The Theory and Empirical Study on the Promotion of Adolescents' Sound Personality Development through Chinese Martial Arts Education

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Abstract

Chinese martial arts education has a unique impact on the promotion of adolescent personality. This study proposes a theoretical hypothesis for Chinese martial arts education in promoting the development of a sound personality in adolescents and conducts empirical analysis. The study selected 108 adolescents aged 12-13 from a junior high school, dividing them into an experimental group and a control group, each consisting of 54 students from Class 1 and Class 2 of the seventh grade.The study used the simplified version of the Chinese Big Five Personality Inventory (CBF-PI-B) to test the personality scores of adolescents in both classes before and after the intervention. The results showed that before the intervention, there was no significant statistical difference in the mean scores of the Big Five personality factors between the two classes. After the intervention, (1) In the conscientiousness and agreeableness factors, the experimental group showed a highly significant statistical difference in the posttest scores and when compared to the posttest scores of the control group ($P<0.01$). (2) In the extraversion and neuroticism factors, the experimental group showed significant statistical differences ($P<0.05$) in the posttest scores and when compared to the posttest scores of the control group. (3) In the openness factor, there were no significant statistical differences ($P>0.05$) in the posttest scores of the experimental group, nor when compared to the posttest scores of the control group. The study concludes that Chinese martial arts education can promote the development of the Big Five personality factors in adolescents, but this intervention only generates partial effects rather than influencing all aspects uniformly, especially having an extremely significant effect on the conscientiousness and agreeableness factors, a significant effect on the extraversion and neuroticism factors, and no significant effect on the openness factor.

Keywords: Chinese Martial Arts Education, Martial Arts Virtue, Adolescents, Big Five Personality, Sound Personality Development.

Introduction

The concept that personality determines destiny underscores the significance of having a sound personality, not only for individual development but also for fostering societal harmony and stability. With the advancement of society, psychological issues stemming from information overload, diverse values, and lack of belief are becoming increasingly prevalent, particularly among adolescents whose personality development is notably crucial. As adolescent personalities are not yet fully formed, deficiencies in empathy, responsibility, self-control, moral judgment, etc., can lead to anxiety, depression, and even severe incidents like school bullying. WHO (2022) published data indicating that in the past five years, over one hundred million adolescents globally have faced mental development disorders, drawing considerable attention from fields such as psychology, law, and education. There are numerous intervention methods for cultivating sound personality and mental health, among which physical education plays an indispensable role in promoting sound personality among adolescents (Piepiora, 2020). However, no studies have been found that explore the use of Chinese martial arts education to foster adolescents' sound personality development, yet this form of education, with its distinctive cultural and training approaches, is particularly effective in nurturing the sound personality of adolescents.

Chinese martial arts, an integral part of China's rich cultural heritage, goes beyond combat or self-defense; it embodies millennia of practice aimed at developing physical abilities, spirituality, and mental fortitude (Lau, 2022). Physically, it includes exercises to enhance flexibility, strength, balance, and coordination, while mentally, it encourages focus, self-awareness, and meditation. Moreover, a unique aspect of Chinese martial

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arts is its integration of Confucian principles, advocating for ideal personalities such as "Ren" "Yi" "Li" "Zhi" "Xin" and "Yong". These ideal personalities offer significant theoretical frameworks and practical support for interpersonal conduct (Pohl, 2023). In intervening in the development of adolescent personality, Chinese martial arts education offers unique advantages compared to other physical education programs. Firstly, it provides a structured and supportive environment for practicing mindfulness, enabling adolescents to manage stress and anxiety. Secondly, the discipline and focus required in martial arts training can be translated into academic performance and better concentration and self-discipline. Lastly, embedding cultural and philosophical teachings in martial arts can cultivate youths' cultural literacy, reinforcing their sense of self-worth and cultural identity.

In conclusion, Chinese martial arts, as a traditional sport that combines physical exercise and spiritual cultivation, offers a comprehensive approach to personal development. Particularly for adolescents, it provides a supportive and enriching environment to navigate the complexities of modern life. These findings hold practical significance for educational institutions and mental health organizations in addressing adolescent mental health issues and even for other age groups. It is recommended to further promote Chinese martial arts education in physical education curricula to foster holistic development of adolescent personalities. Additionally, its ease of implementation makes it a feasible complement to traditional psychological interventions. Collaboration with fitness centers or counseling centers can create a widespread supportive environment, promoting overall societal mental health. These outcomes hold important implications for other researchers and policymakers.

Literature Review

Personality, an intrinsic neuro-psychological structure, represents enduring traits and styles exhibited by individuals (Bergner, 2020). The Five Factor Model is widely accepted as a theoretical model of personality factors (John, Naumann, & Soto, 2008). Extraversion reflects the degree of interpersonal interaction; Agreeableness reflects attitudes towards others; Openness reflects creativity and curiosity; Conscientiousness reflects prudence and perseverance in goal-directed behavior; Neuroticism reflects emotional regulation processes and the tendency towards experiencing negative emotions.

