The Effect of Sport Participation and Social Capital to The Subject's Well-Being

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KEYWORDS
Sports participation; Subjective well-being; Social capital, Sport Science, Sport Health

ABSTRACT:
Objective: This study investigates the relationship between sports participation and subjective well-being among Chinese residents, focusing on the chain mediating effect of social capital. The findings aim to provide theoretical references for enhancing subjective well-being in China.
Method: A cross-sectional survey was conducted with 1,182 Chinese residents using the Physical Activity Rating Scale (PASR-3), the Chinese Residents Subjective Well-being Scale (SWBS-CC20), and a Social Capital Survey. The data were analyzed to examine the relationships between sports participation, social capital, and subjective well-being. An intervention experiment was also conducted with 80 male college students aged 18-25 from Ankang College. The intervention evaluated the effect of sports participation on subjective well-being over eight weeks.
Results: (1) Sports participation, social capital, and subjective well-being showed significant correlations with each other. (2) Social capital was found to mediate the relationship between sports participation and subjective well-being, with the mediating pathway being statistically significant. (3) The eight-week sports intervention improved both social capital and subjective well-being in the experimental group, showing significant differences compared to the control group ($P<0.05$).
Conclusion: Sports participation significantly enhances social capital and subjective well-being among Chinese residents. Social capital serves as an intermediary mechanism in this relationship. Moreover, a structured eight-week sports intervention effectively improves subjective well-being, highlighting the potential of sports participation as a viable approach to promoting mental and social health. This study underscores the importance of integrating sports into public health strategies to improve individual and societal well-being.

Introduction

Over the past 40 years of reform and opening up, China's economic and social development has made leaps and bounds, its economic growth rate has created a world miracle, and its people's living standards have been continuously improved. Rapid economic growth has not generally led to a corresponding increase in national happiness, and personal income's effect on happiness is very weak, or only exists in low-income income groups (Lee, 2020). In an increasingly fast-paced and competitive society, people often lack the time and opportunity to pay attention to and take care of

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their inner world, lack of emotional care, small social circle, and spiritual needs are not effectively satisfied, which makes individual happiness hover at a low level for a long time, and has an impact on the harmonious and stable development of society. When economic growth no longer leads to increased happiness, what other factors might be key to increasing happiness? This problem has also attracted the attention of scholars. As a result, research on non-income sources of happiness has also grown rapidly.

With the deepening of happiness research, happiness has become an interdisciplinary research topic, laying a theoretical foundation for happiness research from the perspective of sports science. Previous studies have found a positive correlation between physical exercise and individual subjective well-being. For example, Richards et al. (2015), based on a survey of citizens in 15 European countries, found that compared with people who did not exercise, people who did not exercise enough, people who did exercise enough, and very active people were 20%, 29% and 52% more likely to be happy, respectively. Buecker et al. (2021) found through a meta-analysis that among 157 studies, 82.24% of physical exercise interventions positively impacted subjective well-being, and the subjective well-being scores of individuals who participated in physical exercise were significantly higher than those who did not. In addition, previous research has also shown a correlation between sports participation and social capital. For example, Zhang Xiaoli, Lei Ming & Huang Qian (2019) used the survey data from 2014JSNET (Social Network and Career Experience in 2014) in 8 cities to explore the role of physical exercise in improving social capital. It is found that physical exercise can improve both individual social capital and collective social capital. Still, most of the measures of physical exercise and social capital show an "inverted U-shaped" relationship. The people who exercise in the medium frequency get the most social capital, suggesting that physical exercise can be used as a way to cultivate social capital. Based on CGSS2013 data and Logit model analysis, Zhu Qiqi (2020) found that physical exercise has a certain positive effect on the accumulation of social capital, which is manifested in the change of individual life attitude and the increase of social support, especially emotional support, so as to promote the enhancement of social relations. Compared with human capital, social capital exists in the connection between people and plays an important role in improving well-being. Social capital can also improve subjective well-being (Klein C, 2013).

Happiness is a complex and multi-dimensional phenomenon with many interacting factors, which also inspires us to ask whether the impact of sports participation on residents' subjective well-being can be influenced by social capital factors such as social interaction and social trust. However, there are few studies on the impact of sports participation and social capital on subjective well-being. Previous studies tended to ignore the relationship between social and psychological outcomes as the result of two independent and unrelated sports participation, and the study groups involved were narrow in scope, primarily focusing on students and the elderly (Chen & Yu , 2015; Zheng , 2019). It is still important to study the influence of sports participation and

social capital on subjective well-being from the perspective of the integration of sports participation and social capital. Therefore, this study takes sports participation and social capital as explanatory variables and, on the basis of controlling other factors affecting individual subjective well-being, builds a regression model to analyze the impact of sports participation and social capital on subjective well-being. Based on the analysis results of the relationship among sports participation, social capital and subjective well-being, a detailed 8-week intervention program was developed to verify the intervention effect of sports participation behavior on subjective well-being through intervention experiments.

Methods

Survey Objects

The first stage: Taking Shaanxi Province as an example, according to the stratification of regional economic development, 6 urban areas (Xi 'a High-tech Zone, Baoji Qishan, Hanzhong Hantai District, Ankang Langao County, Yan 'a Baota District and Yulin Fugu County) were randomly selected for sampling questionnaire survey. A total of 1360 questionnaires were collected. After excluding incomplete questionnaires, regular questionnaires and questionnaires with less than 90 seconds of filling time, 1182 questionnaires remained, with an effective rate of 86.91%, which met the needs of research development.

The second stage: on the basis of the previous research, a sports intervention experiment was designed for 8 weeks, twice a week, 40 minutes each time. 80 male college students aged 18-25 in Ankang College were taken as an example. According to the pre-test data, 80 subjects were divided into two groups with balanced and no difference, one group was the experimental group, and the other group was the control group, for an 8-week sports intervention experiment.

