Humanities & Social Sciences Communications

ARTICLE

https://doi.org/10.1057/s41599-023-02064-4 OPEN

The impact of sports participation on individuals' subjective well-being: the mediating role of class identity and health

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Although studies have explored the relationship between physical activity and subjective well-being, exploration of the mechanisms underlying the effects of sports participation on subjective well-being remains limited. In the context of promoting the deep integration of national fitness and national health in China, we explore the patterns and differences in the effects of sports participation on the subjective well-being of different populations and explore the underlying mechanisms of the effects of sports participation on individual subjective well-being based on body and society theory. Using data from the China General Social Survey, this study used multiple linear regression models, propensity score matching methods, quantile regression and chain mediation models to explore the relationship between sport participation and subjective well-being, and further elaborated the mediating role of subjective class identity and health in it. The results of the study showed that sports participation significantly and positively affected individual subjective well-being. The results of quantile regression and heterogeneity tests showed that the effect of sports participation on individual subjective well-being showed a significant quantile effect and group heterogeneity. Sports participation had a more significant effect on the well-being of older adults. The results of the mediation effect test showed that sports participation increased subjective well-being by enhancing individuals' subjective class identity and health, respectively, while subjective class identity and health had a significant chain mediation effect. Based on the findings of the study this paper provides some practical suggestions for improving the subjective well-being of residents, especially the elderly, which will provide some valuable references for the next studies on residents' well-being and life satisfaction.

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Introduction

Improving people's well-being is an important development indicator recognized by the international community, and people's pursuit and aspiration for a better life point to the concern for individual subjective well-being. Subjective well-being is an individual's reflective cognition and emotional assessment of their life state (Diener, 2006). The multiple fields involved in subjective well-being have caused this topic to receive long-term attention from disciplines such as psychology, sociology and economics. Existing research has examined the effects of age (Becker & Trautmann, 2022), income (Toshkov, 2022), social networks (Huang et al., 2019), social capital (Xu et al., 2023), subjective health (Mohammadi et al., 2022), and depressive symptoms on subjective well-being (Soosova et al., 2021). It has also been suggested that economic factors and lifestyle changes have the greatest impact on individuals' subjective well-being (Okulicz-Kozaryn & Mazelis, 2017). Based on these studies, what we would like to explore further is the effect of physical activity as a lifestyle or as a form of leisure on individuals' subjective well-being. In China, the implementation of the Health China Strategy and the National Fitness Strategy has emphasized and highlighted the comprehensive value and multiple functions of sports participation in improving people's health, promoting all-around human development, and promoting economic and social development. Although studies have verified the significant positive effects of physical exercise and physical activity on subjective well-being (Yuan & You, 2022), they have generally focused on the effects of physical activity on well-being, with limited analysis of the mechanisms underlying the effects of physical activity on subjective well-being. In addition, many studies have focused on the effects of physical activity on the well-being of specific age groups (Jiang et al., 2021; Panza et al., 2019), which does not clearly show the differences in the effects of physical activity participation on the subjective well-being of different age groups and the patterns and characteristics of the effects of physical activity participation on well-being. Therefore, our study expects to construct a theoretical framework for analyzing the effects of sports participation on subjective well-being based on body and society theory, and then explore the intrinsic pathways of the effects of physical activity participation on individuals' subjective well-being.

Based on our research objectives, the rest of the paper is organized as follows: the second part is the literature review and research hypothesis. The third section discusses the required data, variable measurement, and estimation strategies. The fourth part provides an empirical analysis of the effect of sports participation on individuals' subjective well-being. This section includes the use of propensity score matching to address sample selection bias, the use of quantile regression to explore patterns in the effect of sports participation on individual subjective well-being, a test of heterogeneity regarding age, and a test of chain mediating effects. The fifth section presents the conclusions of the paper and discusses them accordingly.

Literature review and research hypothesis

Physical activity, subjective class identity, and health. From the perspective of the sociology of the body, the body becomes a kind of planning for modern people and a constituent part of the individual's self-identity. The planning and devotion to the body give people a means of self-expression (Shilling, 2012). A typical example of using the body as a project is the individual's quest for a healthy body. In this process, individuals expect to build a healthy body through daily behaviors such as fitness and diet to alleviate their concerns about body presentation. Physical activity plays an important role in shaping individuals into healthy bodies. Perceived health plays an important mediating role in physical activity participation and higher well-being or life satisfaction (Lera-Lopez et al., 2017). A growing body of research points to a positive correlation between physical activity and perceived health, physical health and mental health (Humphreys et al., 2014; Wang et al., 2022). In the process of long-term stable physical activity participation, participants can not only improve muscle strength (Shen et al., 2018), enhance cognitive ability and reduce the incidence of obesity directly through physical activity (Petridou et al., 2019; Sewell et al., 2021), but also gain a sense of pleasure and reduce anxiety and depression, thus enhancing the individual's mental health (Buecker et al., 2021; Fortier & Morgan, 2022).