Adolescence refers to the developmental stage from puberty to psychological maturity, approximately between the ages of 10 to 19 (WHO, 2023). During this period, adolescents often exhibit impatience, susceptibility to temptation, lack of independent thinking, poor emotional control, dominance of affective over rational thinking, and significant emotional fluctuations (Haydarova & Nurqulova, 2023), making it a critical period for personality development research. Studies over the past five years on adolescent personality development (Sharp, 2020; Slobodskaya, 2021; Tetzner, Becker, & Bihler, 2023) and longitudinal personality development (Bleidorn et al., 2021; Bleidorn et al., 2022; Graham et al., 2020) have found that the trajectories of the Big Five personality factors in early adolescence tend to decline, potentially contributing to significant personality problems in adolescents. Specifically, extraversion tends to decrease with age; agreeableness and conscientiousness show a decline in early adolescence followed by an increase in mid-to-late adolescence; openness decreases in mid-adolescence and increases thereafter; the trajectory of neuroticism is less clear. Although the Big Five personality factors tend to decline during adolescence, research indicates that adolescent personality development is highly malleable (Galván, 2014). Employing appropriate methods such as physical education to address adolescent personality issues can lead to healthier personality factors: extraversion manifested as sociability and initiative-taking; agreeableness characterized by empathy and imagination; openness associated with curiosity; conscientiousness demonstrated through adherence to social norms and responsible behavior; neuroticism indicated by better emotional regulation and coping abilities (Piepiora, 2021).

While martial arts have been shown to promote adolescent personality development, but there is a lack of systematic research from both theoretical and empirical perspectives on how Chinese martial arts foster the development of adolescents' sound personalities. Representative studies exploring the promotion of adolescent personality development through martial arts intervention have examined several aspects: firstly, martial arts help adolescents reduce stress, anxiety, depression, and overcome emotional disorders (Moore, Dudley, & Woodcock, 2019; Wang et al., 2010a), closely related to neuroticism; secondly, martial arts aid in reducing adolescents' anger, aggression, or violent tendencies (Kotarska et al., 2019; Lafuente, Zubiaur, & Gutiérrez-García, 2021), associated with agreeableness; thirdly, martial arts improve adolescents' social interaction and teamwork skills (Croom, 2014; Moore et al., 2019), related to extraversion; fourthly, martial arts enhance adolescents' confidence, independence, self-discipline, self-esteem, and self-control (Croom, 2014; Kotarska et al., 2019; Moore et al., 2019), associated with conscientiousness; fifthly,

factors influencing martial arts intervention in adolescent personality, including the type of martial arts, traditional or non-traditional martial arts, and coach style or role model effects (Lafuente et al., 2021). From the existing research on martial arts intervention in adolescent mental health and personality development, significant progress has been made in exploring the effects of martial arts on various aspects of adolescent psychological well-being. However, existing studies have several limitations: firstly, many studies lack systematic indicators of adolescent personality development, and inconsistent measurement tools, assessment criteria, and methods may lead to inconclusive findings and research redundancy; secondly, most studies have not quantitatively investigated the extent and effectiveness of martial arts intervention in adolescent mental health development; thirdly, many studies have not considered the influencing factors of martial arts intervention in adolescent mental health development, including different types of martial arts (such as traditional or non-traditional) and the influence of martial arts teachers or coaches' styles.

Therefore, this study employs Chinese martial arts education as an intervention tool, with traditional Chinese martial arts teachers as interveners. Building upon the theoretical hypotheses of how Chinese martial arts promote the development of a sound personality in adolescents, the study selects the Big Five personality inventory to conduct an experimental investigation into the intervention of Chinese martial arts education on adolescent personality development. Through quantitative measures, this study aims to reveal the mechanisms and effects of Chinese martial arts education in promoting the development of the Big Five personality factors in adolescents, providing valuable insights for the development of sound personality in adolescent students.

Theoretical Hypothesis

The core connotation of Chinese martial arts, "Wude" (martial virtue), aligns closely with the structural characteristics of a sound personality of adolescents, thus proposing the theoretical hypothesis that Chinese martial arts education can promote the development of adolescents' sound personality. Wude refers to the moral norms and qualities that individuals engaged in martial arts activities should adhere to in social interactions. It inherits the Confucian essence of "Ren" "Yi" "Li" "Zhi" "Xin" and "Yong" which align closely with the five characteristics of a sound personality structure in adolescents.

The alignment of "Ren" and "Zhi" within the core values of Wude structure corresponds to the requirements of the "Openness" factor in promoting the adolescents' sound personality structure

The core values of "Ren" and "Zhi" in the Wude structure exhibit a significant alignment with the "Openness" factor in the comprehensive personality structure of adolescents. "Ren" is the central value of Wude, representing genuine love that emanates from the heart, encompassing a broad and tolerant affection for all people and things. On one hand, it encourages forgiveness, martial artists are urged to be benevolent, kind-hearted, and forgiving towards others. On the other hand, it emphasizes loyalty, urging martial artists to be faithful to their martial arts lineage, extending to loyalty to the nation and the community (Tao & Qiyong, 2012). Similarly, "Zhi" synonymous with "knowledge" has two main connotations within the Wude context: intellectual knowledge and moral knowledge (Varela, 1999). The attitude of Chinese martial arts education towards intellectual knowledge is reflected in the relentless pursuit and exploration of improving one's own "martial skills". However, compared to intellectual knowledge, martial virtue places greater emphasis on moral knowledge. Moral knowledge requires martial artists to discern right from wrong, good from evil, and to understand benevolence and righteousness. Only by doing so can they truly practice the intellectual knowledge of martial arts. Examining the manifestation of "Ren" and "Zhi" in the core values of Wude, it is evident that both align with the cognitive factors of adolescents' comprehensive personalities, including the diligent contemplation and exploration of new learning experiences and an active thought process in initiating actions. This alignment is further reflected in their cognitive orientations, such as patriotism, respect for teachers and traditions, and a worldview that opposes bullying and supports the weak.

