

The Influence and Mechanism of Chinese Martial Arts on Improving Interpersonal Skills in Adolescents: A Randomized Controlled Trial

Dou dou Yang¹, Qiong Yao^{2*}, Xiao yan Wang³

Abstract

Unlike other forms of martial arts, Chinese Wushu can fortify both the physical and mental health of adolescents. However, limited research has been conducted on the social benefits derived from Chinese martial arts. Grounded in the principles of embodied cognition theory, this study employs the technique of a randomized controlled trial to establish a causal link between Chinese martial arts and the development of interpersonal skills in adolescents. It further explores the mediating role of psychological quality and the potential moderating influence of an only-child status. The practice of Chinese martial arts exhibits a substantial positive impact on interpersonal skills ($\beta=0.161$, $p < 0.01$). Additionally, psychological wellbeing fully mediates the relationship between Chinese martial arts and interpersonal skills ($\beta=0.017$, 95% CI= [-0.098, 0.146]). Intriguingly, the mediating role of psychological wellbeing is moderated by the factor of only-child status ($\beta=0.216$, 95% CI= [0.050, 0.390]). Embodied cognition theory posits that the integration of internal psychological processes with external bodily dynamics leads to a state of harmony and unity. Training in Chinese martial arts enhances psychological well-being through the interaction between the body and its environment. Furthermore, due to the compensation effect and peer influence, Chinese martial arts as a teamwork are particularly advantageous for only children. Training in Chinese martial arts enhances psychological quality by harmonizing internal psychological processes with external bodily dynamics. Furthermore, due to the compensation effect and peer influence, practicing Chinese martial arts as a group activity proves particularly advantageous for only children. The conclusion of this study integrates the principles of Chinese martial arts with embodied cognition theory, providing both a theoretical framework and practical insights. These findings are intended to inform and guide policy formulation regarding Chinese martial arts education by the relevant authorities.

Keywords: Chinese Martial Arts, Interpersonal Skills, Psychological Quality, Only-Child Status, Randomized Controlled Trial.

Introduction

The development of mental health during adolescence has gained significant global attention. United Nations data reveals that out of 1.2 billion youth aged 15 to 24 globally, more than 280 million adolescents face mental health challenges. Such problems critically influence various facets of their development, including aspects like social integration and employability. Adolescents dealing with mental health issues often encounter stigma and discrimination, resulting in societal exclusion. Additionally, the negative labeling discourages these adolescents from seeking help. The emotional instability and judgmental immaturity often displayed by adolescents in their crucial growth stage can lead to detrimental behaviors such as withdrawal, depression, loneliness, and hostility, thereby creating formidable obstacles for effective interpersonal communication (Hagopian et al., 2009). Recent research indicates that socio-economically disadvantaged adolescents are particularly vulnerable, often struggling with diminished self-esteem which induces fears of social interactions and

avoidance of social situations, severely restricting their interpersonal communication capabilities. For single-child families, a lack of interpersonal skills often translates into perceived arrogance and impedes group assimilation. The degree of interpersonal skills significantly influences an adolescent's social adaptability, underlining the imperative need to foster and enhance these skills in a wider societal, academic, and familial context.

Engagement in sports activities not only fortifies the physique but also significantly enhances mental well-being (Biddle & Asare, 2011). The strategic framework highlights the pivotal role of sports in managing emotions and alleviating stress among students, advocating for physical activities to develop a well-rounded personality and achieve comprehensive mind-body wellness. Chinese martial arts, emblematic of the national ethos, not only promote physical and mental vigor but also epitomize the harmony between the internal and external self. These martial arts fuse cognitive engagement with physical action to attain equilibrium, resonating with the principles of embodied cognition theory. This theory

¹ School of martial arts, Guangzhou Sport University, Guangzhou, Guangdong, China. Email: 800004@gzsport.edu.cn

² School of martial arts, Guangzhou Sport University, Guangzhou, Guangdong, China. Email: gtddy999@163.com

³ Guangzhou Polytechnic of Sports. Email: wangxiaoyanj@126.com

*Correspondence: gtddy999@163.com

suggests that our cognitive processes are shaped by the dynamic interplay between the mind-body complex and its surroundings, emphasizing the integral part this interaction plays in the genesis of cognition (Wallace, 2021). While existing research on Chinese martial arts has largely focused on its contributions to cultural preservation, physical efficacy, biomechanical aspects, and individual traits, its ties to sports psychology have been less examined. Limited studies have delved into the societal impact of Chinese martial arts and their mechanisms in shaping the social competencies of adolescents. Consequently, the inquiry into whether Chinese martial arts can enhance adolescents' interpersonal skills, thereby fostering their holistic physical and mental growth, remains open, offering avenues for theoretical and practical exploration.

Literature Review

Chinese martial arts, notably recognized as Kung Fu or Wushu, represent a significant aspect of China's traditional sports. The scholarly interest in Chinese martial arts has surged, particularly regarding their health benefits and cultural importance. This literature review consolidates findings from various studies to assess the effects of Tai Chi and Wushu on health and psychological well-being. Ma et al. (2019) explored Chinese martial arts training's influence on balance and fall prevention in the elderly, finding no significant improvements, suggesting a need for further research in this area. Conversely, Chow et al. (2018) discovered that Tai Chi could enhance bone density, especially in postmenopausal women, marking its potential as a non-pharmacological osteoporosis intervention. Guo et al. (2016) highlighted the broad health benefits of traditional Chinese sports for older adults, including improvements in cardiovascular health, bone density, balance, and mental health. Sun et al. (2022) focused on the psychological advantages, noting Tai Chi and Wushu's effectiveness in reducing depression, anxiety, and enhancing overall mental well-being. The collective findings present a robust argument for the health and psychological merits of Chinese martial arts, such as Tai Chi and Wushu, despite some inconclusive results, like their impact on fall prevention in the elderly. The evidence underscores the importance of integrating these traditional practices into health and wellness strategies. The investigations identify two principal limitations. Firstly, the role of Chinese martial arts in fostering cultural literacy and social competencies remains underappreciated. Secondly, the advantages of Chinese martial arts transcend the enhancement of elderly physical health, exerting a significant impact on adolescent development.

