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More romantic or more realistic: trajectories and influencing factors of romantic love among Chinese college students from entering college to graduation

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College is a significant transition in the growth of individuals, and romantic relationships play an important role in the future development of individuals. Understanding young people's attitudes toward love is helpful for formulating strategies to guide them to form correct attitudes toward love, promote the formation of positive and healthy attitudes toward marriage and life. This study aimed to explore the trajectories of college students' attitudes toward love, reveal the development law of their attitudes toward love, and identify the influencing factors that lead to changes in their attitudes toward love. Descriptive and correlation analyses were performed on participants' attitudes toward love, followed by utilization of a growth mixture model to explore latent trajectory classes and a multinomial logistic regression model to analyze influencing factors across trajectories. The results indicated that romantic attitudes could be divided into three groups: "high-increasing", "low-decreasing" and "low-increasing", and realistic attitudes could be divided into three groups: "high-increasing", "low-increasing" and "high-decreasing". Gender, major, extroversion, and hometown location were factors influencing whether students fell into different trajectory classes. Overall, society and colleges should pay more attention to changes in college students' attitudes toward love, provide timely intervention and guidance, and prevent them from suffering from behavioral, physical, and psychological problems.

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Introduction

Love is generally regarded as the deepest and most meaningful emotion, and it has been discussed in philosophy, literature, and art (Rubin, 1970). College students are in a significant transition from adolescence to adulthood (emerging adulthood), which is a special stage for their physical and psychological development (Fraleigh & Shaver, 2000; Trinke & Bartholomew, 1997). At this stage, college students' demand for love is particularly strong, and the exploration of love lays the foundation for their attitudes toward love and their future marriage (Arnett, 2000). Additionally, romantic relationships can effectively reduce the risk of depression, antisocial behavior, obesity, and other diseases among college students (Barr et al., 2013; Braithwaite et al., 2010; Simon & Barrett, 2010). Therefore, exploring college students' attitudes toward love not only is beneficial for predicting their standards for choosing partners as well as the development of love and marriage but also helps society and schools take measures to prevent their mental health problems. However, academic circles have paid little attention to college students' attitudes toward love. Most of the existing studies have developed theories about attitudes toward love based on Western culture and explored different types, trajectories, and relationships between attitudes toward love and personality, family factors, social environment, etc. However, there are few studies on Eastern college students' attitudes toward love and no in-depth analysis of its influence mechanism. Attitudes toward love are affected by cultural background and social values, which have cultural differences. Considering the influence of social and cultural differences between Eastern and Western countries on attitudes toward love (Dion & Dion, 1996; Neto, 2007; Sprecher et al., 1994), we believe that against the background of Chinese culture, exploring the overall trend of college students' attitudes toward love, the developmental trajectories and influencing factors of their attitudes toward romantic love and realistic love can provide more reference for the existing theories.

Based on the existing theoretical basis of attitudes toward love, this study identified the trajectories of college students' attitudes toward love to understand their changes from entering college to graduation. On this basis, we also analyzed the factors that influence the different trajectories of college students' attitudes toward love. With the second demographic structure transition, China's marriage rate is experiencing a predicament decrease in recent years (Xie & Hong, 2022). Late marriage or no marriage will cause some social problems, such as a declining fertility rate, an aging population, and a decreasing national economy. This phenomenon occurs not only in China but also in countries such as the United States and Northern Europe. Research on young people's attitudes toward love is helpful for understanding how these attitudes and beliefs affect their marriage intentions, which is highly important for helping college students form correct views on love and marriage, promoting college students' marriage intentions, and formulating policies and plans to improve the marriage rate.

Literature review

Theories of love. Starting from Rubin's distinction between "like" and "love" (Rubin, 1970), discussion about love was increasingly heated. For instance, Lee believed that love was not a single thing but an entity that needed to be understood according to an individual's love "style" (Lee, 1977). Lee (1977) proposed six types of love: Eros (passionate love), Ludus (game-playing love), Storge (friendship love), Pragma (logical, "shopping list" love), Mania (dependent love), and Agape (all-giving, selfless love). Shaver and Hazan (1988) believed that loving styles could be integrated into the attachment-theoretical framework, which might be secure,

anxious-ambivalent, or avoidant. Hatfield and Walster (1978) proposed a dichotomy of love from the perspective of typology, distinguished passionate love and companionate love, and answered some questions about love, such as the best place to find love, the differences between men and women in love, and the ways to keep love. According to Sternberg's (1986) triangular theory of love, a combination of intimacy, passion, and commitment defines eight different types of love, such as romantic love (more intimacy, passion, and less commitment) and companionate love (more intimacy, commitment, and less passion). In 1997, Sternberg proposed the construct validation of a love scale based on the triangular theory of love (Sternberg, 1997), but the theory was not fully verified. Based on the views of Knox and Sporakowski, the present study divided attitudes toward love into two types: romantic love and realistic love. People with realistic attitudes believe that love is regarded as a reliable, calm, and comforting emotion, while people with romantic love believe that love is the only reason for choosing a partner rather than other realistic factors (Knox & Sporakowski, 1968).

There is a strong correlation between an individual's attitude toward love and cultural adaptation (Shooter, 1993), which is strongly influenced by social and cultural background, especially in China. The mainstream attitude toward love in ancient China was associated with marriage, and love was not important in marriage at that time. However, there were some stories about nonmainstream attitudes toward love in ancient times, such as "Cowher and Weaver Girl", "Liang Shanbo and Zhu Yingtai", and the elopement of Zhuo Wenjun and Sima Xiaru. Since monogamy was implemented in China in 1950, Chinese attitudes toward love have changed substantially, the view of freedom of love and marriage has gradually increased, and love is no longer based only on the consideration of future marriage (Zeng et al., 2016). In addition, Chinese scholars have gradually formed their understanding of attitudes toward love. For instance, attitudes toward love refer to people's understanding of romantic relationships in society (Zhang & Yang, 1999), which involves issues such as what kind of love is meaningful, what kind of marriage is happy, and what kind of marriage to choose (Huang & Zheng, 1999). Attitudes toward love reflect the values and internal standards in the pursuit of love (Liao, 2006), which are critical parts of attitudes toward life (Chen, 2012). According to these scholars' interpretations of love, the connection between love and marriage is still inseparable in contemporary China. Since the reform and opening up, research on "love" in the Chinese context has rapidly increased, and the research scope has expanded to the campus, which was previously regarded as a forbidden area (Wang, 2023). In the past, school education encouraged students to take a serious attitude toward love, which influenced the overall attitudes of Chinese college students toward love, which tended to be more pragmatic. However, with changes in social attitudes, not all Chinese students agree with pragmatic attitudes, and further discussion on attitudes toward love among college students in the new era is warranted.