The alignment of "Xin" and "Li" within the core values of Wude structure corresponds to the requirements of the "Conscientiousness" and "Neuroticism" factors in promoting the adolescents' sound personality structure

"Xin" and "Li" hold significant importance in the Wude structure, serving as both fundamental values in Wude's core practice and direct manifestations of interpersonal relationships. The basic meaning of "Xin" is to possess integrity, and the basic meaning of "Li" is to be courteous. Traditional Wude places great emphasis on "Xin" encapsulated in the saying "A word spoken is past recalling". Keeping promises is a longstanding and commendable tradition in the martial arts world, and it is

also the most fundamental principle for martial artists to stand in society. Integrity is also a fundamental value criterion for contemporary adolescents, representing honesty, responsibility, and a basic moral requirement that every student should adhere to. "Li" in the Wude system is primarily reflected in external rituals and internal courtesy. Wude etiquette permeates various aspects of a martial artist's life, such as the bowing and weapon-holding rituals during martial practice, and the principle of stopping just short of harm in the application of martial skills, all of which reveal the courteous demeanor of martial artists. Wude's approach to courtesy not only emphasizes formal external rituals but also underscores the internal spiritual aspects of courtesy and righteousness (Hagen, 2010). The connection between "Li" and "Ren" highlights the reliance of courtesy on benevolence, making courtesy an inherently rooted moral practice. Adolescents, through the practice of "Xin" and "Li" can build trust in their words, fulfill responsibilities with determination, and overcome difficulties and negative emotions in life and learning with strong willpower. This, in turn, enhances their moral cultivation and contributes to the development of the "Conscientiousness" and "Neuroticism" factors in a comprehensive and healthy personality.

The alignment of "Yi" and "Yong" within the core values of Wude structure corresponds to the requirements of the "Agreeableness" and "Extraversion" factors in promoting the adolescents' sound personality structure

"Yi" in Confucian thought represents a principle that requires people to act appropriately or suitably. Whether something is appropriate or not depends on whether it aligns with the requirements of "Ren" and "Li". In essence, "Ren" is "Yi" and conformity to "Li" is appropriateness (Lu, 2021). Similarly, in assessing the behavior of martial artists, "Yi" considers whether their actions promote justice or involve unjust killing. It plays a crucial role in judging the morality and honor of actions in the martial arts world, serving as the highest behavioral criterion guiding martial artists in their practices. "Yong", commonly understood as courage displayed in combat or competition, goes beyond mere recklessness or a reliance on martial prowess. The "Yong" in Wude is not about daring actions or a martial prowess-based mentality but views "Yong" as a tenacious moral willpower to uphold "Ren" and "Yi" (Jiang, 2012). An example of Wude's courage is seen in Bian Zhuangzi, who, driven by filial piety, suffered numerous defeats while restrained by the concern for his mother's well-being. However, after his mother's passing, Bian Zhuangzi, free from attachment, bravely sacrificed himself in battle, embodying the true courage of Wude. By examining the expressions of "Yi" and "Yong" within the core values of Wude, it becomes evident that they align with the factor of "Agreeableness" and "Extraversion" in adolescents' comprehensive and healthy personalities. In accordance with the standards of a wholesome personality, adolescents should adhere to principles such as "being kind to others" and meet the fundamental behavioral requirements of "Yong", thus shaping the factors of "Agreeableness" and "Extraversion".

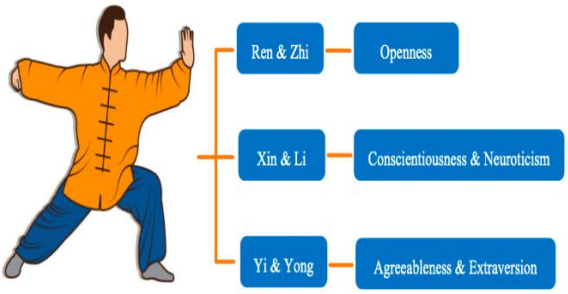

Figure 1: The Alignment of Wude Structure with the Big Five Personality Structure.

Research Subjects and Methods

Research Subjects

Based on existing research, this study employed a cluster random sampling method to select 108 adolescent students as participants, aiming to determine key methodologies (Latpate et al., 2021). The study focused on 108 adolescent students from a junior high school in a city in China. To mitigate the interference of age factors, primarily first-year junior high school students aged between 12 and 13 were chosen as the study subjects. Among them, one class comprising 54 students served as the experimental group, engaging in a one-year experiment on promoting personality development through traditional Chinese martial arts education. The other class, also consisting of 54 students, served as the control group, not participating in the Chinese martial arts education curriculum but scheduled for the following academic year.