Research Tools

(1) Simplified version of the Subjective Well-being Scale for Chinese Residents (SWBS-CC20)

The definition of subjective well-being is the primary basis for formulating the index system of residents' subjective well-being. Subjective well-being is the state of positive satisfaction experienced by individuals in life, formed by the comprehensive influence of objective environmental factors, human needs, values, and other factors. The survey scale adopts the simplified version of the Subjective Well-being Scale of Chinese Residents (SWBS-CC20) compiled by Chinese mainland scholar Xing Zhanjun (2003), which has a total of 20 items, divided into 10 dimensions: contentment, mental health, social confidence, growth and progress, goal value, self-acceptance, physical health, mental balance, interpersonal adaptation, and family atmosphere, which is an effective means to study the subjective well-being of urban residents in Chinese mainland (Zhang J, et al.2022), the reliability of the scale was 0.838, and the validity was 0.864. The project is scored on a 6-point scale, with 1 to 6 points from "strongly disagree, disagree, somewhat disagree, somewhat agree, agree, and strongly agree", of which 4, 5, 6, 9, 10, 11, 13, 15, 17, 18, and 20 are scored in reverse. The total

score is calculated from the sum of all responses, and the higher the total score, the better the sense of well-being. Previous studies have identified the total score of subjective well-being > 90 points (91-120 points) as high level, 50-90 points as medium level, and < 50 points (20-49 points) as low level (Li Shuang, 2018; Tan, 2019).

(2) Physical Activity Rating Scale (PASR-3)

As a part of human social behavior, sports participation interprets the intrinsic relationship between social structure characteristics and physical movement, which has attracted much attention from the academic community. However, there is no accurate definition of "sports participation" in academia and official media (Chen, 2023). Considering the purpose of this study, as well as the limited time and human resources, the analysis of sports participation in this study mainly examines the degree of individual sports participation from three aspects: sports participation frequency, exercise duration, and exercise intensity, and its measurement and evaluation are carried out using the Physical Activity Rating Scale PARS-3. Physical activity amount (physical activity participation) = exercise intensity× (exercise time - 1) × exercise frequency. The scale was developed by Kimio Hashimoto in Japan and revised by Liang Deqing of Wuhan University of Physical Education, and has high reliability (test-retest reliability of 0.82) (Ding , 2021).

(3) Social capital questionnaire

The concept of capital originated in economics (NG, 2014), in which the word capital is often used to describe asset investment to create profits, while social capital is an intangible resource that exists relative to tangible capital, which cannot be seen or touched but is real, and has an essential impact on the operation of society and people's behavior. At this stage, from the perspective of social capital, domestic and foreign scholars have different emphases on the meaning of social capital, and there is no completely unified standard. There are significant differences in the setting and index selection of each dimension of social capital by researchers (Jia, 2021). However, on the whole, researchers believe that social participation and trust are the core evaluation dimensions of social capital. Therefore, based on the research objectives and data availability, this paper compares and analyzes the definition and measurement of social capital dimensions by Kawachi & Berkman et al. (2001), Han Hongyun et al. (2016), Shi Yuxing et al. (2019), Jia Yajuan et al. (2021), and combines the research perspective on the needs of sports participation, mainly from the dimensions of social participation, norms, trust, and social support. On the basis of literature combing and analysis, the social capital assessment questionnaire was developed, with a total of 18 items and a 5-level score. The social capital questionnaire developed in this study passed two rounds of project-goal consistency index (IOC) tests, and the scores of each item in the IOC assessment were greater than or equal to 0.78 (≥ 0.78), which can effectively serve the follow-up survey.

Data Analysis

In this study, SPSS 23.0 software was used to conduct correlation analysis on the three variables of sports participation, social capital and subjective well-being, and

Amos26.0 software was used to construct the model, to confirm once again whether the hypothesized mediating variables had a mediating role and test the mediating effect of social capital between sports participation and subjective well-being. Independent sample T test and paired sample T test were used to conduct statistical analysis on the data obtained in the experimental stage of sports intervention, so as to make the experimental results concrete and clear, and ensure the objectivity of the analysis of research results.

Result

1. Common method deviation test

All data in this study were obtained through questionnaire distribution, so a common method bias test was required. The Harman one-way test was used to test the sample data, and 15 factors with feature roots greater than 1 were extracted from the non-rotated exploratory factor analysis. The maximum factor variance explanation rate was 30.814%, which was less than 40%, so there was no serious common method bias in this study.

2. Correlation analysis of sports participation, social capital and subjective well-being

Table 1 Correlation analysis of sports participation, social capital and subjective well-being of Chinese residents

Dimension	M	SD	Sports participation	Social capital	Subjective well-being
Sports participation	25.52	19.730	1		
Social capital	3.5472	.63881	0.384**	1	
Subjective well-being	3.9742	.90403	0.400**	0.526**	1

Notes: *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

The survey data show that there is a significant positive correlation between Chinese residents' sports participation and social capital (r = 0.384**, P<0.01). Sports participation may affect the improvement of social capital in the following ways: Sports participation helps to increase social opportunities among residents, especially group sports activities usually require team cooperation, so as to increase interaction and cooperation opportunities between people, on the one hand, it helps residents to establish and strengthen social networks, on the other hand, it is easy to enhance trust and support.