Developmental trajectories. The developmental trajectory is a mature framework in studies of attitudes toward love that captures both the time of love development and the sequence of events. Connolly et al. (2013) conducted a longitudinal study on the social development of youth with a sample range of 11 to 17 years old (8 waves of data from late primary school to the end of high school). They were based on a group-based approach and identified three developmental trajectories of romantic stages: on-time, early starters, and late bloomers. The proportion of students in the on-time group was the largest (52.3%), and their romantic

activities gradually matured. Early-stage students (21.4%) started dating and romantic relationships at an early age. Late-bloomer students (26.4%) started ancillary activities in mid-adolescence and dating at a late age. Meier and Allen (2009) studied the relationship types of adolescents from 11 to 18 years old and noted that the romantic relationships of adolescents gradually developed as they grew up, and almost no binary or intimate romantic relationships were observed in early adolescents. This suggests that romantic relationships are characterized by stages, and individuals show different attitudes toward romantic love at different stages of development. Some studies have also suggested that adolescents' romantic development is influenced by their sociocultural background. Although the sequence of Asian adolescents' developmental trajectories of romantic relationships is similar to that of other adolescents (Connolly et al., 2004), their romantic activity begins later than that of adolescents from North American and European backgrounds (Carver et al., 2003; Li et al., 2010). Generally, Chinese students are not allowed to have romantic relationships before they enter college (although some students still experience romantic relationships), and romantic relationships in this period are regarded as "puppy love". In China, "puppy love" is believed to negatively affect students' academic performance and is often not supported by school or family, which causes Chinese students to start romantic relationships later than teenagers from North American and European backgrounds. Considering that college is an important stage of individual emotional maturity and development, we believe that it is necessary to separate this stage for trajectory analysis to understand the changes and differences in college students' attitudes toward love. According to the literature, few studies have analyzed the developmental trajectories of attitudes toward love (romantic love or realistic love) among college teenagers.

Influencing factors. The factors influencing the developmental trajectories of college students' attitudes toward love and the factors influencing attitudes toward love within a group were further explored. We believe that romantic and realistic attitudes are correlated with gender, age, hometown location, extroversion, major, ethnicity, siblings, body mass index (BMI), self-esteem, parents' education levels, family economic status, family social status, etc.

Gender differences in attitudes toward love are the most prominent topic in the field. Brehm's opinion is very representative: "Perhaps the different views on love among individuals mainly exist between genders" (Brehm, 1992). Knox and Sporkowski (1968) mentioned that women tended to have more realistic attitudes than men, and a highly involved romantic relationship could increase both men's and women's realistic attitudes and reduce romantic differences. Contrary to popular belief, studies have shown that men are more likely to be idealized and romanticized than women (Kephart, 1967). According to a survey of college students, men also had higher romantic scores than women (Sprecher & Metts, 1999). A study of lovers and newly married couples suggested that men were more likely to fall in love (Kanin et al., 1970). Women were more realistic and practical than men (Lester, 1985), more likely to agree that "economic conditions should be carefully considered when choosing a partner", more cautious about love, and more able to walk away from a romantic relationship (Hill et al., 1976). Some studies have noted that gender differences in attitudes toward love are related to the stage of a romantic relationship (Fengler, 1974). At the beginning of a relationship, the difference in attitudes between men and women was not significant, but after engagement or marriage, men's romantic attitudes

increased, and women's realistic attitudes increased. Hobart (1958) stated that the development and changes in attitudes toward love differed by gender in a study of undergraduate students' attitudes toward love. Men's romantic attitudes increased as their relationship continued, but women's attitudes did not.

Age is also a variable that can explain the differences in attitudes toward love. In Yun and Young (2005) study of middle-aged and elderly people, an increase in romantic love was discovered among older men. Clemente et al. (2020) concluded that adolescents scored low on the three components of the Sternberg typology (passion, commitment, and intimacy), commitment and unconditional love increased as they grew up, and pragmatic love dominated in mid-adulthood (aged 20 to 32). Although Reeder (1996) obtained the opposite finding, the research conducted by Acker and Davis (1992) suggested that the expected decline in passion only occurred for women.

Bartolac (2012) studied 503 students of different ages, examining their romantic attitudes and their correlation with sociodemographic variables. The results indicated that the participants' romantic attitudes were correlated with their hometown location, with students from rural areas being more romantic. However, Bhana and Pattman (2011) conducted an interview survey among young people (aged 16 to 17) from a poor town in South Africa and discovered that the attitudes toward love of young people in rural areas of South Africa were closely related to material conditions. "Girls want money, boys want virgins", which is a materialistic love, and young people in rural South Africa tended to have more realistic attitudes toward love.

According to the study of Munro (1976), college-educated introverted persons were less romantic than extroverted persons, regardless of gender or life stage. Erevik et al. (2020) conducted a large longitudinal study to investigate the relationship between the use of Tinder and the formation of romantic relationships, which included the differences between Tinder users and non-Tinder users in personality traits (i.e., extroversion, agreeableness, conscientiousness, neuroticism, and openness) and demographic variables. The results revealed that Tinder users scored higher on extroversion tasks than non-Tinder users. Extroversion has always been considered one of the attractive characteristics of a partner, and extroverted persons are more likely to fall into romantic relationships (Botwin et al., 1997; Erevik et al., 2019; Figueredo et al., 2006; Neyer & Lehnart, 2007).

The attitudes toward love reveal individuals' views toward love issues, which also reflect their physical and mental health (Zhang, 1995). Through attitudes toward love, individuals can gain insight into their spiritual world. Liu and Cao (2022) noted that psychological and behavioral issues differed among college students with different majors. Students majoring in the humanities and social sciences had more careful thinking, delicate and sensitive emotions, paid more attention to inner experiences, and were easily affected by external factors. Students majoring in science and engineering spent less time interacting with others, were less communicative, dominated by rational thinking, and less susceptible to external factors. These differences indicate that students in the humanities and social sciences are likely more inclined to romantic attitudes toward love, while students in science and engineering may be more realistic.