Research Tools

The study employed the simplified Chinese Big Five Personality Inventory (CBF-PI-B). This inventory covers the five main factors of the Big Five personality model: Extraversion, Agreeableness, Openness, Conscientiousness, and Neuroticism. Each factor is measured by 8 items, totaling 40 items, with each item rated on a 6-point scale (ranging from 1 to 6, representing "completely disagree", "disagree", "uncertain", "agree", "strofngly agree").

Among these, 33 items are positively scored, while the remaining 7 items are reverse scored. Despite the fewer number of items in the CBF-PI-B, it exhibits a good factor structure, high internal consistency reliability, and expected convergent, discriminant, and criterion-related validity. In practical applications, it still provides valuable information and is one of the important inventories for studying personality factors in the Chinese population (Wang, Dai, & Yao, 2010b).

Research Procedure

pretest: On the day of enrollment, researchers guided adolescents from both the experimental and control groups to self-assess their Big Five personality factors using the CBF-PI-B.

Intervention: For the experimental group, in addition to the regular physical education curriculum, two extra classes of Chinese martial arts per week were added, teaching the Chinese Southern Fist (Nanquan), with each class lasting 45 minutes, over the course of one academic year. The control group only engaged in regular physical education classes without martial arts education intervention, which will be implemented in the following academic year.

posttest: After the experiment concluded, the Big Five personality questionnaire was administered again to both classes. Both pretest and posttest used the same instructions, requiring independent completion, with anonymous questionnaires.

Experimental Data Statistics

Experimental data processing was conducted using SPSS 26.0.

Research Results

Comparison of Big Five personality factors Indices Differences between Experimental Group Pretest and Control Group Pretest

Using SPSS 26.0 statistical software, a normality test and homogeneity of variance test were conducted on the Big Five personality factors indices of the experimental group and the control group before the intervention of Chinese martial arts education, ensuring the homogeneity of the two groups. It was found that both the pretest scores of the experimental group and the control group were normally distributed and exhibited homogeneity of variance. Subsequently, a t-test was performed. As shown in Table 1, before receiving the intervention of Chinese martial arts education, the mean scores of the Big Five personality factors in the experimental group and the control group were very close, and there was no significant difference between the two groups ($P > 0.05$). This indicates that prior to external intervention, adolescents of the same age group were generally at the same average developmental level in the Big Five personality factors. It also suggests that the selected subjects from both groups were homogeneous, and the experimental and control group settings were reasonable.

Table 1

Mean Scores of the Big Five personality factors and t-Test Results in the Experimental Group pretest and Control Group pretest

Big Five personality factors	Experimental Group pretest (n=54)	Control Group pretest (n=54)	t	p
Extraversion	4.03±0.10	4.13±0.12	-0.63	0.53
Agreeableness	4.41±0.10	4.42±0.08	-0.09	0.93
Openness	4.20±0.07	4.34±0.11	-1.1	0.27
Conscientiousness	4.24±0.10	4.31±0.12	-0.45	0.66
Neuroticism	2.86±0.13	2.60±0.14	1.40	0.17

Note: *p<0.05, **p<0.01

Comparison of Big Five personality factors Indices Differences between Pretest and Posttest in the Control Group

First, a normality test was conducted on the mean differences of Big Five personality factors scores between pretest and posttest in the control group, revealing no statistically significant difference between the two ($P > 0.05$), indicating a normal distribution of the data. Thus, a paired-sample t-test was conducted. Secondly, the t-test results presented in Table 2 indicate that, except for the Neuroticism factor, the mean scores of Big Five personality factors in the control group posttest were lower than those in the pretest, showing a decreasing trend. However, there was no statistically significant difference in the mean scores of Big Five personality factors between pretest and posttest in the control group ($P > 0.05$). This finding is consistent with existing research on the developmental trends of Big Five personality factors during adolescence (Bleidorn et al., 2021).

Table 2

Mean Scores of the Big Five personality factors and t-Test Results in the Control Group Pretest and Posttest

Big Five personality factors	Experimental Group pretest (n=54)	Control Group pretest (n=54)	t	p
Extraversion	4.13±0.12	4.04±0.10	0.65	0.52
Agreeableness	4.41±0.08	4.27±0.09	1.15	0.26
Openness	4.34±0.11	4.27±0.08	-0.02	0.99
Conscientiousness	4.31±0.11	4.17±0.12	0.91	0.37
Neuroticism	2.60±0.14	2.88±0.15	-1.37	0.18

Note: *p<0.05, **p<0.01

Comparison of Big Five personality factors Indices Differences between Pretest and Posttest in the Experimental Group

After the intervention of Chinese martial arts education, a normality test was conducted on the Big Five personality factors for the experimental group pretest and posttest. It was found that there was a significant statistical difference in the Extraversion factor scores before and after, indicating a non-normal distribution. Therefore, the Wilcoxon signed-rank test was employed to examine the differences in the Big Five personality factors between pretest and posttest for the experimental group, with results shown in Table 3. It was found that in the Agreeableness and Conscientiousness factors, the mean scores in the posttest were higher than those in the pretest, and there was a highly significant statistical difference (P<0.01); in the Extraversion and Neuroticism factors, the mean scores in the posttest were higher than those in the pretest, and there was a significant statistical difference (P<0.05); in the Openness factor, the mean scores in the posttest were slightly higher than those in the pretest, but there was no statistical difference (P>0.05). It suggests that Chinese martial arts education plays a role in promoting the development of healthy personalities in adolescents.

