

# Clinical Observation on the Prevention and Treatment of Juvenile Mild Myopia with Traditional Chinese Medicine Comprehensive Therapy

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**Abstract:** *Objective:* To observe the clinical effect of traditional Chinese medicine on the prevention and treatment of juvenile mild myopia. *Methods:* One hundred and twenty cases of juvenile mild myopia were randomly divided into six groups, with 20 cases in each group: western medicine group, ultrasonic group, acupuncture group, auricular point group, traditional Chinese oral decoction group, and traditional Chinese medicine comprehensive therapy group. The therapeutic effects of the treatment administered to the six groups were compared. *Result:* In the post-treatment and follow-up stages, the visual acuity of the traditional Chinese medicine comprehensive therapy group significantly improved along with reduced diopter compared to the other groups ( $p < 0.05$ ). However, the axial length of the six groups had no significant change compared with that before treatment ( $p > 0.05$ ). There were no adverse reactions in any of the patients. *Conclusion:* In the treatment of juvenile mild myopia, traditional Chinese medicine comprehensive therapy has good therapeutic effect without any adverse reactions; thus, it is worthy of clinical promotion.

**Keywords:** Traditional Chinese medicine; Comprehensive therapy; Prevention and treatment; Teenagers; Mild myopia

**Online publication:** May 30, 2022

## 1. Introduction

Myopia is a type of refractive error, in which the ability to see distant objects is affected by a change in eye axis and the focus of parallel light rays in front of the retina after passing through the refractive system of the eye <sup>[1]</sup>. With the development of modern science and technology, people are increasingly using their eyes, resulting in a sharp rise in the prevalence of myopia. According to a survey conducted by the National Health Commission in 2018, there are 450 million people with myopia in China, of which the proportion of teenagers with myopia is as high as 55.7%. It is clear that the number of people affected by myopia is steadily increasing among younger age groups <sup>[2]</sup>. The age concern and severity of myopia have become the focus of national attention; hence, reducing the prevalence of myopia has become the top priority. In the clinical practice of treating juvenile myopia, research has found that the traditional Chinese medicine comprehensive therapy has a significant effect on the prevention and treatment of this condition, which can effectively delay its process. This study selected 120 cases of juvenile mild myopia treated in Xi'an Hospital of Traditional Chinese Medicine as research subjects to determine the clinical efficacy of traditional

Chinese medicine comprehensive therapy in the prevention and treatment of juvenile mild myopia.

## 2. Data and methods

### 2.1. Research subjects

A total of 120 juvenile patients with mild myopia treated in Xi'an Hospital of Traditional Chinese Medicine from September 2019 to November 2020 were selected as the research subjects. Their age ranged from 7 to 17 years old. The patients had no treatment contraindications, and their parents agreed to the study. All patients met the diagnostic criteria of mild myopia based on the "Complete Book of Ophthalmology [3]" and the diagnostic criteria for TCM proximal and distant diseases in "Ophthalmology of Traditional Chinese Medicine (10th Edition) [4]." The patients were randomly divided into the western medicine group, ultrasonic group, acupuncture group, auricular point group, traditional Chinese oral decoction group, and traditional Chinese medicine comprehensive therapy group, with 20 cases in each group. The western medicine group comprised of 11 male patients and 9 female patients, age ranging from 9 to 14 years old, with an average age of  $11.60 \pm 2.56$ . The ultrasonic group comprised of 12 male patients and 10 female patients, age ranging from 10 to 15 years old, with an average age of  $12.70 \pm 2.21$ . The auricular point group comprised of 9 male patients and 11 female patients, age ranging from 10 to 14 years old, with an average age of  $12.90 \pm 2.61$ . The acupuncture group comprised of 9 male patients and 11 female patients, age ranging from 5 to 15 years old, with an average age of  $12.40 \pm 1.72$ . The traditional Chinese oral decoction group comprised of 11 male patients and 9 female patients, age ranging from 10 to 15 years old, with an average age of  $12.45 \pm 1.50$ . The TCM comprehensive therapy group comprised of 10 male patients and 10 female patients, age ranging from 10 to 16 years old, with an average age of  $12.65 \pm 1.56$ . Comparing the general data of the six groups, the differences were not statistically significant ( $p > 0.05$ ); thus, they were comparable. This study met the ethical requirements of the Declaration of Helsinki.