There was a significant positive correlation between sports participation and subjective well-being of Chinese residents (r = 0.400**, P<0.01). Sports participation may improve subjective well-being in the following ways: First, by participating in physical exercise, participants' physical health status is improved, the incidence of diseases is reduced, the overall health level is improved, and happiness is enhanced. Second, participating in physical exercise can help regulate and improve mood, reduce psychological problems such as stress, anxiety and depression, and thus enhance subjective well-being. Third, participating in sports activities can bring pleasure and

satisfaction experience, which helps to improve individual subjective well-being.

There was a significant positive correlation between Chinese residents' social capital and subjective well-being (r = 0.526**, P<0.01). Social capital may affect well-being in the following ways: First, frequent social interaction can increase residents' subjective well-being, because interacting and communicating with others can bring emotional satisfaction and support. Positive social interaction can effectively relieve loneliness and reduce the occurrence of negative emotions such as depression and anxiety. Second, adherence to social norms and participation in activities can enhance residents' sense of belonging and identity, which is also crucial for improving subjective well-being. Third, a high level of social trust helps to establish a good relationship between residents, increase social support, and thus enhance subjective well-being.

3. Regression analysis of sports participation, social capital and subjective well-being

Table 2 Regression analysis of sports participation, social capital and subjective well-being of Chinese residents

Regression equation		**Overall fit index**			**Significance of regression coefficient**	
Result variable	predictor	R	R^2	F	β	T
Social capital	Sports participation	0.234	0.055	75.353**	0.039	8.681**
Subjective well-being	sports participation	0.594	0.353	353.580***	0.011	4.284**
	Social capital				0.388	24.512**

* p＜0.05，**p＜0.01

The results showed that sports participation could significantly affect social capital (β=0.039, t=-8.681, p<0.01). Sports participation and social capital significantly affected subjective well-being (β=0.011, t=4.284, p<0.01; β=0.388, t=24.512, p<0.01). Sports participation helps build stronger social capital networks and enhances subjective well-being. It can indirectly improve subjective well-being by enhancing social capital, which indicates that the influence of physical exercise on well-being is multi-level and complex, and its indirect effect on social capital should be considered.

4. Testing the mediating effect of sports participation, social capital and subjective well-being

To further investigate the impact of sports participation on subjective well-being and test the mediating role of social capital, this study adopted bootstrap analysis. The sample size was 5000, the model was 6, and a 95% confidence interval was set. The model of the influence of sports participation through social capital and subjective well-being was tested. The indirect effect sizes of each path are shown in Tables 3 and 4.

Table 3 Analysis of mediating effects of social capital on physical exercise and subjective well-being

Path relation			Standard path coefficient	Standard error	C.R.	P
Social capital	<---	sports participation	0.39	0.001	13.103	***
Subjective well-being	<---	Social capital	0.508	0.053	15.805	***
Subjective well-being	<---	sports participation	0.216	0.001	7.947	***

Notes: *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$*

According to the standard path coefficient table of the model, the coefficient of influence of sports participation on subjective well-being is 0.216, reaching the significance level, indicating that sports participation has a significant positive impact on subjective well-being. The standard path influence coefficient of sports participation on social capital is 0.39, reaching the significance level, indicating that sports participation also has a significant positive impact on social capital. The standard path influence coefficient of social capital on subjective well-being is 0.508, reaching the significance level. It shows that social capital also has a significant positive impact on subjective well-being.

Table 4 Analysis of the mediating effects of social capital on sports participation and subjective well-being

Influence path	Effect size	95% confidence interval lower limit	Upper limit	Boot standard error	p
sports participation →Social capital→Subjective well-being	0.198	0.144	0.259	0.029	***

Notes: *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$*

As can be seen from Table 4, using social capital as the mediating variable between sports participation and SWB, the upper limit and lower limit of Bootstrap95% confidence interval are 0.259 and 0.144, excluding 0, indicating that social capital has a significant mediating effect on the impact of sports participation on SWB. The influence path is "sports participation → social capital → subjective well-being"; AMOS23.0 was further used to test the degree of model fit. The results are as follows:

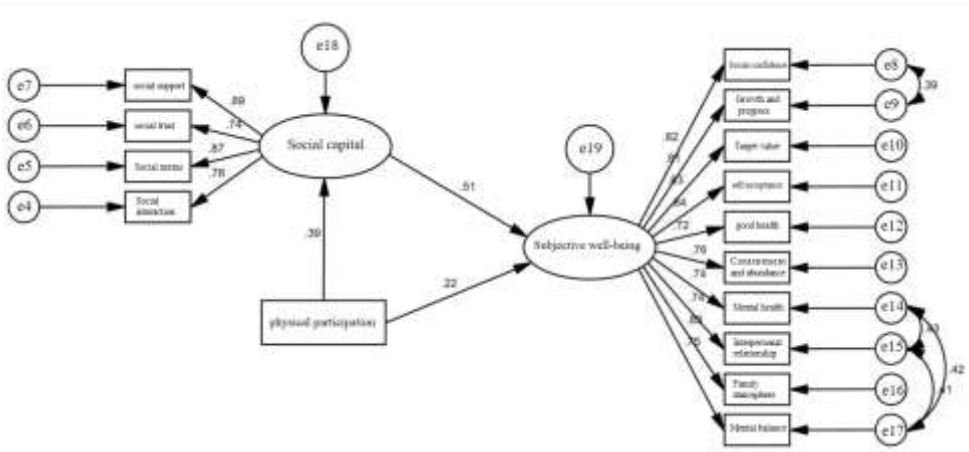

Figure 2. Empirical diagram of the mediating model between social capital and sports participation and subjective well-being

The structural equation model is used to construct a model of sports participation, social capital and subjective well-being of Chinese residents, as shown in Figure 2. Sports participation has a direct impact on subjective well-being, social capital has a direct impact on subjective well-being, and sports participation can indirectly affect subjective well-being through the mediating role of social capital. The ideal value criteria for the acceptable fitting index of the structural equation model are: X2 /df should be less than 3, Bentler and Bonett proposed that the relative fitting index NFI, CFI, TLI, CFI, etc. should be greater than or close to 0.90, and Steiger proposed that the RMSEA value should be lower than 0.06 (lower than 0.08 is also acceptable). According to the fitting index of mediation effect in Table 8, X2 /df=2.928<3, NFI=0.942, RFI=0.923, IFI=0.957, TLI=0.943, CFI=0.957, the above fitting index is greater than 0.90, RMSEA=0.066<0.08. It shows that there is no common bias problem in the research content, and the mediation model fits well and is acceptable.

