

Advances in Chinese Medicine Research on Autism Spectrum Disorders

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Keywords: Autism Spectrum Disorder Traditional Chinese Medicine, Review

Abstract: Autism spectrum disorder (ASD) is a neurological developmental disorder. It has attracted widespread attention because of its increasing incidence year by year. At present, there is no specific medicine for ASD in Western medicine. Traditional Chinese Medicine treatment includes Chinese medicine, acupuncture, Massage, and auricular acupressure. By searching, reviewing, and summarizing the literature, we summarize the current recognition and treatment of autism in Chinese medicine to provide a reference for clinical treatment.

Autism spectrum disorder (ASD) is a neurodevelopmental disorder with persistent social communication deficits, repetitive stereotypic behaviors, and narrowed interests (Figure 1). Usually starting in infancy and early childhood, it not only brings health risks to the child but also poses a serious economic burden to families. The latest prevalence of ASD in 8-year-old children in the United States is reported to be 1 in 54[1] (Figure 2), and it is increasing year by year[2]. The pathogenesis of ASD is not yet clear. The etiology may be related to various factors such as genetics and immunity. There is no effective treatment method. However, many scholars have made certain achievements in treating ASD children with extensive and profound Chinese medicine. This article reviews the research progress of traditional Chinese medicine in treating ASD in order to provide a basis for clinical prevention and treatment of ASD.

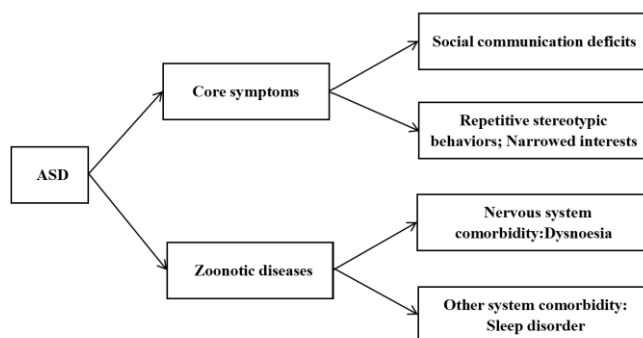


Figure 1: Clinical manifestation.

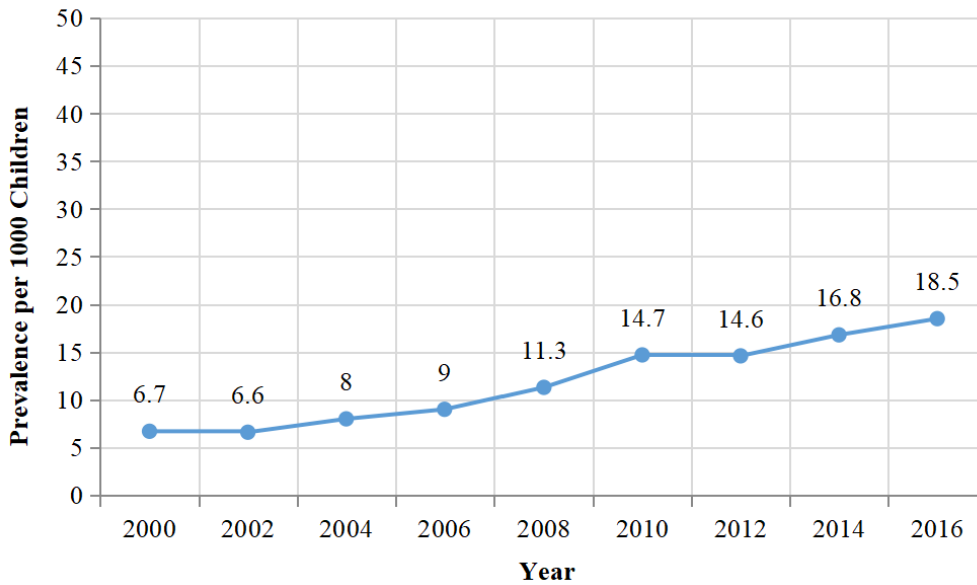


Figure 2: Prevalence among 8-year-olds in the United States.

