

# The Influence of Social Support on College Students' Physical Exercise: The Chain Mediating Role of Self-Compassion and Body Image

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## Article

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# Abstract

## Objective

This study aims to explore the relationship between social support and physical exercise among university students, as well as the chain mediating effects of self-compassion and body image.

## Methods

Using a convenience sampling method, 718 university students from universities in Heilongjiang, Jilin, Liaoning, Hebei, and Henan provinces were selected as participants. Data were collected using the Perceived Social Support Scale, the Self-Compassion Scale, the Body Image Scale, and the Physical Activity Rating Scale. Structural equation modeling was used to analyze the relationships among the variables.

## Results

(1) There is a positive correlation between social support and physical exercise among university students, and social support has a direct predictive effect on physical exercise. (2) Social support positively predicts self-compassion; self-compassion positively predicts body image and physical exercise; and body image positively predicts physical exercise. (3) Self-compassion and body image mediate the relationship between social support and physical exercise, with three mediating paths: social support → self-compassion → physical exercise, social support → body image → physical exercise, and social support → self-compassion → body image → physical exercise.

## Conclusion

(1) Social support positively predicts university students' physical exercise. (2) Self-compassion and body image not only mediate the relationship between social support and physical exercise separately but also serve a chain mediating role between them.

## Background

General Secretary Xi Jinping has emphasized that “we must give strategic priority to ensuring the people's health and improve policies on promoting public health”. As a vital component of national health, the physical health of young college students constitutes a key pillar in building a Healthy China in the new era[1]. In recent years, the physical health of Chinese college students has become a widespread concern across society, with the persistent decline in their physical fitness and insufficient participation in physical exercise growing increasingly prominent[2]. The State Council of the People's Republic of China. A report by China Youth Net, *Nearly Half of College Students Exercise Less Than Three Times a Week*, surveyed 25,125 college students nationwide and revealed that nearly half (48.19%) exercise less than three times a week, including 22.06% who exercise once a week and 26.13% who exercise twice a week[3]. As the core force of the youth cohort, college students' engagement in physical exercise directly bears on their physical and mental well-being, and also shapes the implementation outcomes of the Healthy China strategy[4]. Therefore, exploring the mechanisms influencing

college students' physical exercise and enhancing their exercise behavior has emerged as a critical research topic in the field of college students' physical health promotion[5].

Self-Determination Theory posits that external environmental factors can foster the satisfaction of college students' basic psychological needs, stimulate their motivation for physical exercise, and thereby promote their exercise behavior[6]. However, the mechanisms through which the external environment impacts physical exercise remain insufficiently explored. The Triadic Reciprocal Determinism proposed by American psychologist Albert Bandura provides a clear analytical framework for this study, which contends that behavior, cognition, and environment are interconnected and mutually determinant[7]. As an environmental factor, social support can shape individuals' perceptions and evaluations of their own bodies through internal cognition, ultimately facilitating or constraining the occurrence of physical exercise behavior[8]. As cognitive factors, self-compassion and body image can influence college students' mindsets and persistence in physical exercise[9][10].

Against this backdrop, this study examines the chain mediating roles of self-compassion and body image in the relationship between social support and college students' physical exercise. It aims to provide a new theoretical basis for boosting college students' enthusiasm for physical exercise and improving their physical health. This research not only enriches the theoretical framework concerning college students' physical exercise, psychological cognition, and social support, but also offers targeted practical references for universities to develop physical education, mental health education, and social support systems, thereby helping college students cultivate long-term, stable exercise habits.

## Theoretical Basis and Research Hypotheses

### The Relationship between Social Support and College Students' Physical Exercise

Social support refers to the spiritual and material assistance that individuals obtain from their social relationships[11]. Physical exercise is physical activity conducted through various physical training methods to improve physical fitness and enrich spiritual and cultural life, and it serves as the most effective way to optimize health status and enhance physical quality[12]. The Theory of Planned Behavior holds that individual behaviors are mainly determined by behavioral intentions, and external environmental support acts as a core factor affecting the formation of individual behaviors and promoting the transformation of intentions into actual behaviors, which can provide crucial backing for the implementation of individual behaviors[13]. Social support can guide and motivate college students' physical exercise behaviors through individual perception, while the lack of social support will inhibit individuals' active behavioral participation[14]. Existing studies have verified that there is a positive correlation between social support and college students' physical exercise[15]. Sound social support can provide college students with exercise guidance, emotional encouragement and practical assistance, and effectively improve their initiative and persistence in participating in physical exercise[16]. Zhao Yun et al. pointed out that social support can effectively facilitate the transformation of college students' physical exercise intention into actual behavior[17]. From the perspective of physical exercise attitude, Wu Sixian et al. further supplemented relevant viewpoints, arguing that the social support system can indirectly increase college students' physical exercise participation frequency by positively shaping their physical exercise attitudes[18].

On this basis, this study puts forward Hypothesis 1: Social support can positively predict college students' physical exercise.

## **The Mediating Effect of Self-Compassion**

Self-compassion is a positive self-attitudinal mindset that shields people from self-criticism and rumination[19]. According to Self-Determination Theory, individuals can effectively raise their motivational level, maintain long-term behavioral persistence and achieve sound mental health when their psychological needs for autonomy, competence and relatedness are satisfied[20]. As a positive psychological trait of self-acceptance, self-compassion can effectively convert external support into internal motivation[21]. A high level of self-compassion enables college students to accept their own shortcomings in physical exercise, ease negative emotions arising from exercise setbacks, turn emotional encouragement and practical help into internal willingness to take part in physical exercise, and effectively improve their initiative and persistence in physical activity[22]. Mikesell Matthew et al. pointed out that college students with stronger perceived social support possess higher self-compassion levels[23]. Relevant research conducted by Brian J. Clarke further confirmed that self-compassion can positively predict college students' physical exercise behavior[24]. Self-compassion imposes positive effects on college students' physical exercise; higher self-compassion levels correspond to higher participation frequency and better persistence in physical exercise among college students[25].

