxiety scores accounted for a significant amount of the variance in RLS scores ($\beta = 0.17$, $p = 0.004$). To probe the interaction term further, a simple slopes analysis was conducted by examining the nature of the relationship between FKBS and RLS scores separately for those high and low in anxious attachment. The results indicated that the relationship between idealized first kiss beliefs and romantic love was significant for those high in anxious attachment ($\beta = 0.63$, $p < 0.001$) but not for those low in anxious attachment ($\beta = 0.10$, $p = 0.21$). See Figure 2 for a visual depiction. However, unlike Study One, the interaction between FKBS scores and avoidance scores did not account for a significant amount of the variance in RLS scores ($\beta = 0.12$, $p = 0.23$). Thus, no follow-up analyses were conducted. Although the interaction between anxious and avoidance attachment was not significant ($\beta = -0.07$, $p = 0.20$), the three-way interaction did account for a significant amount of the variance in RLS scores ($\beta = -0.16$, $p = 0.001$). The interaction between attachment avoidance and kissing beliefs varied among those high and low in attachment anxiety, such that attachment avoidance did not alter the relationship between kissing beliefs and romantic love for those high in attachment anxiety but it did for low. In particular, among those low in attachment anxiety, the relationship between kissing beliefs and love was positive for those high in attachment avoidance and negative for those low (see Figure 3).

Discussion

Study Two expanded on Study One by incorporating a multi-item scale to assess romantic love, as well as assessing kissing outcomes to determine whether idealized first kiss beliefs or unmet expectations more strongly predicted reports of romantic love. Consistent with Study One, the results from Study Two indicated that individuals tend to strongly endorse idealized first kiss beliefs and that these beliefs predict romantic love. However, this relationship was once again moderated by anxious romantic attachment (but not avoidance), such that the association between idealized first kiss beliefs and romantic love was significant for those high in anxious attachment but not low. Overall, these results confirm that there are benefits to holding idealized beliefs regarding a first romantic kiss and that these benefits appear to be strongest for those anxiously attached.

The results from Study Two also indicated that both idealized first kiss belief endorsement and unmet expectations predicted romantic love. Contrary to H3, however, the predictive utility of idealized first kiss belief endorsement on reports of romantic love was greater than that of unmet expectations. Although there are numerous potential explanations for this finding, it may relate (in part) to optimism. In fact, research indicates that adults who report greater dispositional optimism report higher relationship quality as compared those who are less optimistic (Leahy et al., 2023). Thus, because those endorsing idealized first kiss beliefs to a greater extent are likely more optimistic about romantic relationships, they are more satisfied with their relationship and ultimately more in love. It is also possible that our findings relate to the degree to which expectations were met in the first place. For example, the majority of participants in Study Two reported that their first kiss expectations were met or even exceeded, whereas Vannier and O'Sullivan (2017) reported that expectations were unmet, on average. This difference in the extent to which expectations were met could have altered the extent to which idealized first kiss endorsement and unmet expectations predicted reports of romantic love.

Of note, the results from Study Two revealed that increased endorsement of idealized first kiss beliefs predicted more unmet expectations within a relationship. Although this finding contrasts with that from Vannier and O'Sullivan's (2017) study, it can be supported by past literature suggesting that idealized romantic belief endorsement could aid in formulating unfeasible, and possibly

TABLE 3 Correlation coefficients for the FKBS, D scores, RLS, and ECR subscales for Study Two.

Study variables	Pearson-product moment correlation coefficients				
	FKBS scores	D scores	RLS scores	ECR-anxiety scores	ECR-avoidance scores
FKBS scores	--	--	--	--	--
D scores	−0.18**	--	--	--	--
RLS scores	0.28***	0.0.22***	--	--	--
ECR-anxiety scores	0.16*	−0.05	−0.15*	--	--
ECR-avoidance scores	0.20**	0.08	0.57***	−0.17*	--