Table 3

Wilcoxon Test of the Mean Scores of the Big Five personality factors in the Experimental Group Pretest and Posttest

Variable	Ranks	N	Mean Rank	Sum of Ranks	Z	P
Extraversion(posttest) Extraversion(pretest)	Negative Ranks	18[a]	24.08	433.50		
	Positive Ranks	33[b]	27.05	892.50	-2.154[a]	0.031*
	Ties	3[c]				
Agreeableness(posttest) Agreeableness(pretest)	Negative Ranks	16[d]	24.21	390.50		
	Positive Ranks	36[e]	27.43	987.50	-2.721[d]	0.007**
	Ties	2[f]				
Openness(posttest) — Openness(pretest)	Negative Ranks	27[g]	24.94	673.50		
	Positive Ranks	25[h]	28.18	704.50	-0.141[g]	0.888
	Ties	2[i]				
Conscientiousness(posttest)— Conscientiousness(pretest)	Negative Ranks	16[j]	25.22	403.50		
	Positive Ranks	36[k]	27.07	974.40	-2.603[j]	0.009**
	Ties	2[l]				
Neuroticism(posttest) — Neuroticism(pretest)	Negative Ranks	30[m]	32.35	970.50		
	Positive Ranks	24[n]	21.44	514.50	-1.965[m]	0.049*
	Ties	0[o]				

Note:(1)a.Extraversion(posttest)<Extraversion(pretest);b.Extraversion(posttest)>Extraversion(pretest);c.Extraversion(posttest)=Extraversion(pretest);d.Agreeableness(posttest)<Agreeableness(pretest);e.Agreeableness(posttest)>Agreeableness(pretest);f.Agreeableness(posttest)=Agreeableness(pretest);g.Openness(posttest)<Openness(pretest);h.Openness(posttest)>Openness(pretest);i.Openness(posttest)=Openness(pretest);j.Conscientiousness(posttest)<Conscientiousness(pretest);k.Conscientiousness(posttest)>Conscientiousness(pretest);l.Conscientiousness(posttest)=Conscientiousness(pretest);m.Neuroticism(posttest)<Neuroticism(pretest);n.Neuroticism(posttest)>Neuroticism(pretest);o.Neuroticism(posttest)=Neuroticism(pretest).(2)*p<0.05, **p<0.01

Comparison of the Big Five personality factors Indices Differences between Experimental Group posttest and Control Group posttest

After the intervention of Chinese martial arts education, a normality and homogeneity of variances test was conducted on the Big Five personality factors for both the experimental and control groups posttest. Both groups exhibited normal distribution and homogeneity of variances. Subsequently, a t-test was performed to compare the scores between the two groups. Table 4 reveals that, in terms of Agreeableness and Conscientiousness factors, the mean scores of the experimental group posttest were significantly higher than those of the control group posttest, with a highly significant statistical difference ($P < 0.01$). For Extraversion and Neuroticism factors, the mean scores of the experimental group posttest were significantly higher than those of the control group posttest, with a significant statistical difference ($P < 0.05$). Regarding the Openness factor, the mean scores of the experimental group posttest were slightly lower than those of the control group posttest, but there was no statistical difference ($P > 0.05$). Here, notable differences were observed between the posttest scores of the experimental and control groups. Table 2 indicates that despite extracurricular physical activities among adolescents in the control group, there were no statistically significant differences in pretest and posttest Big Five personality scores. However, after the intervention of Chinese martial arts education, statistically significant differences were observed in four factors of the Big Five personality structure between pretest and posttest in the experimental group, which may be attributed to the structured nature of Chinese martial arts classes. The learning and training of Chinese martial arts by adolescents are guided by the framework of Confucian culture. Throughout the practice, martial arts instructors continually integrate explanations of Confucian culture, aiming to promote healthy personalities in adolescents through spiritual enlightenment and physical training (Pohl, 2023). This unique aspect of Chinese martial arts education distinguishes it from other sports activities, warranting further discussion on its distinctive effects.

Table 4

Mean Scores of the Big Five personality factors and t-Test Results in the Experimental Group Posttest and Control Group Posttest

Big Five personality factors	Experimental Group pretest (n=54)	Control Group pretest (n=54)	t	p
Extraversion	4.32±0.09	4.04±0.10	2.00	0.046*
Agreeableness	4.80±0.11	4.27±0.09	3.80	0.000**
Openness	4.20±0.08	4.27±0.08	-0.62	0.538
Conscientiousness	4.65±0.09	4.17±0.12	3.21	0.002**
Neuroticism	2.49±0.12	2.88±0.15	-2.17	0.045*

Note: *p<0.05, **p<0.01

Discussion

In this study, overall, Chinese martial arts education appears to have a promoting effect on adolescents' Extraversion, Agreeableness, Conscientiousness, and Neuroticism, while showing no promoting effect on Openness. These findings are consistent with existing research, although previous studies have discussed the degree of promotion to a lesser extent and require further exploration. Specifically, further discussion is needed on the highly significant promotion of Agreeableness and Conscientiousness in adolescents, the significant promotion of Extraversion and Neuroticism, and the lack of significant promotion in Openness.

