

# ***Research on the Network Intervention Experiment of College Students' Sports Morality under the Background of the 'Three-Dimensional Education' in Chongqing***

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**Abstract:** This study explores enhancing university students' sports morality through social network analysis within the "Three-Dimensional Education" framework, integrating moral, intellectual, and physical education. It focuses on how sports can be leveraged for moral education, in line with national vision. The research targets second-year students at Chongqing University of Technology enrolled in a badminton course, using social network analysis to identify key nodes that influence sports morality. By intervening with these central nodes, the study hypothesizes that positive behaviors will spread throughout the network, improving overall sportsmanship and teamwork. Through surveys and a targeted intervention experiment, the study aims to provide insights into the role of social networks in moral education and develop a model for future interventions to enhance university students' sports morality.

## **1. Introduction**

Education in China has long been in an imbalanced state characterized by an emphasis on intelligence, neglect of ethics, weakness in physical education and aesthetic education, and a lack of vocational training. General Secretary Xi (2023) emphasized at the National Conference on Ideological and Political Work in Universities that: "We must insist on making moral education the core link, integrate ideological and political work throughout the entire educational process, and achieve full participation, full coverage, and Three-Dimensional Education to open a new chapter in the development of higher education in our country."<sup>[1]</sup> This provides direction for strengthening and improving ideological and political education in universities in the new era and has significant implications for the further enhancement of university students' ideological and political education. As the primary vehicle for implementing moral education, physical education classrooms carry a heavy historical responsibility. How to use physical education classes to shape sports ethics is not only an important response to moral education but also a key to realizing the new development concept in the new era of education.

18th-century Enlightenment thinker Jean-Jacques Rousseau believed that "sports is a part of the developmental process from childhood to adulthood," and was the first to propose the idea of "using sports to educate." Cai Yuanpei (1912), in his "Textbook for Moral Education in Secondary

Schools," pointed out that "morality begins with self-cultivation, and self-cultivation begins with physical education." He argued that a complete personality begins with physical education<sup>[2]</sup>. The concept of "using sports to educate" reflects the central government's policy on higher education, especially the requirement to implement the "Three-Dimensional Education" (i.e., full participation, full process, and Three-Dimensional Education).

The "Three-Dimensional Education" is an important strategic framework in higher education, aiming to achieve the comprehensive development of students through a holistic education system. Shuman et al. (2024) noted that the current implementation of this system faces challenges related to the singularity of educational subjects and the fragmentation of processes, limiting its effectiveness. By introducing systems thinking, the system can be optimized through interaction among elements, subject orientation, and process integration<sup>[3]</sup>. Chen Ming and Jia Xin (2023) explored the role of traditional Chinese culture in enhancing the "Three-Dimensional Education" system, emphasizing the importance of cultural innovation<sup>[4]</sup>. In physical education, "using sports to educate" is a key component of the "Three-Dimensional Education" system, where sports activities are used to promote students' moral education and holistic development. These studies provide theoretical support, showing that through a systematic educational mechanism, the effectiveness of "using sports to educate" can be enhanced.

Ideological and political education plays a central role in the "Three-Dimensional Education," and the implementation of sports moral education offers a concrete pathway for "using sports to educate." Zhang Fengcui and Wu Zhihui (2023) pointed out that the issues of resource allocation and recognition of educational subjects in current university curriculum-based ideological and political education hinder the advancement of the "Three-Dimensional Education."<sup>[5]</sup> Du Ya and Li Hongxia (2021) suggested that sports moral education is a key factor in building the moral education system for students<sup>[6]</sup>. Research in this field shows that sports moral education is not only a means of cultivating students' athletic abilities but also a strategy that plays a positive role in ideological and political education. In the early 21st century, scholars began using social network analysis as an important research tool to assess adolescent sports behavior and moral character. Pouwels et al. (2018) found that adolescents' social network structure can significantly influence their behavior tendencies, particularly in the development of negative behaviors<sup>[7]</sup>. Scott (2011) also pointed out that social network analysis has important application value in adolescent health interventions, especially in the study of complex group behaviors<sup>[8]</sup>. Domestic scholar Sha Jingying (2023) further verified the widespread applicability of social network analysis in the field of education through research on the impact of adolescents' social networks on academic achievement<sup>[9]</sup>. These studies provide theoretical and methodological support for this research, suggesting that by analyzing university students' social networks, key nodes can be identified, and effective interventions can be made to enhance the effect of "using sports to educate."