1. Etiology and Pathogenesis

The name of “autism” does not exist in ancient literature, but related symptoms are scattered in ancient Chinese medical texts, such as “child fainting”, “five delays”, “no wisdom”. ASD is considered located in the brain and is closely related to the heart, liver, spleen, and kidney. In addition, the clinical evidence is often divided into four types: fire in the heart and liver, phlegm clouding the heart, deficiency of kidney essence, and deficiency of both heart and spleen. The condition of ASD is complex and variable. Therefore, there is a lack of systematic identification ideas. The etiology and pathogenesis of ASD were recapitulated based on the compilation of relevant literature (Figure 3).

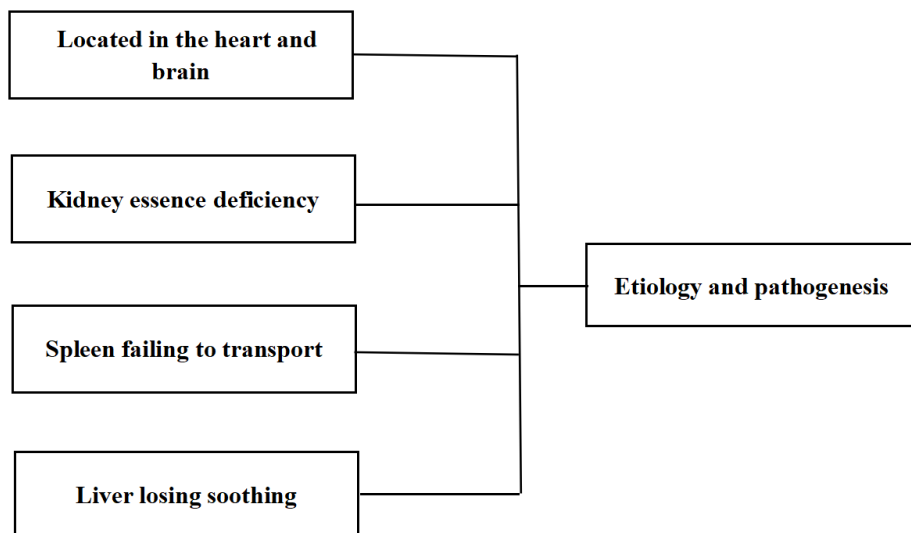


Figure 3: Etiology and pathogenesis.

1.1. The Disease Is Located In the Heart and Brain

The Plain Question · Five Viscera Generation said: “blood all belongs to the heart”, Essence of Huitong Medical Classics wrote: the internal organs and meridians are meeting in the brain, the source of fluid access”. The heart and brain are connected by blood vessels. The normal function of the brain reflects the moistening and infiltration function of the heart blood. According to Ding Yiyun et al[3], the occurrence of autism in children is related to the “occlusion of the ducts” and the heart’s mastery of “any matter”. Studies [4] suggested that acupuncture at Changqiang acupoint could downregulate the expression of related proteins in the hippocampus of model rats, thus improving their abnormal behavior patterns. “The heart and brain highly connect with each other, making their spirits always active”. In addition, the heart and brain are closely linked. Hence, the ASD is located in the heart and brain.

1.2. Kidney Essence Deficiency, Loss of Nourishment for the Primary Spirit

Wang Yannan et al[5] established the spleen-kidney-brain connection theory based on the “cerebro-intestinal axis” in modern medicine. In the Miraculous Pivot · Channels, it is said that people become refined first when they are born, followed by the birth of the brain marrow. It is pointed out that if the kidney essence is sufficient, the marrow will have a source to be nourished, and the vital essence will be hidden. The kidney communicates with the brain through the Directing Vessel and the foot solar bladder meridian. The Plain Question of Internal Classic of Huang Di says: “The kidney is the source of vital energy and the sound is produced by the kidney energy. Therefore, children with ASD may have symptoms of late speech and soft mouth. Liu Xiaoping believes that the intellectual and motor developmental disorders in children with ASD are mostly due to the congenital deficiency of kidney essence[6].