Chinese martial arts education has a highly significant promoting effect on adolescents' Agreeableness and Conscientiousness, which may be mainly influenced by the social environment (Brittian & Humphries, 2015). Adolescents acquire values and behavioral norms from authority figures such as parents during childhood, leading to characteristics of obedience and friendliness (Chen, 2023). However, during adolescence, a crucial developmental task is to establish autonomy, leading adolescents to seek greater independence and question adult standards (Smith, Chein, & Steinberg, 2013), resulting in a decline in Agreeableness. The development of Conscientiousness is also primarily influenced by the social environment, including parental warmth, support, and demands, as well as relationships with teachers, peers, and educational support (Wray-Lake, Syvertsen, & Flanagan, 2015). A positive, supportive atmosphere contributes to higher levels of Conscientiousness in adolescents. As an external intervention factor, Chinese martial arts education promotes both Agreeableness and

Conscientiousness in adolescents. It not only focuses on physical training but also emphasizes the cultivation of integrity, justice, and self-discipline in adolescents, emphasizing that individual behavior should align with the values of "Ren" "Yi" and "Xin". Firstly, Chinese martial arts education emphasizes respect for elders, respect for opponents, and maintaining a humble attitude and etiquette. Secondly, it emphasizes perseverance and diligent training to cultivate learners' persistence and responsible attitude towards goals. Lastly, martial arts training involves not only physical challenges but also the management of one's emotions and behavior. Collectively, these values and behavioral norms play a significant role in the development of adolescents' Agreeableness and Conscientiousness. Regarding the development of adolescents' Extraversion and Neuroticism, apart from social environmental influences, physiological development also plays a role (Tetzner et al., 2023). Some studies suggest that martial arts can improve adolescent neurodevelopment, but the promoting effect is not significant (Johnstone, 2021). Physiological development may limit the promoting effect of Chinese martial arts education on these two factors. As adolescents' nervous systems mature and their self-regulation abilities strengthen, they tend to become more introverted and cautious, leading to a decrease in Extraversion levels. The development of adolescent Neuroticism is not clear-cut, Slobodskaya (2021) and Sharp (2020) suggest that there are gender differences in neuroticism, with girls showing a continuous increase from late childhood to mid-adolescence followed by a decline, while boys exhibit a slight decrease from late childhood to late adolescence. However, research also indicates that neuroticism is not significantly correlated with physiological development (Bleidorn et al., 2022). Regarding the impact of Chinese martial arts education on extraversion and neuroticism, firstly, the learning and training of Chinese martial arts involve social activities where adolescents learn and train in an environment of mutual respect and support, fostering social skills, extraversion, adaptation to social environments, and emotional management. Secondly, self-confidence is a key factor influencing extraversion and neuroticism (Siekanska & Wojtowicz, 2020). After a year of intensive training, students participated in a Chinese martial arts competition and achieved significant awards, greatly enhancing their self-confidence, promoting active participation in social situations, and improving their ability to cope with competition pressure. Chinese martial arts education does not significantly promote openness in adolescents, possibly due to the physiological developmental stage of the selected adolescents and the educational methods of martial arts itself. Previous research has found that during mid to late adolescence (16-18 years old), neural circuits associated with openness, particularly in the frontal lobe regions, reach their peak development (Kolk & Rakic, 2022). However, the students selected for the study were in the first year of junior high school, around 12-13 years old, indicating that their neural circuits related to openness might not have fully matured. Additionally, Chinese martial arts education itself may impose limitations. It emphasizes moral virtues, encouraging practitioners to discern right from wrong and understand principles of "Ren" and "Yi", yet it may restrict exploration and innovation. Some studies (Lee, 2019) suggest that traditional teaching methods, characterized by strict adherence to rules, prevalent in Chinese traditional education including martial arts education, could influence students' openness.

Conclusion

Chinese martial arts education can indeed promote the development of adolescents' Big Five personality factors, but this intervention only generates partial effects rather than influencing all aspects uniformly. Specifically, it has a highly significant promoting effect on Agreeableness and Conscientiousness, a significant promoting effect on Extraversion and Neuroticism, while the promoting effect on Openness is not significant.

This conclusion is supported by research findings indicating that Big Five personality factors showing extremely significant changes are often susceptible to external influences, such as Agreeableness and Conscientiousness, which are particularly influenced by social environments. Therefore, it is crucial to provide proper guidance for these two personality factors. Conversely, Big Five personality factors that only undergo significant changes are influenced both by external factors and their own physiological development, such as Extraversion and Neuroticism, which tend to change after adolescents reach a certain age and receive external interventions. On the other hand, Big Five personality factors that are relatively resistant to change are primarily regulated by individual physiology, such as the Openness factor, which is less susceptible to external influences and is often associated with learning ability. Therefore, promoting the development of Openness requires intensive interventions and training. By demonstrating the capability of Chinese martial arts to promote the development of adolescents' healthy personalities, it also underscores the stage-specific nature of personality development. Longitudinal studies on personality

development have revealed a declining trend in Big Five personality factors during adolescence. Hence, it is essential to prioritize interventions and cultivation of healthy personalities during adolescence. This includes regular testing and monitoring of adolescents' personalities by schools, families, and social psychological health institutions to prevent negative developments during this crucial stage of personality formation.