Research Hypothesis

Chinese Martial Arts and Interpersonal Skills

Within the field of psychology, the concept of interpersonal skills emanated from discussions concerning social skills. Previous studies have largely embraced the behavioral skill perspective and the social cognition viewpoint. Interpersonal skills imply that individuals exhibit communicative intent, actively engage in communication, and demonstrate suitable communicative behaviors to maintain harmony in their relationships with others. Wolfer et al. (2021) proposed that interpersonal skills predominantly encompass three dimensions: communicative motivation, communicative cognition, and communicative skills. Furthermore, a study by Rodriguez-Ayllon et al. (2019) indicated that adolescents who participate in moderate or higher-intensity physical activities exhibit superior interpersonal skills than do those who are less physically active.

Physical training plays a significant role in Chinese martial arts. Through pedagogical instruction and competitive events, Chinese martial arts can offer diverse "embodied" situations for adolescents (Ciaccioni et al., 2024). Within this embodied experience, adolescents learn to exhibit fairness, collaborate, and express mutual respect. This method fosters the collective consciousness of young individuals, enhancing their sense of group responsibility and spirit of dedication. This approach not only meets the needs of interpersonal communication during adolescents' psychological development but also augments their interpersonal skills, thereby subtly improving their effective communication behaviors. A study by Vertonghen, Theeboom and Pieter (2014) suggested that, owing to the attributes of moral quality and cultural heritage inherent in Chinese martial arts, students in this discipline exhibit greater social adaptability than their counterparts in other sports. Thus, it can be inferred that the Chinese martial arts have a unique function in cultivating adolescents' interpersonal skills. Based on this premise, Hypothesis 1 is proposed in this study: Chinese martial arts can positively influence adolescents' interpersonal skills.

Mediating Effect of Psychological Quality

Previous studies have proposed that sports activities could indirectly augment interpersonal skills via the enhancement of self-esteem. Nevertheless, there is an absence of comprehensive exploration concerning the underlying mechanism by which Chinese martial arts can influence these skills. Psychological quality emerges as a fundamental component of both quality and Chinese martial arts education. This quality originates from physiological conditions, where an external stimulus is assimilated into a

stable, basic, and unexpressed psychological aspect and strongly associated with adaptive and creative behaviors (Fujisawa et al., 2015). According to Yang et al. (2008), psychological quality primarily comprises three critical dimensions: cognitive attributes, personality traits, and adaptive capability. As noted by Kriemler et al. (2011), this psychological quality plays a crucial role in adolescent growth and development.

Physical exercise has been shown to impact and improve the psychological quality of individuals (Demetriou et al., 2019). Previous studies have identified that physical activities, such as fitness exercises and aerobics could alleviate the pressures associated with adolescent development, thereby significantly enhancing adolescents' psychological well-being (Lakes & Hoyt, 2004; van Sluijs, McMinn, & Griffin, 2007). Embodied cognition theory posits that individuals comprehend the world via body schema, of which the Chinese martial arts are an intuitive example. Chinese martial arts training can foster unique cognitions through interactions between the body and the environment (Moore, Woodcock, & Dudley, 2021). Adolescents undertaking Chinese martial arts training, according to their individual speed, strength, and sensitivity, progressively develop body cognition, which subsequently influences subjective consciousness. This integration can bolster mental fortitude during practice. Through systemic training, adolescents can internalize aspects of self-improvement and resilience while manifesting actions with assertive characteristics. This process augments individuals' psychological propensity, facilitating the generation of positive social behavior. Given these premises, Hypothesis 2 is proposed in this study: psychological quality has a mediating effect on the relationship between Chinese martial arts and the interpersonal skills of adolescents.

Moderating Effect of Only-Child Status

Only-child status is one of the key factors affecting the growth of adolescents and influencing the balance between material and spiritual resources (Mancillas, 2006). The only child often exhibits a self-centered perspective,

heightened self-awareness, and refined self-value discernment (Karavasilis Karos, Howe, & Aquan-Assee, 2007). However, these individuals may lack team collaboration skills, interpersonal abilities, and social adaptability, leading to loneliness (Downey & Condrón, 2004). Recent studies have shown that, compared with non-only child, only child is at an increased risk of severe psychological disturbances, such as anxiety, depression, and suicidal ideation (Dale et al., 2019). Hence, promoting active engagement in team activities for the only child is emerging as a significant strategy for ambulating such negative emotions. It has been observed that only child who participate actively in team activities have healthier psychological states and more harmonious interpersonal relationships (Twemlow et al., 2008).

Chinese martial arts, embracing both physical and mental disciplines, play an instrumental role in adjusting an individual's psychological condition. Given the compensation effect and peer effect, participation in team activities proves even more beneficial for the only child, exhibiting far-reaching impacts (Sun et al., 2024). Based on embodied cognition theory, unique bodily experiences contribute distinctively to cognition and thought diversity. Chinese martial arts harmonize "martial spirit and morality" into the mindset and actions of an only child (Marusak et al., 2022). Distinctly, compared to the non-only child, the only child benefits from the fortitude of character and independence they foster, ultimately strengthening their personal psychological quality through Chinese martial arts team activities. An increase in psychological quality can ignite a sense of teamwork and further enhance interpersonal skills. Accordingly, Hypothesis 3 is proposed in this study: only-child status moderates the mediating effect of psychological quality.