Table 5 Fitting index of mediating effect of social capital on physical exercise and subjective well-being

Fitness test	Ideal	General	Model	conclusion
X^2/df	1-3	＜5	2.928	fit
RMSEA	＜0.06	＜0.08	0.057	fit
NFI	＞0.90	＞0.80	0.942	fit
RFI	＞0.90	＞0.80	0.923	fit
IFI	＞0.90	＞0.80	0.957	fit
TLI	＞0.90	＞0.80	0.943	fit
CFI	＞0.90	＞0.80	0.957	fit

5. Analysis of experimental results of sports intervention

5.1 Comparative analysis of pre-test results between experimental group and control group

The screening of experimental subjects is more important. Whether different groups of subjects are at the same level before the experiment directly affects the data results after

the experiment. Therefore, it is very important to conduct homogeneity detection for the experimental group and the control group. The method of independent sample test is adopted in this stage. The Independent sample Test is useful for inferring whether the means of two independent populations are significantly different. In order to understand whether there are significant differences in sports participation, subjective well-being and social capital between the control group and the experimental group before the experiment, and to ensure the smooth progress of the experiment. The two groups were pre-tested before the experiment. Independent sample T test was used to compare whether there were differences in the pre-test results between the experimental group and the control group. The results are shown in Table 6.

Table 6 Comparison of pre-test differences between experimental group and control group (N=80)

Description	**experimental group （M±SD）**	**control group （M±SD）**	t	P
Sports participation	36.9750±19.03504	38.3750±22.89966	-.297	.767
subjective well-being	3.8638±0.71781	3.7350±0.89408	.710	.480
Contentment experience	4.2500±1.06217	4.0375±1.16788	.851	.397
mental health experience	3.6500±1.22055	3.4000±1.08722	.967	.336
social confidence experience	3.9625±1.33199	4.1125±1.15185	-.539	.592
growth and progress experience	4.1250±1.26972	4.1625±1.14571	-.139	.890
goal value experience,	4.0375±1.00248	3.8875±1.07111	.647	.520
self-acceptance experience	3.9250±1.02875	3.7500±1.01274	.767	.446
physical health experience	3.4875±1.08892	3.4000±1.24138	.335	.738
mental balance experience	3.6250±1.2234	3.5000±1.0741	.486	.629

	4	7		
interpersonal adaptation	3.6125±1.27846	3.2750±1.06789	1.281	.204
family atmosphere experience	3.9625±1.15685	3.8250±1.05338	.556	.580
social capital	3.5813±0.5262	3.5125±0.55927	.566	.573
social participation	3.4497±0.67009	3.4315±0.66419	.122	.903
standard	4.0188±0.66117	3.8313±0.73027	1.204	.232
trust	3.3625±0.66974	3.2875±0.42195	.599	.551
social support	3.5900±1.00965	3.5500±0.64490	.211	.833

According to Table 6, before the formal intervention, although the experimental group and the control group had differences in the amount of Sports participation, the total score of subjective well-being, the total score of social capital and their dimensions, there were no significant differences ($P > 0.05$), indicating that: There was no statistical difference between the experimental group and the control group in the amount of Sports participation, subjective well-being and social capital before the experiment. The group was properly grouped and there was certain homogeneity among the members, so the experiment could be carried out normally.

5.2 Comparison and analysis of the measured results before and after the experimental group

The Paired Samples Test is used to take two measurements of the same group of subjects at different times or under different conditions. The two groups of data are from the same group of subjects, and the measurement values of the same group of subjects in different time or conditions are compared to test whether the difference is significant. Therefore, after the experiment, paired sample T test was used to analyze the differences in Sports participation, subjective well-being and social capital levels of the same group of subjects before and after the experiment, and the analysis results are shown in Table 7.

Table 7 Comparison of before and after measurements in the experimental group (N=80)

Description	before the experiment （M±SD）	after the experiment （M±SD）	t	P
Sports participation	36.9750±19.03504	50.2500±18.26549	-2.801	.008
subjective well-being	3.8638±0.71781	4.3050±.37856	-6.203	.000
Contentment experience	4.2500±1.06217	4.4750±.68827	-1.514	.138
mental health experience	3.6500±1.22055	4.2875±1.17608	-3.264	.002
social confidence experience	3.9625±1.33199	4.7875±.70609	-4.464	.000
growth and progress experience	4.1250±1.26972	4.8500±.45573	-3.652	.001
goal value experience	4.0375±1.00248	4.1625±.96998	-1.032	.308
self-acceptance experience	3.9250±1.02875	4.5625±.98831	-3.818	.000
physical health experience	3.4875±1.08892	4.3500±1.05125	-4.943	.000
mental balance experience	3.6250±1.22344	3.6875±1.09596	-.597	.554
interpersonal adaptation	3.6125±1.27846	4.0125±1.10644	-2.327	.025
family atmosphere experience	3.9625±1.15685	3.8750±1.06669	.764	.449
social capital	3.5813±0.5262	3.9500±.34231	-6.333	.000
social participation	3.4497±0.67009	3.7755±.58961	-4.340	.000
standard	4.0188±0.66117	4.3250±.61290	-3.066	.004
trust	3.3625±0.66974	3.7000±.69384	-3.919	.000
social support	3.5900±1.00965	4.0950±.84366	-4.505	.000

According to Table 7, after the intervention of physical exercise, both the subjective well-being and the total score of social capital of the experimental group were improved, and the differences were significant ($P<0.05$). There were no significant differences in the four dimensions of contentment, goal experience, mental balance and family atmosphere ($P > 0.05$). There were significant differences in other dimensions ($P<0.05$). This also shows that the designed sports intervention program can effectively improve the subjective well-being and social capital level of participants.