1.3. The Spleen Is Not Healthy and the Spirit Is Not Transformed

The Plain Questions · Treatise on Meridians and Veins says: “Drinking into the stomach, overflowing essence, upward transmission to the spleen, spleen and qi dispersing essence, upward return to the lungs, through the water channel, downward transmission to the bladder, water essence four spread, five meridians parallel.” Zhang Ye et al [7] proposed that the spleen is the source of essence transformation, and. Meanwhile, feeding the hind heaven, the spleen is the pivot of the five organs up and down. Loss of spleen health after birth can lead to a deficiency of the innate kidney essence. Consequently, children will show typical symptoms of ASD such as regression of speech and mental illiteracy. As the ancient saying goes, “all diseases are caused by phlegm.” Professor Wang Sumei holds that the symptoms of ASD are complex and varied due to phlegm. The spleen is the source of phlegm. If the spleen is not healthy, phlegm will be generated internally. Finally, the brain will be clouded by phlegm and then develop[8].

1.4. Loss of Drainage F Liver and Rebellion of the Mind

Cheng Yanran et al[9] pointed out that the pathogenesis of ASD is closely related to the physiological characteristics and functions of the liver. The liver can regulate qi and regulate emotions. If the liver dredges and discharges abnormally, the liver qi rises and develops unfavorably, leading to growth retardation in children. Moreover, if the liver dredges and discharges abnormally, the liver qi becomes stagnant. Thus, children with ASD show a lonely and self-contained state. Xia Xiang believed that the symptoms of autism such as gaze avoidance and mania and irritability are caused by the loss of liver draining and internal wind disturbance[10].

2. Treatments

At present, mostly based on acupuncture, the treatment of autism in Chinese medicine is supplemented by traditional Chinese medicine and pressing manipulation (Figure 4). It is also combined with modern rehabilitation training such as educational training, behavior modification, and speech therapy[11]. Based on the characteristics of the etiology and pathogenesis, clinicians use traditional Chinese medicine therapies to adjust the functions of the internal organs and bring yin and yang into balance.

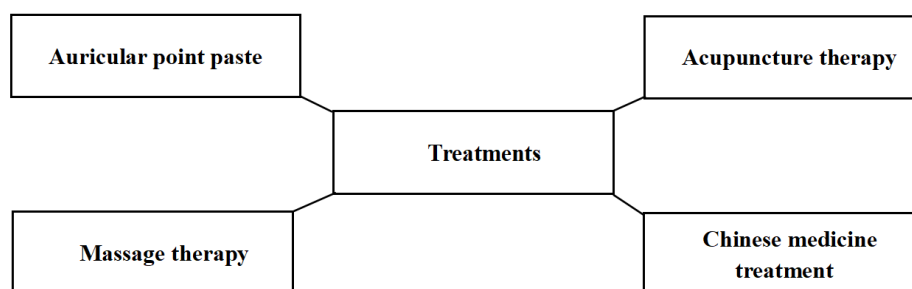


Figure 4: Treatments.

2.1. Acupuncture Therapy

Acupuncture is widely used in the treatment of children with ASD and has some clinical efficacy. Tu Zhihui et al[12] found that the treatment of children with ASD using acupuncture therapy on the basis of rehabilitation training could improve the efficiency. Acupuncture methods mainly include scalp acupuncture, Jin Three-needle electroacupuncture, and tongue acupuncture.

2.1.1. Scalp Acupuncture

Scalp acupuncture is most commonly used in clinical practice. Scalp acupuncture, guided by the theory of internal organs and meridians, directly stimulates the head acupuncture points to stimulate the meridian qi, activate the meridians, and strengthen the brain and marrow, thus improving intelligence and correcting behavioral abnormalities[13]. On the basis of inheriting the “Jin Three-needle”, Yuan Qing created the “Mind-regulating Acupuncture” with personal characteristics. By the combined mode of Si Shen Acupuncture - Brain, Three Acupuncture - Ting Shen Acupuncture - Zhi Sanzhen, This treatment has shown significant efficacy in improving the behavioral abnormalities and social skills of children with ASD[14]. Liang Yamei et al [15] treated children with ASD with head acupuncture together with language training, which significantly improved the children's language expression and comprehension than before treatment. He Yanna[16] adopted Lin's scalp acupuncture to intervene in children with ASD and improved the children's social adjustment ability and emotional cognition.