On this basis, this study puts forward Hypothesis 2: Self-compassion exerts a mediating effect on the relationship between social support and college students' physical exercise.

## **The Mediating Effect of Body Image**

Body image is defined as a multi-dimensional self-attitude that individuals hold towards their own bodies, especially in terms of body size, shape and physical aesthetics[26]. Embodied Cognition Theory suggests that human bodies inevitably interact with real-life contexts to acquire perceptions and experiences of the world[27]. Therefore, individuals' behavioral decisions are markedly influenced by their own body cognition and evaluation[28]. Individuals' cognition and assessment of their bodies directly affect their behavioral decisions, particularly physical exercise behaviors related to physical activities. Positive body image drives individuals to actively engage in physical exercise to maintain or improve their physical state, whereas negative body image induces exercise avoidance mentality and impedes the occurrence of physical exercise behaviors[29]. A positive body image enables college students to correctly recognize their physical ability and body shape, and boosts their self-confidence in participating in physical exercise[30]. Existing studies have verified that body image positively predicts college students' physical exercise[31]. Cao Hui et al. stated that social support can effectively optimize college students' cognition of body image, and further facilitate the conversion of their exercise intention into practical behaviors[32]. Zhao Chengdong et al. further supplemented that the social support system can cultivate college students' positive psychological states, optimize their body image, and indirectly raise their participation frequency in physical exercise[33].

On this basis, this study puts forward Hypothesis 3: Body image plays a mediating role in the impact of social support on college students' physical exercise.

## **Chain Mediating Effect of Self-Compassion and Body Image**

Self-compassion and body image are core components of college students' self-cognitive system, and there exists an intimate correlation between them in the process of college students engaging in physical exercise[34]. Self-Regulation Theory holds that individuals adjust their behaviors and cognition through self-observation, self-judgment and self-response, so personal behaviors can affect their evaluation of their own bodies[35]. Prior

studies have confirmed that individuals with higher self-compassion levels show greater acceptance of their own bodies and possess more positive body image[36]. On the contrary, low self-compassion tends to make individuals fall into self-denial and negative emotions, hinder them from perceiving their physical conditions objectively, and thus restrain the formation of positive body image[37]. Relevant researches have proven that self-compassion positively predicts body image[38]. Braun et al. indicated that self-compassion can effectively alleviate the adverse impacts of ideal beauty standards on individual body image, and a high level of self-compassion can reduce the risk of developing negative body image caused by such beauty standards[39]. Rodgers et al. further pointed out that physical exercise can build a solid path for shaping positive body image by elevating individuals' self-compassion level[40].

Accordingly, this study proposes Hypothesis 4: Self-compassion and body image exert a chain mediating effect in the influencing path of social support on college students' physical exercise.

On this basis, the research hypothesis model is constructed as shown in Figure 1.

## Methods

### Research Subjects

Using the convenience sampling method, this study distributed online questionnaires to college students enrolled in universities in Heilongjiang, Jilin, Liaoning, Hebei and Henan provinces in China. The participants were from all regions across the country and thus possessed representative characteristics. A total of 743 questionnaires were distributed. After strict screening of the collected questionnaires and removal of invalid ones with incomplete responses and logical inconsistencies, 718 valid questionnaires were retained, yielding an effective response rate of 96.64%. Among the valid samples, there were 379 male students (52.79%) and 339 female students (47.21%). Specifically, the number of freshmen, sophomores, juniors and seniors was 179 (24.93%), 201 (27.99%), 224 (31.2%) and 114 (15.88%) respectively.

This study strictly followed the informed protection principles of the Declaration of Helsinki. The research protocol was approved by the Institutional Review Board of Liaoning Normal University (Approval Number: LL2026039; Approval Date: March 20, 2026). Anonymous questionnaire investigation was adopted throughout data collection to fully protect participants' privacy. All student participants signed informed consent voluntarily with full relevant information, and were entitled to withdraw from the research at any time.

### Research Instruments

#### (1) Perceived Social Support Scale (PSSS)

This scale was introduced into China, translated and revised by Jiang Qianjin[41] based on the original scale developed by Zimet. Composed of three dimensions, it contains 12 items in total, covering family support (e.g., My family can provide me with tangible and practical help), friend support (e.g., My friends can render sincere help to me), and other support (e.g., Someone will be by my side when I run into difficulties). Each subscale includes four items. The average value of the total item scores is adopted to reflect individuals' overall level of social support perception. Given the vague evaluation tendency of college students toward perceived social support, this study adopted the 5-point Likert scoring standard by referring to relevant domestic and foreign published studies, with 1 standing for totally inconsistent and 5 for totally consistent. Higher scores of the overall

scale and each subscale indicate higher level of social support obtained by college students. In the present study, the Cronbach's  $\alpha$  coefficient of the Perceived Social Support Scale was 0.902.

