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Update of Stuttering Research in International

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Abstract

Purpose: *Stutter, also known as stuttering, is a common disorder of speech fluency, known as speech arrhythmic disorder in medical research.*

Methods: *To search the domestic and foreign literatures about stutter response mechanism of the diseases, and analyze the literatures according to the characteristics of artificial intelligence.The stutter is accompanied by a series of non-verbal behaviors such as facial tension, blinking or nodding. During communication and expression, speech is not fluent and irregular, which leads to social disorders, affecting their emotional and psychological state, and seriously affects our social life. The etiology is affected by many factors, and there is no clear cause explanation at present. The current study suggests a possible correlation with factors such as neurological, genetic, physiological, psychological and family environment in the brain.*

Results: *Therefore, scholars targeted to provide effective treatment, such as physical therapy, psychological therapy, family parent-child treatment, clinical speech fluency disorder treatment, music therapy, VR environmental desensitization treatment, etc.*

Conclusion: *discusses the current intervention strategy, in order to provide a comprehensive perspective for stuttering understanding and management, and looking to the future research direction, hope to be able to promote in-depth exploration and improvement in the field.*

Keywords: Stuttering, Rehabilitation, Diagnostic Evaluation, Stuttering Treatment Method.

Introduction

Preface

Stutter is commonly known as stuttering, the World Health Organization in 1997 defined stuttering as a speech fluency disorder, stuttering mainly manifested in the casual syllables repetition, dragging and pause these are the embodiment of stuttering symptoms [1]. Basic features of stuttering relative to fluency of speech and temporal patterns of disorder [2]. This disorder is characterized by frequent repetition or lengthening of language or syllables, and other forms of speech, including word breakage, sound or silent blocking, circuitous, excessive physical tension and repetition of monosyllabic words. And with the growth of the age, children or in school and social life aware of their speech disorders, will experience negative emotions because of speech disorders, and negative escape in activities, affect the quality of learning and communication, with the development of age, adulthood will affect work and interpersonal communication, and even reduce the patient's overall quality of life.

According to epidemiological studies, the prevalence of stuttering is about 5% to 10% in children, compared to about 1% in the adult population. Beichman et al showed that the prevalence is 1%~2%, Hewat et al. based on the prevalence of 1%, estimated that there are about 13 million stuttering patients in China, the incidence of stuttering in the United States is about 5%~10%, and the ratio of men to women is about 4:1 [3-8]. DSM-5: childhood developmental stuttering 80% to 90% of individual onset before 6, the age range is 2-7 years old, onset can be hidden or more suddenly after early intervention, about 80% of stuttering

preschool children can heal, especially in a few months after the disease, but another part of children will continue to adulthood.

The formation of stuttering is the result of various factors, which may be related to the neurological mechanism, genetic, social relations, psychology, physiology, behavior, acoustic, parenting environment and other factors. These factors are intertwined, making the causes of stuttering become complex and diverse. This study aims to conduct a comprehensive and in-depth discussion of the current situation of stuttering at home and abroad, reveal its development trend, and analyze the comprehensive treatment methods at home and abroad to provide valuable reference for the clinical practice and policy support of stuttering patients. As well as the mechanism of stuttering and the impact on future life, the current intervention strategies are explored, in order to provide a comprehensive perspective for the understanding and management of stuttering, and look into the future research direction, hoping to promote the in-depth exploration and improvement of this field.

The Cause of Stuttering

About the cause of stuttering, the mechanism factors of stuttering has been controversial in recent years, in recent years, we discussed and summary of the following five aspects: one is the right brain central nerve dysfunction; the second is the movement coordinated development dysfunction; the third is speech perception impairment; the fourth is psychological factors; the fifth is genetic and environmental factors, then make the following statement for the cause mechanism explored at this stage [9].