Crissey (2005) used data from the National Longitudinal Study of Adolescent Health (Add Health) to examine racial/ethnic differences in romantic relationships among adolescents of non-Hispanic white (white), non-Hispanic black (black), Mexican origin, and other races. White teens were more likely to date and engage in serious romantic relationships with marriage

expectations than teens from other racial/ethnic backgrounds. The results in the study of Raley and Sullivan (2010) partially supported Crissey's claim, and they found that non-Hispanic white girls were more likely to have romantic relationships than African American girls, while African American boys were more likely to have romantic relationships than non-Hispanic boys. Regardless of the results, race/ethnicity is found to be correlated with attitudes toward love.

The presence of siblings in childhood has a significant impact on individuals' future interpersonal interactions (Parke et al., 2002; Smith, Hart (2004)), and adolescents with siblings are more mature and independent (Galambos et al., 2003). Some studies have analyzed the correlation between siblings and attitudes toward love. For instance, a family interview conducted by Doughty et al. (2013) reported that intimate relationships with siblings were positive predictors of romantic relationships. Chen et al. (2006) discovered that the conflicts of partners from 19 to 25 years old first increased and then slightly decreased and stated that being an only child and parents' low socioeconomic status were associated with increased conflict. Based on existing research on siblings, we suggest that this factor may be a potential predictor of attitudes toward love.

In studies of romantic relationships, the correlation between obesity and romantic relationships has also received extensive attention. Studies have shown a significant negative correlation between BMI and romantic relationships (Halpern et al., 2005): for every 1-point increase in BMI, the probability of romantic relationships decreases by 6%. Adolescent girls' pursuit of thinness indicates increased expectations of romantic relationships, and young women with lower BMIs are more likely to develop new romantic relationships (Van Woerden et al., 2020).

According to the risk-regulation model, people usually seek a balance between expressing love to promote intimacy and avoiding emotional exposure to achieve self-protection (Knapp et al., 2016; Luerksen et al., 2017). Individuals with high self-esteem are more likely to feel an increase in romantic relationships, while individuals with low self-esteem are more inclined toward self-protection. Anxiety and avoidance behaviors in romantic relationships are also associated with low self-esteem. Moosmann and Roosa (2015) studied the characteristics of romantic relationships among Mexican American adolescents and noted that adolescents with higher-quality romantic relationships reported higher self-esteem.

Studies of parents' education levels and families' socioeconomic status have shown conflicting results. One view is that people with less educated parents and poor family economic conditions tend to be more realistic in choosing partners (Kasser et al., 1995; Kroh, 2009; Marks, 1997). In contrast, people whose parents are highly educated tend to pay more attention to their feelings and have more romantic attitudes toward love. This phenomenon can be explained by postmaterialist theory (Inglehart, 1971, 2018), which holds that individuals with comfortable economic conditions will pursue quality of life and romantic love. The other view is that when parents are more highly educated, the children are more inclined to choose realistic attitudes toward love (Hu & Wu, 2019). This view can be explained by the theory of social closure (Holton, 2013). As parents' education levels, families' social status, and economic status increase, families are more likely to provide a rich environment for children's growth. Once children adapt to this favorable environment, it is difficult for them to accept the decline in class, so college students from wealthier families are more likely to pursue realistic love.

Research gap. In summary, understanding the development trajectories of college students' attitudes toward love and the

factors leading to their differences is of great value for society and colleges to provide correct guidance for college students and provide an empirical reference for solving current social problems such as low marriage rates and aging. Although theories about attitudes toward love have been proposed in previous studies, several issues have not been fully explored. First, previous studies lack further investigation of the developmental trajectories of attitudes toward love, especially under certain cultural backgrounds, such as Chinese college students influenced by Confucian culture (Wan et al., 2000). Second, influenced by cultural background, the Chinese have different attitudes toward love from Western countries. Among Chinese college students, there are two main attitudes toward love: one is to marry for the purpose, and the other is to fill the spiritual gap through love (Zeng et al., 2016). However, few studies have considered the changes and differences in attitudes toward love among Chinese college students. Third, most of the previous studies on the influencing factors of attitudes toward love have focused on gender differences and personality dimensions; the relationships among other factors are still unclear, and the relationships between these factors and attitudes toward love have not been confirmed in Chinese population samples. Therefore, this study analyses the developmental trajectories of college students' attitudes toward love and the influencing factors of different trajectories.

Methods

Participants and procedures. This study utilized a longitudinal survey dataset spanning five consecutive years. Probability proportionate to size sampling was adopted for the survey. Every academic year, sociodemographic characteristics, psychological status, and academic performance data were collected once. Existing studies have described the sampling design of these datasets in detail (Cao & Ji, 2024; Cao & Liu, 2024; Cao, 2023; Liu et al., 2024; Liu et al., 2023a; Liu et al., 2023b; Liu et al., 2023c; Liu et al., 2022), and this study used data from 2473 students (1166 females and 1307 males) who enrolled in 2008, spanning from their freshman to senior years, which reflected the changes throughout their college years from entering college to graduation.

Measures. The core variable of this study is attitudes toward love among college students. The survey of attitudes toward love among college students adopted the 5-point Romantic Love Scale with 23 questions. In this survey, college students were asked to assign values to statements about attitudes toward love, with 1 point indicating "strongly disagree" and 5 point indicating "strongly agree". A higher score indicated that the student was more consistent with the attitudes toward love reflected in the items. Five important factors were extracted by principal component analysis (oblique rotation principal component analysis, OPCR), and they were romantic, realistic, unique, mysterious, and resistant, among which two common factors were selected as the analysis objects in this study: romantic attitudes and realistic attitudes.

The romantic attitudes toward love include four items ("If I love my partner, we will be able to get married, regardless of other factors", "If I break up with my partner, my world will become boring and miserable", "Love is the most important, and everything else can be ignored", and "My life will be meaningless if I cannot be married to the person I love"), with a total score of 20 points. The Cronbach's alpha of the romantic Index from freshman to senior year was 0.68, 0.68, 0.73, and 0.76, respectively. The realistic attitudes toward love also consisted of four items ("Before committing to a relationship, I will consider

the future development of my partner”, “An important consideration when choosing a partner is the impact on my career”, “Before committing to a relationship, I will consider the genetic influence of my partner on our future children”, and “When choosing a partner, I will seriously consider the financial condition”). The total score is 20 points. The Cronbach’s alpha of the realistic index from the freshman to senior year was 0.67, 0.67, 0.71, and 0.73, respectively.