Limitations

Subsequent research in this area should pay attention to the selection of study subjects. Longitudinal personality studies have found certain patterns in the development of the Big Five personality factors in adolescents. Without intervention, extraversion tends to decline throughout adolescence; agreeableness, openness, and conscientiousness show a declining trend in early to mid-adolescence and an increasing trend in late adolescence; neuroticism tends to rise in early adolescence for females and decline in mid to late adolescence, while for males, it consistently decreases. The present study focused on adolescents aged 12-13 in the early stage of adolescence, where the Big Five personality factors are in a descending phase, making it easier to assess the positive impact of Chinese martial arts education on the sound personality development of adolescents. However, when studying personality development in the mid to late stages of adolescence, researchers should be cautious in distinguishing between natural development and development influenced by experimental interventions.

References

Bergner, R. M. (2020). What is personality? Two myths and a definition. *New Ideas in Psychology, 57*, 100759. https://doi.org/10.1016/j.newideapsych.2019.100759

Bleidorn, W., Hopwood, C. J., Back, M. D., Denissen, J. J. A., Hennecke, M., Hill, P. L., et al. (2021). Personality Trait Stability and Change. *Personality Science, 2*(1), e6009. https://doi.org/10.5964/ps.6009

Bleidorn, W., Schwaba, T., Zheng, A., Hopwood, C. J., Sosa, S. S., Roberts, B. W., et al. (2022). Personality Stability and Change: A Meta-analysis of Longitudinal Studies. *Psychological Bulletin, 148*(7-8), 588-619. https://doi.org/10.1037/bul0000365

Brittian, A. S., & Humphries, M. L. (2015). Prosocial Behavior During Adolescence. In J. D. Wright (Ed.), *International Encyclopedia of the Social & Behavioral Sciences* (2nd ed., Vol. 19, pp. 221-227). Elsevier. https://doi.org/10.1016/B978-0-08-097086-8.23190-5

Chen, X. (2023). *Socialization and Socioemotional Development in Chinese Children*. Cambridge University Press. https://doi.org/10.1017/9781009072380

Croom, A. M. (2014). Embodying Martial Arts for Mental Health: Cultivating Psychological Wellbeing With Martial Arts Practice. *Archives of Budo Science of Martial Arts and Extreme Sports, 10*, 59-70. https://croomconditioningdotcom.wordpress.com/wp-content/uploads/2015/09/adam-croom-martial-arts-publication-1.pdf

Galván, A. (2014). Insights about Adolescent Behavior, Plasticity, and Policy from Neuroscience Research. *Neuron, 83*(2), 262-265. https://doi.org/10.1016/j.neuron.2014.06.027

Graham, E. K., Weston, S. J., Gerstorf, D., Yoneda, T. B., Booth, T., Beam, C. R., et al. (2020). Trajectories of Big Five Personality Traits: A Coordinated Analysis of 16 Longitudinal Samples. *European Journal of Personality, 34*(3), 301-321. https://doi.org/10.1002/per.2259

Hagen, K. (2010). The Propriety of Confucius: A Sense-of-Ritual. *Asian Philosophy, 20*(1), 1-25. https://doi.org/10.1080/09552360903577576

Haydarova, S., & Nurqulova, G. (2023). Emergence of Aggression and Negativism in Psychological Characteristics of Adolescent Period. *International Bulletin of Engineering and Technology, 3*(10), 62-64. https://internationalbulletins.com/intjour/index.php/ibet/article/view/1102

Jiang, X. (2012). Confucius's View of Courage. *Journal of Chinese Philosophy, 39*(1), 44-59. https://doi.org/10.1163/15406253-03901005

John, O. P., Naumann, L. P., & Soto, C. J. (2008). Paradigm Shift to the Integrative Big Five Trait Taxonomy. In O. P. John, R. W. Robins, & L. A. Pervin (Eds.), *Handbook of Personality: Theory and Research* (pp. 114-158). New York: The Guilford Press. https://www.elaborer.org/cours/psy7124/lectures/John2008.pdf

Johnstone, A. (2021). *Cognitive Changes Associated with Martial Arts Practice* [Doctoral Dissertation, Bangor University (United Kingdom)]. https://research.bangor.ac.uk/portal/files/37062090/2021JohnstoneAshleighPhD.pdf

Kolk, S. M., & Rakic, P. (2022). Development of prefrontal cortex. *Neuropsychopharmacology, 47*(1), 41-57. https://doi.org/10.1038/s41386-021-01137-9

Kotarska, K., Nowak, L., Szark-Eckardt, M., & Nowak, M. (2019). Selected Healthy Behaviors and Quality of Life in People Who Practice Combat Sports and Martial Arts. *International Journal of Environmental Research and Public Health, 16*(5), 875. https://doi.org/10.3390/ijerph16050875

Lafuente, J. C., Zubiaur, M., & Gutiérrez-García, C. (2021). Effects of martial arts and combat sports training on anger and aggression: A systematic review. *Aggression and Violent Behavior, 58*, 101611. https://doi.org/10.1016/j.avb.2021.101611

