Physical therapy for Attention Deficit Hyperactivity Disorder (ADHD) in children

Abstract Background: Attention Deficit Hyperactivity Disorder (ADHD) is a common neurodevelopmental mental disorderin children, mainly characterized by attention deficit, hyperactivity, and impulsivity. Its etiology is not yet clear, which greatly hinders the development of children's learning ability, social ability, and quality of life. Physical therapy is an emerging treatment method that is increasingly mature in the treatment of ADHD. **Methods:**Literaturesearchisused to organize 66 influential articles, analyze the commonly used physical therapies for ADHD, explain their principles, effects, and shortcomings, and based on this, propose research prospects. **Results:**Physical therapy has fewer side effects and can improve the neuroendocrine, brain and cognitive functions of children with ADHD, improve the core symptoms and physical fitness of ADHD, promote the development of motor skills, and have a positive impact on their behavioral problems, academic performance, and social adaptation. **Conclusion:** Physical therapy has great potential, but its accessibility, fun, and long-term efficacy need to be improved.

Keyword: Attentiondeficit hyperactivity disorder (ADHD), Physical therapy, Progress

1. Introduction

Attention Deficit Hyperactivity Disorder (ADHD)is a common type of neurodevelopmental mental disorder in childhood. Its symptoms are complex, and clinical manifestations mainly include lack of concentration and short attention time, excessive activity, and impulsivity that are disproportionate to age and developmental level. It is often accompanied by learning difficulties, emotional disorders, motor and behavioral deficits, conduct disorders, and maladaptation. The etiology of ADHD is unclear and is generally believed to be caused by various factors such as genetics, biochemistry, neurophysiology, psychology, and organic lesions in the brain [1]. Thisdisease mostly starts in childhood, with a incidence rate of about 2.59% to 7.25%. In recent years, the disease has been on the rise, and the incidence in boys is more than three times higher than that in girls[2-3]. 70% of ADHD children's symptoms persist until adolescence, and 30-50% persist until adulthood [1,4]. Some scholars believe that ADHD can be a lifelong disease [4].

Medication has always been the preferred clinical treatment for ADHD. Medication therapy can increase attention persistence, reduce hyperactivity and impulsivity, improve writing and motor coordination, improve learning efficiency, improve emotional control, increase peer acceptance, improve interaction, increase self-esteem and confidence, reduce impulsivity and overexcitement, reduce hostility,defiance and being punishment. However, drugs have high dependence and significant side effects, often causing side effects such as decreased appetite, nausea and headache, irritability, sleep disordersandslow growth. These side effects are particularly noticeable during the first 1-2 weeks of medication and gradually decrease thereafter, but most of them cannot be completely eliminated. Meanwhile, due to individual differences in patients, almost all drugs have unsatisfactory therapeutic effects on certain pediatric patients [1,5],

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so physical therapiesare often used in clinical practice as a substitute or adjunct to drug therapy. Common physical therapies include exercise therapy, sensory integration training, EEG biofeedback, repetitive transcranial stimulation, andvirtual realitytechnoque.

In order to further explore the impact of physical therapy on children's ADHD, researchers conducted a mixed theme search using the following search terms on the databases of China National Knowledge Infrastructure, VIP, Wanfang, PubMed, Web of Science, and EBSCO-MEDLINE: Chinese terms(ADHD, treatment, therapy, intervention, physical exercise), and English terms (ADHD, attention deficit /hyperactivity disorder, therapy, treatment, intervention, physical exercise), simultaneously supplemented by manual retrieval and literature tracing, and the search deadline is May 16, 2024. And then, summarized the common therapies for children with ADHD, explore the effects of physical therapy on attention, intelligence, psychology, conduct, motor skills. Finally, physical fitness, and provide reference for future research.

2. Common physical therapies

2.1 Exercise therapy

Exercise therapy is a method based on kinematics and neurophysiology that utilizes the activity of human muscles and joints to prevent and treat diseases, promote the recovery and development of physical and mental functions. Exercise therapy is widely used abroad, mainly including aerobic training, acute exercise training, resistance training, balance training, sensory integration training, and playful exercise training [6]. Although directional exercise [7] and Tai Chi [8] are currently being used in China for children with ADHD, the application of exercise therapy is still relatively limited, possibly due to its long duration, slow effectiveness, and difficulty in control.