### 2.2. Treatment methods

#### (1) Western medicine group

The patients were given 0.01% atropine eye drops (GYZZ H2019001, Shenyang Xingqi Pharmaceutical Co., Ltd.; 0.4 ml: 0.04 mg) to be used before going to bed. Over the course of a month, the eye drops were administered twice a day, one drop each time, with a 5-minute interval between the doses [5].

#### (2) Ultrasonic group

The patients were required to lie on their backs with their eyes closed. Safflower introduction liquid was applied to the patients' eyes as a pad. The TCM ion introduction machine's power supply was then switched on for 20 minutes/eye, once a day, for a total duration of one month.

#### (3) Acupuncture group

The patients' Sizhukong, Qingming, Zanzhu, Yuyao, Tongziliao, Sibai, Yangbai, Touwei, Touwei, Qiuhou, Taiyang, Zusanli, and Sanyinjiao were identified. After routine disinfection, needles of 0.25 mm were applied by using the flat tonic and flat catharsis method. The needles were then kept in place for 30 minutes, every alternate day for a month [6].

#### (4) Auricular point group

The acupoints of the ear, such as Shenmen, liver, spleen, kidney, and eyes were identified and pressed with Wangbuliuxing seed. The patients were asked to massage those areas three to four times a day on a daily basis over a month's period.

#### (5) Traditional Chinese oral decoction group

According to "Ophthalmology of Traditional Chinese Medicine (10th Edition)," the following dialectics were carried out: (a) with insufficient heart Yang, the near vision is acceptable, but the far vision is blurry; patients will have pale face, pale tongue, weak pulse, and palpitations; they also have spiritual and visual

fatigue; the addition and subtraction of Zhiwan can be used; (b) with insufficient Qi and blood, the visual acuity is fair but blurry, and the fundus changes in such a way that it appears like leopard prints; a lusterless complexion can be seen; patients may experience spiritual and visual fatigue; their tongue will be pale, with thin and white moss, and their pulse will be thin and weak; in this case, Danggui Buxue decoction can be used; (c) with liver and kidney deficiency, vision can be both, near and far; there will be dark shadows floating in the patients' vision, and vitreous liquefaction and turbidity may develop; leopard-print fundus can also be appreciated; these patients may have dizziness, tinnitus, sleep disturbances, and visual fatigue; they may also have pale tongue and weak pulse; the addition and subtraction of Zhujingwan can be used, with one dose warmed, taken twice daily, once in the morning and the other in the evening, over 7 days in a period of 1 month.

#### (6) TCM comprehensive therapy group

The treatment for this group involved the integration of the aforementioned acupuncture treatment, auricular point treatment, traditional Chinese oral decoction treatment, and ultrasonic treatment. The combined treatment was formulated according to individual patient's state over a period of one month.

### 2.3. Observation indicators

#### (1) Vision

The standard logarithmic visual acuity chart was used to detect the visual acuity of patients before and after treatment as well as their follow-up under natural light.

#### (2) Diopter

Optometry was performed after mydriasis with 1% atropine eyedrops, and the results before and after treatment were recorded.

#### (3) Ocular axis

An ultrasonic A/B scan was carried out to measure the ocular axis before and after treatment, and the average value was recorded.

### 2.4. Efficacy criteria

According to the Guiding Principles for Clinical Research of New Chinese Medicine<sup>[7]</sup>, the changes in the patients' visual acuity after treatment were observed.

Remarkable effect: main clinical symptoms basically alleviated, recovery of far vision more than three rows, and a significant decrease in diopter after mydriasis compared to before treatment (reduced by 1.00D). Valid: clinical symptoms improved significantly, far vision improved by two to three rows, and a decrease in diopter after mydriasis (degree of reduction  $\geq 0.50D$ ). Invalid: symptoms were not relieved after treatment, the improvement of far vision was less than two rows, and the decrease in diopter was less than 0.50D after mydriasis. Total effective rate = (remarkable effect + valid) / total number of cases  $\times 100\%$ .

### 2.5. Statistical analysis

All data were expressed in mean  $\pm$  standard deviation and  $X^2$  test was conducted,  $\alpha = 0.05$ .  $p < 0.05$  indicates a difference,  $p < 0.01$  indicates a significant difference,  $p > 0.05$  indicates no significant difference. SPSS 19.0 was used for statistical analysis.