2.1.2. Other Needle Methods

WONG et al[17] found that electroacupuncture had significant effects in improving children's language, expression, and behavior. Nevertheless, it was not suitable for children with cardiac arrhythmia and epilepsy because of the high stimulation. Wu Xu selected the acupuncture method of Baihui, Yin Tang and Yang Ming meridian points for the treatment of ASD under the theory of “regulating the intestines to treat spirit”[18]. Zhao Ningman et al[19] used eye acupuncture with acupuncture point injection to relieve the gaze communication disorder in children with ASD. He Jinhua [20] et al advocated head and tongue acupuncture combined with a comprehensive

rehabilitation therapy intervention for children with ASD, which was effective in improving lonely behavior.

2.2. Chinese Medicine Treatment

Under the guidance of TCM diagnosis and treatment, Chinese medicine has become one of the effective options for the treatment of ASD with the advantage of individualized treatment. The current treatment of the disease is based on the following four treatment rules according to the disease mechanism. It is of guiding significance for clinical research (Figure 5).

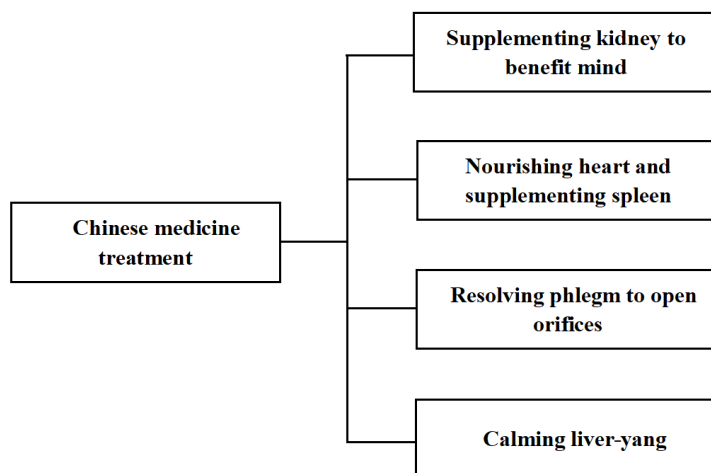


Figure 5: Chinese medicine treatment.

2.2.1. Tonifying the Kidney and Educating the Mind

Yu Ocean et al[21] pointed out that vitamin D was focused according to kidney tonifying and essence filling therapy to treat children with ASD. Jiang Xiaoyu et al[22] observed the efficacy of protecting kidney-qi based Kindling decoction in treating children with ASD. The control group was only given intervention training while the treatment group was treated with kindling decoction orally on the basis of the control group. After three courses of treatment, the efficiency of the treatment group was significantly higher than that of the control group ($P < 0.05$).

2.2.2. Nourishing the Heart and Tonifying the Spleen

Zhou Rong Yi[23] analyzed the distribution pattern of TCM evidence types in ASD and found that the heart and spleen deficiency type was the most common. Cao Peiji et al[24] used Guipi decoction with additional flavor as an adjunctive treatment for children with ASD of the heart and spleen deficiency type. It can promote sleep and physical and mental development of children. Cao Jianying[25] et al. founded Nourishing Heart and Anti-closure Decoction. They combined it with intervention training to treat children with ASD of both heart and spleen deficiency. CARS scores decreased in both groups after treatment and the observation group was lower than the control group ($P < 0.05$).

2.2.3. Resolving Phlegm and Inducing Resuscitation

Wu Maier et al[26] found that the treatment of children with ASD by using the combination of additive warm bile decoction and teaching training could correct the abnormal behavior of the children and restore their mental health. Wang Sumei believed that the treatment of children with

ASD should be based on both the symptoms and the root cause. On the basis of the treatment of tonifying the kidneys and benefiting the marrow, educating and opening the ligaments, appropriate attention should be given to resolving phlegm and inducing resuscitation[9].

2.2.4. Calming Liver-Yang

Gao Feng et al[27] applied Chai Hu plus Gui Zhi Long Bone Oyster Soup to treat children with ASD with hyperactive liver yang. Children's emotional behavior and gastrointestinal symptoms were improved, and sleep quality was enhanced. After summarizing Tang Weiyong's experience in treating children with ASD, Lu Chaoyuan et al[28] stated that the treatment of children with manic ASD is often based on the method of pacifying the liver and calming the wind by Tianma Gouteng decoction and Antelope Horns Soup with addition and subtraction.