## **(2) Physical Activity Rating Scale (PARS-3)**

This scale was translated and revised by Liang Deqing et al.[42]. It consists of three dimensions with one item for each dimension, namely exercise intensity (e.g., What is the intensity of your physical exercise?), exercise duration (e.g., How long do you spend on physical activity each time?) and exercise frequency (e.g., How many times do you engage in physical activity per month). The scale adopts the 5-point Likert scoring method, where exercise intensity and exercise frequency are scored from 1 to 5 points respectively, and exercise duration is scored from 0 to 4 points. The total physical activity volume is calculated as the product of physical activity intensity, frequency and duration, and higher scores represent greater physical activity volume. In this study, the Cronbach's  $\alpha$  coefficient of the Physical Activity Rating Scale was 0.750.

## **(3)Self-Compassion Scale (SCS)**

The Chinese version of the Self-Compassion Scale (SCS) was revised by Chen Jian et al.[43] on the basis of the original scale compiled by Neff. This scale contains 26 items divided into six dimensions, including common humanity (e.g., When encountering difficulties, I regard hardships as part of life that everyone experiences), self-kindness (e.g., I treat myself with more care when I am in a bad mood), mindfulness (e.g., I try my best to keep emotionally stable when facing troubles), isolation (e.g., I feel more lonely when noticing my own shortcomings), self-judgment (e.g., I feel dissatisfied with and critical of my own flaws and deficiencies), and over-identification (e.g., I tend to dwell on unpleasant things when feeling depressed). Among them, the latter three dimensions are reverse-scored. This scale adopts a 5-point Likert scoring method, with 1 indicating strongly disagree and 5 indicating strongly agree. Higher scores represent a higher level of self-compassion. In this study, the Cronbach's  $\alpha$  coefficient of this scale was 0.955.

## **(4)Multidimensional Body-Self Relations Questionnaire (MBSRQ)**

This scale was revised by Taiwanese scholars Wang Zhengsong and Wang Jianxing[44] based on the Multidimensional Body-Self Relations Questionnaire (MBSRQ) originally developed by Thomas F. Cash. The revised Chinese version of MBSRQ was adopted in this study. In combination with the actual situation of college students, five core subscales were selected for research, namely Appearance Evaluation (e.g., I have an attractive figure), Appearance Orientation (e.g., I always pay attention to my appearance before going out in public), Fitness Evaluation (e.g., I can pass most physical fitness tests), Fitness Orientation (e.g., I think it is important to have good physical strength), and Body Areas Satisfaction (e.g., face including facial features and skin tone). The five subscales contain 7, 12, 5, 10 and 9 items respectively, with a total of 43 items. This scale adopts the 5-point Likert scoring method, ranging from strongly disagree to strongly agree, corresponding to scores from 1 to 5. Higher scores indicate more positive individual body image. In this study, the Cronbach's  $\alpha$  coefficient of the scale was 0.972.

## **Statistical Analysis**

In this study, SPSS 27.0 and AMOS 27.0 software were used for data analysis. Firstly, Cronbach's  $\alpha$  coefficient was adopted to test the reliability of scales, and Harman single-factor test was conducted to control common method bias. Afterwards, descriptive statistics and Pearson correlation analysis were performed to explore the

relationships among social support, physical exercise, self-compassion and body image. Finally, the structural equation model was established via AMOS 27.0, and Bootstrap sampling with 5000 iterations and 95% confidence intervals was used to verify the mediating effects.

## Results

### Common Method Bias Test

Given that four measurement scales were administered to the same participants and all data were collected via self-reporting, the Harman single-factor test was adopted to conduct exploratory factor analysis on all items so as to effectively avoid common method bias. The results are presented in Table 1. There were 15 factors with eigenvalues greater than 1, and the variance explained by the first factor was only 29.765%, which was lower than the critical threshold of 40%. It indicated that no serious common method bias existed in this study. Meanwhile, the multi-factor confirmatory factor analysis model of the four variables achieved good model fit indices ( $\chi^2/df<3$ , CFI>0.9, RMSEA<0.08), suggesting that the common method bias was well controlled. Therefore, the degree of common method bias in this study was slight and would not substantially affect the reliability of the research conclusions.

**Table 1.** Total Variance Explained

| Factor Number | Initial Eigenvalues |                        |              | Extraction Sums of Squared Loadings |                        |              |
|---------------|---------------------|------------------------|--------------|-------------------------------------|------------------------|--------------|
|               | Total               | Percentage of Variance | Cumulative % | Total                               | Percentage of Variance | Cumulative % |
| 1             | 25.002              | 29.765                 | 29.765       | 25.002                              | 29.765                 | 29.765       |
| 2             | 9.380               | 11.167                 | 40.932       | 9.380                               | 11.167                 | 40.932       |
| 3             | 4.362               | 5.193                  | 46.126       | 4.362                               | 5.193                  | 46.126       |
| 4             | 2.368               | 2.820                  | 48.945       | 2.368                               | 2.820                  | 48.945       |
| 5             | 2.073               | 2.468                  | 51.413       | 2.073                               | 2.468                  | 51.413       |
| 6             | 1.871               | 2.228                  | 53.640       | 1.871                               | 2.228                  | 53.640       |
| 7             | 1.570               | 1.869                  | 55.509       | 1.570                               | 1.869                  | 55.509       |
| 8             | 1.483               | 1.766                  | 57.275       | 1.483                               | 1.766                  | 57.275       |
| 9             | 1.416               | 1.685                  | 58.960       | 1.416                               | 1.685                  | 58.960       |
| 10            | 1.320               | 1.571                  | 60.531       | 1.320                               | 1.571                  | 60.531       |
| 11            | 1.253               | 1.492                  | 62.023       | 1.253                               | 1.492                  | 62.023       |
| 12            | 1.210               | 1.440                  | 63.463       | 1.210                               | 1.440                  | 63.463       |
| 13            | 1.172               | 1.395                  | 64.858       | 1.172                               | 1.395                  | 64.858       |
| 14            | 1.104               | 1.314                  | 66.172       | 1.104                               | 1.314                  | 66.172       |
| 15            | 1.081               | 1.287                  | 67.459       | 1.081                               | 1.287                  | 67.459       |