## 3. Results

### 3.1. Comparison of visual acuity before and after treatment

After treatment, the visual acuity of the six groups improved in varying degrees ( $p < 0.05$ ), but the visual acuity of the traditional Chinese medicine comprehensive therapy group significantly improved compared with the other five groups ( $p < 0.05$ ), as can be seen in **Table 1**.

**Table 1.** Comparison of visual acuity before and after treatment (n = 20) ( $\bar{x} \pm s$ )

Group	Before treatment	After treatment
Western medicine group	0.38 ± 0.12	0.55 ± 0.13 <sup>#</sup>
Ultrasonic group	0.37 ± 0.13	0.48 ± 0.12 <sup>#Δ</sup>
Auricular point group	0.40 ± 0.13	0.45 ± 0.15 <sup>#Δ▲</sup>
Acupuncture group	0.41 ± 0.15	0.53 ± 0.11 <sup>#Δ▲*</sup>
Traditional Chinese oral decoction group	0.39 ± 0.16	0.51 ± 0.14 <sup>#Δ▲**</sup>
TCM comprehensive therapy group	0.40 ± 0.20	0.58 ± 0.19 <sup>#Δ▲**•</sup>

Compared with before treatment, <sup>#</sup>*p* < 0.05; compared with after treatment, <sup>♦</sup>*p* < 0.05; compared with western medicine group, <sup>Δ</sup>*p* < 0.05; compared with ultrasonic group, <sup>▲</sup>*p* < 0.05; compared with auricular point group, <sup>\*</sup>*p* < 0.05; compared with acupuncture group, <sup>\*\*</sup>*p* < 0.05; compared with traditional Chinese oral decoction group, <sup>•</sup>*p* < 0.05

### 3.2. Comparison of diopter before and after treatment

After treatment, the diopter of the six groups decreased to varying degrees compared with that before treatment (*p* < 0.05), but the diopter of the traditional Chinese medicine comprehensive therapy group significantly improved compared with the other five groups (*p* < 0.05), as shown in **Table 2**.

**Table 2.** Comparison of diopter before and after treatment (n = 20) (D,  $\bar{x} \pm s$ )

Group	Before treatment	After treatment
Western medicine group	-1.28 ± 0.17	-1.15 ± 0.14 <sup>#</sup>
Ultrasonic group	-1.27 ± 0.18	-1.20 ± 0.15 <sup>#Δ</sup>
Auricular point group	-1.29 ± 0.20	-1.22 ± 0.14 <sup>#Δ▲</sup>
Acupuncture group	-1.32 ± 0.14	-1.17 ± 0.15 <sup>#Δ▲*</sup>
Traditional Chinese oral decoction group	-1.30 ± 0.18	-1.19 ± 0.15 <sup>#Δ▲**</sup>
TCM comprehensive therapy group	-1.29 ± 0.19	-1.11 ± 0.16 <sup>#Δ▲**•</sup>

Compared with before treatment, <sup>#</sup>*p* < 0.05; compared with after treatment, <sup>♦</sup>*p* < 0.05; compared with western medicine group, <sup>Δ</sup>*p* < 0.05; compared with ultrasonic group, <sup>▲</sup>*p* < 0.05; compared with auricular point group, <sup>\*</sup>*p* < 0.05; compared with acupuncture group, <sup>\*\*</sup>*p* < 0.05; compared with traditional Chinese oral decoction group, <sup>•</sup>*p* < 0.05

### 3.3. Comparison of ocular axis before and after treatment

In all six groups, there was no significant change in the ocular axis after treatment compared with before treatment (*p* > 0.05), as shown in **Table 3**.

**Table 3.** Comparison of ocular axis before and after treatment (n = 20) (mm,  $\bar{x} \pm s$ )

Group	Before treatment	After treatment
Western medicine group	23.92 ± 0.47	23.95 ± 0.51 <sup>#</sup>
Ultrasonic group	23.95 ± 0.56	23.97 ± 0.57 <sup>#</sup>
Auricular point group	23.91 ± 0.53	23.94 ± 0.60 <sup>#</sup>
Acupuncture group	23.88 ± 0.50	23.92 ± 0.46 <sup>#</sup>
Traditional Chinese oral decoction group	23.90 ± 0.49	23.97 ± 0.55 <sup>#</sup>
TCM comprehensive therapy group	23.89 ± 0.45	23.90 ± 0.41 <sup>#</sup>

Compared with before treatment, the ocular axis of the six groups had no significant difference, <sup>#</sup>*p* > 0.05; from multiple comparisons among different groups, there was no significant difference between each group (*p* > 0.05).