The neuropathological mechanism of ADHD is due to poor executive function in the frontal lobe of the brain, resulting in decreased inhibitory function in the cerebral cortex, thereby affecting the development of cognitive function based on attention, sensory input, and integration [9]. Exercise intervention has a positive impact on most cognitive functions, mainly attention [10] and executive function [10-12]. First, from learning motor skills to gradually mastering them, children need to invest a lot of attention. During the process of exercise, the child needs to try their best to maintain stable attention, focus their attention on their own movements, and pay attention to the surrounding to avoid unnecessary collisions. Therefore, the breadth, stability, transfer, and allocation ability of attention are exercised in this process. Chou et al. [13] improved the attention of children with ADHD through 8 weeks of moderate intensity yoga training. Liu Yang et al. [7] used a randomized controlled experiment to verify that directional exercise for 14 weeks, 3 times a week, 35 minutes each time, can improve attention allocation and attention span in children with ADHD, and enhance their visual spatial working memory ability. Verret et al. [14] confirmed that 10 weeks of aerobic training, muscle strength training, and ball training such as football and basketball can improve information processing, visual search ability, and sustained attention in children with ADHD. Second, children need to receive various instructions during exercise and complete tasks according to the instructions, so their working memory ability, inhibition ability, and other executive functions have been greatly improved. Gapin et al. [15] conducted a 40 minute moderate to high-intensity run on a treadmill in 10 children with ADHD, confirming that their working memory, short-term memory, and inhibitory function were all improved, and the

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progress was much greater than that of normal children in the control group. Third, sports can decrease the hyperactivity, reflected in significant improvements in inattention, excitability, and aggressive behavior, mainly because any sports skills and technical movements have norms and standards, and cannot be played freely. Under exercise intervention, the cognitive function of children has been greatly improved, especially the improvement of attention level and inhibitory function, which helps them gradually restrain their hyperactive behavior and enable them to make correct responses to external stimuli [9]. Fourth, physical exercise significantly improves the levels of brain-derived neurotrophic factor (BDNF), thereby enhancing children's persistent attention, memory, and learning abilities [16]. Fifth, exercise can increase the secretion of dopamine in the brain [17], enhance positive emotions, alleviate negative emotions such as depression and anxiety, and reduce hyperactivity, impulsiveness, and oppositional defiance behaviors related to negative emotions. Sixth, during long-term training, children can gradually gain a correct understanding of themselves and others, eliminate negative cognition, and establish a positive attitude towards life. Final, when engaging in collective sports, close cooperation from teammates is required, which enhances social skills.

Researchers have considered various sports and exercise methods, mainly including aerobic exercise, high-intensity interval training, single sports events, and a combination of sports events. Due to the lack of comparative studies on the intervention effects of different sports or exercise methods, there is no conclusion on which sports or exercise methods are more beneficial for children with ADHD. However, the vast majority of exercise methods have a positive effect on the motor ability, cognitive function, and hyperactivity behavior. Among them, ball games are the most frequently used, for the following reasons: First, large ball events are mostly collective events that require communication and cooperation with teammates, as well as attention to multiple opponents. Second, small ball events require faster and more continuous movement between both sides, which is beneficial for improving the concentration of attention. The key to effective implementation of exercise intervention lies in the fact that exercise programs or methods can stimulate the interest of children and make them persevere. Therefore, using sports games as a carrier for exercise intervention is one of the important research directions.

2.2 Sensory integration training

Sensory integration refers to the ability required to organize sensory information. The process of sensory integration involves the brain processing and synthesizing various types of sensory information transmitted by sensory organs, resulting in coordinated and unified body movements and adaptive responses to environmental stimuli [18]. When an individual is unable to organize, synthesize, and respond appropriately to the stimuli of the five basic senses (i.e. visual, auditory, tactile, proprioceptive, and vestibular) due to a malfunction in the brain's integration function, a phenomenon of sensory integration disorder (SID) occurs [19]. Sensory integration dysfunction is closely related to the occurrence of ADHD. The higher the degree of sensory integration disorder, the higher the incidence of ADHD, and vice versa. Miller LJ et al. [20] confirmed this using electroencephalogram (EEG) technology and skin electrodermal response. The study by Pan Xuexia et al. [21] also showed that the incidence of sensory integration disorder in 6-12 year old children with attention deficit and mixed type ADHD in Shanghai is 76.09% to 81.58%. Sensory integration disorder leads to impaired daily function in children, making it difficult to make adaptive responses in their daily living environment [22-23], causing damage to memory ability,

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visual integration ability, visual space, and form perception ability, affecting the flexibility of thinking and speech summarization ability of children [24].