Physical fitness as a "soft technology" is not only a pathway to health but also an important means of communicating lifestyle and self-identity (Yongfeng & Ge, 2021). Featherstone (2007) points out that the body represents the self and that the relationship between the self and the body can be re-examined through physical fitness and other body technologies. In this study, we shifted the perspective of identity to subjective class identity. Class identity is an individual's perception of his or her position in the class structure (Jackman & Jackman, 1973), and it is an individual's identification of his or her social class based on certain criteria. The positive correlation between physical activity and subjective class identity has been verified in studies (Yang et al., 2022). This relationship between physical activity and subjective class identity can be further understood in terms of the effect of leisure style on subjective class identity. As lifestyle and consumption patterns have become mechanisms of social exclusion (Duncan & Duncan, 2001), tools of social competition and mean of identity construction (Cerneviciute, 2008). Physical activity is a form of leisure, so we cannot ignore its influence on an individual's subjective class identity.

Subjective class identity is closely related to health. Unlike objective socioeconomic status, subjective class identity emphasizes one's subjective consciousness, evaluation and feelings, and is a judgment of one's social status and social identity (Peilin, 2005). In the subject's perception of social status and identity, the individual will acquire a subjective status that is different from the objective one in accordance with life experiences and values (Adler et al., 2000). In the process of forming subjective class identity, individuals need to be compared with other groups, and in social comparison, those who subjectively feel inferior may develop a sense of relative deprivation (Xin, 2002), and the perception of relative deprivation will have a negative impact on individual health (Wang et al., 2023). This demonstrates the close association between individuals' perceptions of their class and their physical and mental health (Adler et al., 2000; Garza et al., 2017). Related studies point out that the impact of subjective evaluation of social status on individual health has exceeded the impact of objective socioeconomic status on individual health (Hoebel & Lampert, 2020), Subjective status assessments provide key information for understanding health disparities (Cundiff & Matthews, 2017).

Subjective class identity and subjective well-being. Subjective class identity is closely related to subjective well-being (Sani et al., 2010; Tang & Tan, 2022). Studies on subjective class identity emphasize that stratification includes subjective awareness, evaluation and feelings, and that even objective social stratification cannot be separated from subjective identity (Peilin, 2005). Existing research points to differences in the effects of subjective social status and objective socioeconomic status on individual well-being. Sweeting and Hunt

(2014) research on adults and adolescents points out that subjective socioeconomic status is associated with health and well-being, while objective socioeconomic status is less associated with health and well-being. Individuals' self-rated social status has a higher impact on subjective well-being than objective socioeconomic status, which is driven by a sense of power and social acceptance (Anderson et al., 2012). Compared with other groups, residents with lower class status tend to have a sense of relative deprivation, which will affect personal happiness and psychological integration.

Health and subjective well-being. Perceptions of health lead to a positive relationship between physical activity and well-being (Lera-Lopez et al., 2017). The positive effect of physical health on subjective well-being has been widely recognized (Garrido et al., 2013), and the mediating role of physical and mental health issues such as pain, sleep problems, loneliness, anxiety and boredom in the relationship between lack of physical activity and subjective well-being has also been demonstrated (Gyasi et al., 2023). Even though there is a correlation between physical health and mental health, there is a need to be aware of the unique role of different dimensions of health in research (Wang et al., 2022)· What we need to be clear about is the relationship between mental health and well-being. This is because existing research often identifies mental health and happiness together as important variables in the analysis of human well-being (Mahmoodi et al., 2022; Perneger et al., 2004). However, the association and distinction between subjective well-being and mental health have been validated by studies (Chen et al., 2013). In our study, we emphasize the difference between mental health and well-being, that is, mental health and well-being are closely but not identically related (Keller, 2020), and it is important to note that mental health is a significant predictor of subjective well-being (Burns & Machin, 2010; Min, 2019).

Based on the above analysis, we constructed the research framework in Fig. 1 and proposed the following research hypotheses for this paper:

H1: Sports participation has a positive effect on individual subjective well-being.