### 3.4. Comparison of unaided visual acuity among the six groups 6 months after treatment

Six months after treatment, the unaided visual acuity of the six groups decreased in varying degrees on the basis of the original findings ( $p < 0.05$ ), but the decrease in the traditional Chinese medicine comprehensive therapy group was smaller than that of the other five groups ( $p < 0.05$ ), indicating that the visual acuity of the traditional Chinese medicine comprehensive therapy group is more stable than the other five groups, as shown in **Table 4**.

**Table 4.** Unaided visual acuity after 6 months of follow-up ( $\bar{x} \pm s$ )

Group	After treatment	Follow up
Western medicine group	0.55 ± 0.13	0.52 ± 0.15♦
Ultrasonic group	0.48 ± 0.12	0.44 ± 0.13♦△
Auricular point group	0.45 ± 0.15	0.43 ± 0.17♦△▲*
Acupuncture group	0.53 ± 0.11	0.50 ± 0.12♦△▲*
Traditional Chinese oral decoction group	0.51 ± 0.14	0.48 ± 0.10♦△▲**
TCM comprehensive therapy group	0.58 ± 0.19	0.57 ± 0.19♦△▲**•

Compared with after treatment, ♦ $p < 0.05$ ; compared with western medicine group, △ $p < 0.05$ ; compared with ultrasonic group, ▲ $p < 0.05$ ; compared with auricular point group, \* $p < 0.05$ ; compared with acupuncture group, \*\* $p < 0.05$ ; compared with traditional Chinese oral decoction group, • $p < 0.05$

### 3.5. Comparison of diopter among the six groups 6 months after treatment

Six months after treatment, the diopter of the six groups increased in varying degrees on the basis of the original findings ( $p < 0.05$ ), but the increase in the TCM comprehensive therapy group was smaller than that of the other five groups ( $p < 0.05$ ), indicating that TCM comprehensive therapy can delay the progress of juvenile myopia, as shown in **Table 5**.

**Table 5.** Comparison of diopter among the six groups 6 months after treatment (D,  $\bar{x} \pm s$ )

Group	After treatment	Follow up
Western medicine group	-1.15 ± 0.14	-1.17 ± 0.12♦
Ultrasonic group	-1.20 ± 0.15	-1.23 ± 0.13♦△
Auricular point group	-1.22 ± 0.14	-1.24 ± 0.14♦△▲
Acupuncture group	-1.17 ± 0.15	-1.20 ± 0.11♦△▲*
Traditional Chinese oral decoction group	-1.19 ± 0.15	-1.22 ± 0.12♦△▲**
TCM comprehensive therapy group	-1.11 ± 0.16	-1.12 ± 0.14♦△▲**•

Compared with after treatment, ♦ $p < 0.05$ ; compared with western medicine group, △ $p < 0.05$ ; compared with ultrasonic group, ▲ $p < 0.05$ ; compared with auricular point group, \* $p < 0.05$ ; compared with acupuncture group, \*\* $p < 0.05$ ; compared with traditional Chinese oral decoction group, • $p < 0.05$

### 3.6. Comparison of efficacy

The improvement of visual acuity 6 months after clinical remission was recorded. The comparison of effective rates after 6 months of follow-up is shown in **Table 6**.

**Table 6.** Comparison of effective rates after 6 months of follow-up (cases)

Group	Number of cases	Remarkable effect (%)	Valid (%)	Invalid (%)	Effective rate (%)
Western medicine group	20	4 (20)	13 (65)	3 (15)	85
Ultrasonic group	20	1 (5)	9 (45)	10 (50)	50
Auricular point group	20	1 (5)	8 (40)	11 (55)	45
Acupuncture group	20	2 (10)	11 (55)	7 (35)	65
Traditional Chinese oral decoction group	20	2 (10)	10 (50)	8 (40)	60
TCM comprehensive therapy group	20	5 (25)	13 (65)	2 (10)	90 <sup>#△▲*※</sup>

Compared with western medicine group, <sup>#</sup> $p < 0.05$ ; compared with ultrasound group, <sup>△</sup> $p < 0.05$ ; compared with auricular point group, <sup>▲</sup> $p < 0.05$ ; compared with acupuncture group, <sup>\*</sup> $p < 0.05$ ; compared with traditional Chinese oral decoction group, <sup>※</sup> $p < 0.05$