Functional Disorders in the Brain and Language Processing Area

In the early 20th century, researchers suggested that language was caused by abnormal connections between the left and right hemispheres. Due to the lack of normal speech mechanism in the laterality of the right hemisphere, the nerve impulse cannot reach the bilateral muscles of the brain, and recent studies have shown it to be closely related to the changes in brain structure and function. Functional magnetic resonance imaging (fMRI) studies showed that during speech production, activity patterns in certain brain regions such as the frontal lobe and basal ganglia were significantly different from non-stutter users [10]. These regions are implicated in motor control, language processing, and emotion regulation, suggesting that multiple neural mechanisms may be involved in stuttering. Moreover, structural imaging studies revealed that gray matter volume in stutters may be significantly reduced in some critical areas (e. g., inferior frontal and superior temporal gyrus), which may affect speech fluency and control [11]. White matter fiber bundles have poor connectivity, especially between brain regions in speech-related subjects, which may lead to delay and incoordination of information transfer, thus exacerbating stuttering performance [12]. With the help of nearly twenty decades of clinical and experimental neuropsychological analysis technology development, and many studies of the cerebral hemisphere laterality and link between hemispheric experiments show that stuttering patients abnormal compared with normal people, when speaking both hemisphere local cerebral blood flow and electrophysiological indicators, in the solid mirror field difference in [13]. All of these experiments suggest abnormal interhemispheric connections in stuttering patients, and excessive activity in the right hemisphere of the brain when talking to people [14]. In conclusion, the structural and functional changes in the brain provide important clues to understanding the physiological mechanisms of stuttering.

Neural Mechanism Defects

From the perspective of brain nerves, the activity of the rostral cingulate cortex is significantly reduced during voluntary behavioral choice interactions. This area plays a crucial role in language processing and social behavior selection, and also suggests that the occurrence of stuttering mechanism is related to the development of the nerve center. If the nerve conduction velocity changes or the neural network link is not smooth, it may lead to the occurrence of stuttering. If the nerve center is underdeveloped in childhood, the language function may be affected, leading to stuttering. Children may have difficulty in self-verbal fluency [15]. In childhood developmental stuttering, the language network system in the left hemisphere involves primary defects in the lateral premotor cortex and in the primary motor cortex. Experimental studies suggest that the cerebellum may play a compensatory role on the functional defects of the basal ganglia-thalamo-cortical motor circuit pathway in stuttering [16].

Movement Disorders

Stutter patients in voice and authorize movement coordination disorder, in regulating muscle activity intermittent muscle group uncoordinated, this uncoordinated muscle activity for muscle group regulation and control problems, which may be related to the cerebral cortex control function abnormalities may also be related to the pronunciation muscle itself [17]. When emotional tension is accompanied by verbal expression, the coordination of the patient's muscle groups becomes difficult, and the body's muscle activity becomes urgent, thus creating a "stuttering" situation. In addition, stuttering patients laryngeal antagonistic muscle coordination mechanism movement is slower than normal people, and the inhibitory and impulsive control in nonverbal and verbal areas is also weaker than ordinary people [18]. The breathing rhythm and control of stuttering groups, the planning and execution of vocal movements, and the movement perception and feedback mechanism may all be abnormal.

Speech Perception Defects

Patients who stutter may have format or other errors in vocabulary, sentence coding, semantic extraction, speech coding, grammar and language output, such as lag in speech information output, speech delay, extraction information, etc. In 1993 Postma stuttering speech Caton defects from speech cognitive stage vocabulary choice requires the activation of the application of entry information too much, lead to speech cognitive information cannot be accurately extracted, in the process may be lack of entry information, speech information mechanism fault, information extraction is not unobstructed, cause expression card [19]. Smith in 1997 through data research stutter in daily frequency and express the length of sentences and grammar complexity is positively correlated, on the brain mechanism of the central nervous system, stutter may be in the brain with the language regulation system speech dysfunction, and people in the brain disease will damage to the speech control center, thus reduce speech fluency [20]. In 2000, Anderson and also believed that speech coding was not the determinant leading to stuttering [21]. Most of stuttering had obstacles in the organization of sentence coding, information extraction and integration of word meaning,

and coding of speech. Smith et al. point out that most researchers believe that stuttering cannot be explained by univariate theory.

