

Research on the Impact of Rock Climbing Physical Education Courses on University Students' Psychological Resilience

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Abstract: Research on the influence of rock climbing physical education courses on college students' mental health is still insufficient. Taking the rock climbing PE course at Xiamen University as a research object, this paper carries out an in-depth study on college students' psychological resilience. By using experimental and data analysis methods, this research adopts the Connor-Davidson Resilience Scale (CD-RISC) to evaluate college students' psychological resilience before and after the experiment, so as to explore the specific impact of rock climbing PE courses on their psychological resilience.

Keywords: Rock Climbing Physical Education Course; Psychological resilience; College students

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1. The concept of psychological resilience

The phrase “psychological resilience” comes from the English word “Resilience.” At first, it was a physical concept that described an object's ability to change its shape when subjected to external force and return to its original form once the force disappears. It was introduced into psychological research in the 1970s. Later, based on their respective studies and understandings of this concept, different scholars translated it alternatively as mental toughness, adversity resilience, psychological recovery capacity, etc. In the present study, the expression “psychological resilience” is retained as the standard translation, primarily because the concept of “resilience” in English aligns more precisely with and better captures the core connotation of the construct under discussion. Scholarly inquiry into psychological resilience has been largely shaped by three distinct theoretical paradigms.

The first is the outcome-focused perspective, most notably advanced by Masten (1995). According to this view, psychological resilience describes an individual's ability to attain satisfactory adaptation and positive developmental outcomes despite exposure to unfavorable or challenging environments. Put differently, it captures the positive adaptive results that emerge when individuals successfully navigate and overcome

adverse conditions ^[1]. The second strand of research follows the trait-based perspective, championed by Connor and Davidson (2003). From this standpoint, psychological resilience is conceptualized as a stable personal ability or dispositional trait that manifests when individuals confront stressful events and negative experiences. Specifically, it reflects the capacity to endure profound disruptive changes or rebound from crisis situations, while exhibiting fewer maladaptive behaviors and maintaining effective functioning within one's environment ^[2]. The third framework is the process-oriented perspective, with Kathleen as its leading proponent. This approach frames psychological resilience as a continuously unfolding and dynamic process, placing particular emphasis on the active adaptive adjustments individuals make as they encounter setbacks and obstacles.

For all their theoretical divergences, these three perspectives converge on two fundamental components of psychological resilience: first, the presence of exposure to adversity and setbacks, and second, the individual's capacity to surmount such hardship and achieve positive adaptation to their surroundings. For the purposes of the present research, the trait perspective put forward by Connor and Davidson (2003) is adopted as the theoretical foundation. Under this definition, psychological resilience refers to the set of abilities and dispositional traits displayed by individuals in response to stress and adverse events; it describes one's ability to withstand severe disruptive change or recover from unexpected crises, with relatively few problematic behaviors and strong adaptive capacity in the face of environmental demands ^[3].

2. Measurement of psychological resilience

Common measurement scales adopted in psychological resilience research are listed as follows: The Ego Resilience Scale compiled by Bartone *et al.* (1989) contains 45 items covering three dimensions: control, execution, and challenge. It is mainly used to assess psychological endurance ^[4].

The Resilience Scale developed jointly by Wagnild and Young (1993) consists of 25 items grouped into two subscales: personal competence and self-acceptance, forming five dimensions with a 7-point scoring system ^[4].

The Resilience Scale for Adults (RSA) compiled by Friborg *et al.* (2003) includes 33 items scored on a 7-point scale. It comprises five dimensions: personal competence, social support resources, family harmony, future orientation, and organizational style ^[4].

The Connor-Davidson Resilience Scale (CD-RISC), developed by Connor and Davidson (2003), includes 25 items rated on a 5-point scale, divided into five dimensions: competence, tolerance for negative affect, acceptance of change, control, and spiritual support. Considering Sino-Western cultural differences, Chinese scholars Yu Xiaonan and Zhang Jianxin (2007) revised the scale to make it more suitable for measuring psychological resilience among Chinese populations. While the number of items and scoring method remained unchanged, the original five dimensions were adjusted to three: tenacity, optimism, and self-improvement. Widely applied in subsequent relevant studies, this revised scale can effectively evaluate multiple subject groups, including college students, and possesses good reliability and validity. Therefore, the Chinese revised version of CD-RISC is adopted as the measurement tool in this research. Its internal consistency reliability is 0.89, and the test-retest reliability is 0.87.

While learning from overseas research, Chinese scholars have also developed indigenous scales. For instance, Yang Yi (2005) compiled the College Students' Resilience Scale with 31 items across six dimensions. Hu Yueqin and Gan Yiqun (2008) developed the Adolescent Psychological Resilience Scale

containing 27 items and five dimensions.

3. Research on rock climbing physical education courses and psychological resilience

In relevant studies on rock climbing courses and psychological resilience, Zhang Yue (2019) explored the influence of rock climbing on junior high school students' volitional qualities and pointed out that rock climbing helps shape adolescents' willpower, and longer participation may strengthen such effects. Long-term rock climbing practice can generate significant improvements in junior high school students' volition^[5]. Wang Qixiang (2011) studied the impacts of rock climbing on the physical fitness and mental health of at-risk adolescents in Hong Kong, and found that systematic rock climbing training exerts positive effects on their physical and mental health as well as social adaptation^[6]. Zhao Yuanyuan (2015) indicated that rock climbing exerts positive and significant effects on improving college students' ability to cope with setbacks^[7].