#### 4. Discussion

In modern medicine, there are three types of ametropia: myopia, hyperopia, and astigmatism. At present, myopia is the main cause of visual impairment in adolescence. In China, the prevalence of juvenile myopia is 55.7%, of which primary and secondary school students account for 36%. The critical period of vision development is before the age of 9, so juvenile myopia should be addressed at an early age. It is not only a medical problem, but also a social problem in every family <sup>[8]</sup>. There are many causes of myopia. One of the causes is physiological heredity. Based on epidemiological research, the incidence of myopia is often characterized by family aggregation, and its incidence in the same family is as high as 2.09% to 3.86% <sup>[9]</sup>. In a study <sup>[10]</sup>, 1,020 primary school students were divided into three groups according to their optometry results: non-myopia group, low myopia group, as well as medium and high myopia group; the study concluded that the degree of myopia in a child is directly proportional to the degree of myopia of both parents. In addition, the degree of myopia of a child who has both parents was found higher than that of those with one parent or no parents. Therefore, the genetic factor is one of the main factors leading to myopia. Other factors include environmental factors. Due to the high academic pressure, students do not relax their eyes when reading or writing over a duration of time; hence, the adjustment function of their eyes is not well-exercised. This results in functional abnormalities, such as delayed adjustment, decreased adjustment amplitude, and reduced adjustment sensitivity <sup>[11]</sup>. Whenever the eyes are used in close range, the eyes' regulatory response is lesser than the regulatory stimulus of the corresponding distance, which is the regulatory lag. The higher the degree of myopia, the greater the adjustment lag and the longer the ocular axis, which further aggravates myopia <sup>[12]</sup>. Poor reading posture and lack of light are also some of the factors that lead to myopia. In addition, due to the continuous development of science and technology, the use of electronic devices has greatly increased the duration spent looking at these devices. Especially during COVID-19, online teaching has become the most common way of teaching. Due to prolonged usage of electronic devices, the vision of 67.7% of teenagers in China has deteriorated in just one year <sup>[13]</sup>.

Although the prevalence of myopia is increasing year by year, there is no cure in modern medicine. The most common treatment methods include optical correction, drug treatment, and surgical treatment. Since teenagers are generally younger and have more surgical complications, surgery is not suitable for teenagers with myopia. Traditional frame glasses are the most common in optical correction, but they are inconvenient to wear in daily life, and they do not prevent the further aggravation of myopia. The long-term use of corneal shaping lenses carries significant risks, including dry eyes, corneal hypoxia, ocular infection, and inflammation owing to poor sanitation. Drug treatment involves using atropine eyedrops. Its long-term use also carries some side effects, including photophobia, blurred vision, attenuation of ocular

function control, allergies, and other adverse reactions [14].

In traditional Chinese medicine, myopia is under the category of “being able to be near and afraid to be far.” According to the “Treatise on the Causes of Most Diseases,” the viscera are injured by fatigue, liver Qi is insufficient, and the Qi of essence is weakened by wind evil, so hyperopia is not possible. It has been pointed out that the etiology and pathogenesis of hyperopia are the lack of heart Yang, and the divine light cannot travel far, or there is a deficiency in the liver and kidney, with insufficient blood essence and weakened divine light [15]. In view of its pathogenesis, traditional Chinese medicine mainly focuses on supplementing Qi and nourishing the heart, tonifying the liver and kidney, as well as dredging the eyes and collaterals. Due to the circulation of human meridians, the benefits and losses of the five zang organs are closely related to the eyes. Therefore, in order to improve the quality of life of teenagers and promote a healthy growth, a comprehensive treatment with features of traditional Chinese medicine is often used in clinical practice.