Additionally, this study also added a series of variables that might affect romantic and realistic attitudes, including gender (the dichotomous variable: 1 for men and 0 for women), ethnicity (the dichotomous variable: 1 for Han nationality and 0 for ethnic minorities), hometown location (the dichotomous variable: 1 for urban areas and 0 for rural areas), siblings (the dichotomous variable: 1 for yes and 0 for no), major (dichotomous variable: 1 for engineering/science/agriculture/medicine, 0 for humanities/social sciences), BMI (dummy variable: 0 for low, 1 for normal, and 2 for high), extroversion (continuous variable, 1–9 points, higher score indicates more extroversion), age (continuous variable), father’s education level (continuous variable, unit: year), mother’s education level (continuous variable, unit: year), family economic status (continuous variable, 1–5 represents the status from high to low) and family social status (continuous variable, 1–5 represents the status from high to low). The self-esteem scale compiled by Rosenberg (1965) was used to measure self-esteem, including 10 items with a 5-point response, and the total score ranged from 10–50. A higher score indicates a higher level of self-esteem.

Data analysis. First, Stata 15.0 was used for descriptive analysis to explore the changes in college students’ romantic attitudes and realistic attitudes toward love during their college years. Second, for Pearson correlation analysis, Stata 15.0 was used. Third, for the growth mixture model (GMM), Mplus 8.3 was used for the GMM (Muthén, 2004) to explore the heterogeneity in the population and the trajectories of romantic attitudes and realistic attitudes toward love. The GMM is very flexible, can divide the population into several latent classes, and can describe the trajectories of the subgroups as well as the changes in individuals within the group over time. Fourth, the optimal model was determined according to the Akaike Information Criteria (AIC), Bayesian Information Criteria (BIC), Sample Size Adjusted BIC (SABIC), Lo Mendel-Rubin Likelihood Ratio Test (LMR-LRT), Bootstrapped Likelihood Ratio Test (B-LRT), entropy values, and theory of love. Fifth, for the multinomial logistic regression analysis, Stata 15.0 was used to investigate the effects of various factors on the different trajectories of romantic attitudes and realistic attitudes toward love.

Results

Descriptive statistics. There were 1307 males in the survey, accounting for 52.85%, and 1166 females, accounting for 47.15%, with an average age of 19.6 years. Romantic attitude scores increased from 9.12 in the freshman year to 9.695 in the junior year before dropping to 9.622 in the senior year. The realistic attitudes, which scored above 12 points, increased from 12.183 points in the freshman year to 12.794 points in the junior year but decreased to 12.527 points in the senior year. Overall, realistic attitudes scored higher than romantic attitudes.

Correlation analysis of romantic attitudes and realistic attitudes among college students. Table 1 shows the correlation coefficients of romantic attitudes, realistic attitudes, and other variables among college students. Romantic attitudes were significantly negatively correlated with realistic attitudes

($r = -0.1492, p < 0.05$); were significantly positively correlated with gender ($r = 0.1886, p < 0.05$), major ($r = 0.0791, p < 0.05$), age ($r = 0.0542, p < 0.05$), and BMI ($r = 0.0608, p < 0.05$); were significantly negatively correlated with hometown location ($r = -0.0622, p < 0.05$), father’s education levels ($r = -0.0348, p < 0.05$), mother’s education levels ($r = -0.0374, p < 0.05$), and self-esteem ($r = -0.1240, p < 0.05$); and were not significantly correlated with ethnicity, siblings, extroversion, family economic status, or family social status ($p > 0.05$). Realistic attitudes were significantly positively correlated with age ($r = 0.0247, p < 0.05$), siblings ($r = 0.1606, p < 0.05$), extroversion ($r = 0.0105, p < 0.05$), hometown location ($r = 0.1579, p < 0.05$), father’s education levels ($r = 0.1673, p < 0.05$), mother’s education levels ($r = -0.1678, p < 0.05$), and self-esteem ($r = 0.0348, p < 0.05$); were significantly negatively correlated with gender ($r = -0.1886, p < 0.05$), major ($r = -0.1325, p < 0.05$), ethnicity ($r = -0.0393, p < 0.05$), family economic status ($r = -0.1487, p < 0.05$), and family social status ($r = -0.1535, p < 0.05$); and were not significantly correlated with BMI ($p > 0.05$).

Trajectory classes of romantic attitudes among college students. To clarify the heterogeneity and trajectory classes of romantic attitudes among college students, based on previous theoretical studies, fit tests were conducted on the growth mixture models of classes 1–5, and the results are shown in Table 2. AIC, BIC, and SABIC reflect the fitness of the models, and higher values indicate greater fitness. According to the results, the 3-class model is better than the others. The LMR-LRT and B-LRT also exhibited significant differences between the 3-class model and the adjacent model ($p < 0.001$), and the entropy was 0.68. Considering the test results of six indexes and the sample size proportion of each group, this study states that the 3-class model best fits.

Figure 1 shows the trajectories of romantic attitudes. The first class, accounting for 1.05%, showed an increasing trend from the freshman year (7.808) to the senior year (18.458), with a large range of scores; thus, this class was named “high-increasing”. The students in the second class accounted for 13.79%, and their scores decreased from the freshman year (14.267) to the senior year (10.54) within a small range, so we call them the “low-decreasing”. In the third class, students accounted for 85.16%, and their scores increased from the freshman year (8.305) to the senior year (9.36) within a small range, which we call “low-increasing”.

The slope and intercept of the 3-class model are included in Table 3. For the “high-increasing” class, the increasing trend from the freshman year to the senior year was significant (slope = 3.043, $p < 0.001$). For the “low-decreasing” class, the scores slightly decreased from the freshman year to the senior year, and the decreasing trend was significant (slope = $-0.766, p < 0.05$). For the “low-increasing” class, there was a slight increasing trend from the freshman year to the senior year, which was also significant (slope = 0.347, $p < 0.001$).

Trajectory classes of realistic attitudes among college students. The fit tests of the development trajectories of college students’ realistic attitudes are shown in Table 4. The AIC, BIC, and SABIC indicate that realistic attitudes are better divided into three classes, in which the LMR-LRT is significant ($p < 0.05$), the B-LRT is also significantly different between the 3-class model and the adjacent model ($p < 0.001$), and the entropy is 0.86. According to the test results and considering the sample size proportion of each group, this study considers that the 3-class model best fit.

Figure 2 shows the trajectories of realistic attitudes. The scores of students in the first class, accounting for 1.58%, increased from

Table 1 Correlation analysis of romantic attitudes and realistic attitudes among college students.