H2: Subjective class identity has a mediating role in the relationship between sports participation and individual subjective well-being.

H3: Physical and mental health has a mediating role in the relationship between sports participation and individual subjective well-being.

H4: There is a chain mediating role of subjective class identity and physical and mental health in the relationship between sports participation and individual subjective well-being.

Data and methods

Data source. This article uses data from the Chinese General Social Survey (CGSS) 2017, a national, comprehensive and continuous academic survey launched in 2003. The survey provides data for the promotion of social science research and international comparative studies through the regular and systematic collection of data on various aspects of Chinese people and Chinese society. A total of 12,582 valid samples were completed for the CGSS 2017 data. Considering the research objectives of this paper, the study will exclude samples with missing key variables and those with outliers. The final sample we used contained 3501 observations.

Variables. Subjective well-being (SWB) was taken as the dependent variable. The 2017 China General Social Survey used the Subjective Well-being Scale to ask respondents how much they agreed with the 21 views on the scale. Respondents were asked to choose from the following levels of agreement: 1 = Strongly disagree; 2 = Disagree; 3 = Somewhat disagree; 4 = Somewhat agree; 5 = Agree; 6 = Strongly agree. The different levels of agreement were sequentially assigned a value from 1–6. After transforming the opposite statements in the scale, we analyzed the scale reliability. The analysis revealed a Cronbach's α of 0.844, which indicates that the scale exhibits excellent internal consistency. The sum of the scores on these measures will be used as the value of the subjective well-being variable, with higher scores indicating higher subjective well-being.

Sports participation (SP) was used as the independent variable. The sports participation variable is measured by the question "In the past year, did you regularly engage in physical activity in your free time?" in the China General Social Survey. The survey classified the level of sports participation into five categories, which were "Daily", "Several times a week", "Several times a month", "Several times a year or less" and "Never". Since occasional participation in physical activity has been shown to be an episodic behavior and physical participation needs to be constant (Wei & Jianyong, 2020), we use this approach to treat physical participation as a dichotomous variable. In this study, "every day", "several times a week" and "several times a month" were considered as regular physical activity participation and were combined and assigned a value of 1, while "several times a year and "never" are considered as not participating in physical activity and are assigned a value of 0.

Subjective class identity (SCI) and physical and mental health (PMH) were used as mediating variables. The CGSS questionnaire divides class identity into 10 levels, with a maximum score of 10 representing the top tier and a minimum score of 1 representing the bottom tier. We measured respondents' subjective class identity by their responses to the question, "In

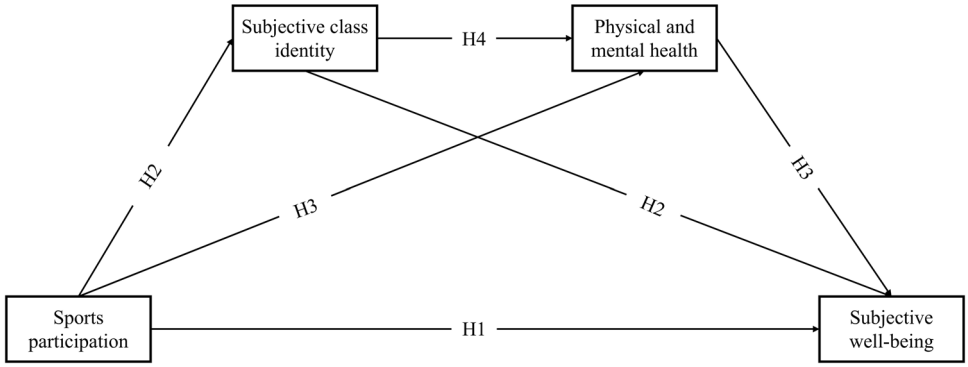

Fig. 1 Assumption diagram. Note: A hypothetical model of the relationship between sports participation, subjective class identity, physical and mental health and subjective well-being.

general, where are you on the social scale?". We evaluated the physical and mental health of the interviewees by their answers to the questions about self-rated health, physical health and mental health in the CGSS. The CGSS asked respondents "How healthy are you at the moment", and measured their self-rated health on a scale of 1 to 5 (1 = very unhealthy; 5 = very healthy). About physical health and mental health, the CGSS questionnaire measures how often, over the past four weeks, health problems have affected your work or other daily activities, and how often, over the past 4 weeks, you have felt depressed. Studies have applied this scale to analyze the impact of physical and mental health on the subjective well-being of older people (Qiaolei & Zonghai, 2021). We used this as a reference and applied the total score to measure the physical and mental health of respondents. The Cronbach's α coefficient for this scale in this study was 0.741 and the reliability of the scale was high.