A general conclusion from existing studies on rock climbing training and mental health is that rock climbing facilitates positive development of psychological qualities among adolescents and college students, especially in enhancing frustration tolerance and social adaptability. Such effects may stem from the inherent characteristics of rock climbing: it demands sophisticated skills and carries adventurous elements, requiring practitioners to be brave, tenacious, and enterprising. Accordingly, this study hypothesizes that rock climbing courses exert positive effects on college students' psychological resilience. Findings from prior relevant studies have served as important theoretical references and provided methodological inspiration for developing the research framework and study design employed in this paper.

4. Research subjects

This experiment recruited 68 undergraduate students from Xiamen University as research participants. Among them, 38 were students enrolled in the university's rock-climbing physical education course, and the remaining 30 were undergraduates with a long-term physically inactive lifestyle and no regular exercise habits. A total of 136 questionnaires were distributed throughout the research process. After excluding invalid samples with missing or irregular responses, 130 valid questionnaires were retained, corresponding to an effective recovery rate of 95.59%.

5. Experimental method

The study adopted a between-group comparative design: undergraduates taking the rock-climbing physical education course were assigned to the experimental group, while the 30 students with sedentary lifestyles formed the control group.

Prior to the formal launch of the experimental intervention, all participants completed the CD-RISC scale to provide baseline data, after which a homogeneity test was conducted to verify the comparability between the two groups. Following a 12-week continuous intervention period, the CD-RISC scale was administered a second time to complete the post-test assessment. At the final stage, all valid data were imported into SPSS for statistical processing and analysis, in order to examine the influence of rock-climbing physical education courses on college students' psychological resilience.

6. Comparison of psychological resilience levels before and after the rock climbing course experiment

Descriptive statistics for the test variables display pre-test and post-test scores of overall psychological resilience and its three subdimensions, alongside sample size, mean values, standard deviations, and standard errors of the mean. The sample size of the rock climbing group was 37. The pre-test average score of psychological resilience was 84.64, with a standard deviation of 9.23 and a standard error of the mean of 1.51. The correlation coefficient between pre-test and post-test variables was 0.187 ($P < 0.001$), indicating a significant correlation between the two measurements.

As shown in **Table 1**, paired-samples *t*-tests were conducted on psychological resilience scores before and after the course. Statistical results revealed that the post-test total psychological resilience score (97.08) was significantly higher than the pre-test score (84.64) ($P < 0.001$), demonstrating significant differences in overall psychological resilience for the experimental group. Detailed descriptions of sample size, mean values, standard deviations, and standard errors for the three subdimensions are omitted here. For the tenacity dimension, the post-test average score (49.51) was significantly higher than the pre-test score (42.45) ($P < 0.001$), indicating significant differences. For the optimism dimension, the post-test average score (31.83) was slightly higher than the pre-test score (28.48), with a statistically significant difference ($P < 0.05$). For the self-improvement dimension, the post-test average score (15.72) exceeded the pre-test score (13.70) ($P < 0.001$), showing significant differences.

Test results for college students' psychological resilience before and after the rock climbing physical education course yielded a *t*-statistic of -7.52 ($P < 0.001$). It can be concluded that significant changes occurred in college students' psychological resilience levels after participating in the rock climbing course, which exerted a positive effect on psychological resilience.

Table 1. Comparison of psychological resilience levels before and after the rock climbing course experiment

	Mean	Standard deviation	Standard error of mean	<i>t</i>	<i>df</i>	<i>P</i>
Resilience (Pretest–Posttest)	-7.05	5.57	0.91	-7.69	36	<0.001
Optimism (Pretest–Posttest)	-3.35	4.67	0.76	-4.36	36	0.023
Self-efficacy (Pretest–Posttest)	-2.02	3.04	0.49	-4.10	36	<0.001
Psychological Resilience (Pretest–Posttest)	-12.43	10.05	1.65	-7.52	36	<0.001

7. Comparison of psychological resilience levels of the control group before and after the experiment

As presented in **Table 2**, paired-samples *t*-tests on the control group's pre-test and post-test psychological resilience scores indicated no statistically significant differences in the total score of psychological resilience or its three subdimensions ($P > 0.05$). That is, no significant changes were observed in the psychological resilience levels of the control group throughout the experiment.

Table 2. Comparison of psychological resilience levels of the control group before and after the experiment

	Mean	Standard deviation	Standard error of mean	<i>t</i>	<i>df</i>	<i>P</i>
Resilience (Pretest–Posttest)	-1.33	10.80	1.97	-0.67	29	0.504
Optimism (Pretest–Posttest)	-1.23	5.81	1.06	-1.16	29	0.255
Self-efficacy (Pretest–Posttest)	-1.24	4.53	0.82	-0.24	29	0.664
Psychological Resilience (Pretest–Posttest)	0.14	2.83	0.51	0.19	29	0.848

8. Conclusion

Twelve weeks of rock climbing physical education courses exert a significantly positive influence on college students' psychological resilience. In other words, rock climbing physical education courses can effectively enhance and improve college students' psychological resilience.

Disclosure statement

The author declares no conflict of interest.

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