In summary, this study employs adolescents as subjects to construct a moderated mediation model (see Figure 1), drawing upon embodied cognition theory, with the objective of further exploring the influence of Chinese martial arts on adolescents' interpersonal skills.

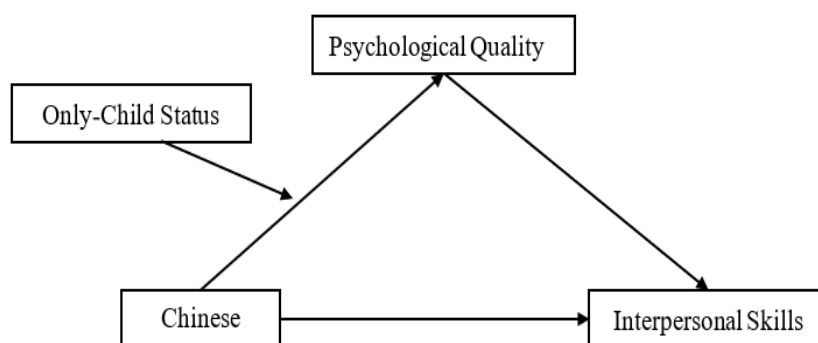


Figure 1: Relationships Among the Concepts of the Study.

Methodology

Participants And Procedure

Randomized controlled trial emphasizes random sampling within a specific population. Accordingly, this study sampled 400 middle school students aged 12-15 years who were enrolled in middle school at Sun Yat-sen University. To promote Chinese martial arts, the school opened the Chinese martial arts course. Students were assigned to experimental and control groups using a random lottery draw, comprising 200 students each. Both groups were furnished with paper questionnaires before and after the experiment. After discarding invalid responses from the 400 initially distributed questionnaires, 379 valid questionnaires were recovered. The recovery rate of valid questionnaires was 94.8%. Consequently, 195 students were included in the experimental group and 184 were included in the control group.

Table 1

Descriptive Statistics of Each Variable

| Variables | Experimental Group (N=195) | Control Group (N=184) |
|-----------------------|----------------------------|-----------------------|
| Gender (Male/Female) | 90/105 | 90/94 |
| Only child (Yes/No) | 114/81 | 113/71 |
| Psychological quality | 3.98±0.760 | 3.59±0.679 |
| Interpersonal skills | 4.04±0.649 | 3.82±0.738 |

Measures

The Psychological Quality Scale

The questionnaire was revised by [Blasco-Belled and Alsinet \(2022\)](#). The questionnaire consists of 24 items involving 3 dimensions: cognitive traits, personality traits and adaptive capacity. The items are scored on a 5-point Likert scale. The participants make a reasonable choice from “1= very inconsistent” to “5= very consistent” according to their real situation. All questions are scored by forward-scoring. The higher the total score is, the stronger the psychological quality is. In this study, the Cronbach’s alpha coefficient for this questionnaire was 0.94. The construction validity of the CFA model was good ($\chi^2 /df=2.21$, RMSEA=0.06, IFI=0.97, CFI=0.97, SRMR=0.04).

The Interpersonal Skills Scale

The questionnaire was revised by [Zahra et al. \(2021\)](#). The questionnaire consists of 16 items, involving 3 dimensions: communicative motivation, communicative cognition and communicative skills. The items are scored on a 5-point

Likert scale. The participants made a reasonable choice from “1= very inconsistent” to “5=very consistent” according to their real situation. All questions are scored by forward-scoring. The higher the total score is, the stronger the interpersonal skills are. In this study, the Cronbach’s alpha coefficient for this questionnaire was 0.91. The construction validity of the CFA model was good ($\chi^2 /df=2.99$, RMSEA=0.07, IFI=0.96, CFI=0.96, SRMR=0.03).

Experimental Design

This study adopted a randomized controlled trial method. Based on the intergroup experimental design of 2 (whether to participate in Chinese martial arts) \times 2 (whether to be only child), Chinese martial arts was taken as independent variable, psychological quality as mediating variable, only-child status as moderating variable, and interpersonal skills as dependent variable.

Intervention Details

In this study, the Chinese martial arts intervention was classified as follows: the experimental participants, in addition to their routine sports curriculum, took a Chinese martial arts course twice a week as part of their group intervention. The specific activities of the experimental group involved five steps and three phases of elementary boxing. Conversely, in addition to their standard sports classes, the control group engaged in conventional extracurricular sports activities (basketball, badminton, track and field, etc.) twice a week. Both the Chinese martial arts course and the additional extracurricular sports activities each had a duration of 45 minutes per class.

The experimental group underwent a 12-week, 24-class, continuous intervention in Chinese martial arts. The classes were of moderate intensity, with students’ average heart rate controlled within the range of (220-year) \times (60%-69%), exclusive of preparatory and relaxation periods. Each class lasted 30 minutes. The duration and frequency of the Chinese martial arts were synchronized with the students’ regular physical education classes to mitigate confounding factors associated with transitioning from daily physical activities to martial arts. This synchronization enhanced the comparability between the experimental and control groups. Ten students were randomly selected to wear a Polar Heart Rate monitor before each class. Heart rate was checked at 3-minute intervals to manage workout intensity. The running conditions of both the control and experimental groups mirrored each other concerning both course progression and class timetables. However, the exercise intensity in the

control group remained low and the heart rate was maintained 110-125 beats/minute. All participants strictly followed their assigned courses throughout the experiment. To maintain sample reliability and rigor, 5-8 students were randomly chosen before each class to monitor their participation. If the number of missing data exceeded five, those samples were deemed invalid and excluded from the experiment.