2.3. Massage Therapy

Massage can deliver stimulation to the internal organs and nervous system and play a role in preventing and correcting abnormal neurodevelopment[29]. Pediatric tui na, acupoint point rubbing, and chiropractic are commonly used in ASD. Feng et al [30] built a standardized massage intervention program for ASD based on the theory of "Promoting the vein to enter the brain". By pressing, pushing, and kneading as the main techniques, it effectively improved the social and learning abilities of the children. Kong Yamin et al[31] randomly divided 96 children with ASD into two groups, with the control group undergoing rehabilitation training and the observation group undergoing rehabilitation training combined with the three-part massage method to open the orifices. After six months of treatment, the ATEC score of the observation group was better than that of the control group, indicating that "Three part massage for resuscitation" can dredge the meridians, replenish the kidney and refresh the brain, thus improving the language and behavior, social communication and other functions of children with ASD, and reducing the autistic symptoms of children.

2.4. Auricular Point Acupressure

Traditional Chinese medicine believes that the ear is gathered by the blood vessels. According to the holographic theory, five viscera and six internal organs can be found in the ear. Moreover, stimulating the corresponding points can promote the restoration of the functions of the corresponding organs. Jim Tingting et al[32] gave ear point pressure beam and educational rehabilitation therapy to the study group and educational rehabilitation therapy to the control group. The results showed that the efficacy of the control group was better than that of the control group ($P < 0.05$). Studies have shown[33-34] that, based on head acupuncture treatment with auricular acupressure, the ABC or CARS scores were taken to compare the scores before and after treatment, and the results showed that this method had significant benefits for children in various aspects such as interpersonal communication and self-care.

2.5. Other Therapies

Some studies have found that intestinal flora can have an impact on brain function through the microbial-gut-brain axis model, which plays a key role in brain development[35]. Based on the theory of "brain-gut axis", Zhou Zhijie[36] treated 12 children with ASD with spleen transportation. Children's gastrointestinal symptoms were significantly improved, which may be related to the reduction of food-specific IgG antibodies. Zhang Wenliu[37] showed that by having children complete the Five Animal Exercises, stereotypical behavior could be reduced and narrow interest

could be improved. The use of five elements, music combined with acupuncture in the treatment of children with ASD has also been beneficial in stabilizing the mood of children with ASD and improving verbal expression[38].

3. Summary

In recent years, clinical studies on the treatment of ASD with TCM have gradually increased, with a clinical focus on correcting abnormal behaviors and addressing social barriers, which have achieved great results. However, there are still shortcomings: It lacks basic research and unknown mechanisms in the treatment of ASD in TCM, and the evaluation of efficacy is mainly through clinical observation, lacking biological data support. There is no specific medicine for ASD. Thus, early detection, early diagnosis, and early intervention are needed. TCM treatment should be based on evidence-based treatment. By multiple therapies and developing treatment plans with individual characteristics according to the condition, as well as combining with Western medicine therapies, it can better rehabilitate children with ASD and return to society as early as possible.

Acknowledgement

Funding Information: This study is funded by the Qinchuangyuan TCM Innovation Research Transformation Project of Shaanxi Provincial Administration of Traditional Chinese Medicine (No. 2022-QCYZH-008)