Some variables that might be associated with subjective well-being were controlled. These variables included the respondent's gender (1 = male, 0 = female), age, marital status (1 = married with the spouse, 0 = no spouse), years of education (never had any education = 0, private school = 2, primary school = 6, junior high school = 9, senior high school = 12, vocational high school, junior college, technical school = 13, university college (adult higher education) = 14, university college (formal higher education) = 15, undergraduate (adult higher education) = 15, undergraduate (formal higher education) = 16, postgraduate = 19), self-assessed personal socioeconomic status (PSES) (1 = lower class, 2 = lower middle class, 3 = middle class, 4 = upper middle class, 5 = upper class) and self-assessed household socioeconomic status (HSES) (1 = well below average, 2 = below average, 3 = average, 4 = above average, 5 = well above average).

Analytic strategies. Multiple linear regression was applied to examine the impact of sports participation on residents' subjective well-being. In addition, when analyzing the effect of sport participation on individuals' subjective well-being, it is necessary to take into account the problem of possible selective bias between individuals' sport participation and their subjective well-being. Therefore, this paper uses the propensity score matching method proposed by Rosenbaum and Rubin (1983) to construct a counterfactual framework to correct for selection bias, so as to obtain the net effect of individuals' sport participation on their subjective well-being and thus increase the robustness of the results. In a further analysis, we used quantile regression to explore the distribution of the effects of sport participation across different levels of subjective well-being. The use of quantile regression allows not only for robustness checks of the results of multiple linear regressions but also for analysis of the differentiation effects of sport participation between individuals with different levels of subjective well-being. Finally, we further explored the pathways inherent in the impact of sport participation on individual subjective well-being using Model 6 in the SPSS plugin PROCESS provided by Hayes (2017).

Results

Descriptive statistics and correlation analysis. Table 1 presents the means, standard deviations and correlations for all variables. The Pearson correlation coefficient shows that the correlations between gender, marital status, and individual subjective well-being are not significant. Among the control variables, age, years of education, self-rated personal socioeconomic status, and self-rated family socioeconomic status have significant correlations with individual subjective well-being. There is a significant correlation between the key independent variable sport participation and individual subjective well-being; the mediating variables subjective class identity and physical and mental health are also significantly correlated with individual subjective well-being. Among them, all are positively correlated, except for age, which is negatively correlated with subjective well-being. In addition, there is a significant correlation between the mediating variable of subjective class identity and the mediating variable of physical and mental health. Based on the results of the correlation analysis, we will further verify the effect of physical activity participation on individuals' subjective well-being.

Basic regression results. We further explored the effects of each predictor variable on individual subjective well-being through a hierarchical regression analysis, the results of which are displayed in Table 2. Model 1 is the baseline model, to which control variables were added to analyze the effect of the main control variables on individuals' subjective well-being. Age, years of education, self-rated personal socioeconomic status, and self-rated family socioeconomic status all have a significant effect on subjective well-being. In Model 2, we added the key independent variable of this study, sports participation, and the results showed that participation in physical activity significantly increased individuals' subjective well-being. Model 3 adds mediating variables to Model 2. The results show that both subjective class identity and physical and mental health have a significant positive effect on subjective well-being, while the regression coefficients of the sports participation variable are reduced but still significant at the 1% level after the addition of the two mediating variables, which confirms hypothesis 1. At the same time, the decrease in

Table 1 Mean, standard deviation, and correlation coefficient of each variable. (*N* = 3501).

	1	2	3	4	5	6	7	8	9	10
1. Gender										
2. Age	0.019									
3. Marriage	0.014	0.121***								
4. Education	0.119***	−0.477***	−0.087***							
5. PSES	−0.036**	−0.070***	0.052***	0.226***						
6. HSES	−0.016	−0.085***	0.021	0.230***	0.553***					
7. SWB	0.031	−0.060***	0.025	0.244***	0.317***	0.317***				
8. SP	0.032	−0.088***	−0.095***	0.303***	0.171***	0.167***	0.189***			
9. SCI	−0.048***	−0.070***	0.023	0.222***	0.668***	0.482***	0.309***	0.192***		
10. PMH	0.059***	−0.335***	−0.008	0.374***	0.282***	0.262***	0.434***	0.212***	0.277***	
M	0.464	49.748	0.764	9.465	2.244	2.576	87.800	0.456	4.193	11.304
SD	0.499	16.671	0.425	4.671	0.852	0.750	11.480	0.498	1.664	2.585

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

the regression coefficient of the sport participation variable suggests that there may be a mediating effect of subjective class identity and physical and mental health in the way that sports participation affects individual well-being. The mediating effect will be tested further in a later section.