## Descriptive Statistics and Correlation Analysis

**Table 2.** Gender Differences in Different Variables (n=718)

|                   | Gender | Number of Cases | M±SD        | t      | P     |
|-------------------|--------|-----------------|-------------|--------|-------|
| social support    | Male   | 379             | 3.68±0.79   | -0.004 | 0.997 |
|                   | Female | 339             | 3.68±0.80   |        |       |
| physical exercise | Male   | 379             | 48.11±24.94 | 1.590  | 0.112 |
|                   | Female | 339             | 45.18±24.31 |        |       |
| self-compassion   | Male   | 379             | 3.63±0.83   | -0.009 | 0.993 |
|                   | Female | 339             | 3.63±0.83   |        |       |
| body image        | Male   | 379             | 3.70±0.79   | -0.320 | 0.749 |
|                   | Female | 339             | 3.72±0.78   |        |       |

Note: \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ ; Gender: 1 = Male, 2 = Female.

Independent-samples t-test was adopted to explore gender differences in social support, physical exercise, self-compassion and body image among 718 college students (379 males and 339 females). As shown in Table 2, in the dimension of social support, males scored  $3.68 \pm 0.79$  and females scored  $3.68 \pm 0.80$ , with  $t = -0.004$ ,  $p = 0.997 > 0.05$ , showing no statistically significant gender difference. In terms of physical exercise, males scored  $48.11 \pm 24.94$  and females scored  $45.18 \pm 24.31$ ; males had slightly higher scores, but the difference was not statistically significant ( $t = 1.590$ ,  $p = 0.112 > 0.05$ ). For self-compassion, both males and females scored  $3.63 \pm 0.83$ ,  $t = -0.009$ ,  $p = 0.993 > 0.05$ , with no significant gender difference. In the body image dimension, males scored  $3.70 \pm 0.79$  and females scored  $3.72 \pm 0.78$ ; females had marginally higher scores, while the difference had no statistical significance ( $t = 0.320$ ,  $p = 0.749 > 0.05$ ).

In summary, no statistically significant gender differences were found in the four variables including social support, physical exercise, self-compassion and body image among college students in this study (all  $p > 0.05$ ). The results indicated that gender had little practical effect on college students' levels of social support, physical exercise, self-compassion and body image (Table 2).

**Table 3.** Grade Differences in Various Variables (n=718)

|                   | Grade     | Number of Cases | M±SD        | F     | P     |
|-------------------|-----------|-----------------|-------------|-------|-------|
| social support    | Freshman  | 179             | 3.63±0.85   | 0.806 | 0.491 |
|                   | Sophomore | 201             | 3.67±0.79   |       |       |
|                   | Junior    | 224             | 3.75±0.76   |       |       |
|                   | Senior    | 114             | 3.68±0.78   |       |       |
|                   | Total     | 718             | 3.68±0.79   |       |       |
| physical exercise | Freshman  | 179             | 48.09±25.05 | 0.883 | 0.450 |
|                   | Sophomore | 201             | 44.70±26.56 |       |       |
|                   | Junior    | 224             | 46.46±23.21 |       |       |
|                   | Senior    | 114             | 48.68±23.39 |       |       |
|                   | Total     | 718             | 46.73±24.67 |       |       |
| self-compassion   | Freshman  | 179             | 3.65±0.82   | 0.209 | 0.891 |
|                   | Sophomore | 201             | 3.59±0.86   |       |       |
|                   | Junior    | 224             | 3.64±0.81   |       |       |
|                   | Senior    | 114             | 3.64±0.83   |       |       |
|                   | Total     | 718             | 3.63±0.83   |       |       |
| body image        | Freshman  | 179             | 3.73±0.78   | 0.565 | 0.638 |
|                   | Sophomore | 201             | 3.65±0.82   |       |       |
|                   | Junior    | 224             | 3.75±0.76   |       |       |
|                   | Senior    | 114             | 3.71±0.77   |       |       |
|                   | Total     | 718             | 3.71±0.79   |       |       |

Note: \*p<0.05, \*\*p<0.01, \*\*\*p<0.001; Grade: 1=Freshman, 2=Sophomore, 3=Junior, 4=Senior.

One-way analysis of variance (ANOVA) was used to compare the differences in social support, physical exercise, self-compassion and body image among college students of different grades. As shown in Table 3, the scores of social support from freshmen to seniors were 3.63±0.85, 3.67±0.79, 3.75±0.76 and 3.68±0.78 respectively, with no statistically significant difference among groups (F=0.806, p=0.491>0.05). In terms of physical exercise, the corresponding scores were 48.09±25.05, 44.70±26.56, 46.73±23.21 and 48.68±23.39, and the inter-group difference was not statistically significant (F=0.883, p=0.450>0.05). For self-compassion, the scores were 3.65±0.82, 3.59±0.86, 3.64±0.81 and 3.64±0.83, showing no significant inter-group difference (F=0.209, p=0.891>0.05). Regarding body image, the scores were 3.73±0.78, 3.65±0.82, 3.75±0.76 and 3.71±0.77, with insignificant differences across grades (F=0.565, p=0.638>0.05).

In conclusion, there were no statistically significant differences in social support, physical exercise, self-compassion and body image among college students of different grades (all p>0.05) (Table 3).