Sensory integration therapy is proposed based on Theory of Sensory Integration, the close relationship between sensory integration disorder and ADHD [19]. This treatment method uses multiple motor instruments to provide various sensory stimuli, promote the input and processing of sensation, as well as the integration function of the brain, thereby promoting the development of brain nerve cells and improving the phenomenon of sensory integration disorder. First, sensory integration training can improve the neurobiochemical mechanisms of the brain. Jung SS [25] found that after 3 months of sensory integration training, fMRI images showed a significant increase in activity in the prefrontal lobe of the child's brain, with moderate activation of cortical blood vessels, nerves, and biochemical substances in the frontal and prefrontal lobes;the neural pathways were close to normal levels, and the activation patterns were more similar to those observed in the healthy control group. Second, sensory integration training can improve executive function. The core deficiency of children with ADHD is impaired inhibitory ability in executive function. Therefore, starting from restoring inhibitory ability is of great significance for the treatment of ADHD [9]. Hang et al. [26] conducted 60 sensory integration training sessions on the experimental group (52 ADHD children) in their study, while the control group (52 healthy children volunteers) did not receive any intervention. The results showed that after the experiment, the number of completed categories and conceptualization level of the experimental group were significantly improved, while the number of incorrect responses, selection error rate, first category number, and continuous error percentage were significantly reduced, indicating that sensory integration training can improve executive function. However, although there were differences between before and after training in the percentage of continuous errors representing concept formation and plasticity, and the first category number representing concept formation level, they were still significantly higher than the control group, indicating that executive function did not return to normal levels. Third, sensory integration training has a positive impact on sensory integration ability [27,28], attention deficit [28], and daily behavioral problems [27,28]. Final, integration training can improve intelligence. Attention is a core foundational component of cognition (intelligence), and improving attention and sensory integration training can enhance the intelligence of children. Wang Chenhu [29] found that after sensory integration training, children with ADHD scored significantly higher in IQ and five units (excluding E unit) of the Combined Raven's Test (CRT) than before training. The randomized controlled experiment by Hang et al. [26] also showed that sensory integration training can improve the IQ value of the Combined Raven's Test (CRT) in children with ADHD. Final, sensory integration training can improve social function. Nandgaonkar et al. [30] found that after sensory integration training, the scores of the goal achievement scale and sensory processing scale in children with ADHD were significantly improved, specifically in terms of learning and applying knowledge, proactive needs, self-care, and integration into family activities.

Sensory integration training is actually a specialized exercise, with the advantages of simple operation, no significant location restrictions, and no side effects. Compared with drug therapy, it can be said to provide a safer treatment option.a Its most significant drawback is that its clinical use has not been standardized, manifested in a lack of consistency in training mode, frequency, and duration, and the design of intervention plans varies in different studies. This situation leads to poor comparability and credibility of various studies.

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2.3 EEG bio-feedback, EBF

Also known as Neurofeedback (NF), it is based on the principle of operant conditioning, allowing learners to learn how to control and regulate brain activity through direct feedback of visual and auditory signals. The main approach is to collect EEG signals from children with ADHD, amplify and analyze them, and provide timely feedback in the form of visual and auditory signals to the children. The task difficulty is adjusted according to the actual situation of patients, and gradually, so that children can learn to selectively suppress 4-8Hz theta waves, strengthen 12-15Hz sensory motor rhythm waves SMR or/and β waves (15-18Hz), thereby reducing the theta/SMR and theta/β ratio in the brain, improving low arousal level, enhancing attention, and improving the clinical symptoms [31].