Although existing literature has widely explored the construction of the "Three-Dimensional Education" system and its application in higher education, research on intervention experiments for "using sports to educate" among university students using social network analysis is relatively scarce. Most studies focus on adolescent groups, especially in primary and secondary schools. The application of social network analysis to improve university students' sports morality has not been fully explored. Therefore, the innovation of this research lies in the first-time combination of social network analysis, identifying key nodes in university students' social networks, and conducting cohort intervention experiments to explore the impact on the enhancement of sports morality. This provides a new theoretical perspective and practical path for the "using sports to educate" approach for university students.

## 2. Research Design

### 2.1 Research Objectives

(1) This study aims to examine the current state of physical education in universities in Chongqing and investigate how to effectively promote students' sports morality through the "using sports to educate" approach within the "Three-Dimensional Education" framework. The goal is to expand the understanding of systematic educational strategies that can be used to improve students' moral education through physical education.

(2) The second objective of the study is to apply social network analysis to explore the key nodes and structural characteristics of university students' social networks. By examining how these network elements impact the development of sports morality, the study seeks to uncover the mechanisms through which social networks shape behaviors such as sportsmanship, teamwork, and ethical conduct. The findings will provide insights into how social networks can be utilized to enhance moral education.

(3) The study will design and implement interventions based on social network analysis, focusing on key central nodes in students' social networks. The idea is that by intervening with these key nodes, their behaviors will influence the entire network, improving sports morality. This objective will also assess the effectiveness of these network-based interventions in fostering positive behavioral changes among students. The results will offer reference models for future educational strategies aimed at enhancing sports morality in university settings.

### 2.2 Research Subjects

The subjects of this research are second-year students from Chongqing University of Technology who are enrolled in the elective public physical education badminton course. A total of 90 students from two classes (45 students each) will participate. The participants were selected to ensure a variety of genders, athletic backgrounds, and interests in physical education. The sample was chosen through random sampling, with participation being voluntary. All participants completed surveys on sports morality and social network analysis, ensuring the external validity and applicability of the results.

### 2.3 Research Methods

This study is based on social network analysis, with the hypothesis that intervening in key nodes of university students' social networks (such as students with central positions or other centrality characteristics) can effectively improve their sportsmanship, sense of responsibility, and teamwork. The study also suggests that these interventions can influence the behavior of other students through the diffusion effect of social networks. Similar to methods used in public health research by Valente and Davis (1999), the study identifies key nodes as "promoters" who can spread the values and behaviors associated with sports morality within their networks<sup>[10]</sup>. The study will begin by collecting data on students' sports morality and social network information through surveys and a name generator questionnaire<sup>[11]</sup>. This data will help identify the network structure and key nodes. Then, a network intervention experiment will be designed to target these key nodes and assess their impact on students' sports morality. Finally, data analysis will be conducted using social network analysis software and statistical tools to evaluate changes in sports morality and confirm the role of social networks in "using sports to educate."

## 2.4 Research Procedure

### 2.4.1 Relationship Data Survey and Network Analysis

The relationship data network in this study will be based on students' social preference networks. The social preference index captures the dynamics of classmate relationships and their sense of group belonging, which is closely related to organizational behavior. Using a name generator questionnaire, students will identify three classmates they would prefer to attend physical education classes with. The data will be represented in an adjacency matrix, where a value of 1 indicates that student  $i$  nominates student  $j$  as a good friend, and 0 indicates otherwise. The network analysis will focus on "betweenness centrality," which measures a student's influence in the network in terms of information diffusion.

### 2.4.2 Sports Morality Evaluation System

The sports morality evaluation system for this study is based on a framework developed by Tang Lijun and Cai Hao (2019)<sup>[12]</sup>. This system includes three main indicators: sportsmanship, sports character, and sports ethical behavior, which are further divided into 14 sub-indicators such as patriotism, teamwork spirit, innovation, and self-education in sports ethics. Participants will rate their performance on each indicator using a five-point Likert scale. The total score will be recalculated based on the weights of different indicators to assess the overall state of sports morality.