**Table 4.**Correlation Analysis of Various Variables (n=718)

| Variables           | M±SD        | 1      | 2     | 3        | 4        | 5        | 6 |
|---------------------|-------------|--------|-------|----------|----------|----------|---|
| 1 Gender            | 1.47±0.50   | 1      |       |          |          |          |   |
| 2 Grade             | 2.38±1.03   | 0.019  | 1     |          |          |          |   |
| 3 Social Support    | 3.68±0.79   | 0.001  | 0.039 | 1        |          |          |   |
| 4 Physical Exercise | 46.73±24.67 | -0.059 | 0.008 | 0.349*** | 1        |          |   |
| 5 Self-Compassion   | 3.63±0.83   | 0.002  | 0.004 | 0.394*** | 0.290*** | 1        |   |
| 6 Body Image        | 3.71±0.79   | 0.012  | 0.007 | 0.364*** | 0.420*** | 0.374*** | 1 |

Note: \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ ; Gender: 1=Male, 2=Female; Grade: 1=Freshman, 2=Sophomore, 3=Junior, 4=Senior.

This study selected social support, physical exercise, self-compassion and body image as core research variables, and gender and grade as demographic variables. Pearson correlation analysis was conducted to test the relationships among all variables, and the results are shown in Table 4.

In terms of demographic variables, the correlation coefficient between gender and grade was  $r = 0.019$  ( $p > 0.05$ ). The absolute values of correlation coefficients between demographic variables and the four core variables were all less than 0.06 ( $p > 0.05$ ), which indicated no significant correlation between demographic variables and core variables. This provided empirical basis for excluding gender and grade as control variables in the subsequent structural equation model.

Correlation analysis of core variables showed that there were significant positive correlations among all variables ( $p < 0.001$ ). Social support was moderately positively correlated with physical exercise ( $r = 0.349, p < 0.001$ ), self-compassion ( $r = 0.394, p < 0.001$ ) and body image ( $r = 0.364, p < 0.001$ ). Physical exercise had weak-to-moderate positive correlations with self-compassion ( $r = 0.290, p < 0.001$ ) and body image ( $r = 0.420, p < 0.001$ ). Self-compassion was also moderately positively correlated with body image ( $r = 0.374, p < 0.001$ ).

To sum up, there existed stable positive relationships among social support, physical exercise, self-compassion and body image, and demographic variables had no significant influence on core variables. The findings supplied preliminary statistical support for constructing the sequential mediation model and verifying research hypotheses, and laid a solid foundation for further exploring the internal mechanism among variables.

### Multicollinearity Test

Given the positive correlations among social support, physical exercise, self-compassion and body image, potential multicollinearity may exist. Accordingly, collinearity diagnosis was conducted for the regression model. The results showed that the variance inflation factor (VIF) of all predictive variables ranged from 1.18 to 1.27, which were all much lower than 5; the tolerance values varied from 0.79 to 0.85, all higher than 0.2; and the maximum condition index was 14.047, far below 30. Based on the comprehensive evaluation criteria, no serious multicollinearity was found in the research data[46]. The data conformed to the basic assumptions of regression analysis, which made it feasible to carry out the sequential mediation effect test further.

### Construction of Structural Equation Model

**Table 5.** Fitting Indices of the Mediation Model of Self-Compassion and Body Image

| $\chi^2/df$ | GFI   | NFI   | IFI   | TLI   | CFI   | RMSEA |
|-------------|-------|-------|-------|-------|-------|-------|
| 1.054       | 0.981 | 0.981 | 0.999 | 0.999 | 0.999 | 0.009 |

Prior to structural equation model analysis, this study verified data assumptions including normality and linearity, and the data satisfied the model application criteria. AMOS 27.0 was adopted to establish the structural equation model. Social support was set as the independent variable, physical exercise as the dependent variable, and self-compassion and body image as mediating variables. Given that gender and grade showed no significant effects in previous tests, no control variables were incorporated into the model to explore the mediating mechanism among the four variables.

Confirmatory Factor Analysis (CFA) was first conducted on the four latent variables of social support, physical exercise, self-compassion and body image to assess measurement model fit. The results indicated that all measurement model fit indices reached the standard ( $\chi^2/df < 3$ , GFI, CFI  $\geq 0.90$ , RMSEA  $< 0.05$ ) with acceptable reliability and validity, which laid a foundation for structural model construction. The fit indices of the integrated structural model are shown in Table 5. The chi-square to degrees of freedom ratio was  $\chi^2/df = 1.054 < 3$ , meeting the ideal fitting standard; GFI=0.981, NFI=0.981, IFI=0.999, TLI=0.999 and CFI=0.999 were all above 0.95, indicating excellent model fit; RMSEA=0.009  $< 0.05$  suggested an optimal fitting effect. Collectively, the established model fitted well with the empirical data, enabling further path effect analysis.

Path analysis results are illustrated in Figure 2. Social support had significant positive effects on physical exercise ( $\beta = 0.28, p < 0.001$ ), self-compassion ( $\beta = 0.46, p < 0.001$ ) and body image ( $\beta = 0.30, p < 0.001$ ). Self-compassion was positively associated with physical exercise ( $\beta = 0.17, p < 0.001$ ) and body image ( $\beta = 0.28, p < 0.001$ ). Moreover, body image significantly positively predicted physical exercise ( $\beta = 0.38, p < 0.001$ ), demonstrating that higher body image level was accompanied by higher participation in physical exercise.