The research group has been engaged in clinical work for more than 20 years. They found that TCM comprehensive therapy has a unique effect on juvenile myopia. The results of this study showed that after treatment, the vision of the traditional Chinese medicine comprehensive therapy group significantly improved ( $p < 0.05$ ), and there was a significant reduction in the diopter reading ( $p < 0.05$ ) compared with the western medicine group, ultrasonic group, auricular point group, acupuncture group, and traditional Chinese oral decoction group. Six months after treatment, the visual acuity of the six groups decreased in varying degrees on the basis of the original findings ( $p < 0.05$ ), but the decrease of the traditional Chinese medicine comprehensive therapy group was smaller than the other five groups, indicating an achievement of visual stability. Other than that, the diopter of the six groups also increased in varying degrees ( $p < 0.05$ ). Compared with the other five groups, the diopter of the traditional Chinese medicine comprehensive therapy group also increased but at a lesser degree. At the same time, there was no significant difference in the ocular axis before and after treatment ( $p > 0.05$ ), suggesting that the treatment had no significant effect in improving ocular axis over a short period of time. The follow-up in the study showed that the effective rates of the other five groups were significantly lower than the TCM comprehensive therapy group. This indicates that the comprehensive therapy of traditional Chinese medicine can effectively improve the vision of patients, reduce their diopter, delay the process of juvenile myopia, and play a significant role in the prevention and treatment of juvenile myopia.

Traditional Chinese medicine comprehensive therapy refers to the use of acupuncture, auricular points, oral herbal medicine, ultrasonic devices, and other techniques to formulate an appropriate treatment that is in line with the patient's own condition. Acupuncture and moxibustion involve the identification of Sizhukong, Jingming, Zanzhu, Tongziliao, Sibai, Chengqi, Yiming, Qiuhou, Taiyang, etc. and the selection of other acupuncture points for treatment. Yangming meridians, Shaoyang meridians, and Taiyang meridians are all closely related to the eyes. Yangming meridians are full of Qi and blood. Acupuncture at Sibai can dispel wind and brighten the eyes, dredge meridians, as well as activate collaterals; acupuncture at Chengqi can brighten the eyes and benefit orifices, as well as connect Qi and blood internally and externally. Sizhukong and Tongziliao are both Shaoyang meridians, and they are located in the eyes. Acupuncture helps in unblocking the flow of blood and Qi in the eyes. Jingming and Zanzhu at the foot sun bladder meridian have spasmolytic and visual effects. The other points, Yiming, Qiuhou, and Taiyang, are ophthalmology points. All acupoints cooperate together and locally, so as to dredge the eye meridians, promote the smooth flow of Qi and blood, as well as achieve the purpose of dredging the meridians and brightening the eyes. Modern medical research believes that acupuncture can stimulate the sympathetic nerve innervating the ciliary muscles and alleviate muscle spasms caused by long-term muscle tension to a certain extent, so as to adjust refraction and improve myopia [16]. Auricular acupoints are based on the meridian theory and viscera theory of traditional Chinese medicine. Auricular acupuncture or auricular

acupoint sticking method is used to relax blood vessels and alleviate muscle spasms. The ear has rich lymphatic vessels, blood vessels, and other tissues. It has thin subcutaneous tissues. When the ear is stimulated, it is easier to convey the signal to the nerve and brain, and from the brain to the organs, thus allowing the brain to take charge of the overall coordination and improving blood supply to the eyes, so as to alleviate myopia<sup>[17,18]</sup>. The treatment used in the traditional Chinese oral decoction group focused on dialectics by gauging the patient's condition, clarifying the syndrome type, and prescribing oral traditional Chinese medicine, so as to coordinate the functions of zangfu organs as a whole, balance Yin and Yang, tonify the liver and kidney, activate blood and dredge the orifices, improve blood circulation around the eyes, as well as increase blood flow, thus improving visual sensitivity and achieving the effect of brightening the eyes<sup>[19]</sup>. In the ultrasonic group, safflower was used as the introduction liquid to massage the eyes. The safflower introduction liquid will slowly penetrate into the eyes and then be converted into heat energy, which dilates local blood vessels, increases blood flow, and enhances vascular permeability, so as to improve the nutritional supply to the eyes, relieve and regulate ciliary muscles, as well as alleviate visual fatigue<sup>[20]</sup>.

In conclusion, this study used the comprehensive therapy of traditional Chinese medicine and achieved good prevention and treatment results, which delayed the progress of juvenile myopia. However, at present, there is still a lack of standardized clinical guidance and scientific efficacy evaluation for the prevention and treatment of juvenile myopia with TCM comprehensive therapy. In the future, more clinical trials along with the processing and analysis of big data are needed to verify the therapeutic effect of traditional Chinese medicine comprehensive therapy for the prevention and control of juvenile myopia.

## Funding

Xi'an Hospital of Traditional Chinese Medicine 2019 Hospital Level Scientific Research Project (Project Number: YJ201905)

## Disclosure statement

The authors declare no conflict of interest.