5.3 Comparison and analysis of measured results before and after the control group

Similarly, paired sample T test was used to analyze whether there were significant differences in Sports participation, subjective well-being and social capital before and after intervention in the control group. The results are shown in Table 8.

Table 8 Comparison of before and after measurements in control group (N=80)

Description	before the experiment （M±SD）	after the experiment （M±SD）	t	P
Sports participation	38.3750±22.89966	39.4500±22.61262	-.231	.819
subjective well-being	3.7350±0.89408	3.8913±.85925	-.856	.397
Contentment experience	4.0375±1.16788	4.2375±1.20887	-.542	.591
mental health experience	3.4000±1.08722	3.5750±1.24833	-.666	.509
social confidence experience	4.1125±1.15185	4.2500±1.13228	-.542	.591
growth and progress experience	4.1625±1.14571	4.3500±1.22055	-.773	.444
goal value experience,	3.8875±1.07111	4.0125±1.15185	-.541	.592
self-acceptance experience	3.7500±1.01274	4.0000±1.01274	-1.047	.302
physical health experience	3.4000±1.24138	3.6250±1.25958	-.961	.342
mental balance experience	3.5000±1.07417	3.5750±1.02250	-.367	.716
interpersonal adaptation	3.2750±1.06789	3.3875±1.05300	-.502	.618
family atmosphere experience	3.8250±1.05338	3.9000±1.15581	-.301	.765
social capital	3.5125±0.55927	3.5700±.48553	-.520	.606
social participation	3.4315±0.66419	3.4218±.63574	.070	.944
standard	3.8313±0.73027	3.9813±.71921	-.883	.382
trust	3.2875±0.42195	3.3188±.52192	-.360	.721
social support	3.5500±0.64490	3.6500±.74386	-.644	.523

According to the above table 8, although the pre-test and post-test results of the control group were different in Sports participation, subjective well-being, and social capital, although the total score of subjective well-being also increased, there was no significant difference in statistical analysis (P>0.05).

5.4 Comparative analysis of post-test results between experimental group and control group

An independent sample T test was used to analyze the differences in Sports participation, subjective well-being, and social capital levels between the experimental group and the control group after the experiment. The analysis results are shown in Table 9.

Table 9 Comparison of post-test differences between experimental group and control group (N=80)

Description	experimental group（M±SD）	control group （M±SD）	t	P
Sports participation	50.2500±18.26549	39.4500±22.61262	2.350	.021
subjective well-being	4.3050±.37856	3.8913±.85925	2.787	.007
Contentment experience	4.4750±.68827	4.2375±1.20887	1.080	.284
mental health experience	4.2875±1.17608	3.5750±1.24833	2.627	.010
social confidence experience	4.7875±.70609	4.2500±1.13228	2.548	.013
growth and progress experience	4.8500±.45573	4.3500±1.22055	2.427	.018
goal value experience,	4.1625±.96998	4.0125±1.15185	.630	.531
self-acceptance experience	4.5625±.98831	4.0000±1.01274	2.514	.014
physical health experience	4.3500±1.05125	3.6250±1.25958	2.795	.007
mental balance experience	3.6875±1.09596	3.5750±1.02250	.475	.636
interpersonal adaptation	4.0125±1.10644	3.3875±1.05300	2.588	.012
family atmosphere experience	3.8750±1.06669	3.9000±1.15581	-.101	.920
social capital	3.9500±.34231	3.5700±.48553	4.046	.000
social participation	3.7755±.58961	3.4218±.63574	2.580	.012
standard	4.3250±.61290	3.9813±.71921	2.301	.024
trust	3.7000±.69384	3.3188±.52192	2.777	.007
social support	4.0950±.84366	3.6500±.74386	2.502	.014

According to Table 9, after the intervention of sports participation, the scores of sports participation, subjective well-being and social capital of the experimental group were higher than those of the control group, and there were significant differences ($P<0.05$).

The 8-week sports intervention experiment showed no significant difference in subjective well-being and social capital between the experimental and control groups before the experiment. However, after the experiment, the experimental group's subjective well-being and social capital level at different stages before and after the experiment had specific changes, and there were significant differences. In contrast, the control group's subjective well-being and social capital level had no significant differences before and after the experiment. In addition, after the experiment, there were substantial differences between the experimental and control groups in the level of subjective well-being and social capital. Before the experiment, the two groups of subjects were equal in quality, and there was no significant difference. The experiment proved that sports participation had a positive impact on individual subjective well-being, and the intervention of sports participation could improve individual subjective

well-being to a certain extent.