$N = 234$. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

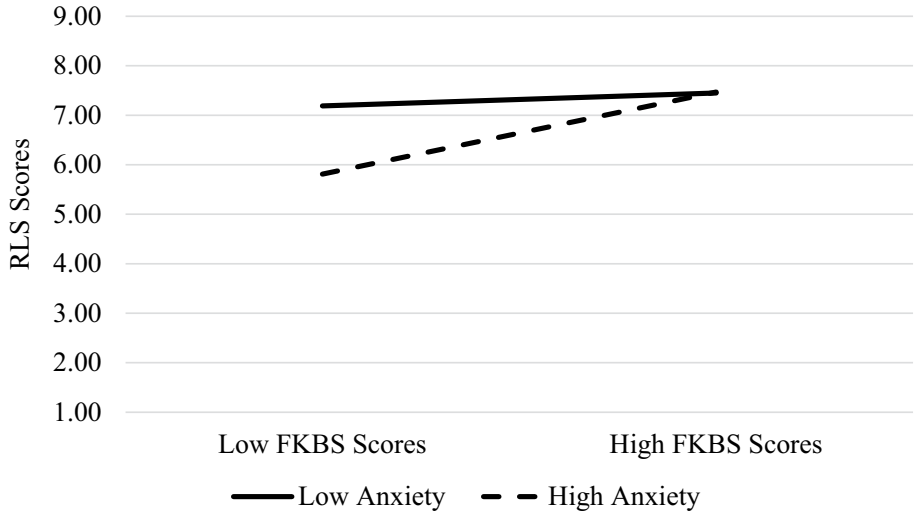

FIGURE 2
The relationship between FKBS scores and RLS for those high and low in anxious attachment for Study Two. Low anxiety=*M* − 1SD. High anxiety=*M*+1SD.

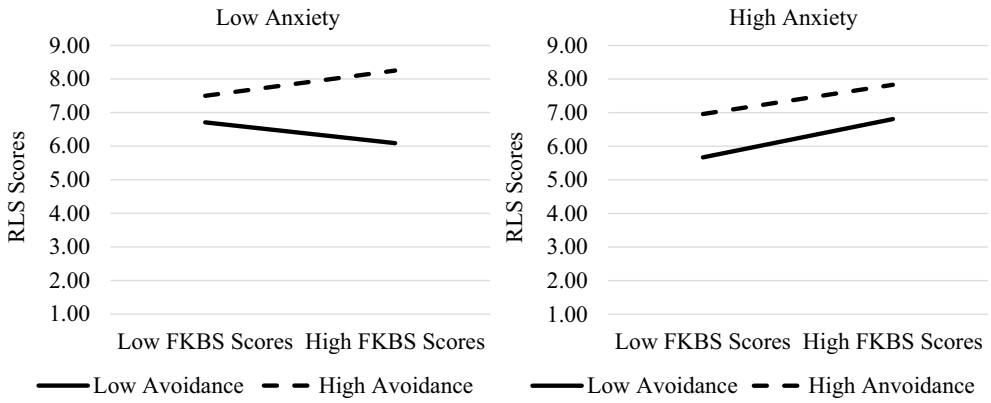

FIGURE 3
The three-way interaction between FKBS scores, ECR scale scores, and RLS scores for Study Two. Low anxiety/Avoidance = *M* − 1SD. High anxiety/Avoidance = *M* + 1SD.

unattainable romantic expectations (Spaulding, 1970; Glenn, 1991; Galician, 2004). Moreover, it is possible that reports of romantic love could have been highest for those who adopted high first kiss expectations, and these expectations were met or even exceeded.

Finally, the three-way interaction between kissing beliefs, anxious, and avoidant attachment revealed that the association between idealized kissing beliefs on reports of romantic love was positive for everyone except those low in both anxious and avoidant attachment (i.e., securely attached individuals). It is possible that those who are securely attached place less emphasis on romantic kissing beliefs when evaluating their relationship. In fact, research indicates that insecurely attached adults endorse more relationship-specific irrational beliefs (e.g., "people who love each other know exactly what each other's thoughts are without a word even being said," "I take it as a personal insult when my partner disagrees with an important idea of mine") than those securely attached (Stackert and Bursik, 2003). Consequently, adults who are securely attached who resort to endorsing idealized kissing beliefs may be doing so in times of distress as a tool to overcome dissatisfaction or in an attempt to savor a dissolving relationship.

General discussion

Despite the frequency of romantic kissing in Western cultures (Welsh et al., 2005), as well as the well-supported links between idealized romantic beliefs and relationship satisfaction (e.g., Vannier and O'Sullivan, 2017), the current program of research was the first to assess the beliefs that individuals hold when entering a first romantic kiss and the extent to which these beliefs predict romantic love. The first objective of this research was to assess idealized first kiss belief endorsement via the development of a novel measure. In creating this measure, we were able to determine that individuals do, in fact, endorse idealized first kiss beliefs. In fact, holding idealized first kiss beliefs was very commonplace among respondents. The pervasiveness of idealized first kiss beliefs among our sample could possibly

be explained via Cultivation Theory (Gerbner and Gross, 1976; Gerbner et al., 1980; Lichter et al., 1994), in that the high prevalence (76% television shows, Timmermans and Van den Bulck, 2018) and the overidealized depiction of first romantic kisses within mainstream media (e.g., first kisses presume living "happily ever after" with one's true love; Hefner et al., 2017; Dajches and Aubrey, 2020) leads viewers to adopt equally idealized notions about first romantic kisses in the real world.