Propensity score matching. Data and variable limitations will make the basic analysis process highly susceptible to the problem of selective bias. To correct for selectivity bias, the propensity score matching method we used estimated the net effect of sport participation on individual subjective well-being. To ensure the robustness of the results, we used three methods: nearest-neighbor matching, radius matching, and kernel matching. Table 3 shows the results of the sample balance test. The data show a well-balanced sample after matching.

Table 2 Estimation results of the benchmark equation.

Variables	Model 1	Model 2	Model 3
Gender	0.370	0.371	0.057
	(0.362)	(0.361)	(0.339)
Age	0.038***	0.033***	0.088***
	(0.012)	(0.012)	(0.012)
Marriage	0.592	0.792*	0.471
	(0.424)	(0.424)	(0.398)
Education	0.463***	0.398***	0.235***
	(0.046)	(0.047)	(0.045)
PSES	2.396***	2.303***	0.961***
	(0.254)	(0.253)	(0.282)
HSES	2.756***	2.672***	1.944***
	(0.288)	(0.287)	(0.273)
SP		2.032***	1.132***
		(0.379)	(0.358)
SCI			0.546***
			(0.138)
FMH			1.581***
			(0.074)
Constant	68.44***	68.63***	52.95***
	(1.076)	(1.073)	(1.233)
Adj R^2	0.156	0.163	0.266
N	3501	3501	3501

***$p < 0.01$, *$p < 0.1$.

After matching, we measured the mean treatment effect of subjective well-being for individuals who participated in physical activity. The results are shown in Table 4. The results of radius matching showed that the subjective well-being of the physical activity group was 1.033 higher than that of the non-physical activity group at a 5% confidence level. In addition, the ATT results for both Kernel density matching and nearest-neighbor matching showed that physical activity participation was significant on individual subjective well-being at the 5% confidence level after eliminating observable systematic differences between samples. This result ensures the robustness of the baseline regression results that participation in physical activity significantly increases an individual's subjective well-being, which further validates Hypothesis 1.

Quantile regression. In this section, we have used quantile regression to further analyze the pattern of physical activity participation on individuals' subjective well-being. Table 5 demonstrates the quantile effects of sport participation on individual subjective well-being. The estimates show that at the lower quartile (0.1), participation in sports does not have a significant effect on subjective well-being, but at the middle and low quartiles (0.25), sports participation has a positive effect on subjective well-being at a statistical level of 10%. And, as the quantile increases, the regression coefficient for sports participation shows an upward trend. This result suggests that sports participation has less of an impact on individuals with low and medium subjective well-being and more of an impact on individuals with high subjective well-being. In addition, physical and mental health passed the significance test at all quantile points, indicating that good physical and mental health can contribute to higher perceptions of well-being for individuals in different well-being states. In contrast to the trend in the regression coefficients for sports participation, the regression coefficients for the subjective class identity showed a decreasing trend as the quartile increased.

Heterogeneity analysis. We have analyzed the patterns of the effects of physical activity participation on individual subjective well-being above, and in this section, we will further explore group differences in the effects of physical activity participation on subjective well-being. Wang et al. (2022) point out that individuals under the age of 35 are more aware of their physical health, making exercise a greater impact on personal well-being. Individuals between the ages of 36 and 59 are more likely to

Table 3 Balance test of the treatment group and control group. (*K*-nearest-neighbor matching).

Variables	Unmatched	Mean value		Deviation %	Deviation reduction ratio%	*T*-test	
	Matched	Treated	Control			*T*-value	*P* > |t|
Gender	U	0.482	0.450	6.4		1.88	0.060
	M	0.482	0.476	1.2	81.2	0.34	0.735
Age	U	48.138	51.095	−17.7		−5.25	0.000
	M	48.129	48.823	−4.2	76.5	−1.14	0.255
Education	U	11.014	8.168	64.0		18.84	0.000
	M	11.007	10.961	1.0	98.4	0.30	0.764
Marriage	U	0.720	0.801	−19.2		−5.67	0.000
	M	0.721	0.718	0.5	97.2	0.14	0.886
PSES	U	2.403	2.110	34.9		10.28	0.000
	M	2.401	2.410	−1.2	96.6	−0.34	0.736
FSES	U	2.713	2.461	34.1		10.02	0.000
	M	2.711	2.708	0.3	99.1	0.09	0.930
SCI	U	4.542	3.902	39.2		11.54	0.000
	M	4.538	4.534	0.2	99.4	0.07	0.946
PMH	U	11.903	10.804	43.9		12.82	0.000
	M	11.900	11.853	1.9	95.8	0.57	0.568

Table 4 The processing effect of sports participation on individual subjective well-being.