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Romantic attitudes	1														
2. Realistic attitudes	-0.1492*	1													
3. Gender	0.1886*	-0.1886*	1												
4. Major	0.0791*	-0.1325*	0.3853*	1											
5. Age	0.0542*	0.0247*	0.0451*	0.0028	1										
6. Ethnicity	-0.0086	-0.0393*	-0.02	-0.0248*	0.0093	-0.1342*	-0.0863*	1							
7. Siblings	-0.039	0.1606*	-0.0447*	-0.0816*	-0.0729*	0.1418	0.0052	0.0417*	1						
8. Extroversion	-0.0105	0.0741*	-0.0877*	-0.0729*	0.1418	0.0052	0.0417*	0.0719*	0.0736*	1					
9. Hometown location	-0.0622*	0.1579*	-0.1113*	-0.1219*	-0.1354*	-0.0067	0.5129*	0.0736*	0.5573*	0.7035*	1				
10. Father's education level	-0.0348*	0.1673*	-0.1074*	-0.0874*	-0.1410*	-0.0369*	0.4725*	0.0848*	0.5795*	-0.4644*	1				
11. Mother's education level	-0.0374*	0.1678*	-0.1184*	-0.1146*	-0.1213*	-0.0253*	0.4993*	0.0848*	0.5795*	-0.4378*	0.7035*	1			
12. Family economic status	0.0172	-0.1487*	0.1026*	0.1153*	0.1516*	0.0279	-0.3050*	-0.1003*	-0.4378*	-0.4644*	-0.4367*	1			
13. Family social status	0.0122	-0.1535*	0.0919*	0.1055*	0.1372*	0.0393	-0.2819*	-0.1001*	-0.3763*	-0.4513*	-0.4246*	0.6959*	1		
14. BMI	0.0608*	0.0106	0.0936*	0.0713*	0.6290*	0.0016	0.0016	0.1869*	-0.0159	0.0035	-0.0012	0.0011	0.0004	1	
15. Self-esteem	-0.1240*	0.0348*	-0.0438*	-0.0456*	-0.1280*	0.0175	0.0847*	0.2060*	0.0755*	0.0934*	0.0910*	-0.1285*	-0.1631*	-0.1209*	1

*5% significance level.

freshmen (7.564) to seniors (16.973) with a large range, so we call this class “high-increasing”. Students in the second class accounted for 96.97%, and their scores showed an increasing trend from the freshman year (12.202) to the senior year (12.534) with a small change in score, which we call “low-increasing”. The third class, which accounted for 1.46%, decreased from the freshman year (15.944) to the senior year (7.343) with relatively large changes in scores, which is classified as “high-decreasing”.

The slope and intercept of the 3-class model are shown in Table 5. For the “high-increasing” class, the increasing trend from the freshman year to the senior year was significant (slope = 2.212, $p < 0.001$). The “low-increasing” class slightly increased from freshmen to seniors, and the increasing trend was significant (slope = 0.124, $p < 0.05$). For the “high-decreasing” class, the decreasing trend from the freshman year to the senior year was significant (slope = -2.213, $p < 0.001$).

Influencing factors for latent classes of romantic attitudes. This study further explored the factors leading to differences in the trajectories of romantic attitudes among college students. A multinomial logistic regression model was used to analyze the categorical variables of high-increasing vs. low-increasing (reference group), low-decreasing vs. low-increasing (reference group), and high-increasing vs. low-decreasing (reference group), and the results are shown in Table 6.

Considering “low-increasing” as the reference group and comparing the relative risk rate and p value with those of the “high-increasing” group, the existing variables could not significantly explain the difference in developmental trajectories between the two groups ($p > 0.05$). The difference was small, or more complex intermediate variables needed to be discovered. Compared with the “low-decreasing” group, gender (RRR = 1.92, $p = 0.000$) significantly affected the students who entered the “low-increasing” group. In other words, men were more likely to fall into the “low-decreasing” group than into the “low-increasing” group of romantic attitudes.

The study also used the “low-decreasing” group as the reference group and compared it with the “high-increasing” group. The results indicated that the existing variables could not significantly explain the difference in the developmental trajectories between the two groups ($p > 0.05$).

Influencing factors for latent classes of realistic attitudes. This study also explored the factors leading to the differences in the developmental trajectories of college students’ realistic attitudes and used a multinomial logistic regression model to analyze the categorical variables of high-increasing vs. high-decreasing (reference group), low-increasing vs. high-decreasing (reference group), and high-increasing vs. low-increasing (reference group), and the results are shown in Table 7.

Using the “high-decreasing” group as the reference group, this study compared the relative risk rate and p value with those of the “high-increasing” group and found that the major (RRR = 0.21, $p = 0.007$) significantly affected whether the students fell into the “high-increasing” group. Compared with the “high-decreasing” group, the major (RRR = 0.42, $p = 0.036$) significantly affected whether they entered the “low-increasing” group. In conclusion, students majoring in engineering/science/agriculture/medicine were more likely to enter the “high-decreasing” group in realistic attitudes than students majoring in humanities/social science.

By using “low-increasing” as the reference group and comparing it with the “high-increasing” group, the results showed that extroversion (RRR = 0.76, $p = 0.009$) and hometown location (RRR = 2.83, $p = 0.050$) significantly affected whether the students entered the “high-increasing” group, indicating that

Table 2 Determination of the number of trajectory subgroups of romantic attitudes.

Romantic attitudes	1-class model	2-class model	3-class model	4-class model	5-class model
AIC	46139.24	46100.87	46068.49	46053.43	46031.98
BIC	46191.56	46170.63	46155.69	46158.06	46154.05
SABIC	46162.96	46132.50	46108.03	46100.87	46087.33
LMR-LRT		$p < 0.001$	$p < 0.001$	$p = 0.3355$	$p = 0.1154$
B-LRT		$p < 0.001$	$p < 0.001$	$p < 0.001$	$p < 0.001$
Entropy		0.54	0.68	0.64	0.66
Mixture proportion (%)	100.00	15.57	1.05	5.01	2.67
		84.43	13.79	1.17	49.70
			85.16	46.62	4.97
				47.19	1.46
					41.21

AIC akaike information criterion, BIC Bayesian information criterion, SABIC sample size adjusted Bayesian information criterion, LMR-LRT Lo-Mendel-Rubin adjusted likelihood ratio test, B-LRT bootstrapped likelihood ratio test.