Across both studies, H1 was supported. In particular, greater idealized first kiss belief endorsement predicted higher reports of romantic love (expect among those securely attached). This is intuitive given the aforementioned roles of kissing frequency (Welsh et al., 2005) and idealized romantic belief endorsement (Vannier and O'Sullivan, 2017; Kretz, 2019) in promoting relationship satisfaction. This is also consistent with the romantic belief framework. Because idealized kissing beliefs influence relationship/courtship scripts, kissing likely has a large role in predicting expectations in romantic relationships (Sprecher and Metts, 1989, 1999; Driesmans et al., 2016). In fact, our findings support existing literature documenting the importance of one's first kiss (Robinson, 1992; Regan et al., 2007; Simpson et al., 2020). Evidence of the importance of kissing can be gleaned from research by Rice et al. (2017) indicating that people can remember approximately 90% of the details surrounding their first romantic kiss (more than the proportion of details remembered relating to one's sexual debut).

Partially consistent across both studies was H2. In particular, higher attachment anxiety consistently predicted endorsement of idealized first kiss beliefs. It is no surprise that attachment anxiety was positively correlated with idealized first kiss beliefs because of the existing literature linking anxious attachment to idealized romantic beliefs (e.g., Feeney and Noller, 1991; Hart et al., 2012, 2013). However, additional research should be conducted to explore the relationships between attachment avoidance and idealized first kiss beliefs. In fact, it is possible that the ubiquitous negative association between attachment avoidance and idealized romantic belief endorsement documented in previous studies (e.g., Feeney and Noller, 1991; Hart et al., 2012, 2013; Jin and Kim, 2015) may not generalize to specific intimate behaviors such as one's *first* romantic kiss.

Given the significant moderating role of romantic attachment on the relationship between idealized first kiss beliefs and reports of romantic love, adopting and endorsing idealized first kiss beliefs could be particularly useful for insecurely attached adults, particularly those high in attachment anxiety (as this was the only construct that consistently moderated the relationship across both studies). These findings could potentially be explained by the tendency for those scoring higher in attachment anxiety to seek reassurance to a greater extent (Clark et al., 2020), as well as report greater interpersonal attraction when given positive feedback (Sperling and Borgaro, 1995). Specifically, it is possible that idealized first kiss belief endorsement could have been used as a means of reassurance that their current partner loves them in return (i.e., positive feedback), which could have translated to increases in their own reports of romantic love. With regard to attachment avoidance, endorsing idealized first kiss beliefs may not be useful as people high in avoidance likely evade placing the same degree of emphasis on a first romantic kiss in an effort to reduce the threat of intimacy that may result. Nevertheless, more research exploring the impact of attachment avoidance on idealized first kiss beliefs is important in order to clarify the inconsistencies documented in the two current studies.

Finally, contrary to H3, idealized first kiss beliefs more strongly predicted reports of romantic love than did unmet expectations. Specifically, idealized first kiss belief endorsement explained two times as much of the variance (10%) in romantic love as compared to unmet expectations (5%). This supports research by Vannier and O'Sullivan (2017) that romantic beliefs (on their own predict relationship outcomes). Furthermore, our research suggests that entering a relationship with high first kiss expectations may be beneficial in promoting romantic love toward one's current romantic partner, regardless of the potential for unmet expectations.

Limitations and future directions

Although this program of research expanded our understanding of romantic kissing expectations (a severely understudied area), several limitations must be noted. First, all participants were asked to reflect on their first romantic kiss with their current romantic partner. Consequently, it is likely that our results were plagued by issues associated with recall bias considering that participants reported being in their current relationship for a substantial amount of time and likely were far past the courtship phase, particularly in Study Two (roughly 14 years). As a result, our participants may not have adequately remembered their expectations prior to their first romantic kiss. In fact, the recall bias often results in an overestimation in remembering past affect (Wirtz et al., 2003; Ben-Zeev et al., 2009; Colombo et al., 2019), such that people have a tendency to overestimate positively-valanced emotions. Consequently, it is plausible that people overestimated how much they idealized their first kiss because they are still with their current partner, whereas those no longer with their partner (who were not allowed to participate) likely would report different expectations. Researchers should work to replicate this research by recruiting individuals currently in the courtship phase of a relationship and following them longitudinally to assess their reports of romantic love. Additionally, researchers could recruit dyads to assess kissing beliefs and romantic love (allowing for comparisons for validity purposes) or, better yet, employ implicit measures to bypass issues with response biases.

Second, our study was comprised of U.S. adults who were currently in a romantic relationship. Thus, the results of our study likely fail to generalize to adults from other cultures. In fact, several studies have produced findings that counter the common Western belief that romantic partners express their desire for one another through romantic kissing (e.g., Jankowiak et al., 2015). Despite common depictions of romantic kissing in a variety of media, romantic kissing is only present in approximately 46% of cultures. Thus, kissing beliefs likely do not impact romantic love in many cultures the way it does in Western cultures.