Experimental Procedure

The individuals in the experimental group participated in Chinese martial arts classes, while the individuals in the control group participated in regular extracurricular sports activities. Both groups engaged in their respective activities twice a week for a 12-week period. After the activities, we evaluated both the experimental and control groups using scales for psychological quality and interpersonal skills.

Data Analysis

Common method deviation, descriptive statistics and correlation analysis were conducted on variables related to Chinese martial arts, psychological quality, interpersonal skills, and only child status using SPSS 26.0 statistical software. Internal consistency coefficients and reliabilities were calculated using Cronbach’s α -value method. Regression analysis was used to test the main effect. Specifically, Model 4 and Model 7 in the PROCESS module of Amos 26.0 were deployed separately to assess mediating and moderating effects.

Results

Common Method Deviation Test

All the data in this study were obtained from questionnaires. In order to avoid possible common method deviation, the Harman single-factor method was used to test in this study. The test results showed that a total of 7 common factors with eigenvalues greater than 1 were extracted. The first factor could explain 11.07% of the variance variation, which was less than the critical value of 40% (Podsakoff et al., 2003). There was no single common factor that explained most of the variation. Therefore, there was no serious common method bias in the study.

Descriptive statistics and correlations

The results of the analysis of the Pearson correlation for the three variables in this study are shown in Table 2. The results of the study showed that Chinese martial arts were significantly positively correlated with psychological quality ($r=0.260, p<0.01$), Chinese martial arts were significantly positively correlated with interpersonal skills ($r=0.161, p<0.01$), and psychological quality was significantly positively correlated with interpersonal skills ($r=0.558, p<0.01$). These results enabled further examination of the causal relationship between Chinese martial arts and interpersonal skills and established a necessary foundation for testing the mediating effect in subsequent studies.

Table 2

Statistics for Correlation Analysis of Various Variables

| Variables | Chinese martial arts | Psychological quality | Interpersonal skills |
|-----------------------|----------------------|-----------------------|----------------------|
| Chinese martial arts | 1 | | |
| Psychological quality | 0.260** | 1 | |
| Interpersonal skills | 0.161** | 0.558** | 1 |
| M | 0.51 | 3.79 | 3.93 |
| SD | 0.50 | 0.746 | 0.702 |

Note. ** $p<0.01$

Table 3

Regression Analysis of Chinese Martial Arts on Interpersonal Skills

| Model | Non standardized Regression coefficient | | Standardized Regression coefficient | t | p |
|-------------------------|---|-------|-------------------------------------|--------|-------|
| | B | SE | Beta | | |
| Constant | 3.815 | 0.051 | | 74.609 | 0.000 |
| Martial arts | 0.226** | 0.071 | 0.161 | 3.167 | 0.002 |
| F | | | 10.033** | | |
| R | | | 0.161 | | |
| R ² | | | 0.026 | | |
| Adjusted R ² | | | 0.023 | | |

Note. ** $p<0.01$

Regression Analysis of Chinese Martial Arts on Adolescents' Interpersonal Skills

This study adopted step-up regression analysis to examine the direct influence of Chinese martial arts on interpersonal skills. Table 3 shows that the regression equations were significantly different ($F=10.033$, $p=0.002<0.01$; $R=0.161$; $R^2=0.026$; adjusted $R^2=0.023$). The non standardized regression coefficient of Chinese martial arts was 0.226, and $p=0.002<0.01$. These findings indicated that Chinese martial arts had a significant positive effect on adolescents' interpersonal skills, confirming that there was

a causal relationship between them; thus, Hypothesis 1 was verified

Examination of the Mediating Effect of Psychological Quality

This study adopted the SPSS macro program Process, compiled by Hayes (2009). Model number 4 was selected by repeating a sample size of 5000 and employing the default 95% confidence interval to test the mediating effect of psychological quality between Chinese martial arts and interpersonal skills. A significant mediating effect was inferred when the confidence interval excluded 0.

Table 4

Regression Analysis of The Mediator Model Between Chinese Martial Arts and Interpersonal Skills

| Variables | Interpersonal skills (Total effect) | | | Psychological quality | | | Interpersonal skills (Direct effect) | | |
|-----------------------|-------------------------------------|----------|---------|-----------------------|-----------|----------|--------------------------------------|-----------|-----------|
| | B | SE | t | B | SE | t | B | SE | t |
| Martial arts | 0.226 | 0.071 | 3.167** | 0.387 | 0.074 | 5.219*** | 0.024 | 0.062 | 0.388 |
| Psychological quality | | | | | | | 0.521 | 0.042 | 12.509*** |
| R ² | | 0.026 | | | 0.067 | | | 0.312 | |
| F | | 10.033** | | | 27.237*** | | | 85.327*** | |

Note. The first is the regression model of X and Y; the second type is the regression model of X and M; and the third category is regression model for X and M together with Y. ** $p<0.01$, *** $p<0.001$.

As shown in Table 4, the path coefficient of Chinese martial arts on interpersonal skills was 0.226, the path coefficient of Chinese martial arts on psychological quality was 0.387, and the path coefficient of psychological quality on interpersonal skills was 0.521. All these path coefficients reached statistical significance ($p < 0.01$, $p < 0.001$). However, the direct path coefficient of Chinese martial arts on interpersonal skills was 0.024, which did not reach statistical significance ($p=0.698 > 0.05$).