Latpate, R., Kshirsagar, J., Kumar Gupta, V., & Chandra, G. (2021). Cluster Sampling. In R. Latpate, J. Kshirsagar, V. Kumar Gupta, & G. Chandra (Eds.), *Advanced Sampling Methods* (pp. 61-75). Springer Singapore. https://doi.org/10.1007/978-981-16-0622-9_5

Lau, K.-Y. (2022). Chinese Martial Arts. In M.-K. Wong & C.-M. Kwong (Eds.), *Hong Kong History: Themes in Global Perspective* (pp. 241-260). Springer Singapore. https://doi.org/10.1007/978-981-16-2806-1_10

Lee, T. H. C. (2019). Education in Traditional China. In S.-w. Chan (Ed.), *The Routledge Encyclopedia of Traditional Chinese Culture* (pp. 238-253). Routledge. https://doi.org/10.4324/9781315453491-14

Lu, Y. (2021). Shame and the Confucian Idea of Yi (Righteousness). In Y. Lu (Ed.), *Confucianism and Phenomenology: An Exploration of Feeling, Value and Virtue* (pp. 113-128). Brill. https://doi.org/10.1163/9789004319097_008

Moore, B., Dudley, D., & Woodcock, S. (2019). The effects of martial arts participation on mental and psychosocial health outcomes: a randomised controlled trial of a secondary school-based mental health promotion program. *BMC Psychology, 7*(1), 60. https://doi.org/10.1186/s40359-019-0329-5

Piepiora, P. (2020). A review of personality research in sport. *Pedagogy and Psychology of Sport, 6*(4), 64-83. https://doi.org/10.12775/PPS.2020.06.04.007

Piepiora, P. (2021). Personality profile of individual sports champions. *Brain and Behavior, 11*(6), e02145. https://doi.org/10.1002/brb3.2145

Pohl, K.-H. (2023). Kungfu—Musings on the Philosophical Background of Chinese Martial Arts. In D. Jiao, D. Li, L. Meng, & Y. Peng (Eds.), *Understanding and Translating Chinese Martial Arts* (pp. 1-13). Springer Nature Singapore. https://doi.org/10.1007/978-981-19-8425-9_1

Sharp, C. (2020). Adolescent Personality Pathology and the Alternative Model for Personality Disorders: Self Development as Nexus. *Psychopathology, 53*(3-4), 198-204. https://doi.org/10.1159/000507588

Siekanska, M., & Wojtowicz, A. (2020). Impulsive athlete as a self-regulated learner. Can self-confidence and a positive social attitude change a developmental inhibitor into a growth catalyst? *Journal of Physical Education and Sport, 20*(2), 623-629. https://doi.org/10.7752/jpes.2020.02091

Slobodskaya, H. R. (2021). Personality development from early childhood through adolescence. *Personality and Individual Differences, 172*, 110596. https://doi.org/10.1016/j.paid.2020.110596

Smith, A. R., Chein, J., & Steinberg, L. (2013). Impact of socio-emotional context, brain development, and pubertal maturation on adolescent risk-taking. *Hormones and Behavior, 64*(2), 323-332. https://doi.org/10.1016/j.yhbeh.2013.03.006

Tao, C., & Qiyong, G. (2012). The Values of Confucian Benevolence and the Universality of the Confucian Way of Extending Love. *Frontiers of Philosophy in China, 7*(1), 20-54. https://doi.org/10.3868/s030-001-012-0002-5

Tetzner, J., Becker, M., & Bihler, L.-M. (2023). Personality development in adolescence: Examining big five trait trajectories in differential learning environments. *European Journal of Personality, 37*(6), 744-764. https://doi.org/10.1177/08902070221121178

Varela, F. (1999). *Ethical Know-How: Action, Wisdom, and Cognition.* Stanford University Press. https://www.sup.org/books/theory-and-philosophy/ethical-know-how

Wang, C., Bannuru, R., Ramel, J., Kupelnick, B., Scott, T., & Schmid, C. H. (2010a). Tai Chi on psychological well-being: systematic review and meta-analysis. *BMC Complementary and Alternative Medicine, 10*(1), 23. https://doi.org/10.1186/1472-6882-10-23

Wang, M.-C., Dai, X.-Y., & Yao, S.-Q. (2010b). Development of Chinese Big Five Personality Inventory (CBF-PI)—Theoretical Framework and Relability Analysis. *Chinese Journal of Clinical Psychology, 18*(5), 545-548. https://doi.org/10.16128/j.cnki.1005-3611.2010.05.012

WHO. (2022). *WHO Highlights Urgent Need to Transform Mental Health and Mental Health Care.* World Health Organization. https://www.who.int/news/item/17-06-2022-who-highlights-urgent-need-to-transform-mental-health-and-mental-health-care

WHO. (2023). *Global Accelerated Action for the Health of Adolescents (AA-HA!): Guidance to Support Country Implementation*. World Health Organization. https://www.who.int/publications/i/item/9789240081765

Wray-Lake, L., Syvertsen, A. K., & Flanagan, C. A. (2015). Developmental Change in Social Responsibility During Adolescence: An Ecological Perspective. *Developmental Psychology, 52*(1), 130-142. https://doi.org/10.1037/dev0000067