### 2.4.3 Experimental Design

The experimental design, as proposed by VanderWeele and An (2013), divides the students into two groups: a control group (CG) and an intervention group (TG)<sup>[13]</sup>. A longitudinal research method will be used to assess the sports morality of students in both groups. At the end of the first semester of the 2023-2024 academic year, sports morality will be evaluated in both groups. After regular physical education activities, 10% of the students in the control group will be randomly selected for a sports morality education intervention, while the remaining students will be placed in an untreated subgroup (CG2). In the intervention group, students with the top 10% betweenness centrality in the social network will receive targeted intervention, while the rest will belong to an untreated subgroup (UNTG2). At the end of the second semester of the 2023-2024 academic year, sports morality will be re-evaluated in both groups. The results of the non-intervened students in the intervention group (key nodes) will be compared to those of the non-intervened students in the control group to estimate the peer effects of the intervention and confirm the effectiveness of interventions at central nodes.

## 3. Data and Results Analysis

The research surveyed 90 second-year students enrolled in the public physical education elective courses (CG, TG) using a name-generation questionnaire to assess social preferences in the sports classroom. A total of 90 valid responses were collected, achieving a 100% response rate. The total number of valid names was 256, resulting in a naming rate of 95%. Based on these responses, two distinct social preference networks for the sports classrooms were established.

### 3.1 Social Preference Network Characteristics of University Students

Throughout the research process, we utilized social network analysis to calculate the

betweenness centrality for each student. The results showed significant differences in betweenness centrality between the control group (CG) and the intervention group (TG). This indicates that certain nodes within the social preference networks had a higher level of influence. These nodes are crucial for the flow of information and the spread of behavior across the network.

Table 1 The average betweenness centrality and standard deviation for the two groups:

Class	Average	Standard Deviation	Total	Minimum	Maximum
CG	185.04	211.02	9752	0	773.06
TG	191.42	207.19	9871	0	895.86

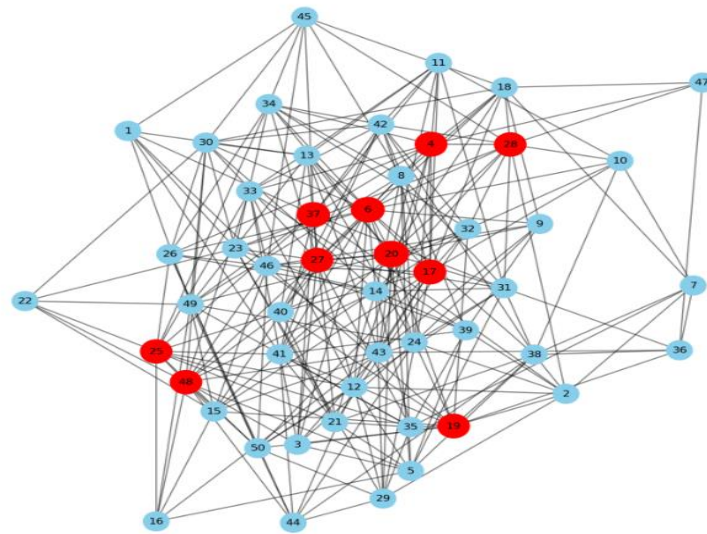


Figure 1: Friendship Network of University Students with Top 10 Betweenness Centrality Highlighted

The social preference network diagrams for the intervention group (TG) were created using UCINET and NetDraw (see Figure 1). These diagrams clearly illustrate the nodes and their interconnected relationships within the network. In Figure 1, the nodes with higher betweenness centrality in the intervention group are represented by larger red circles, indicating the most influential students, known as "promoters." These "promoters" occupy key positions in the network and play an essential mediating role. They act as bridges within the network, transmitting information and behavior norms through their social relationships, thereby influencing other nodes. According to the experimental design, these key nodes in the intervention group received targeted sports morality education. Due to their higher centrality and connectivity, their influence extends beyond individual behavior, creating a wider diffusion effect through their social networks. The social network layout in Figure 1 demonstrates that by intervening with these central nodes, the intervention's influence can quickly spread, providing empirical support for a network-based intervention model of "using sports to educate."

### 3.2 Sports Morality Score Analysis

The students' sports morality was evaluated using a five-point Likert scale, assessing aspects like sports spirit, sports character, and moral behavior. The results show that the intervention group experienced a significant improvement in sports morality after the experiment, particularly in sports spirit and sports character, which showed a notable increase compared to the pre-intervention scores.

In contrast, the control group saw only a mild improvement, confirming that the intervention effectively enhanced students' sports morality.