As shown in Table 5, the total effect of Chinese martial arts on interpersonal skills was 0.226 ($p=0.002 < 0.01$), and the bootstrap 95% CI was [0.086,0.366]. The effect reached the 0.01 level of significance. After adding psychological quality, the direct effect was 0.024 ($p=0.698 > 0.05$), and the bootstrap 95%CI was [-0.098, 0.146]. The confidence interval included 0, indicating that the direct effect was nonsignificant. This finding showed that psychological quality had a complete mediating effect on the relationship between Chinese martial arts and interpersonal skills, and Hypothesis 2 was verified. Specifically, the mediating effect included one path: Chinese martial arts→psychological quality→interpersonal skills. The effect value was 0.202, and the bootstrap 95% CI was [0.122,0.289]. The

absence of 0 in the confidence interval of this path indicated that the mediating effect had reached a significant level.

Table 5

Results of the Mediating Effect of Psychological Quality

| Path | Effect value | Boot SE | Bootstrap 95% CI | |
|-----------------|--------------|---------|------------------|-----------|
| | | | Boot LLCI | Boot ULCI |
| Total effect | 0.226** | 0.071 | 0.086 | 0.366 |
| Direct effect | 0.024 | 0.062 | -0.098 | 0.146 |
| Indirect effect | 0.202 | 0.043 | 0.122 | 0.289 |

Note. ** $p<0.01$

Examination of the Moderating Effect of Only-Child Status

Two-factor analysis of variance 2 (Chinese martial arts: yes and no) × 2 (only child: yes and no) was used to explore the interaction effect of two factors on psychological quality and interpersonal skills. As shown in Table 6, for psychological quality, the interaction effect between Chinese martial arts and only-child status was significant ($F=7.214$, $p=0.008 < 0.01$). For interpersonal skills, the interaction effect between Chinese martial arts and only-child status was significant ($F=5.17$, $p=0.024<0.05$).

Table 6

Two-Factor Variance Analysis of The Effect of Chinese Martial Arts on Outcome Variables

| Outcome variables | Source of variation | III Sum of squares | Degree of freedom | Mean square | F | p |
|-----------------------|--|--------------------|-------------------|-------------|--------|-------|
| Psychological quality | Chinese martial arts | 8.461 | 1 | 8.461 | 16.583 | 0.000 |
| | Chinese martial arts × only-child status | 3.681 | 1 | 3.681 | 7.214 | 0.008 |
| | only-child status | 1.66 | 1 | 1.66 | 3.253 | 0.072 |
| Interpersonal skills | Chinese martial arts | 2.547 | 1 | 2.547 | 5.353 | 0.021 |
| | Chinese martial arts × only-child status | 2.46 | 1 | 2.46 | 5.17 | 0.024 |
| | only-child status | 0.665 | 1 | 0.665 | 1.398 | 0.238 |

Table 7 shows the results of the pairwise comparisons. For psychological quality, the difference between the mean value of only child who participated in Chinese martial arts (experimental group) and the mean value of only child who did not participate in Chinese martial arts (control group) was 0.522. The difference was statistically significant ($P=0.000 < 0.001$). Conversely, the difference between the mean value of a non-only child participating in Chinese martial arts (experimental group) and the mean value of a non-only child not participating in Chinese martial arts (control group) was 0.107. Moreover, the difference was statistically insignificant ($p=0.373 > 0.05$). These findings illustrated that Chinese martial arts could enhance the psychological quality of only child but had no significant effect on the psychological quality of non-only child in the experimental group.

For interpersonal skills, the difference between the mean value of only child who participated in Chinese martial arts (experimental group) and the mean value of only child who did not participate in Chinese martial arts (control group) was 0.342. The difference was statistically significant ($P=0.000 < 0.001$). Conversely, the difference between the mean value of non-only child who participated in Chinese martial arts (experimental group) and the mean value of non-only child who did not participate in Chinese martial arts (control group) was 0.003. Moreover, the difference was statistically insignificant ($p=0.98 > 0.05$). These findings illustrated that Chinese martial arts could enhance the interpersonal skills of only child but had no a significant effect on the interpersonal skills of non-only child.

Table 7

Descriptive Statistics and Pairwise Comparisons of Outcome Variables

| Outcome Variables | Only-Child Status | Participate In Chinese Martial Arts | | M | SD | Mean difference | p |
|-----------------------|-------------------|-------------------------------------|--------------------|------|-------|-----------------|-------|
| | | Experimental group (Yes) | Control group (No) | | | | |
| Psychological quality | Yes | Yes | | 4.08 | 0.713 | 0.522*** | 0.000 |
| | | No | | 3.56 | 0.641 | | |
| | No | Yes | | 3.73 | 0.76 | 0.107 | 0.373 |
| | | No | | 3.62 | 0.715 | | |
| Interpersonal skills | Yes | Yes | | 4.12 | 0.615 | 0.342*** | 0.000 |
| | | No | | 3.77 | 0.723 | | |
| | No | Yes | | 3.86 | 0.699 | 0.003 | 0.980 |
| | | No | | 3.85 | 0.738 | | |

Note. *** $p < 0.001$

This study adopted the SPSS macro program Process, selected Model number 7 and the percentile bootstrap method. Additionally, a sample size of 5000 was used. The default confidence interval was 95% to test the moderate mediation effect. A significant mediating effect was

considered when the confidence interval excluded 0. As shown in Table 8, the mediating effect of psychological quality was not significant for non-only children, with a value of 0.056 and bootstrap 95% CI of [-0.076, 0.192], which included 0. For only children, the mediating effect

of psychological quality was significant, with a value of 0.272 and bootstrap 95%CI of [0.175, 0.383], excluding 0. The moderated mediation effect index was 0.216, and the bootstrap 95%CI was [0.050, 0.390]. The index of the moderate mediation effect was 0.216, and the bootstrap 95% CI was [0.050, 0.390]. Its confidence interval excluded 0, indicating that the moderated mediation effect was

significant. This indicated that the only-child status could moderate the mediating effect of psychological quality. Compared with non-only child, only child who participated in Chinese martial arts demonstrated greater psychological quality. As a result, this further bolstered individuals' interpersonal skills, and Hypothesis H3 was verified.

