

Research on the Exercise Intervention of Classroom Interaction in College Sports Health Courses on Students' Social Anxiety

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Abstract: Social anxiety is a prevalent mental health issue among college students, and physical education and health classes, as an essential component of higher education, may offer an effective way to alleviate social anxiety through the combination of classroom interaction and exercise interventions. This study systematically explores the intervention effects of classroom interaction in physical education classes on students' social anxiety through literature reviews and experimental research analysis, proposing optimization strategies and practical suggestions to provide theoretical support and practical references for mental health education in colleges and universities.

Keyword: Physical Education Teaching; Classroom Interaction; Social Anxiety; Exercise Intervention

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1. Research Background and Significance

1.1. Current Situation and Impact of Social Anxiety among College Students

In recent years, social anxiety among college students has become increasingly prominent, characterized by excessive nervousness, low self-esteem, and emotional suppression in interpersonal interactions. Studies indicate that the mean social anxiety score among Chinese college students is higher than both Chinese and American norms, with some students experiencing elevated levels of social anxiety. Causally, liberal arts students are more prone to anxiety due to over-interpretation of social cues, while rural students face heightened anxiety due to economic pressures. Additionally, dependence on social media exacerbates the decline in real-world social skills, creating a paradox of being “active online but withdrawn offline.” In terms of impact, social anxiety not only leads to decreased academic engagement and restricted career choices but also triggers secondary psychological issues such as inferiority and depression by weakening social support systems, forming a vicious cycle of “anxiety-withdrawal-increased anxiety” that threatens the mental health and long-term development of college students, severely affecting academic performance and quality of life.

1.2. Potential Role of Physical Education Courses

Physical education courses offer significant potential benefits for students' psychological and physiological development.

Physiologically, regular exercise enhances cardiovascular function, improves bone density and muscle mass, and reduces the risk of metabolic diseases such as hypertension and diabetes. Psychologically, physical activities alleviate anxiety and depression by stimulating endorphin secretion, boosting self-efficacy and resilience; collective sports strengthen teamwork awareness, improve interpersonal relationships, and promote psychological compatibility. Research confirms that moderate-intensity aerobic exercise positively affects adolescents' emotional states and reduces trait depression, while strength training aids in stress regulation among adults^[1].

1.3. Physical Education and Health Classes as a Special Component of Physical Education Courses

Physical education and health classes represent a unique branch within the higher education physical education system, characterized by their focus on students with varying physiological and psychological health profiles. These classes require tailored teaching content and organizational forms that consider individual differences, aiming to foster exercise habits while preventing social marginalization due to physical limitations.

1.4. Research Significance

This study investigates the effects of classroom interaction within college physical education and health classes on students' social anxiety through exercise interventions, aiming to establish a "treatment-rehabilitation-prevention" (closed loop centered on health, individualized approaches, and scientific support). It extends beyond the realm of physical education, serving as a crucial element of the public health system, while offering fresh perspectives for reform in higher education physical education and innovative methods for enhancing college students' mental health. Experimental research highlights the impact of classroom interaction in physical education and health classes on students' social anxiety, offering scientific evidence and references for college physical education and mental health education.

2. Literature Review

2.1. Physiological Regulation Mechanisms

Exercise enhances anxiety states by regulating neurotransmitter levels. Studies indicate that sustained aerobic exercise exceeding 40 minutes notably increases the secretion of serotonin and dopamine while decreasing cortisol concentrations, creating a closed loop of "Exercise-Neuroregulation-Mood Enhancement." For example, Pan Hongling et al.'s intervention experiment on rural left-behind children revealed that regular physical exercise reduced social anxiety scale scores by 32.7%, with effects that were significantly and positively correlated with enhanced psychological capital^[2].

2.2. Psychological Cognitive Restructuring

Exercise alleviates social anxiety by altering self-cognitive patterns. ZanHui et al.'s meta-analysis of 12 national universities revealed that team sports (such as basketball and football) were more effective in reducing social anxiety than individual sports^[3]. This is because collective collaboration requires overcoming self-imposed limitations and rebuilding positive self-cognitions, such as "I can do it," through successful tactical coordination. Furthermore, body image theory suggests that exercise indirectly reduces social anxiety by improving body satisfaction^[4]. For example, Zhao Chendong et al.'s study on college students found that social anxiety levels decreased by 41.3% among underweight students after strength training^[5].

2.3. Overview of Social Anxiety

Social anxiety refers to negative emotional experiences such as worry, unease, and fear in social situations. It is closely related to factors such as an individual's self-esteem, confidence, and social skills^[6]. Social anxiety not only affects an individual's mental health but may also have negative impacts on academic, work, and life aspects.