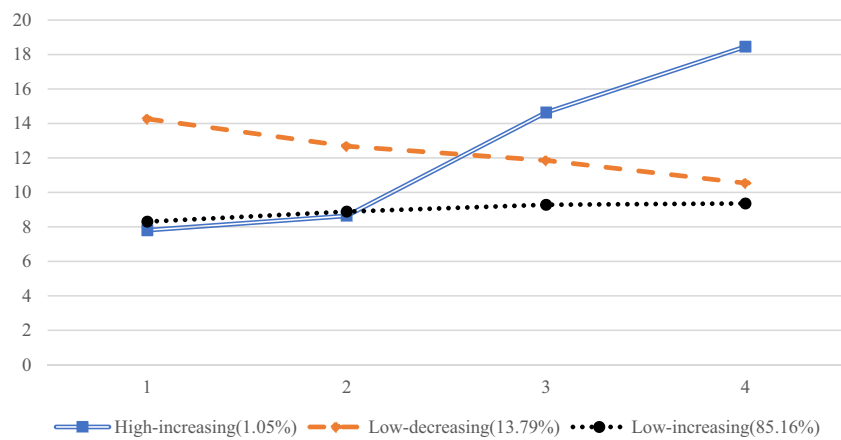


Fig. 1 Growth mixture model of romantic attitudes. Trajectory classes of romantic attitudes.

Table 3 Intercept and slope of latent classes of romantic attitudes.

Romantic attitudes	High-increasing (n = 26)			Low-decreasing (n = 341)			Low-increasing (n = 2106)		
	Means	SE	p Value	Means	SE	p Value	Means	SE	p Value
Intercept	6.736	0.633	0.000	12.582	0.488	0.000	8.410	0.263	0.000
Slope	3.043	0.432	0.000	-0.766	0.23	0.001	0.347	0.061	0.000

SE standard error.

Table 4 Determination of the number of trajectory subgroups of realistic attitudes.

Realistic attitudes	1-class model	2-class model	3-class model	4-class model	5-class model
AIC	45225.01	45208.32	45190.61	45191.68	45192.23
BIC	45277.33	45278.08	45277.80	45296.31	45314.31
SABIC	45248.73	45239.95	45230.15	45239.12	45247.59
LMR-LRT		$p < 0.05$	$p < 0.05$	$p = 0.6359$	$p = 0.2839$
B-LRT		$p < 0.001$	$p < 0.001$	$p = 1.0000$	$p = 0.5000$
Entropy		0.96	0.86	0.59	0.63
Mixture proportion (%)	100.00	99.52	1.58	1.29	73.55
		0.49	96.97	81.84	0.77
			1.46	15.16	2.06
				1.70	22.60
					1.01

AIC akaike information criterion, BIC Bayesian information criterion, SABIC sample size adjusted Bayesian information criterion, LMR-LRT Lo Mendel-Rubin adjusted likelihood ratio test, B-LRT bootstrapped likelihood ratio test.

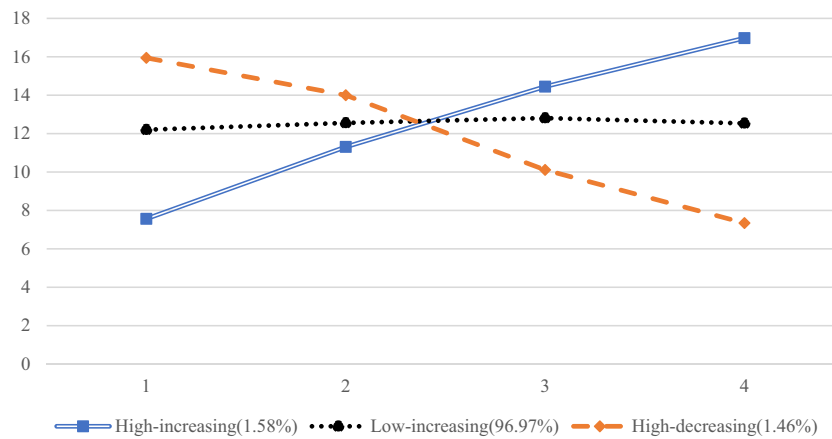


Fig. 2 Growth mixture model of realistic attitudes. Trajectory classes of realistic attitudes.

Table 5 Intercept and slope of latent classes of realistic attitudes.

Realistic attitudes	High-increasing (n = 39)			Low-increasing (n = 2398)			High-decreasing (n = 36)		
	Means	SE	p Value	Means	SE	p Value	Means	SE	p Value
Intercept	9.249	0.738	0.000	12.345	0.081	0.000	15.435	0.857	0.000
Slope	2.212	0.43	0.000	0.124	0.039	0.001	-2.213	0.422	0.000

Note: SE standard error.

Table 6 Multinomial logistic regression analyses of influencing factors for classes of romantic attitudes.

Romantic attitudes	High-increasing (vs Low-increasing)			Low-decreasing (vs Low-increasing)			High-increasing (vs Low-decreasing)		
	RRR	95% CIs	p Value	RRR	95% CIs	p Value	RRR	95% CIs	p Value
Gender: Men (vs Women)	2.37	0.92-6.10	0.072	1.92	1.45-2.53	0.000	0.81	0.30-2.14	0.666
Age	1.00	0.64-1.58	0.995	1.01	0.88-1.15	0.924	1.01	0.63-1.60	0.983
Ethnicity: Minority (vs Han)	1.53	0.51-4.56	0.449	0.85	0.57-1.27	0.431	0.56	0.18-1.76	0.320
Siblings: No (vs Yes)	1.49	0.52-4.29	0.462	0.88	0.65-1.19	0.403	0.59	0.20-1.75	0.342
Extroversion	1.10	0.85-1.42	0.476	1.03	0.95-1.11	0.524	0.93	0.72-1.22	0.611
Hometown location: Urban (vs Rural)	1.23	0.37-4.10	0.730	0.91	0.64-1.30	0.613	0.74	0.21-2.54	0.631
Father's education level	0.97	0.83-1.15	0.746	1.03	0.98-1.08	0.249	1.06	0.89-1.25	0.511
Mother's education level	0.95	0.82-1.09	0.446	1.00	0.95-1.04	0.860	1.05	0.91-1.22	0.493
Family economic status	0.72	0.34-1.53	0.390	1.07	0.85-1.33	0.574	1.49	0.68-3.24	0.320
Family social status	1.07	0.52-2.21	0.856	0.99	0.81-1.22	0.946	0.93	0.44-1.96	0.846
BMI									
Low (vs Normal)	0.68	0.20-2.36	0.546	1.08	0.78-1.48	0.649	1.58	0.44-5.64	0.481
High (vs Normal)	0.74	0.17-3.25	0.686	0.85	0.55-1.31	0.461	1.15	0.25-5.32	0.855
Self-esteem	1.00	0.93-1.08	0.925	1.00	0.98-1.02	0.744	0.99	0.92-1.07	0.855
Major: Engineering/science/agriculture/medicine (vs Social sciences/Humanities)	0.62	0.26-1.47	0.275	0.92	0.71-1.19	0.521	1.49	0.61-3.67	0.384

RRR relative risk ratio, 95% CIs 95% confidence intervals.

the more introverted and urban college students were more likely to enter the “high-increasing” group of realistic attitudes.