Second, the scale we used to assess idealized first kiss expectations (FKBS) was novel and the validity still needs to be assessed. Thus, the extent to which this scale accurately and holistically assesses idealized first kiss beliefs remains unknown. Future studies should be used to validate the scale to ensure that all domains of idealized first kiss beliefs are accurately assessed. Relatedly, according to Classical True Score Theory (Gulliksen, 1987) the use of D_{kiss} scores in Study Two may yield concerns about

the reliability of our results. In fact, statisticians have documented the problematic reliability of difference scores computed from highly correlated items/scales. Thus (although the scales themselves demonstrated excellent scale reliability), all results involving the D_{kiss} scores should be interpreted with caution.

Finally, the associations between idealized first kiss beliefs, romantic attachment, and reports of romantic love were strictly correlational. From this research program alone, we are unable to determine whether having high first kiss expectations increases reports of romantic love, or whether individuals report more romantic love for their current partners as a result of setting high expectations for their first kiss. We are also unable to determine whether scoring high in attachment anxiety and/or avoidance increases idealized first kiss belief endorsement. Thus, we encourage researchers to adopt innovative experimental designs to explore the causal relationship between idealized first kiss beliefs and romantic love, as well as the relationship between romantic attachment and idealized first kiss beliefs.

Implications

In sum, the current research confirmed that adults do hold idealized first kiss beliefs and that these beliefs have important implications for romantic relationships, particularly the love reported for one's romantic partner. Consequently, the results from our research have a variety of implications. First, the novel scale in our study demonstrated utility in understanding variations in romantic love. Thus, we encourage researchers to modify/expand the FKBS to assess other "firsts" in intimate behaviors (physical and/or emotional) other than kissing (e.g., sexual debut). In doing so, a more holistic understanding of how beliefs regarding novel behaviors impact romantic love and relationship functioning. Second, to support those in interpersonal distress and to promote romantic love between partners, items in the FKBS could serve as a guide for the beliefs individuals should endorse prior to engaging in first kisses with their current partners. Finally, these results could prove useful for clinicians and practitioners looking to improve the experience of romantic love. In fact, clinicians could encourage adults to internalize more idealistic kissing beliefs in an effort to promote and/or enhance feelings of romantic love.

Data availability statement

The datasets presented in this study can be found in online repositories. The names of the repository/repositories and accession number(s) can be found at: https://osf.io/zjmby/?view_only=b3ab79df70ce45ac87cafffb468f69f6.

Ethics statement

The studies involving humans were approved by University of Minnesota Institutional Review Board. The studies were conducted in accordance with the local legislation and institutional requirements. The ethics committee/institutional review board waived the requirement of written informed consent for participation from the participants or the participants' legal guardians/next of kin because participants were recruited online via Prolific.

Author contributions

AT: Conceptualization, Formal analysis, Investigation, Methodology, Project administration, Supervision, Validation, Writing – original draft, Writing – review & editing. MH: Writing – original draft, Writing – review & editing. JR: Writing – original draft, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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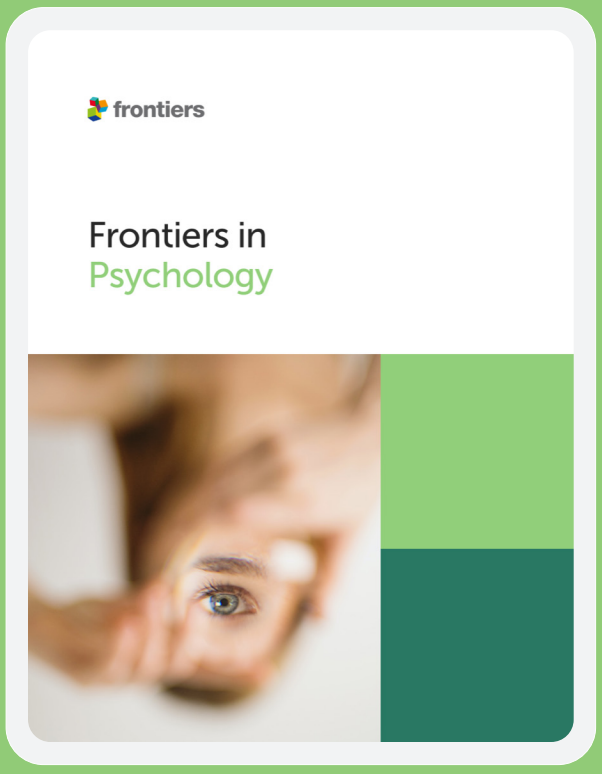

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