Discussion

1. Causal relationship analysis of sports participation, social capital and subjective well-being

The results of correlation and regression analysis show that sports participation can positively affect the social capital of Chinese residents, that is, the higher the intensity, time and frequency of sports exercise, the higher the degree of social capital. Sports participation can positively affect the subjective well-being of Chinese residents, that is, the higher the level of sports participation, the higher the level of subjective well-being. In addition, social capital can positively affect the subjective well-being of Chinese residents, that is, the higher the score of social capital, the higher the degree of subjective well-being. This is consistent with the research results of most scholars at present. For example, Huang Qian, Zhang Xiaoli and Ge Xiaoyu (2019) explored the impact of sports participation on the generation of social capital from the perspectives of individual social capital and collective social capital by using 22,048 adult samples in the 2014 Chinese Family Tracking Survey. The findings are as follows :1) The higher the frequency of sports participation, the higher the score of interpersonal self-evaluation, that is, sports participation significantly promotes the generation of individual social capital; 2) The higher the frequency of sports participation, the easier it is to increase people's likelihood of reciprocity significantly, and the likelihood of political and organizational participation is also significantly increased. Based on CGSS2013 data and Logit model analysis, Zhu Qiqi (2020) found that physical exercise has a specific positive effect on the accumulation of social capital, which is manifested in the change of individual life attitude and the increase of social support, especially emotional support, to promote the enhancement of social relations. Sukkyung You & Kyulee Shin (2017) surveyed 402 adults aged between 40 and 59 in South Korea. The results showed that although men and women exercised for different reasons, sports participation increased the subjective well-being of middle-aged men and women. Stefano Testoni et al. (2018) reviewed the current status of the impact of sports on subjective well-being and argued that sports can help improve individual and social well-being, but it is not completely equal because everyone's preferences are different. Bartolini & Bilancini (2007) found that social capital can have a positive impact on Americans' subjective well-being. Stefano &Bartolini et al. (2015) analyzed the data of the World Value Survey and concluded that the reduction of social comparison and social capital explained the reasons for the decline in happiness, and analyzed the predictors of the trend of life satisfaction in China. Anjing (2017) argues that social capital such as trust, mastery of social norms, and community participation all have a significant impact on promoting Russian residents' subjective well-being. Liu Yanduo et al. (2022) empirically analyzed the impact of social capital on farmers' subjective well-being by using the ordered Probit model based on the data of rural household survey in Jiangxi in 2021. The results show that social capital has a significant positive impact on farmers' subjective well-being, and the better the neighborhood relationship,

the higher the subjective well-being of farmers. Sun Qian (2022) took the rural elderly as investigation objects and analyzed whether social capital would affect their happiness. The research results showed that social capital had a significant positive impact on the happiness of the rural elderly. The higher the social capital, the happier the rural elderly. Alma Kudebayeva et al. (2022) examined how social capital affects subjective well-being in three Central Asian countries, Kazakhstan, Kyrgyzstan, and Uzbekistan, based on data from WVS (Wave 6). It found that social capital was an important predictor of subjective well-being in all three countries. Trust has a positive impact on the SWB of Kyrgyzstan, while social participation has a positive impact on the SWB of Kazakhstan and Uzbekistan.

2. Analysis of the Mediating effect of Social Capital

This study confirms that sports participation can predict residents' subjective well-being through the mediating effect of social capital, indicating that sports participation can effectively improve residents' social capital and subjective well-being. On the one hand, sports participation can directly affect residents' subjective well-being. The more active they are in sports exercise, the higher their subjective well-being will be. The reasons may lie in: Residents can enhance their physical fitness, life, sports skills, fitness and fitness, improve their overall health through regular participation in physical exercise, and maintain good physical level, which can improve the physical security of individuals to a certain extent, full of confidence and recognition of life, and thus enhance their subjective well-being. Moreover, physical exercise can also improve the physical and mental state of the individual, relieve pressure, relax the body and mind, and then stimulate more positive emotions and effectively inhibit negative emotions. Residents not only get a healthy physique but also form positive psychological emotions by participating in physical exercise. The external and internal interaction ultimately promotes the subjective well-being of residents.

On the other hand, sports participation can also indirectly affect residents' subjective well-being through social capital, which plays an intermediary effect in the relationship between sports participation and residents' subjective well-being. Sports participation helps to build a stronger social capital network, increase social opportunities, enhance community participation and enhance social trust. High levels of social capital bring more social support and trust, which indirectly improves residents' subjective well-being. Sports participation can indirectly improve subjective well-being through enhancing social capital, which also indicates that the impact of sports participation on subjective well-being is multi-level and complex, and its indirect effect on social capital should be considered. This study reveals the positive impact of sports participation on residents' subjective well-being, and emphasizes the partial mediating role of social capital in this process. This finding has specific implications for developing interventions targeting residents' subjective well-being. It is necessary further to strengthen residents' social trust and community participation, and encourage them to increase the frequency of physical exercise to improve their subjective well-being and overall health. Previous studies have also shown that sports participation can

affect subjective well-being through the effects of "direct influence" and "indirect transfer" (Du, 2010; Zou, 2017). For example, sports participation can affect participants' subjective well-being by influencing their health experience, satisfaction experience and development experience. Different studies focus on different perspectives and analyze different variable relationships, but all of these contribute to deepening our understanding of the relationship between sports participation and subjective well-being.

3. Analysis of experimental effect of sports intervention on subjective well-being

It can be seen from the results of the experimental data analysis that before the experimental intervention, the experimental group and the control group had homogeneity in terms of physical exercise, social capital and subjective well-being and their sub-dimensions. After the eight-week sports intervention, the experimental group had a certain improvement in social capital and subjective well-being, and there were significant differences between the experimental group and the control group ($P<0.05$), indicating that the eight-week sports intervention could effectively improve subjects' subjective well-being. The results of this study are consistent with those of previous studies (Liu, 2023; Shi, 2022; Tian, 2022; Regen, 2021)

Why is there some consistency rather than complete consistency? First of all, because these studies are based on sports as intervention means, only the specific content of the selected sports intervention project is different, the intervention experiment period is different, but no matter the eight-week (Liu, 2023; Huang , 2023), or 12-week (Liang, 2021; Wu, 2019) Intervention experiment, and its findings all show that physical exercise can promote the improvement of subjects' subjective well-being.