2.4. Relationship between Physical Exercise and Social Anxiety

Numerous studies indicate that physical exercise has a positive effect on alleviating social anxiety. Physical exercise promotes the release of neurotransmitters such as endorphins in the brain, which helps improve emotional states; at the same time, physical exercise can also enhance an individual's physical fitness and confidence, thereby increasing their ability to cope with social situations^[7]. Cao Hui implemented a three-stage model of "pair cooperation, group presentation, and whole-class feedback" in the sports dance intervention for hearing-impaired college students., resulting in a 28.6% decrease in the social anxiety scale score of the experimental group compared to the control group^[8]. This model reduces social uncertainty by clarifying role divisions (such as leaders and collaborators) and reinforces positive behaviors through immediate feedback mechanisms. Zhang Xiaoming's longitudinal study on military academy students indicated that non-competitive activities in outdoor training, such as "trust fall" and "blind array," increased the frequency of active communication among socially anxious students by 3.7 times. Such designs create a safe social environment by reducing competitive pressure, aligning with Clark's cognitive model of social anxiety, which emphasizes intervention in "low-threat situations."

2.5. Classroom Interaction and Teaching Effectiveness

Classroom interaction is an indispensable part of the teaching process. Through classroom interaction, teachers can better understand students' learning needs and confusion, thereby adjusting teaching strategies and methods; students can learn from each other and make progress together in the interaction. In physical education and health classes, classroom interaction can not only improve students' participation and learning interest but may also have a positive impact on alleviating social anxiety.

3. Research Objectives and Hypotheses

3.1. Research Objectives

This study aims to explore the effects of classroom interaction in college physical education and health classes on students' social anxiety through exercise interventions, with specific objectives including understanding the current situation and characteristics of classroom interaction in college physical education and health classes and investigating the effects of classroom interaction in physical education and health classes on students' social anxiety through exercise interventions.

3.2. Research Hypotheses

This study proposes the following hypotheses: Classroom interaction in college physical education and health classes can significantly reduce students' social anxiety levels; exercise intervention, as a form of classroom interaction, has a positive effect on alleviating students' social anxiety.

4. Research Design

4.1. Experimental Design

Sample Selection: Sixty students with certain exercise abilities were selected from the college's physical education and health classes and randomly divided into an experimental group (30 students receiving classroom interaction + exercise intervention) and a control group (30 students receiving conventional physical education classes).

Teaching Content: Both the experimental and control groups adopted an 8-week Taijiquan course.

Intervention Program: The control group was taught using conventional physical education and health class teaching methods, including an introduction to the origin of Taijiquan, demonstration and explanation of Taijiquan steps and gestures, with the teaching process primarily led by the teacher and minimal classroom interaction. The experimental

group, in addition to the conventional demonstration and explanation teaching methods of physical education and health classes, incorporated classroom interaction links, with specific interaction forms including group discussions, cooperative games, and role-playing. For example, in the group discussion link, the teacher proposed social-related topics, such as “How can the Taijiquan principle of ‘yielding to overcome’ be applied to resolving interpersonal conflicts?” and asked students to discuss in groups and share their views; in cooperative games, games based on the teaching content that required student cooperation to complete, such as “Taiji double mirror pushing hands,” were designed, and students were asked to demonstrate in groups; in role-playing, different social scenarios were set, and students were asked to play different roles for simulated social interactions, such as “Taijiquan culture’s modern social theater in specified scenarios.”

Measurement Tool: The Social Anxiety Scale (SAS) was used to measure students’ social anxiety levels. This scale has high reliability and validity and can accurately reflect students’ social anxiety status. The scale contains 20 items, uses a 1-4 rating scale, with a total score range of 20-80 points, where a higher score indicates a more severe level of social anxiety.

4.2. Experimental Data Collection and Analysis

Data Collection: The social anxiety scale was administered to students in both groups before and after the exercise intervention to collect relevant data.

Experimental Data Analysis: Analysis was conducted from both horizontal and vertical dimensions. Horizontal analysis used independent samples t-tests to compare whether there were differences in social anxiety levels between the two groups before the intervention and whether there were differences in the improvement of social anxiety levels between the two groups after the intervention; vertical analysis used paired samples t-tests to compare the changes in social anxiety levels before and after the intervention for each group. All data were statistically analyzed using SPSS 22.0 software, with $P < 0.05$ considered statistically significant.

4.3. Interview Method

Interviews were conducted with 60 students to enhance understanding of their physiological and psychological states. This helped to grasp the current teaching situation in the health classes and students’ needs for physical education classes, facilitating adjustments to teaching organization and methods.

5. Research Results and Analysis

5.1. Current Situation and Characteristics of Classroom Interaction in Physical Education and Health Classes

Through pre-experiment interviews with students, it was found that the current situation and characteristics of classroom interaction in physical education and health classes are characterized by a coexistence of interaction forms and deep-seated contradictions, mainly reflected in the following aspects: Interaction forms are relatively single, primarily teacher-led. Currently, classroom interaction in college physical education and health classes still mainly adopts the traditional model of “teacher explanation - student imitation,” where the teacher dominates the class through action demonstrations and instructions, and students passively receive knowledge. For example, in traditional Taijiquan teaching, the teacher usually first breaks down the movements and then leads the students to practice collectively, lacking attention to student classroom interaction. This model, while ensuring teaching order, fails to stimulate students’ active thinking, leading to the widespread phenomenon of “knowing the how but not the why.”