Table 8

Test Results of the Moderated Mediation Effect

| Mediating variable | Moderating variable | Mediating effect | | | | Moderated mediation effect | | | |
|-----------------------|---------------------|------------------|-------|-----------|-----------|----------------------------|-------|-----------|-----------|
| | | Effect | SD | Boot LLCI | Boot ULCI | Index | SD | Boot LLCI | Boot ULCI |
| Psychological quality | Non-only child | 0.056 | 0.069 | -0.076 | 0.192 | 0.216 | 0.087 | 0.050 | 0.390 |
| Psychological quality | Only child | 0.272 | 0.053 | 0.175 | 0.383 | | | | |

Note. The independent variable is Chinese martial arts, the dependent variable is interpersonal skills, the mediating variable is psychological quality, and the moderating variable is only-child status.

Discussion

The Relationship Between Chinese Martial Arts and Interpersonal Skills

This study's findings reveal a causal link between Chinese martial arts and the development of interpersonal skills, indicating a significant positive influence of martial arts on adolescents' social abilities. As the practice of Chinese martial arts progresses, it simultaneously enhances these interpersonal skills. The theory of embodied cognition underscores the essential role of bodily engagement in cognitive processes, suggesting that through the guidance of martial arts instructors, adolescents engage in extensive training that cultivates unique cognitive frameworks (Rodrigues et al., 2018). This process of cognition, while complementing the knowledge gained from traditional martial arts teachings, emphasizes the evolving relationship among instructors, students, and the pedagogical context, embodying a spirit of continuous reform and innovation.

The pedagogical approach of physical interactivity, especially in the context of Chinese martial arts, facilitates enhanced cooperation between instructors and students. Specifically, the offensive and defensive drills in Chinese martial arts necessitate that pairs of students observe and provide feedback on each other's movements, footwork transitions, hand configurations, and overall bodily motions. This iterative and physically engaging process fosters a heightened sense of situational awareness, thereby bolstering unity, teamwork, and, fundamentally, interpersonal abilities among participants. Additionally, Chinese martial arts competitions promote personal initiative, stimulate active peer engagement, and contribute to the formation of intimate communication networks.

Such an environment supports experiential learning that augments psychological resilience, aiding individuals in acquiring and exhibiting effective communication strategies in social interactions, which in turn, enhances their interpersonal competencies.

The Mediating Role of Psychological Quality

This study's findings indicate that engaging in Chinese martial arts can enhance adolescents' interpersonal skills by improving their psychological quality, thereby acting as a complete mediator between martial arts participation and interpersonal skills, confirming Hypothesis 2. Initially, adolescent involvement in Chinese martial arts has been linked to improved psychological quality, primarily through the core principle of attack and defense. The practice of Chinese martial arts initiates a psychological cycle of resistance, encouragement, dejection, and then back to encouragement, culminating in confidence. This cycle mirrors the challenging progression from resistance to acceptance, frustration, effort, and eventually success. Such continuous practice significantly bolsters resilience against setbacks and fortifies psychological resilience and quality. Supporting the embodied cognition theory, Danish et al. (2020) affirm that integrating martial virtues into the physical, mental, and behavioral dimensions of adolescents promotes mental health and cultivates their inherent qualities.

Practitioners with robust psychological resilience are adept at managing their emotions and behaviors, leading to a predisposition towards positive social interactions. They are more likely to actively engage with others and approach interpersonal relationships from a rational standpoint. Moreover, the focus of Chinese martial arts on attack and defense dynamics necessitates effective cooperation

between partners, reducing interpersonal distance and enhancing communication through structured offensive and defensive engagements. Rooted in traditional cultural values, practitioners are encouraged to develop both physically and mentally, promoting a holistic approach to self-improvement that includes moral and ethical self-reflection.

The Moderating Role of Only-Child Status

This study revealed that, in contrast to their peers without siblings, the only child engaging in Chinese martial arts experience significant enhancements in psychological quality and interpersonal skills. The impact of psychological quality as a mediating factor is influenced by the status of being an only child, corroborating Hypothesis 3. Typically, the absence of siblings might lead to fewer close friendships for only children, heightening their vulnerability to loneliness, anxiety, feelings of inferiority, and insecurity. However, Chinese martial arts, which emphasize both physical and mental development, can substantially bolster the resilience of the only child, thus improving their psychological well-being. Faced with external adversities, these individuals demonstrate commendable courage in tackling challenges, which in turn mitigates their feelings of inferiority and insecurity. Recent studies indicate that emotional instability is a significant marker of poor psychological resilience. In the practice of Taijiquan, a discipline within Chinese martial arts, the focus is on mental concentration, physical and mental relaxation, and the clearing of extraneous thoughts. For the only child, deep involvement in this form of exercise can reduce anxiety and stabilize their emotional state, leading to enhanced serenity, the release of negative emotions, and the strengthening of psychological resilience. Furthermore, participation in Chinese martial arts competitions promotes a sense of competition in only children, instilling values of mutual respect and tolerance. Such experiences not only improve effective interpersonal relations but also increase adaptability to social environments, thereby augmenting interpersonal skills and alleviating feelings of isolation.