## References

- [1] Cai XB, Shen SR, Chen DF, et al., 2019, An Overview of Myopia Genetics. *Exp Eye Res*, 188: 107778.
- [2] Shi H, Ma S, Zhang Y, et al., 2021, Research Progress on Influencing Factors of Myopia. *Medical Review*, 2021(12): 2391-2396.
- [3] Li F, 1996, Completed Book of Ophthalmology, People's Health Publishing House, Beijing.
- [4] Peng Q, 2012, Ophthalmology of Traditional Chinese Medicine, China Traditional Chinese Medicine Press, Beijing.
- [5] Ji Y, 2019, Clinical Efficacy of 1% Atropine Eye Solution in the Treatment of Early Myopia in Adolescents. *Chinese Medical Guidelines*, 17(28): 28-29.
- [6] Jin Q, Hao X, Xie L, et al., 2021, Study on Acupuncture and Moxibustion Prevention and Treatment of Adolescent Myopia acupoint Selection Law. *Liaoning Journal of Traditional Chinese Medicine*, 48(04): 177-180.
- [7] 1994, State Administration of Traditional Chinese Medicine Diagnostic and Curative Effect Criteria of TCM Diseases and Syndromes, Nanjing University Press, Nanjing, 1-36, 95-119.



- [8] Li L, 2021, Current Situation and Measures of Family Prevention and Control of Myopia in Primary School Students. *Science and Technology Wind*, 2021(17): 154-156.
- [9] Chen L, He H, 2020, Research Progress of Traditional Chinese and Western Medicine on Influencing Factors and Prevention and Control of Myopia. *China Journal of Traditional Chinese Medicine Ophthalmology*, 30(01): 64-67.
- [10] Yang L, Ding W, Liu C, et al., 2018, Cause Analysis and Prevention Measures of Myopia in School-Aged Children. *Chinese Community Physician*, 34(31): 171-172.
- [11] Lv Y, Meng H, Shen Z, 2020, Research Progress of Binocular Visual Function and Visual Training Effect in Children and Adolescents with Myopia. *Medical Journal of Yanbian University*, 43(03): 239-241.
- [12] Yue H, Ren Q, Mei Y, 2013, The Controlling Effect of Visual Training on the Development of Myopia in Adolescents with Regulatory Lag. *Chinese Journal of Modern Medicine*, 23(29): 89-91.
- [13] Fang C, Guo C, 2021, Study on Visual Acuity Status and Influencing Factors of Ordinary Senior High School Students in China: Based on the Survey Data of Ten Provinces and Cities During Epidemic Period. *Educational Science Research*, 2021(02): 57-63.
- [14] Luo X, Zhang L, Liu Y, et al., 2012, Observation on the Short-Term Efficacy of Traditional Chinese Medicine Combined Therapy in the Treatment of Juvenile Mild Myopia. *Western Traditional Chinese Medicine*, 25(05): 90-91.
- [15] Liu S, Song J, Bi H, 2021, Research Progress on Etiology and Pathogenesis of Myopia. *Shandong Journal of Traditional Chinese Medicine*, 40(06): 658-661, 667.
- [16] Chen L, He H, 2020, Research Progress of Traditional Chinese and Western Medicine on Influencing Factors and Prevention and Control of Myopia. *China Journal of Traditional Chinese Medicine Ophthalmology*, 30(01): 64-67.
- [17] Guo C, Huang D, Ren H, et al., 2018, Analysis of the Therapeutic Effect of Combined Acupoint Massage on Mild Myopia and Moderate Myopia in Adolescents. *Liaoning Journal of Traditional Chinese Medicine*, 45(09): 1962-1965.
- [18] Li X, Yu , Hu X, et al., 2019, Clinical Observation on Treatment of Pediatric Myopia with Liver and Kidney Deficiency by Ear Acupoint Pressing bean and Pediatric Massage. *Chinese Folk Therapy*, 27(19): 40-42.
- [19] Jiang T, 2021, Study on the Clinical Effectiveness of Comprehensive Treatment of Chinese Medicine for Adolescent Myopia. *Medical Dietotherapy and Health*, 19(12): 19-20.
- [20] Teng Y, Zhang L, Su L, et al., 2020, A Stratified Randomized Controlled Study on the Intervention of TCM Comprehensive Therapy in Adolescent Patients with Simple Myopia. *Journal of Traditional Chinese Medicine*, 61(14): 1253-1258.

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