Students’ intrinsic motivation for participating in physical education and health classes is utilitarian, limiting the quality and effectiveness of teacher-student and peer interactions. Most students interviewed participated in health classes primarily to “earn credits,” with few hoping to enhance physical fitness and cultivate exercise habits. This utilitarian motivation leads students to focus more on assessment results.

5.2. Horizontal Analysis of Experimental Results

Table 1. Horizontal Analysis of Experimental Data

Analysis Stage	Group	Social Anxiety Scale Score(points, $\bar{x} \pm s$)	t-value	P-value
Before Intervention	Control	51.88 \pm 5.43	0.31	0.74 > 0.05
Before Intervention	Experimental	52.33 \pm 5.68	-	-
After Intervention	Control	48.77 \pm 5.13	-5.11	0.00 < 0.05
After Intervention	Experimental	42.16 \pm 4.88	-	-

Table Comparison of social anxiety levels between the two groups before exercise intervention: Before exercise intervention, the social anxiety scale scores of the control group and the experimental group were (51.88 \pm 5.43) points and (52.33 \pm 5.68) points, respectively. Independent samples t-test results showed that $t = 0.31$, $P = 0.74 > 0.05$, indicating no statistically significant difference in social anxiety levels between the two groups before exercise intervention, suggesting comparability.

Comparison of social anxiety levels between the two groups after exercise intervention: After exercise intervention, the social anxiety scale score of the control group was (48.77 \pm 5.13) points, and that of the experimental group was (42.16 \pm 4.88) points. Independent samples t-test results showed that $t = -5.11$, $P = 0.00 < 0.05$, indicating that the social anxiety level of the experimental group was significantly lower than that of the control group after exercise intervention.

5.3. Vertical Analysis of Experimental Results

Table 2. Vertical Analysis of Experimental Data

Group	Intervention Stage	Social Anxiety Scale Score(points, $\bar{x} \pm s$)	t-value	P-value
Experimental	Before Intervention	52.33 \pm 5.68	8.24	0.00 < 0.05
Experimental	After Intervention	42.14 \pm 4.88	-	-
Control	Before Intervention	51.88 \pm 5.43	2.35	0.03 < 0.05
Control	After Intervention	48.77 \pm 5.13	-	-

Table Comparison of social anxiety levels in the experimental group before and after exercise intervention: Before exercise intervention, the social anxiety scale score of the experimental group was (52.33 \pm 5.68) points, and after exercise intervention, it was (42.14 \pm 4.88) points. Paired samples t-test results showed that $t = 8.24$, $P = 0.00 < 0.05$, indicating that the social anxiety level of the experimental group was significantly lower after exercise intervention than before.

Comparison of social anxiety levels in the control group before and after exercise intervention: Before exercise intervention, the social anxiety scale score of the control group was (51.88 \pm 5.43) points, and after exercise intervention, it was (48.77 \pm 5.13) points. Paired samples t-test results showed that $t = 2.35$, $P = 0.03 < 0.05$, indicating that the social anxiety level of the control group also decreased after exercise intervention. By comparing the two sets of data, the decline in the experimental group's data was greater than that of the control group.

5.4. Analysis of Experimental Results

Exercise intervention, when paired with classroom interaction, significantly improves students' social anxiety. The study's findings indicate that students in the experimental group experienced a notable reduction in social anxiety levels following exercise intervention and classroom interaction, a decrease more pronounced than that observed in the control group. This

suggests that the combination of exercise intervention and classroom interaction effectively alleviates social anxiety in students. Exercise intervention stimulates the production of neurotransmitters like endorphins, enhancing emotional states, self-confidence, and self-efficacy. Classroom interaction designs provide students with increased social opportunities, creating a communication platform within physical education classes that enables students to gradually overcome social fears and enhance their social skills and coping abilities through interactions with teachers and peers.

Both horizontal and vertical analyses of the impact of classroom interaction in physical education and health classes on students' social anxiety, mediated by exercise intervention, yield consistent results. Horizontal analysis data reveal that the experimental group's social anxiety levels were significantly lower post-exercise intervention compared to the control group. Vertical analysis data indicate that the experimental group's social anxiety levels decreased significantly after exercise intervention, with a greater reduction than observed in the control group. The concordance of these two data analysis methods further confirms the significant effect of classroom interaction in physical education and health classes on students' social anxiety, as mediated by exercise intervention.

6. Conclusion

This study demonstrates that implementing exercise interventions, including classroom interaction, in college physical education and health classes can effectively reduce students' social anxiety levels. It is recommended that colleges and universities appropriately increase classroom interaction links in physical education and health class teaching, fully leverage the synergistic effects of exercise intervention and classroom interaction, and promote students' physical and mental health and overall development. At the same time, colleges and universities should strengthen attention to and intervention in college students' social anxiety issues and provide more mental health support and assistance to students. Classroom interaction in physical education and health classes is not only a platform for imparting exercise skills but also a "social laboratory" for alleviating social anxiety. By scientifically designing courses, strengthening faculty training, and improving policy support, colleges and universities can effectively leverage the mental health promotion function of physical education and help students achieve overall development.

Disclosure statement

The author declares no conflict of interest.

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