### Mediating Effect Test

**Table 6.** Mediating Effect Analysis of Self-Compassion and Body Image Between Social Support and Physical Exercise

| Path                                                                    | Effect Size | SE    | P     | 95%CI |       |
|-------------------------------------------------------------------------|-------------|-------|-------|-------|-------|
|                                                                         |             |       |       | LB    | UB    |
| Total Effect                                                            | 0.536       | 0.069 | 0.000 | 0.403 | 0.675 |
| Direct Effect                                                           | 0.289       | 0.071 | 0.000 | 0.155 | 0.436 |
| Ind1: Social Support → Self-Compassion → Physical Exercise              | 0.078       | 0.030 | 0.003 | 0.027 | 0.146 |
| Ind2: Social Support → Body Image → Physical Exercise                   | 0.118       | 0.029 | 0.000 | 0.069 | 0.187 |
| Ind3: Social Support → Self-Compassion → Body Image → Physical Exercise | 0.050       | 0.014 | 0.000 | 0.028 | 0.084 |

This section examined the effect mechanism of the sequential mediation model, taking social support as the independent variable, physical exercise as the dependent variable, self-compassion and body image as mediating variables without introducing additional control variables. The Bootstrap method with 5000 repeated samplings

was adopted to test the significance of mediating effects, and whether the 95% confidence interval (CI) of each mediating path contained zero served as the core judgment criterion. The relevant results are presented in Table 6.

The 95% CIs of all three mediating paths did not contain zero. Specifically, Ind1 was [0.027, 0.146] with  $p=0.003$ ; Ind2 was [0.069, 0.187] with  $p<0.001$ ; Ind3 was [0.028, 0.084] with  $p<0.001$ . Their standard errors were 0.030, 0.029 and 0.014 respectively, and the corresponding effect sizes were 0.078, 0.118 and 0.050. The above results fully confirmed the existence of significant mediating effects.

## Discussion

### **The Relationship between Social Support and College Students' Physical Exercise**

The present study revealed that social support could positively predict college students' physical exercise behavior, which was consistent with findings of previous studies[46][47] and verified Hypothesis 1.

Although college students possess strong independent awareness, they are easily troubled by insufficient exercise motivation, poor persistence and lack of professional guidance during physical activity participation[48]. As a crucial external supportive factor, social support can effectively resolve such predicaments and help college students develop regular physical exercise habits[49], which further supports the viewpoints of the Theory of Planned Behavior. Previous studies on college students have demonstrated that compared with those with low social support and insufficient emotional and behavioral support, students who obtain adequate social support tend to take physical exercise more frequently with appropriate intensity and maintain better exercise persistence[50]. From the perspective of social interaction, social support can narrow interpersonal distance, facilitate experience sharing and behavioral imitation related to physical exercise, and thus form a positive sports community atmosphere[51].

In addition, sufficient social support can relieve college students' psychological worries about physical exercise, motivating them to formulate and stick to personal exercise plans actively[52]. Meanwhile, the exemplary behaviors from peers can directly drive students to engage in physical activities[53]; support from teachers and families can provide sports resources and time guarantee, reduce exercise barriers, and indirectly promote college students to form regular exercise habits[54]. Consequently, the viewpoint that social support exerts influences on college students' physical exercise has been widely recognized by academic researchers.

### **The Mediating Role of Self-Compassion Between Social Support and College Students' Physical Exercise**

The results of this study confirmed that self-compassion exerted a significant mediating effect between social support and college students' physical exercise behavior, which was in line with previous research conclusions[23][55] and verified Hypothesis 2.

In the process of gaining social support, college students can gain a sense of understanding and acceptance. Such positive external feedback enables them to treat personal deficiencies and setbacks in physical exercise in a tolerant and friendly manner, thereby improving their level of self-compassion[56]. Furthermore, adequate social support alleviates feelings of shame and inferiority caused by worries about poor exercise performance, and the improvement of such emotional experiences contributes greatly to the enhancement of self-compassion[57].

Meanwhile, social support provides emotional buffering for college students, helping them reduce self-denial when confronted with exercise difficulties and gradually elevate their self-compassion level[58].

Relevant studies have proven that individuals with high self-compassion are less likely to give up exercising due to non-standard movements or unsatisfactory fitness effects; namely, higher self-compassion corresponds to higher levels of physical exercise participation[25]. In contrast, college students with low self-compassion tend to be overly harsh on their own exercise performance and prone to self-negation after minor setbacks. Such negative self-perception will weaken exercise motivation, lead to exercise procrastination and premature termination of exercise plans, and ultimately exert adverse impacts on physical exercise participation[59]. To sum up, self-compassion plays an independent mediating role in the relationship between social support and college students' physical exercise.

### **The Mediating Role of Body Image Between Social Support and College Students' Physical Exercise**

The findings verified that body image played a significant mediating effect between social support and college students' physical exercise, which was consistent with prior research results[60][61] and confirmed Hypothesis 3.

Adequate social support helps individuals build positive body image and improve acceptance of their physical conditions[62]. Meanwhile, sufficient social support enables college students to form positive perceptions of their physical shape and physical fitness, relieve body anxiety, and thus take part in physical exercise more initiatively[63]. Compared with students lacking enough social support, those who continuously receive support from families, peers and schools during college life tend to hold more positive body image and show higher participation in physical exercise[64].

Individuals trapped in long-term negative body image are inclined to avoid physical exercise and fall into self-isolation, which severely undermines their initiative to engage in sports activities[61]. This study also proved a positive correlation between body image and college students' physical exercise: the more positive one's body image is, the stronger their initiative and persistence in physical exercise will be[65]. More social support facilitates the formation of positive body image, and brings individuals greater sense of achievement and pleasure during exercise[66]. On the contrary, negative body image makes college students evade physical exercise out of worry about personal performance and excessive concern over others' comments[67]. In conclusion, body image acts as an independent mediator between social support and college students' physical exercise.