Matching method	Treated	Controls	ATT	Standard error	*T*
Unmatched	90.174	85.813	4.361	0.383	11.40
Matched					
Radius matching method	90.163	89.130	1.033**	0.450	2.29
Kernel density matching method	90.163	89.054	1.109**	0.442	2.51
K-nearest-neighbor matching method	90.163	89.141	1.022**	0.479	2.14

The radius of radius matching is 0.01; The number of neighbors in the nearest-neighbor matching is set to 4; $^{**}p < 0.05$.

Table 5 The impact of sport participation on subjective well-being: quantile regression.

Variable	Dependent variable: Subjective well-being				
	0.1	0.25	0.50	0.75	0.90
SP	0.655	0.812*	1.029**	1.077**	1.359**
	(0.665)	(0.464)	(0.442)	(0.475)	(0.590)
SCI	0.780***	0.604***	0.624***	0.399**	0.098
	(0.257)	(0.179)	(0.170)	(0.183)	(0.227)
PMH	1.380***	1.554***	1.640***	1.643***	1.516***
	(0.137)	(0.096)	(0.091)	(0.098)	(0.122)
Constant	41.85***	45.15***	49.41***	60.05***	70.35***
	(2.291)	(1.598)	(1.522)	(1.635)	(2.031)
Control variables	YES	YES	YES	YES	YES
Observations	3501	3501	3501	3501	3501

0.10 indicates low quantile, 0.25 indicates middle-low quantile, 0.50 indicates middle quantile, 0.75 indicates middle-high quantile, and 0.90 indicates high quantile. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table 6 Results of heterogeneity analysis by age.

Subjective well-being	Age under 35	Age between 36 and 59	Age over 60
SP	0.884	0.948*	1.935***
	(0.755)	(0.547)	(0.621)
SCI	0.451	0.386*	0.782***
	(0.283)	(0.211)	(0.240)
PMH	1.793***	1.603***	1.410***
	(0.188)	(0.112)	(0.117)
Constant	51.90***	53.57***	55.02***
	(3.599)	(2.622)	(3.277)
Control variables	YES	YES	YES
Adj R^2	0.179	0.268	0.322
Observations	833	1543	1125

$^{***}p < 0.01$, $^{*}p < 0.1$.

recognize physical importance at work and to focus on physical activity. For those over-60s, physical health will directly affect their perception of subjective well-being. Therefore, we will further analyze the heterogeneity of the effect of sports participation on individuals' subjective well-being by dividing the sample into groups under 35 years old, 36–59 years old, and over 60 years old according to their age. The results of the subgroup regressions are shown in Table 6. The results show that there is no significant effect of sports participation on subjective well-being for the under 35 group. For the 36–59 year old group sports participation was only significant at the 10% level. However, the effect of sports participation on subjective well-being was significant at the 1% level for the older age group of 60 years and above, and the regression coefficient was significantly higher. The effect of subjective class identity on subjective well-being for different age groups is similar to the effect of sports participation on subjective well-being for different age groups. That is, there is no significant effect of subjective class identity on the subjective well-being of the group under 35 years old, but the effect of subjective class identity on the subjective well-being of the group between 36 and 59 years old is significant at the level of 10%, the effect on the subjective well-being of the group aged over 60 was significant at the level of 1%. The physical and mental health of different age groups has a significant impact.