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Jiao Min et al. [32] used suppression of 4-8Hz θ waves and enhancement of 16-20Hz β waves, i.e. θ/β treatment, to treat children with ADHD. IVA-CPT tests showed that compared with pre-treatment and untreated ADHD children, the NF group improved after 20 treatments, and after 40 treatments, there was a significant improvement in comprehensive response control quotient (FRCQ), comprehensive attention quotient (FAQ), hyperactivity quotient, as well as hyperactivity behavior, impulsivity, and aggressive behavior in the Corners questionnaire. Tang Min et al. [33] reported that after 3 months of treatment, the Corners questionnaire and Wechsler Children's Intelligence (C-WISC) scores of ADHD children in the Ritalin group and 48 session of θ/SMR groups showed significant improvement compared to before treatment. However, the scores of behavior, learning, physical activity, hyperactivity, and anxiety factorsin Corners questionnaire in the Ritalin group were significantly lower than those in the θ/SMR group, and the C-WISC scores of digit breadth, coding, arithmetic, and C-factor were significantly higher than those in the θ/SMR group. Fan Qiuxia [34] reported that the Corners scores of ADHD patients in the 3-month Ritalin group and 36 θ/SMR groups were significantly lower than before treatment. However,the improvement in the Ritalin group during treatment was more significant, but symptoms recurred in the Ritalin group after 3 months of follow-up, while there was no recurrence in the θ/SMR group. Chen Yu et al. [35] reported that children with ADHD in the 6-month methylphenidate group showed more significant improvements in FRCQ and FAQ during and after treatment, while the Corners score decreased more significantly after treatment. But at a follow-up of 3 to 6 months, the efficacy of the 60 session of θ/SMR group was better than that of the methylphenidate group.

The therapeutic mechanisms of NF and drugs are different [1], and there are differences in the therapeutic effects on core symptoms and cognitive function. Both treatments have their own advantages and limitations. Drug therapy for children with ADHD takes effect quickly, but only has short-term efficacy, which can easily lead to dependence and side effects; EEG-B takes effect relatively slowly, but the therapeutic effect is more long-lasting [32-35]. Therefore, a combination therapy of drugs and EEG B is used to explore the complementary and synergistic effects of their therapeutic effects. Overall, its therapeutic characteristics are as follows: (1) NF treatment has a definite therapeutic effect compared to no treatment [32], NF treatment has a long-term therapeutic advantage of 6 months compared to methylphenidate [33]; (2) Drugs (methylphenidate, toroxetine) combined with NF treatment have better short-term (3 months) and long-term (6 months) therapeutic effects compared to single drugs [34-35]. (3) The efficacy of NF is closely related to its treatment course or frequency (usually 20-40 times, the more the better), frequency

(usually2-4 times), and single treatment time (20-40 minutes). The comparison between NF and drug efficacy is also influenced by factors such as drug dosage and usage time [32-35].

So far, there are few randomized controlled studies in China on the combination therapy of drugs and EEG-B, and it is necessary to add large sample, double-blind randomized controlled studies with a follow-up time of more than 6 months. Secondly, combination therapy has a better therapeutic effect, which can compensate for the shortcomings of drug or NF therapy alone, reduce drug dosage and side effects, lower the cost of NF treatment, reduce treatment time, and have a more lasting therapeutic effect. The effectiveness of combination therapy is closely related to factors such as sample size, drug dosage, selection of EEG frequency band, duration of single treatment, and duration of treatment. Further exploration is needed on the following issues: (1) Clarify the types of drugs, as well as the optimal dosage for single, daily, and total use, to improve efficacy while reducing drug side effects; (2) Because there are differences in the mechanisms and effects of MPH and ATX drugs, and the baseline intelligence level, impaired executive function, and severity of clinical symptoms are also important predictive indicators of drug efficacy in children, it is of great significance to select more suitable drugs based on the patient's condition. (3) Explore the differences in therapeutic effects of NF on children with different subtypes and conditions, and determine the ideal time, frequency (course of treatment), and cycle (frequency) required for NF treatment [36]. (4) Many psychological and social factors, including communication between the patient and the therapist, psychological harmony, and parental support, can affect the effectiveness of NF and combination therapy, and should be included in the indicators for efficacy evaluation.

2.4 Repetitive transcranial magnetic stimulation

Repetitive transcranial magnetic stimulation (rTMS) is a safe and non-invasive method of electromagnetic induction stimulation of the brain. The basic principle is to apply pulsed current to a coil placed above the head, and then generate a pulsed magnetic field around the coil. The pulsed magnetic field generates induced current in the head, which stimulates brain tissue in a regular and repetitive manner [37]. This promotes the release of dopamine, regulates cortical excitability, and has a positive impact on the blood flow and metabolism of local brain tissue. It regulates neurotransmitters in the advanced central nervous system and various receptors in different brain regions, such as brain-derived neurotrophic factors and serotonin receptors, thereby regulating brain functional status [38] and normalizing abnormal patterns of cortical activity [39-41].