Table 2 details the changes in scores before and after the intervention for the control group and intervention group

Group	Sports Spirit	Sports Character	Sports Moral Behavior	Total Score
CG (Pre-intervention)	3.4	3.2	3.3	3.3
CG (Post-intervention)	3.5	3.3	3.4	3.4
TG (Pre-intervention)	3.3	3.1	3.2	3.2
TG (Post-intervention)	4.1	4.0	3.9	4.0

### 3.3 Statistical Analysis

A paired sample t-test conducted on the data revealed that the intervention group (TG) showed notable improvements in all aspects of sports morality, including sports spirit, sports character, and sports moral behavior ( $p < 0.05$ ). Specifically, the sports spirit score increased from 3.3 to 4.1, the sports character score rose from 3.1 to 4.0, and the sports moral behavior score grew from 3.2 to 3.9, demonstrating a significant positive impact of the network intervention on students' sports morality. While the control group (CG) also showed some improvement, the change was substantially smaller compared to the intervention group ( $p > 0.05$ ). This strongly affirms the effectiveness of using social network analysis-based interventions to enhance sports morality.

## 4. Discussion and Recommendations

### 4.1 Discussion of Results

The results of this study highlight the powerful role that Social Network Analysis (SNA) can play in enhancing sports morality among university students. By focusing on students who hold central positions in their social networks—those with high betweenness centrality—this approach has shown real promise in fostering key values like teamwork, responsibility, and sportsmanship. When these central students were targeted for intervention, their influence spread throughout their social networks, creating a "diffusion effect" that positively impacted their peers.

This outcome echoes the findings of Valente and Davis (1999), whose research in public health demonstrated that individuals with central network positions can act as "promoters," spreading behaviors and values across their communities<sup>[10]</sup>. In a similar vein, the success of this intervention is in line with Rousseau's belief that physical education plays a critical role in shaping an individual's overall development, as well as Cai Yuanpei's assertion that sports are foundational to moral and personal growth<sup>[2]</sup>. These ideas are further supported by the "Three-Dimensional Education" framework, which emphasizes a holistic approach to education—encouraging participation, process engagement, and comprehensive development. This study adds weight to that framework by showing that SNA can help translate these educational ideals into practical strategies for improving students' sports morality.

Moreover, the study builds on the work of Shuman et al. (2024) and Chen Ming & Jia Xin (2023), who highlighted the importance of multi-dimensional education and cultural innovation<sup>[3,4]</sup>. By using social network structures, this research addresses gaps in traditional educational approaches, such as fragmentation and narrow subject focus. The intervention's success in identifying and targeting key students as part of a system-thinking approach shows how social networks can be strategically leveraged to improve educational outcomes.



Additionally, the findings extend previous research by Pouwels et al. (2018) and Scott (2011), which focused on the impact of social networks on adolescent behavior<sup>[7,8]</sup>. This study demonstrates that, much like in younger populations, social networks at the university level are equally influential in shaping sports morality. By focusing on central students, the intervention not only boosted the sports morality of these individuals but also triggered positive changes throughout their networks, underscoring the power of SNA as a tool for shaping collective responsibility and moral behavior in education.

In conclusion, the study validates the concept of using sports as a moral education tool, reinforcing the idea that targeted interventions within student social networks can effectively enhance sports morality. These results demonstrate the practical value of integrating SNA into moral education strategies, offering a promising model for future educational practices.

## 4.2 Limitations of the Study and Future Research Directions

While the study demonstrates the effectiveness of social network interventions, there are a few limitations to consider. The sample size was relatively small, drawn only from second-year students at Chongqing University of Technology and limited to those in physical education electives. This may limit the generalizability of the findings. Future studies could expand the sample to include a broader range of students, across different years and disciplines, to further validate these results. Additionally, the study showed improvements in sports morality but didn't address how long these effects might last. Future research should focus on long-term tracking to better understand the sustainability of these interventions.

## 4.3 Recommendations for Educational Practice

This research suggests that social network analysis can be a powerful tool for educational interventions. Here are some practical recommendations:

Educational institutions should identify central students—those with the most influence in their networks—and provide them with specialized training to amplify their positive impact within the student body.

Schools and universities should consider applying similar network-based interventions across different subjects and year groups, widening the scope and impact of these strategies.

Educational policymakers should establish a tripartite evaluation framework that integrates annual digital ethnographic tracking of network evolution, biannual cross-sectional comparisons of ethical behaviour metrics, and five-year controlled cohort studies to systematically assess the sustainability of sport morality interventions.

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