Mediation effect analysis. In this section, we will further examine the mechanisms by which sport participation affects an individual's subjective well-being. In the theoretical analysis section, we illustrate the internal logic of sport participation affecting well-being from two perspectives: subjective class identity and health. In the correlation analysis, we found that there was a significant correlation between sports participation, subjective well-being, subjective class identity and physical and mental health. In the stratified regression analysis, the coefficient of the effect of sports participation on subjective well-being was reduced after adding the variables of subjective class identity and physical and mental health. Based on this, this section will explore the mechanisms underlying the impact of sport participation on subjective well-being. We constructed a chain mediation test model with individual subjective well-being as the dependent variable, sports participation as the independent variable, and subjective class identity and physical and mental health as mediating variables. The results of the path coefficient estimation are shown in Fig. 2, and the results of the chain-mediated effects analysis are shown in Table 7. In order to clearly present the interrelationships between the variables, we report the standardized path coefficients in this section. We used the Bootstrap method to repeatedly sample 5000 times to analyze the main effect and chain-mediated effect. The results showed that the indirect effect of the pathway with subjective class identity as the mediating variable was 0.009 (95% CI = [0.003,0.016]), the indirect effect of the pathway with physical and mental health as the mediating variable was 0.065 (95% CI = [0.042,0.089]), the indirect effect of the pathway with subjective class identity and physical and mental health as the mediating variable was 0.004 (95% CI = [0.002,0.007]), with all indirect effects totaling 0.078 (95% CI = [0.054,0.103]). The chain mediating role of subjective class identity and physical and mental health in the positive effect of sport participation on individuals' subjective well-being is established, which verifies hypothesis 2, hypothesis 3 and hypothesis 4.

Discussion

We examined the relationship between sports participation, subjective class identity, physical and mental health and subjective well-being using data from the 2017 China General Survey. Our study builds on previous research on physical activity and subjective well-being to further explore the mechanisms underlying the impact of sport participation on individual well-being. Our findings have several points that deserve further discussion,

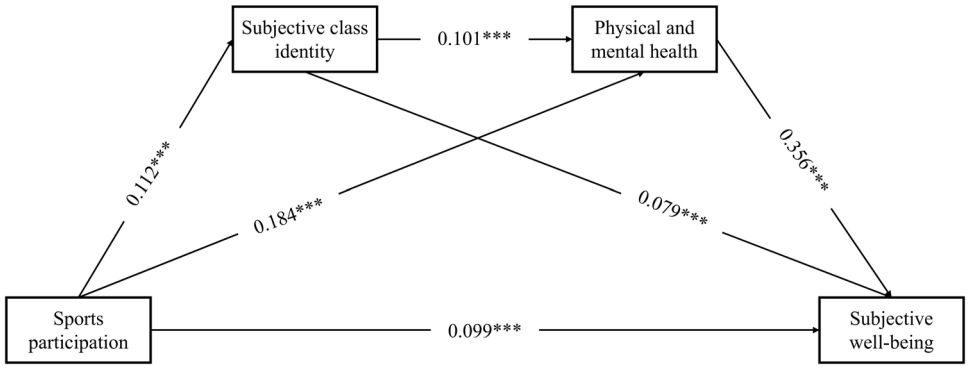

Fig. 2 Chain mediation model of physical exercise and subjective well-being. Note: ***$p < 0.01$. The numbers in the figure are the standardized regression coefficients for the path.

Table 7 Bootstrap analysis of significance test of mediating effect.

Affect the path	Effect	BootSE	BootLLCI	BootULCI
Total indirect effect	0.078	0.012	0.054	0.103
SP → SCI → SWB	0.009	0.003	0.003	0.016
SP → PMH → SWB	0.065	0.012	0.042	0.089
SP → SCI → PMH → SWB	0.004	0.001	0.002	0.007

which will provide some valuable references for the next studies on residents' well-being and life satisfaction.

Physical activity participation can significantly enhance individuals' subjective well-being. This result remained significant after accounting for sample selection bias. This result further supports previous research findings on the significant positive effect of physical activity on individuals' subjective well-being (Biddle & Asare, 2011; VanKim & Nelson, 2013). We further analyzed the patterns and group heterogeneity of the effects of sports participation on individual subjective well-being perceptions. The results showed that the effect of sports participation on individual subjective well-being was heterogeneous across populations. Specifically, the effect of sports participation on individual subjective well-being showed a significant quantile effect, and with increasing quantile values, this effect showed a significant linear upward trend. In addition, our results show that the effect of sports participation on individual subjective well-being differs significantly across age subgroups. Specifically, the effect of sports participation was not significant for the youth group aged 35 and younger, while the effect was more significant for the older age group aged 60 and older. This corresponds to the results of previous studies. Lera-Lopez et al. (2017) showed a significant relationship between physical activity during leisure time and personal well-being and life satisfaction among adults aged 50 to 70. Differences regarding the impact of sports participation on the well-being of individuals at different ages can be analyzed from the perspective of leisure time use. Different age groups face different life and work pressures, and in comparison, older people have more freedom to arrange their leisure time than young and middle-aged people. Cho and Kim (2020) point out that middle-aged groups are under pressure to balance family and work more than older groups and require more effort for acquiring personal free time, thus older people are more involved in regular physical activity than middle-aged people.