Tao Danhong [40] selected 33 children with attention deficit and hyperactivity/impulsivity mixed ADHD, and treated them with rTMS for 12 weeks, 15 minutes per session, 648 stimuli per session/2 days. the SNAP-IV scale (parental version) scores, audio-visual integration continuous operation test (IVA CPT), and brain fluctuation graph analysis (EFG) data before and after treatmentwere compared. The results showed that the total score of SNAP-IV scale (parental version), and average scores of attention deficit and hyperactivity impulsivity after treatment were significantly lower than those before treatment (all $P<0.05$), and there was no statistically significant difference in average score of oppositional defiance disorder before and after treatment ($P>0.05$); The comprehensive attention quotient, comprehensive control quotient, auditory/visual control quotient, and auditory/visual attention quotient were significantly increased compared to before treatment (all $P<0.05$); There was no statistically significant difference in the absolute power value of the ultra slow wave of EEG, the relative power value of the ultra slow wave of

EEG, and the total power of the whole brain before and after treatment (all P>0.05); There were no significant adverse reactions during the rTMS treatment process.

GaoQinnaet al. [42] randomly divided 90 children with ADHD into a control group and an experimental group, with 45 cases in each group. The control group receivedrTMS, while the experimental group received NF combined withrTMS. The recovery status, levels of adrenocorticotropic hormone (ACTH) and serum cortisol (Cor) between two groupswere compared. The results showed that after treatment, the attention level, hyperactivity, ACTH and Cor levels of both groups improved; The clinical effective rate of the experimental group was significantly higher than that of the control group (P<0.05); The experimental group showed significantly higher levels of Attention Deficit Hyperactivity Screening (SNAP-IV), Continuous Visual and Audio Visual Integration Test (IVA-CPT), ACTH, and Corlevelscompared to the control group (all *P*<0.05).

The mechanism of rTMS can be explained from two perspectives. First, from the perspective of neurobiochemistry.Alyagon et al. [43] believe thatrTMS can non-invasive regulate the excitability, activity, and plasticity of neurons, which is beneficial for regulating behavior, emotion, and attention. Zhang Xuequn [44] found that after the recovery, patients' ACTH levels and Cor significantly increased. The study by Chen et al. [45] also showed that plasma ACTH is a predictive factor for the therapeutic effect ofrTMS. RTMS can affect various neurotransmitter levels, which are related to stress response and cortisol such as Cor secretion. At the same time, stress response further activates the hypothalamic vertical adrenal axis, thereby promoting the secretion of ACTH and Cor. Second is the perspective of EEG. AfterrTMS, the amplitudes of N45 and N100 decreased, indicating an improvement in cortical inhibitory function [46].

2.5Virtual reality technology, VRT

VRT was first proposed by Jaron Lanier in the 1980s, referring to the generation of a virtual environment through computers, combining technologies such as sensors, multimedia, and human-computer interaction to simulate various sensory perceptions such as sight, hearing, and touch in reality, allowing users to producethe feeling of being physically present [47]. The application of VRT in the treatment of ADHD makes it personalized, fun and autonomy based on The principles of Constructivist Teaching Theoryand the "two-stage" process principle of Sensory Integration Theory.VRTprovides a new approach to attention training and create personalized training scenarios tailored to children with different subtypes and conditions from a holistic perspective. For example, VRTcan be utilizedto design a scene with obstacles for children with vestibular dysfunction, in which the child needs to go throughjump and squat to overcome obstacles. In this way, users can receive training in a virtual environment and be guided by the program, ensuring safety and greatly reducing the demand for manpower. Secondly, VRTis not limited by time and space,which can enrich the training scheme of ADHD [48]. Thirdly, VRTcan simulate children's daily living environment, and the training results can be well applied to real life.finally, VRT can independently evaluate interference factors such as classroom daily sound and screen interference, so the impact of confounding factors eliminates [49].

VRT can effectively combine cognitive training with sports training, and immersive user experience can effectively solve the problemof ADHD children's lack of concentration in traditional training [50].VRTcan be used to simulate classroom environment, and design tasks in virtual classrooms to explore the completion statusof continuous performance task (CPT). Adams compared 16 ADHD children aged 8-14 with a same agegroup of normal children,and found that