Discussion

This study used the sample of Chinese college students to gain insight into the development of college students’ attitudes toward love and analyzed the predictive factors, which not only provided support for understanding Chinese attitudes toward love but also provided practical insight for guiding college students to form positive attitudes and values toward love. In this study, we

identified the developmental trajectories of Chinese college students’ romantic attitudes and realistic attitudes toward love and explored the factors related to romantic attitudes and realistic attitudes and the factors influencing college students’ different developmental trajectories of attitudes toward love.

Demographics and individual factors associated with romantic and realistic attitudes. First, romantic attitudes are positively correlated with gender, age, major, and BMI and negatively correlated with hometown location, parents’ education levels, and

Table 7 Multinomial logistic regression analyses of influencing factors for classes of realistic attitudes.

Realistic attitudes	High-increasing (vs High-decreasing)			Low-increasing (vs High-decreasing)			High-increasing (vs Low-increasing)		
	RRR	95% CIs	p Value	RRR	95% CIs	p Value	RRR	95% CIs	p Value
Gender: Men (vs Women)	0.94	0.31-2.83	0.909	1.23	0.56-2.71	0.611	1.31	0.60-2.86	0.496
Age	0.92	0.53-1.61	0.776	0.99	0.66-1.49	0.970	1.08	0.73-1.58	0.711
Ethnicity: Minority (vs Han)	0.39	0.107-2.19	0.284	0.49	0.12-2.10	0.339	1.27	0.48-3.33	0.626
Siblings: No (vs Yes)	0.78	0.23-2.68	0.696	0.79	0.32-1.99	0.620	1.01	0.44-2.33	0.975
Extroversion	1.32	0.97-1.79	0.077	1.00	0.80-1.25	0.982	0.76	0.61-0.93	0.009
Hometown location: Urban (vs Rural)	0.37	0.08-1.72	0.207	1.06	0.34-3.28	0.923	2.83	1.00-7.99	0.050
Father's education level	1.08	0.88-1.33	0.447	1.05	0.90-1.23	0.508	0.97	0.85-1.11	0.697
Mother's education level	1.04	0.87-1.25	0.675	1.03	0.89-1.18	0.700	0.99	0.88-1.11	0.849
Family economic status	0.95	0.37-2.39	0.907	0.81	0.41-1.61	0.555	0.86	0.46-1.62	0.644
Family social status	1.05	0.43-2.55	0.913	1.45	0.75-2.79	0.265	1.38	0.75-2.53	0.297
BMI									
Low (vs Normal)	1.07	0.29-3.88	0.920	0.96	0.38-2.42	0.936	0.90	0.36-2.25	0.824
High (vs Normal)	0.74	0.12-4.56	0.746	0.74	0.17-3.23	0.687	1.00	0.34-2.94	0.997
Self-esteem	1.04	0.96-1.14	0.316	1.04	0.97-1.11	0.252	1.00	0.94-1.05	0.876
Major: Engineering/science/agriculture/medicine (vs Social sciences/Humanities)	0.21	0.07-3.65	0.007	0.42	0.18-0.94	0.036	1.95	0.90-4.21	0.090

RRR relative risk ratio, 95% CIs 95% confidence intervals.

self-esteem. Realistic attitudes are positively correlated with age, extroversion, self-esteem, siblings, hometown location, and parents' education levels and negatively correlated with romantic attitudes, gender, ethnicity, major, family social status, and family economic status. Our correlation analysis results are consistent with those of several previous studies (Bartolac, 2012; Bhana & Pattman, 2011; Kephart, 1967; Knox & Sporakowski, 1968; Yun & Young 2005). However, for age, we noticed that age had a significant positive correlation with both romantic and realistic attitudes. This result suggests that romantic and realistic attitudes may exist simultaneously, and both romantic and realistic attitudes can be high or low at the same time and are not necessarily mutually exclusive (Driscoll et al., 1972). Inconsistent with many studies (Botwin et al., 1997; Erevik et al., 2019; Munro, 1976), our data showed a significant positive correlation between realistic attitudes and extroversion, while romantic attitudes had no significant correlation with extroversion. Yan (2010), an anthropologist, proposed that individuals in modern society were no longer willing to sacrifice themselves for the group and the family. Instead, they seek their own interests and happiness through the functioning of the family. We assume that the core of romantic relationships among contemporary young people is no longer about each other but points to themselves at all times. In modern society, family background, concept of interests, bride price, and other topics related to romantic relationships are widely discussed. Compared with introverts, extroverted people are more likely to be influenced by the general environment, and their attitudes toward love tend to be more realistic. In terms of major, the study revealed that students majoring in science, engineering, agriculture, and medicine were positively correlated with romantic attitudes toward love and negatively correlated with realistic attitudes toward love, which might be related to the rational thinking of students majoring in science and engineering (Liu & Cao, 2022). In terms of ethnicity/race, only a negative correlation with realistic attitudes was detected. In contrast to the conclusion of Doughty et al. (2013), we believe that siblings are significantly positively correlated with realistic attitudes. The positive correlation between BMI and romantic attitudes is also inconsistent with previous research results (Halpern et al., 2005; Van Woerden et al., 2020), and our results showed that an increase of 1 point in BMI was associated with an increase of

0.0608 points in the scores of romantic attitudes. In addition, self-esteem is negatively correlated with romantic attitudes and positively correlated with realistic attitudes, which is completely different from previous findings (Knapp et al., 2016; Luerssen et al., 2017). Parents' education levels are positively correlated with realistic attitudes and negatively correlated with romantic attitudes. Family social status and family economic status are negatively correlated with realistic attitudes. These findings indicate that when parents have higher education levels, family social status and economic status are greater, college students will have more realistic attitudes toward love, which can be explained by the theory of social closure (Holton, 2013). People with better educated parents can be socialized, and to maintain a closed social status, they usually take realistic attitudes.