Secondly, for the study on the influence between sports participation and subjective well-being, in addition to the analysis of its direct impact, the selected observational mediating variables are different, such as Yang Wei (2018), Sun Shuai (2021), Wang Youlin (2022), Sui Yuqing (2023), etc. The mediating variables they chose to observe in the study were psychological resilience, physical health, physical self-esteem, sleep quality. In contrast, the mediating variables in this study were social capital, with different research perspectives. The results of this study, on the one hand, further prove the relationship between sports participation and subjective well-being; on the other hand, it also shows that sports participation can not only directly affect subjective well-being, but also indirectly affect the improvement of subjective well-being through other ways. This also suggests that the concept of happiness has always been a complex scientific system, and there are many factors affecting subjective well-being. Future research should adhere to the interdisciplinary research perspective and multi-angle thinking to explore the relationship between them. Because the benefits of exercise are widespread, regular physical activity not only physically helps our bodies, but also provides a range of mental and emotional health benefits. In exercise psychology, it is pointed out that the most affordable and easy-to-operate health activity that is beneficial to physical and mental health at present is physical exercise (Zhu, 2015), which is a resilience tool that can be used to improve positive emotions, self-

confidence, and overall well-being.

Conclusions

(1) There was a significant positive correlation between physical exercise and social capital (r = 0.384**, P<0.01); There was a significant positive correlation between residents' physical exercise and happiness (r = 0.400**, P<0.01). There was a significant positive correlation between social capital and well-being (r = 0.526**, P<0.01).

(2) Physical exercise significantly affected residents' social capital (β=0.039, t=-8.681, p<0.01); Physical exercise and social capital could significantly affect residents' subjective well-being (β=0.011, t=4.284, p<0.01; β=0.388, t=24.512, p<0.01).

(3) The standard path influence coefficient of physical exercise on happiness was 0.216, reaching the significant level; It shows that physical exercise has a significant positive effect on happiness. The influence coefficient of physical exercise on the standard path of social capital is 0.39, reaching the significant level. It shows that physical exercise has a significant positive impact on social capital. The standard path influence coefficient of social capital on happiness is 0.508, reaching the significance level. It shows that social capital has a significant positive effect on happiness. Physical exercise can directly improve the subjective well-being of Chinese residents, and can indirectly affect the subjective well-being through social capital, which plays an intermediary effect between physical exercise and subjective well-being.

(4) After the intervention of moderate intensity physical exercise twice a week for 8 weeks for 40 minutes each time, the social capital and subjective well-being of the experimental group and the control group were not significantly different except in four dimensions of contentment, goal experience, mental balance and family atmosphere (P > 0.05); There were significant differences in other dimensions (P<0.05), indicating that sports intervention can effectively improve participants' subjective well-being and social capital level.

Reference：

【1】Richards J, Jiang X, Kelly P, et al(2015). Don’t worry, be happy: cross-sectional associations between physical activity and happiness in 15 european countries.BMC Public Health.2015;15(1):1–8.

【2】Buecker S, Simacek T, Ingwersen B, et al(2021). Physical activity and subjective well-being in healthy individuals: a meta-analytic review. Health Psychol Rev. 2021;15(4):574–92.

【3】Zhang Xiaoli, Lei Ming & Huang Qian. (2019). Can Physical Exercise Improve Social capital? - the empirical analysis based on the survey data of 2014 JSNET. Journal of Shanghai sports institute (03), 76-84. The doi: 10.16099 / j.s us. 2019.03.012.

【4】Zhu Qiqi. (2020). Study on the interaction mechanism between social capital and physical exercise. Wealth Today (China Intellectual Property)(03), 42-45.

【5】Klein C（2013）. Social Capital or Social Cohesion: What Matters for Subjective Well-Being?Soc. Indic. Res;110:891–911. doi:10.1007/s11205-011-9963-x.

【6】Chen, Z. & Yu, P. (2015). The impact of physical exercise on college students' subjective well-being: the mediating effect of peer relationship. Journal of Capital Institute of Physical Education (02), 165-171. doi:10.14036/j.cnki.cn11-4513.2015.02.015.

【7】Zheng Yuan-nan. (2019). Does physical exercise have an impact on the subjective well-

being of the elderly? -- An empirical study on Chinese elderly recreational sports participants. Chinese sports science and technology (10), 32-40. The doi: 10.16470 / j.carol carroll SST. 2019032.

【8】Xing Zhanjun(2003).Developing the brief subjective well-being scale for Chinese citizen. Chinese Journal of Behavioral Medical Science. 2003;12(6):703–5.doi:10.3760/cma.j.issn.1674-6554.2003.06.054

【9】Zhang J, Zheng Y, Wen T, Yang M.The impact of built environment on physical activity and subjective well-being of urban residents: A study of core cities in the Yangtze River Delta survey.Frontiers in Psychology. 2022;13:1050486. doi: 10.3389/fpsyg.2022.1050486 ; PubMed Central PMCID: PMC9773078

【10】Chen Geng. (2023). Master's Thesis on Social Support for Sports Participation of rural left-behind children in Zunyi City. Guizhou normal university). https://link.cnki.net/doi/10.27048/d.cnki.ggzsu.2023.000176 doi: 10.27048 /, dc nki. Ggzsu. 2023.000176.

【11】Ding Ying. (2021). A study on the relationship between sports participation, mental resilience and subjective well-being of rural migrant elderly in Hangzhou from the perspective of social Integration (Master's Thesis, Shanxi Normal University). Master's https://link.cnki.net/doi/10.27287/d.cnki.gsxsu.2021.000256 doi: 10.27287 /, dc nki. Gsxsu. 2021.000256.