### **Sequential Mediating Effect of Self-Compassion and Body Image**

The results of this study indicated that self-compassion and body image played a sequential chain mediating role between social support and college students' physical exercise, which was consistent with previous research conclusions[68][69] and verified Hypothesis 4.

From the perspective of self-compassion theory, individuals can form positive self-protection mechanisms, cope with negative experiences with self-compassion, and establish positive and healthy social connection and a sense of well-being[70]. Individuals with high self-compassion will not engage in self-denial due to physical limitations, but treat physical imperfections rationally. Such positive self-perception makes people attach more importance to physical health and vitality, improve their body image, and take the initiative to improve physical

conditions through physical exercise[71]. Meanwhile, the elevation of college students' self-compassion level can boost their body image, which further promotes their participation in physical exercise[68].

Many scholars have explained this relationship theoretically. Self-compassion is essentially a positive self-cognitive mode[72], and body image represents individuals' cognition and evaluation of their own bodies. Positive self-cognition can guide individuals to form positive physical self-evaluation[73]. Accordingly, individuals with high self-compassion are more likely to develop positive body image, and thus facilitate the occurrence of physical exercise behaviors[68]. In conclusion, the sequential mediating effect of self-compassion combined with body image between social support and college students' physical exercise is tenable.

## **Conclusions and Prospects**

### **Research Conclusions**

Social support can positively predict college students' physical exercise behavior. Furthermore, social support can positively predict college students' physical exercise through the independent mediating effects of self-compassion and body image, as well as their sequential chain mediating effect. Therefore, in the implementation of college physical education courses, universities should attach importance to the influence of social support on college students' physical exercise, and pay close attention to the mediating roles of self-compassion and body image in promoting college students' physical exercise participation.

### **Prospects and Limitations**

This study explores the relationship between social support and college students' physical exercise, as well as the internal mechanism of self-compassion and body image in the impact of social support on college students' physical exercise, aiming to improve the level of college students' physical exercise and promote the high-quality development of modern education. However, this study has certain limitations that need to be improved.

First of all, this study collected data through questionnaires among college students, which is a cross-sectional study and difficult to reveal the causal relationship between variables. Future research can adopt longitudinal study or experimental research design to further verify the causal relationship among social support, physical exercise, self-compassion and body image.

Secondly, this study is only limited to the sequential mediating role of self-compassion and body image between social support and college students' physical exercise. There may also be other relevant mediating variables such as self-efficacy, exercise motivation, social anxiety and academic stress that affect this relationship. In the future, other relevant variables can be added to carry out in-depth research from multi-dimensional and multi-perspective angles, so as to improve the research on the impact of social support on college students' physical exercise.

Finally, the research subjects of this study are undergraduate students from freshman to senior year in colleges and universities, and the sample source of the research subjects is relatively single, which has limitations. Although it covers different grades and colleges and universities, which enriches the diversity of samples to a certain extent, future research can include more diverse groups, such as postgraduates and junior college students, so as to enhance the authenticity of the relationship between social support and college students' physical exercise. Therefore, this study should adjust and optimize the research methods, variable selection and data sources, further improve the research on the relationship between social support and college students'

physical exercise, and provide more reliable theoretical guidance for improving the level of college students' physical exercise.

## **Declarations**

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### **Compliance statement**

During the implementation of this study, it strictly adheres to the International Ethical Guidelines for Health-related Research Involving Human Subjects issued by the Council for International Organizations of Medical Sciences (CIOMS) and relevant Chinese scientific research ethics management measures and regulations. All aspects, such as the design of research methods and the collection and use of data, prioritize the protection of the rights, safety, and well-being of participants, ensuring that the research is carried out within a legal and compliant framework.

### **Data availability**

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation. If anyone would like to request data from this study, please contact the corresponding author, hongbo1128@163.com.

### **Authors' contributions**

H-B Z conceived and supervised the study. Y-Z W collected and analyzed the data and drafted the manuscript. Both authors reviewed and approved the final version of the manuscript. H-B Z is responsible for conceiving, writing, reviewing, editing the first draft and obtaining funds. Y-Z W is responsible for conceiving, writing, reviewing and editing the draft. All the authors read and approved the final manuscript.

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### **Competing interests**

The authors declare no competing interests.

### **Ethics approval and consent to participate**

This study strictly followed the informed protection principles of the Declaration of Helsinki. The research protocol was approved by the Institutional Review Board of Liaoning Normal University (Approval Number: LL2026039; Approval Date: March 20, 2026). Anonymous questionnaire investigation was adopted throughout data collection to fully protect participants' privacy.

### **Informed consent**

All student participants signed informed consent voluntarily with full relevant information, and were entitled to withdraw from the research at any time.