Trajectories of romantic attitudes and realistic attitudes. Second, according to the descriptive analysis, we noticed that the overall trend of the romantic attitudes and realistic attitudes of college students first increased and then decreased during the four years of college. We believe that this trend reflects the special cultural background in China; that is, the romantic relationships of students before they enter college are often subject to social constraints. To obtain higher scores on the college entrance examination, most parents and teachers oppose their romantic relationships. This phenomenon indicates that most Chinese students do not begin to develop their attitudes toward love until they enter college. Overall, realistic attitudes scored higher than romantic attitudes. The results of the growth mixture model further revealed that the development of romantic attitudes could be divided into three groups. The first group is called "high-increasing" (1.05%), which manifests a significant increase in romantic attitudes from the freshman to the senior year. The second group, known as the "low-decreasing" (13.79%), decreased slightly from the freshman to the senior year. The third group is "low-increasing" (85.16%), which was represented by a small increase during the college years. The trajectories of realistic attitudes fall into three groups: "high-increasing" (1.58%), "low-increasing" (96.97%), and "high-decreasing" (1.46%). Most students were in the "low-increasing" group in terms of both romantic and realistic attitudes, indicating that both the romantic

and realistic attitudes of college students increased slowly and that they were not in conflict. From the perspective of evolutionary theory (Ma et al., 2015), romantic love is a “commitment device” that motivates individuals to maintain romantic relationships and contributes to long-term and stable relationships. Although both attitudes show increasing trends, the overall scores of realistic attitudes are higher than those of romantic attitudes, and the proportion of the “low-decreasing” group in romantic attitudes (13.79%) is higher. The realistic attitudes among Chinese college students are likely related to cultural factors in the collectivist society (Dion & Dion, 1993, 1996), which is different from individualism in Western countries (Bellah et al., 2007). People in a collectivist society are more inclined to abide by social norms and meet family expectations (Lamanna et al., 2020). In China, love is the premise of marriage, but the selection of the “partner” often involves the whole family (Day, 2002). As a result, young Chinese should consider more realistic factors. Another explanation is that college life is a transitional period for college students before they enter their professional life. Engaging in an ideal romantic relationship requires much energy for them, and when they get closer to graduation, they will focus more on their career choice (Gomez, 2019).

Influencing factors of latent classes of romantic attitudes and realistic attitudes. Third, gender, major, extroversion, and hometown location are the factors that lead to differences in the developmental trajectories of college students’ attitudes. Men are more likely to fall into the “low-decreasing” group than into the “low-increasing” group of romantic attitudes. Compared to the “high-increasing” and “low-increasing” groups of realistic attitudes, students majoring in science/engineering/agriculture/medicine are more likely to belong to the “high-decreasing” group. Compared with extroverted students and students from rural areas, introverted students and students from urban areas are more likely to be in the “high-increasing” group of realistic attitudes. There is much evidence that males are more idealized and romantic than females (Kanin et al., 1970; Kephart, 1967; Knox & Sporakowski, 1968; Sprecher & Metts, 1999), possibly because in Asia, the gender gap in social status makes women more cautious about marriage and more realistic toward love than men (Ra, 1994). Introverted students’ and urban students’ attitudes toward love are becoming more realistic, which is different from previous findings (Bartolac, 2012; Bhana & Pattman, 2011; Munro, 1976), and we speculate that this may be caused by the particularity of the Chinese sample, which needs further verification.

Limitations

First, since the samples were selective, the results from these data should be used with caution when generalizing to other groups. Given the differences in sociocultural background, whether our results can be generalized to other countries is uncertain. Second, the Romantic Love Scale in this study is a self-report scale, which may lead to subjective biases, and the Cronbach’s alpha of the scales was not high. Third, due to limitations in the existing data, this study included only a few intervenable factors, and additional intervenable variables should be considered in future studies. Despite these limitations, this study on Chinese college students’ attitudes toward love supplements this field. It is not only valuable for understanding young Chinese people’s attitudes toward love but also has implications for understanding attitudes toward love in other similar societies.

Conclusions

This study focused on two typical attitudes toward love, romantic love and realistic love, and deepened the psychological

understanding of college students’ attitudes toward love. This study revealed that attitudes toward love were correlated with gender, major, age, BMI, self-esteem, ethnicity, siblings, extroversion, hometown location, parents’ education levels, family economic status, and family social status. Moreover, attitudes toward love are classified into three sub-trajectories. Gender, extroversion, and major influence students into different sub-trajectories.

In general, Chinese college students’ realistic scores on realistic attitudes were higher than their romantic scores. It is a critical task for society, colleges, and families to pay attention to the problems of college students’ romantic relationships and their differences in gender, major, personality and hometown, and to take measures to guide and shape college students’ attitudes toward love in time. The study suggests that colleges should be based on mental health courses and guide students to form correct attitudes toward love. In the class or after class, positive encouragement, micro-class science popularization, emotional counseling, case simulation, and psychological empowerment should be used to intervene and help students form mature attitudes toward love to guide their future love behavior and life.

Data availability

The data of this study came from the “Beijing College Student Panel Survey” (BCSPS), which is a follow-up survey for the five consecutive years. The data ownership belongs to the National Survey Research Center, Renmin University of China. For any related questions about data, please reach the National Survey Research Center, Renmin University of China. Since the dataset has not been publicly released, the authors only obtained the right to use the dataset and do not have the authority to publicly distribute it. Therefore, a download link for the dataset cannot be provided. However, descriptive statistical analysis results regarding this dataset have been published in the appendix of the author’s previously published paper. You can refer to the following paper for more information: <https://doi.org/10.1057/s41599-023-02252-2>. The data that support the findings of this study are available from the corresponding author upon reasonable request.

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Author contributions

Author XL designed the study and wrote the protocol. Authors XL and XJ undertook the statistical analysis. Author XJ, XL and YZ wrote the first draft of the manuscript and managed the literature analyses. All authors read and approved the final manuscript.

Competing interests

The authors declare no competing interests.

Ethical approval

Ethical approval was acquired from the Ethics Committee of Tianjin University (ethical approval number: TJUE-2022-188; name of approval committee: Ethics Committee of Tianjin University).

Informed consent

Before filling out the questionnaire, informed consent was obtained from all participants in the study.

Additional information

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