The analysis of the mechanism of the effect of sports participation on subjective well-being showed that sports participation enhances subjective well-being by improving individuals' subjective class identity and physical and mental health, respectively, while subjective class identity and physical and mental health have a significant chain mediating effect. Our study confirms the significant positive effects of subjective class identity and physical and mental health on subjective well-being, and this finding can be supported by previous studies(Etxeberria et al., 2019; Tang & Tan, 2022). In addition, we focus on the relationship between physical activity, subjective class identity, physical and mental health and individual subjective well-being based on body and society theory, which has received less attention in existing studies. We will return to the theoretical framework of this paper to further explore the intrinsic causes. The sociological definition of exercise is not one-sidedly focused on physical exertion, but emphasizes the socially differentiated nature of the practice of exercise as a way of life(Lagaert & Roose, 2016). This points to the exploration and research about the social body. Individuals in the lifeworld maintain and express their class position and social identity through differentiated and compartmentalized social practices(Lawler, 2005; Mellor et al., 2010). Social networks play an important role in influencing individuals' subjective assessment of their position in the social hierarchy and the construction of their social identity(Firat et al., 1994; Huang, 2023). Under this perspective, we argue that individuals' physical activity behaviors and sports social networks during sports participation will influence the way individuals categorize themselves and form perceptions about their self-position. Social comparison in the process of acquiring a subjective class identity and the questions it raises about confidence and self-esteem will further point to concerns about individual mental health. Social comparison orientation has been shown to have a negative effect on mental health, and self-esteem has a significant negative mediating role in this (Lee, 2022). Thus, we connected the relationship between subjective class identity and physical and mental health, and further verified the positive effect of subjective class identity on physical and mental health. As a result, we conclude that sports participation affects individuals' physical and mental health by influencing their subjective class identity. Combining the effects of subjective class identity and physical and mental health on subjective well-being, our study explored and validated the positive effects of sports participation on subjective well-being and the chain mediating effects of subjective class identity and physical and mental health.

Conclusions and limitations

Our findings confirm the positive effect of sports participation on subjective well-being and validate the mechanisms underlying the effect of sports participation on subjective well-being based on body and society theory. These findings can provide some practical suggestions for enhancing the subjective well-being of residents, especially the elderly. The impact of sports participation on subjective class identity, physical and mental health and

subjective well-being requires the optimal allocation of sports resources between regions and urban and rural areas, especially to protect the needs of people at the bottom in their pursuit of a better life, thereby enhancing their opportunities for physical maintenance, and expression and reducing the relative deprivation they feel. The significant impact of sports participation on the subjective well-being of the elderly population calls for promoting age-friendly communities, improving the construction of sports facilities in the community, improving the sports environment for the elderly and enriching their leisure life.

There are still some research limitations present in our study. Due to the limitations of the study data, we used cross-sectional data, and the main content of the analysis was the effect of whether individuals participate in physical activity on residents' subjective well-being and its underlying mechanisms. However, there are also differences in the duration and intensity of sports participation among individuals who participate in physical exercise, and further exploration is needed regarding the effect of the degree of participation of physical exercise participants on individual subjective well-being. In addition, we used cross-sectional data to verify the relationship between sports participation, subjective class identity, health, and subjective well-being in accordance with relevant theories, but future research would be more helpful to understand the relationship between sports participation and individual subjective well-being and to make logical causal judgments if we can break the data limitations and obtain tracking survey data for longitudinal studies.

Data availability

Raw data collected and analyzed in the current study are available in the Chinese General Social Survey: http://cgss.ruc.edu.cn/. Data supporting the findings of this study are presented in the supplementary file.

Received: 20 April 2023; Accepted: 24 August 2023;
Published online: 31 August 2023

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Author contributions

NL: conceptualization; methodology; software; validation; formal analysis; data curation; writing-original draft preparation; writing-review and editing; visualization. QZ: conceptualization; formal analysis; writing-original draft preparation; writing-review and editing; visualization.

Competing interests

The authors declare no competing interests.

Ethical approval

This article does not contain any studies with human participants performed by any of the authors.

Informed consent

This article does not contain any studies with human participants performed by any of the authors.

Additional information

Supplementary information The online version contains supplementary material available at https://doi.org/10.1057/s41599-023-02064-4.

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