Limitations and Future Directions

This study contributes valuable theoretical insights and offers practical guidance, yet it is subject to several limitations. Firstly, the sample size was constrained, involving adolescents aged 12-15 years, which introduces a potential bias in the conclusions. Future research should broaden the sample to encompass adolescents of all ages, thereby enabling more comprehensive empirical investigations. Secondly, although the study categorized

participants into two groups, it lacked an extensive examination of both pretest and posttest conditions. Future studies should employ longitudinal data analysis to thoroughly assess the impact of time on the results. Thirdly, interpersonal skills are influenced by numerous factors, including various potential mediating and moderating variables that warrant further identification and examination in subsequent research. Lastly, considering the diversity within the only-child cohort, the specific effects of Chinese martial arts on this demographic merit additional exploration.

Conclusion

This study, through a randomized controlled trial, examined the interplay between Chinese martial arts, psychological quality, only-child status, and interpersonal skills. It aimed to investigate the influence of Chinese martial arts on adolescents' interpersonal skills, assess the mediating role of psychological quality, and determine the moderating effect of only-child status. The findings are summarized as follows: (1) A causal link exists between Chinese martial arts and interpersonal skills, with Chinese martial arts exerting a significant positive impact on adolescents' interpersonal skills. (2) Psychological quality acts as a complete mediator between Chinese martial arts and interpersonal skills. (3) Among the experimental group, the mediating role of psychological quality is influenced by the status of being an only child. These conclusions bridge Chinese martial arts with embodied cognition theory, shedding light on how physical engagement in Chinese martial arts affects cognitive aspects of interpersonal skills. This research offers both theoretical insights and practical guidance for the development of Chinese martial arts education policies by relevant authorities.

Fundings

- 1.Integration of Sports Education of Science and Technology Innovation Project of Guangdong Sports Bureau in 2022(GDSS2022N076)
- 2.The University Research Project of the Guangdong Provincial Department of Education in 2023(2023WQNCX036)
- 3.One of the 11th batches of Education Reform Projects of Guangzhou Education Bureau: Reform of Sports Industry Operation Courses in Higher Vocational Colleges from the Perspective of School-enterprise "Dual" Education (2021JG233)

References

- Biddle, S. J. H., & Asare, M. (2011). Physical activity and mental health in children and adolescents: a review of reviews. *British Journal of Sports Medicine*, 45(11), 886. <https://doi.org/10.1136/bjsports-2011-090185>
- Blasco-Belled, A., & Alsinet, C. (2022). The architecture of psychological well-being: A network analysis study of the Ryff Psychological Well-Being Scale. *Scandinavian Journal of Psychology*, 63(3), 199-207. <https://doi.org/10.1111/sjop.12795>
- Chow, T. H., Lee, B. Y., Ang, A. B. F., Cheung, V. Y. K., Ho, M. M. C., & Takemura, S. (2018). The effect of Chinese martial arts Tai Chi Chuan on prevention of osteoporosis: A systematic review. *Journal of Orthopaedic Translation*, 12, 74-84. <https://doi.org/10.1016/j.jot.2017.06.001>
- Ciacconi, S., Castro, O., Bahrami, F., Tomporowski, P. D., Capranica, L., Biddle, S. J. H., et al. (2024). Martial arts, combat sports, and mental health in adults: A systematic review. *Psychology of Sport and Exercise*, 70, 102556. <https://doi.org/10.1016/j.psychsport.2023.102556>
- Dale, L. P., Vanderloo, L., Moore, S., & Faulkner, G. (2019). Physical activity and depression, anxiety, and self-esteem in children and youth: An umbrella systematic review. *Mental Health and Physical Activity*, 16, 66-79. <https://doi.org/10.1016/j.mhpa.2018.12.001>
- Danish, J. A., Enyedy, N., Saleh, A., & Humburg, M. (2020). Learning in embodied activity framework: a sociocultural framework for embodied cognition. *International Journal of Computer-Supported Collaborative Learning*, 15(1), 49-87. <https://doi.org/10.1007/s11412-020-09317-3>
- Demetriou, Y., Reimers, A. K., Alesi, M., Scifo, L., Borrego, C. C., Monteiro, D., et al. (2019). Effects of school-based interventions on motivation towards physical activity in children and adolescents: protocol for a systematic review. *Systematic Reviews*, 8(1), 113. <https://doi.org/10.1186/s13643-019-1029-1>
- Downey, D. B., & Condran, D. J. (2004). Playing Well with Others in Kindergarten: The Benefit of Siblings at Home. *Journal of Marriage and Family*, 66(2), 333-350. <https://doi.org/10.1111/j.1741-3737.2004.00024.x>
- Fujisawa, D., Temel, J. S., Traeger, L., Greer, J. A., Lennes, I. T., Mimura, M., et al. (2015). Psychological factors at early stage of treatment as predictors of receiving chemotherapy at the end of life. *Psycho-Oncology*, 24(12), 1731-1737. <https://doi.org/10.1002/pon.3840>
- Guo, Y., Shi, H., Yu, D., & Qiu, P. (2016). Health benefits of traditional Chinese sports and physical activity for older adults: A systematic review of evidence. *Journal of Sport and Health Science*, 5(3), 270-280. <https://doi.org/10.1016/j.jshs.2016.07.002>
- Hagopian, L. P., Kuhn, D. E., Strother, G. E., & Van Houten, R. (2009). Targeting Social Skills Deficits in an Adolescent with Pervasive Developmental Disorder. *Journal of Applied Behavior Analysis*, 42(4), 907-911. <https://doi.org/10.1901/jaba.2009.42-907>
- Hayes, A. F. (2009). Beyond Baron and Kenny: Statistical Mediation Analysis in the New Millennium. *Communication Monographs*, 76(4), 408-420. <https://doi.org/10.1080/03637750903310360>
- Karavasilis Karos, L., Howe, N., & Aquan-Assee, J. (2007). Reciprocal and complementary sibling interactions, relationship quality and socio-emotional problem solving. *Infant and Child Development*, 16(6), 577-596. <https://doi.org/10.1002/icd.492>
- Kriemler, S., Meyer, U., Martin, E., van Sluijs, E. M. F., Andersen, L. B., & Martin, B. W. (2011). Effect of school-based interventions on physical activity and fitness in children and adolescents: a review of reviews and systematic update. *British Journal of Sports Medicine*, 45(11), 923. <https://doi.org/10.1136/bjsports-2011-090186>
- Lakes, K. D., & Hoyt, W. T. (2004). Promoting self-regulation through school-based martial arts training. *Journal of Applied Developmental Psychology*, 25(3), 283-302. <https://doi.org/10.1016/j.appdev.2004.04.002>
- Ma, A. W. W., Wang, H.-K., Chen, D.-R., Chen, Y.-M., Chak, Y. T. C., Chan, J. W. Y., et al. (2019). Chinese Martial Art Training Failed to Improve Balance or Inhibit Falls in Older Adults. *Perceptual and Motor Skills*, 126(3), 389-409. <https://doi.org/10.1177/0031512518824945>
- Mancillas, A. (2006). Challenging the Stereotypes About Only Children: A Review of the Literature and Implications for Practice. *Journal of Counseling & Development*, 84(3), 268-275. <https://doi.org/10.1002/j.1556-6678.2006.tb00405.x>
- Marusak, H. A., Borg, B., Morales, A., Carrington Smith, J., Blankenship, K., Allen, J. L., et al. (2022). Martial Arts-Based Curriculum Reduces Stress, Emotional, and Behavioral Problems in Elementary Schoolchildren During the COVID-19 Pandemic: A Pilot Study. *Mind, Brain, and Education*, 16(1), 5-12. <https://doi.org/10.1111/mbe.12307>
- Moore, B., Woodcock, S., & Dudley, D. (2021). Well-being warriors: A randomized controlled trial examining the effects of martial arts training on secondary students' resilience. *British Journal of Educational Psychology*, 91(4), e12422. <https://doi.org/10.1111/bjep.12422>

- Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common Method Biases in Behavioral Research: A Critical Review of the Literature and Recommended Remedies. *The Journal of Applied Psychology*, 88(5), 879-903. <https://doi.org/10.1037/0021-9010.88.5.879>
- Rodrigues, F., Bento, T., Cid, L., Pereira Neiva, H., Teixeira, D., Moutão, J., et al. (2018). Can Interpersonal Behavior Influence the Persistence and Adherence to Physical Exercise Practice in Adults? A Systematic Review. *Frontiers in Psychology*, 9, 2141. <https://doi.org/10.3389/fpsyg.2018.02141>
- Rodriguez-Ayllon, M., Cadenas-Sánchez, C., Estévez-López, F., Muñoz, N. E., Mora-Gonzalez, J., Migueles, J. H., et al. (2019). Role of Physical Activity and Sedentary Behavior in the Mental Health of Preschoolers, Children and Adolescents: A Systematic Review and Meta-Analysis. *Sports Medicine*, 49(9), 1383-1410. <https://doi.org/10.1007/s40279-019-01099-5>
- Sun, Y., Tabeshian, R., Mustafa, H., & Zehr, E. P. (2024). Using Martial Arts Training as Exercise Therapy Can Benefit All Ages. *Exercise and Sport Sciences Reviews*, 52(1), 23-30. <https://doi.org/10.1249/JES.0000000000000326>
- Sun, Y., Zhang, B., Ji, A., & Sun, W. (2022). A Study on the Impact of Wushu Sports Health on College Students' Mental Health. *Journal of Environmental and Public Health*, 2022(1), 5841017. <https://doi.org/10.1155/2022/5841017>
- Twemlow, S. W., Biggs, B. K., Nelson, T. D., Vernberg, E. M., Fonagy, P., & Twemlow, S. W. (2008). Effects of participation in a martial arts-based antibullying program in elementary schools. *Psychology in the Schools*, 45(10), 947-959. <https://doi.org/10.1002/pits.20344>
- van Sluijs, E. M. F., McMinn, A. M., & Griffin, S. J. (2007). Effectiveness of interventions to promote physical activity in children and adolescents: systematic review of controlled trials. *BMJ*, 335(7622), 703. <https://doi.org/10.1136/bmj.39320.843947.BE>
- Vertonghen, J., Theeboom, M., & Pieter, W. (2014). Mediating Factors in Martial Arts and Combat Sports: An Analysis of the Type of Martial Art, Characteristics, and Social Background of Young Participants. *Perceptual and Motor Skills*, 118(1), 41-61. <https://doi.org/10.2466/06.30.PMS.118k14w3>
- Wallace, R. (2021). Toward a Formal Theory of Embodied Cognition. *Biosystems*, 202, 104356. <https://doi.org/10.1016/j.biosystems.2021.104356>
- Wolfer, C., Vislã, A., Held, J., Hilpert, P., & Flückiger, C. (2021). Assessing interpersonal skills—A comparison of trainee therapists' and students' interpersonal skills assessed with two established assessments for interpersonal skills. *Clinical Psychology & Psychotherapy*, 28(1), 226-232. <https://doi.org/10.1002/cpp.2487>
- Yang, H.-C., Thornton, L. M., Shapiro, C. L., & Andersen, B. L. (2008). Surviving recurrence: Psychological and quality-of-life recovery. *Cancer*, 112(5), 1178-1187. <https://doi.org/10.1002/cncr.23272>
- Zahra, S. T., Saleem, S., Subhan, S., & Mahmood, Z. (2021). Interpersonal skills scale: Development and validation in urbanized sample of adolescents. *Social Development*, 30(1), 23-37. <https://doi.org/10.1111/sode.12475>