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## Figures

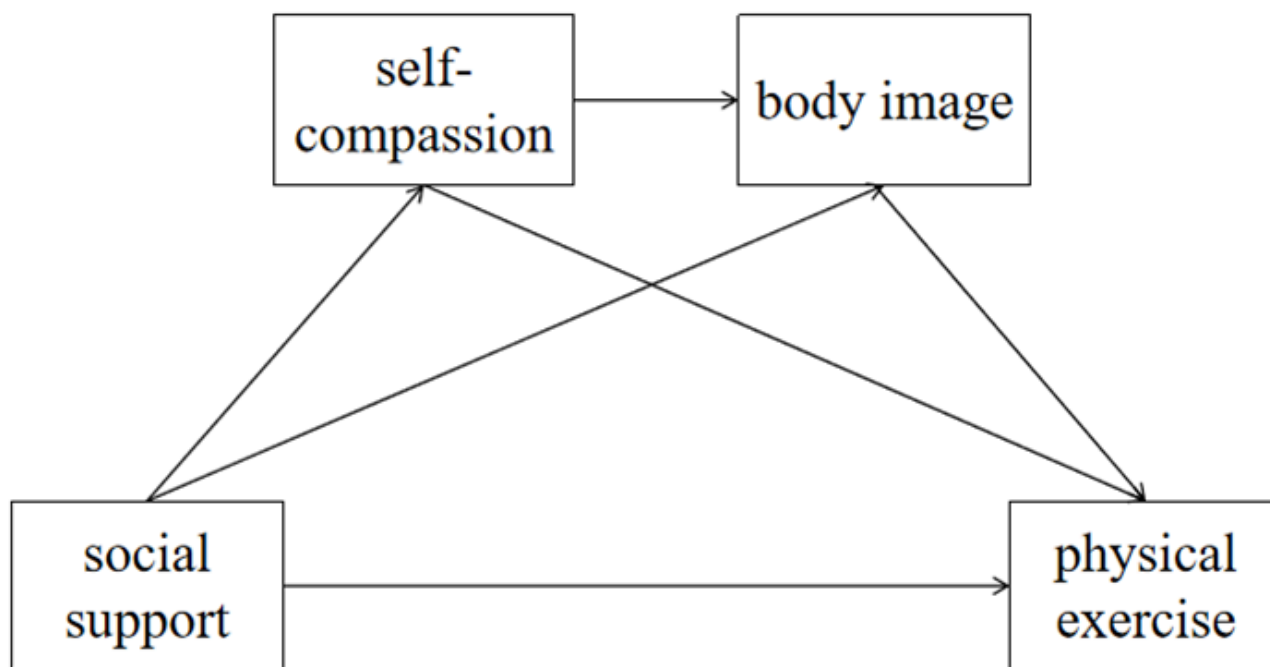


Figure 1

Hypothetical Model

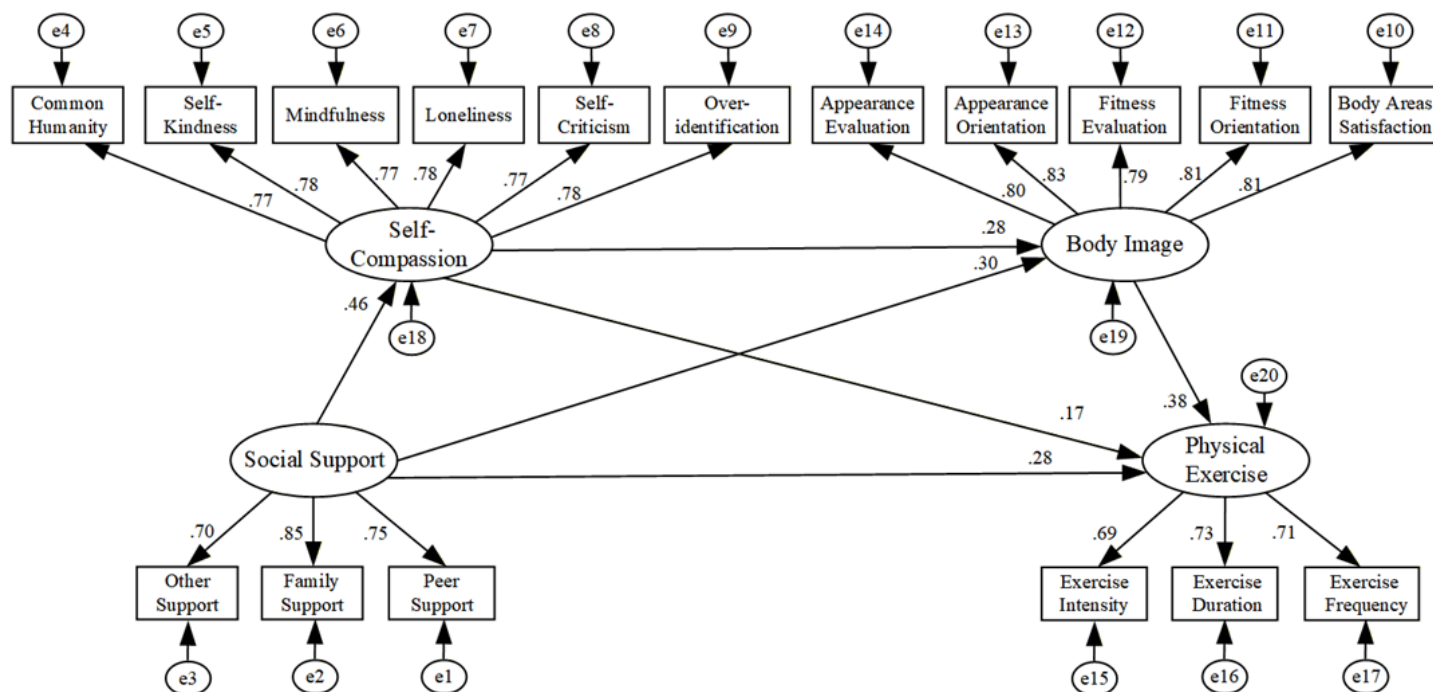


Figure 2

SEM Analysis Diagram of Mediation Effect Model