References

- [1] MAENNER MJ, SHAW KA, BAI O J, et al. Prevalence of autism spectrum disorder among children aged 8 years—autism and developmental disabilities monitoring network, 11 sites, United States, 2016. *MMWR Surveill Summ*, 2020, 69(4):1-12.
- [2] Fang Lingling, Gao Hui, Wu De, et al. Advances in developmental neurobiology of autism spectrum disorders. *Chinese Journal of Rehabilitation Medicine*, 2019, 35(5):613-617.
- [3] Ding Yiyun, Wei Li, Wang Sumei. Research progress of traditional Chinese and western medicine in autism and analysis of traditional Chinese medicine research ideas. *World of Traditional Chinese Medicine*, 2014, 9 (6):820-823.
- [4] Yu Ping, Zheng Changyue, Li Feng, et al. Effect of acupuncture at Changqiang Point on expression of related proteins in hippocampus of autism model rats. *Modern Distance Education of Chinese Traditional Medicine*, 2019, 17(1):111-113.
- [5] Wang Yanan, Ma Yanfang, Chen Yanni, et al. Research on TCM treatment of autism based on the theory of spleen, kidney and brain connection. *World of Traditional Chinese Medicine*, 2020, 15(16):2486-2489.
- [6] Liu Pan, Jin Xuan, Zhao Ningxia, et al. Liu Xiaoping's understanding of the etiology and pathogenesis of autism spectrum disorder in traditional Chinese medicine. *Chinese Journal of Traditional Chinese Medicine*, 2022, 37(4):1999-2001.
- [7] Zhang Ye, Guo Yaxiong, Ma Yanfang, et al. Discussion on syndrome differentiation of autism based on spleen and stomach. *Global Traditional Chinese Medicine*, 2020, 13(8):1333-1337.
- [8] Hao Hongwen, Liu Yi, Wei Li, et al. Wang Sumei's experience in treating children's autism. *Journal of Traditional Chinese Medicine*, 2016, 57(1):19-21.
- [9] Cheng Yanran, Xiong Zhenfang, He Anne. Treatment of sleep disorder in children with autism from the perspective of liver. *Global Traditional Chinese Medicine*, 2018, 11(4):577-580.
- [10] Xu Yi, Cao Hexin. Xia Xiang's clinical experience in treating children with autism. *Liaoning Journal of Traditional Chinese Medicine*, 2015, 42(7):1204-1206.
- [11] Yan Haihong, Zhang Xilian, Rong Ping, et al. Clinical research progress of Traditional Chinese and Western Medicine in the treatment of children with autism spectrum disorder. *Chinese Journal of Traditional Chinese Medicine*, 2022, 37(2):933-938.
- [12] Tu Zhi-hui, LI Jian-qiang. Clinical observation of acupuncture treatment of children with autism. *Review of Traditional Chinese Medicine*, 2018, 24(3):106-108.
- [13] Sun Zhongren, Lv Xiaolin, Hao Jishun, et al. Research overview of head acupuncture therapy for autism. *Chinese Journal of Traditional Chinese Medicine*, 2017, 32(12):5499-5501.