【12】Mankiw NG(2014).principles of Microeconomics,7th Edition [M].South-Western College Pub,2014

【13】Jia Yajuan. (2021). Social Capital, environmental Concern and Farmers' choice preference in Household Waste classification and Management (Ph. D. Dissertation, Northwest A&F University). Dr. Https://link.cnki.net/doi/10.27409/d.cnki.gxbnu.2021.000061 doi: 10.27409 /, dc nki. Gxbnu. 2021.000061.

【14】Huang Qian, xiao-li zhang & ge light rain. (2019). The path and the way of the generation of sports participation to promote social capital, based on the Chinese family investigation data in 2014. The empirical analysis the Chinese sports science and technology (7), 63-70. The doi: 10.16470 / j.carol carroll SST. 2019019.

【15】Sukkyung You & Kyulee Shin（2017）.Relationships among Exercise Beliefs, Physical Exercise, and Subjective Wellbeing: Evidence from Korean Middle-Aged Adults,Health Care for Women International,doi: 10.1080/07399332.2017.1323905

【16】 Stefano Testoni,Louise Mansfield & Paul Dolan(2018).Defining and measuring subjective well-being for sport policy,International Journal of Sport Policy and Politics,doi: 10.1080/19406940.2018.1518253

【17】Bartolini,S.,Bilancini,E.,& Pugno,M(2007). Did the Decline in Social Capital Decrease American HAPPiness? A Relational Explanation of the HAPPiness Paradox. Department of Economics University of Siena. 2007.

【18】Stefano, Bartolini, Francesco & Sarracino(2015).The Dark Side of Chinese Growth: Declining Social Capital and Well-Being in Times of Economic Boom,World Development,doi: 10.1016/j.worlddev.2015.05.010

【19】Sun Q. (2022). The impact of social capital on the well-being of rural elderly people Master's Thesis, Jilin university). https://link.cnki.net/doi/10.27162/d.cnki.gjlin.2022.002298 doi: 10.27162 /, dc nki. Gjlin. 2022.002298.

【20】Alma Kudebayeva,Alma Sharipova,Dina Sharipova(2022).Social Capital and Subjective Well-Being in Central Asia,Europe-Asia studies,doi: 10.1080/09668136.2021.1973965

【21】Du H. (2010). Research on the impact of Sports Participation on Subjective well-being of postgraduate students Shanxi Normal University). https://kns.cnki.net/kcms2/article/abstract?v=9hl5eXOdJcYxaH9Yt2g6EnKEA2LJRXNaKgFkw-SOmPSgJuzY5w4XvmhSJQTqfXoy0gTqDsQJgtZBgfs5XXwG44pxXjpPRyva87ZBEz8Wbmf-v9WHBnAvrWG_OVLL9ZsPpyM0uXQkMGZs8itBHXd42Q==&uniplatform=NZKPT&language=CHS

【22】Tian Jiaxue. (2022). Research on the effects of Different sports Interventions on Self-efficacy, Coping style and Subjective well-being of Junior Middle School Students. Master's Thesis. Yangzhou university). https://link.cnki.net/doi/10.27441/d.cnki.gyzdu.2022.001019 doi: 10.27441 /, dc nki. Gyzdu. 2022.001019.

【23】Liang Jiafeng. (2021). Research on the influence of 12-week Tai Chi Exercise on Elderly People's Subjective well-being Master's Thesis, Henan normal university). https://link.cnki.net/doi/10.27118/d.cnki.ghesu.2021.000205 doi: 10.27118 /, dc nki. Ghesu. 2021.000205.

【24】Wu Cui. (2019). A study on the effects of 12-week moderate intensity Cha-cha dance Exercise on self-confidence and subjective well-being of college students Yangzhou university). https://link.cnki.net/doi/10.27441/d.cnki.gyzdu.2019.001201 doi: 10.27441 /, dc nki. Gyzdu. 2019.001201.

【25】Yang Wei. (2018). Experimental research on the effects of Basketball and aerobics on mental resilience and Subjective well-being of college students. Master's Thesis. Yangzhou University).https://kns.cnki.net/kcms2/article/abstract?v=HR7ide6_o4TZZ4uXEG1p7v74UERC43FgiZ67Jx7mDRA3ubF3mp_8oxqO3S4qX0e8PYAN5b9RCgCIJ52MsCil9qFq_68FuCqyBuHc4pamGVcEXNqSfz1xQ5QDW5g8CXDeTyn-JIle95yTUIsegOxu7g==&uniplatform=NZKPT&language=CHS

【26】Huang Yongchao, (2023). A study on the efficacy and happiness of emotion regulation in the elderly with simplified 24-form Tai Chi. (eds.) Abstract Collection of the 13th National Sports Science Conference -- Special Report (Sports Psychology Branch) (pp.157-159). Zhengzhou Institute of Industrial Application Technology; Zhengzhou Key Laboratory of Motor Function Rehabilitation;

【27】Sui Yuqing. (2023). Research on the Influence of bodybuilding on Mental Resilience and Subjective Well-being of College Students Master Thesis, Tianjin sports college). https://link.cnki.net/doi/10.27364/d.cnki.gttyy.2023.000109 doi: 10.27364 /, dc nki. Gttyy. 2023.000109.

【28】Wang Youlin. (2022). Experimental study on the effects of 12-week ballroom dance Exercise on sleep quality and subjective well-being in middle-aged adults. Master's Thesis, Wuhan sports college). https://link.cnki.net/doi/10.27384/d.cnki.gwhtc.2022.000320 doi: 10.27384 /, dc nki. GWHTC. 2022.000320.