ADHD children are more susceptible to virtual classroom interference compared to normal children [51]. The VRT-CPT task developed on this study is believed to be able to simply detect cognitive impairment and ADHD in children.Bioulac et al. selected 36 ADHD patients aged 7-10 and normal children to complete VRT-CPT in a virtual classroom.After the task, it was also found that compared to the normal group, the ADHD group had a lower task completion rate [52]. CaiJingjing [53] used a controlled approachDesign paradigm for pre-test and post-test experiments in the experimental group, with 30 participants in the experimental group and 10 participants in the control group. The experimental group underwent continuous responseinhibiting virtual reality rehabilitation training, superior response inhibition virtual reality rehabilitation training, and interference response inhibition virtual reality rehabilitation training,and the control group received corresponding routine computer response inhibition rehabilitation training. The intervention training program for each group is 60 minutes per session, 2 sessions per week,a total of 16 sessions. The results showed that on the indicators of sustained response inhibition task (SST) error rate and dominant response inhibition task (inhibition conflict), anderror rate effect, the post-test scores of the two groups were significantly reduced compared to those of pre-test (all $P<0.05$), while the post-test scores of the experimental group were significantlower than those of control group (all $P<0.01$); On the indicators of error rate effect size in the interference response inhibition task (Simon), the post-test score of experimental group significantly decreased compare to that of pre-test ($P<0.01$), the difference in scores between the pre - and post-tests of the control group was not significant,the difference in post-test scores between the two groups is significantly ($P<0.01$); Compared with the pre-test, the experimental group's post- test CPT miss rate, MFFT error count, and total score of behavior scalesignificantly decreased ($P<0.01$), and the accuracy of the Raven Intelligence Test significantly increased ($P<0.01$); the control group’s post-test CPT missing rate decreased($P<0.01$), while and the accuracy of the Raven Intelligence Test significantly increased ($P<0.05$), MFFT error count and total score of behavior scale did not change significantly ($P>0.05$), and there was a significant difference in the number of MFFT errors between the two groups in the post-test ($P<0.05$).

Due to the security of virtual environments, the fun of virtual tasks, multi-channel interaction, immersion, and the flexibility of reinforcement mechanisms, diversity of evaluation indicators, as well as the rationality of resource utilization, VRT has high ecological validity, completion probability, and high efficiency and other advantages, but there are several shortcomings. (1) The maintaining and controlling of immersion, interest, training effectiveness need to be solved. Due to insufficient technical skills, many real-life scenarios cannot be well simulated, coupled withthetime delay between users' operations and the feedback of the computer system, which affects the beauty, authenticity, and fun of the virtual scene, and thus affects the participationenthusiasm of patients with ADHD and intervention effectiveness. (2) In terms of equipment, the huge demand of ADHD community requires the industrial development of VRT. The industrial development of applications in retraining requires convenient, portable, and inexpensive equipment. Future task design can be completed combining wireless somatosensory or EEG detection instruments, children with ADHD can use their limbs in front of somatosensory cameras complete the training task by focusing attention on feedback from a portable EEG detection instrument.

3. Summary

The existing treatmentmethods for ADHD in children mainly focus on drug intervention and non-drug intervention, such as the use of stimulants such as Ritalin and amphetamine or other non stimulant substitute drugs, as well as various management and intervention plans for ADHD children and parents [5-6]. Eachexisting intervention strategy hasits own advantages, but there are some prominent issues when applied. For example, drug interventions, especially those involving stimulants, often have serious side effects [7]. Many parents are concerned that their children's excessive medication can lead to side effects including short-term symptoms such as headaches, nausea, and anorexia, and long-term symptoms such as slowed growth. Psychotherapy can improve the emotions and core symptoms of children, enhance their academic performance and social adaptability, but treatment is a long and arduous process for children and their families. Physical therapy has various forms and principles, no side effects, and bothadvantages and disadvantages in use and efficacy. In general, physical therapy has clear neurophysiological principles and rigorous operating procedures, which are easy to convince various sectors of society; The treatment operation is simple and does not require patients and their families to put in too much energy and mental effort; It takes effect faster than drug therapy and psychotherapy, and some physical therapies even have immediate effects on certain treatment indicators; Its therapeutic effect can be expressed through diverse physiological and psychological indicators, with strong scientific validity. Its shortcomings lie in: first, besides exercise therapy, other physical therapies require specialized instruments, which are expensive and require specialized hospitals or tertiary hospitals, resulting in poor accessibility; Second, besides virtual reality therapy, the treatment process of other physical therapies (including most exercise therapies) is monotonous and uninteresting for children, making it difficult to persist in the long term. Final, the short-term efficacy is confirmed, but the long-term efficacy is not clear, as previous studies have focused on follow-up results six months after treatment.

In summary, physical therapy has great potential for development, and we urgently need to reduce the cost, improve its accessibility, fun, and long-term efficacy.

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