- [14] Tang Jingqing. *Study on the attribute partial order of Professor Yuan Qing's treatment of children's encephalopathy with the treatment of acupuncture of regulating mind*. Guangzhou: Guangzhou University of Traditional Chinese Medicine, 2018.
- [15] Liang Yamei, Miao Yingying, Zhao Jiajia, et al. *Clinical observation of head acupuncture combined with language training on language rehabilitation of children with autism*. *Pediatrics Journal of Traditional Chinese Medicine*, 2019, 15(3):71-74.
- [16] He Yana. *Observation on the efficacy of scalp acupuncture in the treatment of children with autism*. *Journal of Practical Traditional Chinese Medicine*, 2018, 34(7):833-834.
- [17] WONG VC, CHEN WX. *Randomized controlled trial of electro-acupuncture for autism spectrum disorder*. *Altern Med Rev*, 2010, 15(2):136-146.
- [18] Zhu Lili, Chen Dong, Zhang Yiyi, et al. *Wu Xu's Experience in the treatment of autism spectrum disorder with the acupuncture Method of "Regulating Bowel to cure God"*. *Journal of Traditional Chinese Medicine*, 2020, 61(11): 950-953.
- [19] Zhao Ningxia, Gao Feng, Zhang Ningbo, et al. *Clinical study of eye needle combined with acupoint injection in the treatment of eye communication disorder in autistic children*. *Chinese Journal of Traditional Chinese Medicine*, 2017, 32(10): 4741-4742.
- [20] He Jinhua, Liu Zhixiong, Liu Hongwen, et al. *Clinical study on early intervention of children with autism spectrum disorder with head tongue acupuncture combined with comprehensive rehabilitation*. *Guide to Traditional Chinese Medicine*, 2019, 25(21):74-77.
- [21] Yu Haiyang, Chen Yujia, Liu Huaquan, et al. *Study on the potential target of treatment of autism spectrum disorder based on kidney tonifying therapy: focusing on vitamin D*. *Chinese Journal of Traditional Chinese Medicine*, 2022, 40(1):130-133.
- [22] Jiang Xiaoyu, Cai Zaixin, Zhang Zuomei, et al. *Observation of therapeutic effect of Kindling decoction combined with intervention training on children with autism*. *Chinese Journal of Traditional Chinese Medicine*, 2016, 31(10): 4322-4324.
- [23] Zhou Rongyi, Ma Bingxiang, Zhou Zheng, et al. *Distribution and regularity of TCM syndromes in 180 children with autism spectrum disorder*. *Chinese Journal of Basic Medicine of Traditional Chinese Medicine*, 2021, 27(3): 476-479.
- [24] Cao Peiji, Zhao Yanli. *Effect of Guipi decoction in the adjuvant treatment of autistic children with deficiency of heart and spleen and analysis of CARS score*. *Clinical Research*, 2022, 30(5):128-131.
- [25] Cao Jianying, Qu Xiujun, Wang Suli, et al. *Clinical observation of Yangxin Kangbei decoction combined with intervention training in the treatment of children with autism with deficiency of heart and spleen*. *Henan Traditional Chinese Medicine*, 2019, 39(6):898-900.
- [26] Aynur Wumaer, Liu Xingsheng. *Jiawei Wendan decoction combined with teaching training to treat 21 cases of abnormal behavior in children with autism*. *World Latest Medical Information Abstracts*, 2015, 15(48):138.
- [27] Gao Feng, Zhao Ningxia, Zhang Ningbo, et al. *Clinical study on the treatment of problem behavior of children with autism spectrum disorder by Chaihu and Keel Oyster decoction*. *New Chinese Medicine*, 2019(4):78-80.
- [28] Lu Chaoyuan, Zhao Yun. *Tang Weiyong's experience in treating Autism in children*. *Shanghai Journal of Traditional Chinese Medicine*, 2012(8):23-24.
- [29] Liu Jianbang, Zhang Yajing, Luo Guiqing, et al. *Clinical study on pediatric massage combined with acupuncture treatment of autism*. *New Chinese Medicine*, 2017(8):122-125.
- [30] Feng Xiang, Li Tao, Jiang Quanrui, et al. *Study on the intervention of massage in autism spectrum disorder based on the theory of "Du pulse into brain"*. *Journal of Hunan University of Chinese Medicine*, 2022, 42(3):401-405.
- [31] Kong Yamin, Bai Qingyun, Liu Jiayin. *Clinical observation and mechanism of action of three massage therapy combined with rehabilitation training in the treatment of children with autism spectrum disorder*. *Tianjin Traditional Chinese Medicine*, 2021, 38(3):328-332.
- [32] Zhan Tingting, Zhou Lingzhi, Liang Weijian. *Effect of auricular acupoint pressure and bean combined with education and rehabilitation on children with autism spectrum disorder*. *Chinese and Foreign Women's Health Study*, 2022(5):57-58+68.
- [33] Qin Jinghua. *Effect of auricular acupoint sticking combined with head acupuncture in the treatment of 24 cases of children with autism*. *Clinical Research of Traditional Chinese Medicine*, 2019, 11(20):94-96.
- [34] Jia Jinhua, Liu Tingting. *Clinical analysis of head acupuncture combined with auricular acupoint sticking in the treatment of children with autism*. *Shenzhen Journal of Integrated Traditional Chinese and Western Medicine*, 2017, 27(11): 43-44.
- [35] FLLING C, DINAN TG, CRYAN JF. *Gut microbe to brain signaling: what happens in vagus*. *Neuron*, 2019, 101(6): 998-1002.
- [36] Zhou Zhijie. *Clinical study on the treatment of children with autism spectrum disorder by spleen transport method based on the theory of "gut-brain axis"*. Beijing: Beijing University of Chinese Medicine, 2019.

[37] Zhang Wenliu. *A randomized parallel controlled study of Wuqinxi in the treatment of autism spectrum disorder. Journal of Practical Chinese Medicine*, 2019, 33(4):66-67.

[38] Jiang Yueting, Qian Linxia, Lin Facai. *Application of acupuncture and moxibustion combined with five elements music therapy in children with autism. Chinese Folk Therapy*, 2019, 27(19):9-10.