Psychological Factors Anxiety and Stuttering Relationship

Anxiety is widely recognized as an important psychological factor in stuttering, and studies show that stutters often experience higher levels of anxiety in social situations. Anxiety not only affects the performance of stuttering, but also may aggravate the severity of stuttering [22]. A study of adult stutters found that social anxiety was positively associated with the severity of stuttering, meaning that higher anxiety levels and higher frequency and severity of stuttering [23]. In addition, stutterers tend to show avoidance behavior in social situations, which in turn exacerbates their anxiety and creates a vicious circle. In treatment, psychotherapy approaches such as cognitive behavioral therapy have been shown to be effective in reducing social anxiety in stuttering, and thus improving their speech fluency.

Self-esteem and Social Fear

The level of self-esteem has a significant effect on the social fear of the stutter. Studies have shown that stutters with lower self-esteem are more likely to experience social fear, which affects their daily communication ability and quality of life [24]. Social fear is not just the fear of stuttering, it also involves the worry about the evaluation of others. People often worry that their verbal performance will be laughed at or judged by others, leading to the avoidance of social activities [25]. Studies have pointed out that improving the self-esteem of stuttering people can effectively reduce their social fear and promote their participation and confidence in social situations [26]. Therefore, treatment should be paid to the improvement of self-esteem to help stutters to establish a positive self-image and thus improve their social fear.

Negative Emotions on the Development of Stuttering Negative emotions are potential factors that influence the development and persistence of stuttering compared to the normal population [27]. Anxiety, stress, mental tension, and depression are all factors that can cause stuttering, especially mental tension. Du Minxian found that stuttering patients are significantly different from normal patients in speech expression [28]. Stuttering patients often have negative emotions and social anxiety due to speech performance due to fluid speech in many occasions, thus affecting the quality of life, work and normal social interaction. Some negative emotions including stuttering this situation of anxiety, frustration, fear, and the specific care about individual, environment and special situation to escape, by trying to change the communication after the development of sustainability and frustration, and the conversation situation process such as life communication, work meeting performance or specific tension environment is difficult to complete expression of anxiety escape state of physiological reaction. Zhang Yan found in early childhood, about 3~4 years old stuttering children show higher state anxiety especially some characteristics anxiety, parents by parents for children's speech problems, more intensified children on the verbal expression of escape depression, especially in the school group environment, the same age children, fluent verbal hindered specific environment of social communication, may be the special attention of peers, thus affect mental health [29].

Genetic and Environmental Factors

Study the risk factors of stuttering, Chen Rong through screening control experiment, analysis the history of stuttering as a risk factor of children stuttering after Logistic regression equation, the results said that stuttering family history to higher risk of stuttering (OR = 344P=0024), is the main risk factors of stuttering history and stuttering family history [29]. Genetic studies have found multiple genes associated with susceptibility to stuttering, including GNPTAB, GNPTG and NAGPA, and mutations in these genes may affect neurodevelopmental and speech-related neural networks. In addition, the study also found that some specific single nucleotide polymorphisms (SNP) were significantly associated with the risk of stuttering, suggesting that genetic susceptibility plays a key role in the pathogenesis of stuttering. Manson et al. (2000) concluded that 36%~ 60% of children with stuttering have a family history, and the pathogenesis of stuttering families is 36%~55%. Therefore, some scholars believe that stuttering, or related to family heredity, may be single gene inheritance, and is common among male relatives and friends and immediate family members [30]. Within the family, it is mainly due to the poor language learning environment, such as parents 'stuttering, or parents and parents' fast and ambiguous oral English, children are not easy to imitate or the incorrect speech habits acquired by stuttering patients in the family. Statistics show that the possibility of stuttering members is more than three times that of non-stutter families [31]. People generally explain this fact in terms of the environment and the genes. After a detailed survey of Zhang Mo and his team on 577 patients who stutter, the results showed that in the same environment, the imitation patients accounted for 77.1%. The proportion of brothers was particularly striking in families where fathers stutter. Thus, it can also be seen that male patients stutter more than female patients. Although the influence of genetic factors on stuttering cannot be ignored, environmental factors and psychological factors are equally important, and the interaction of the two may jointly affect the performance and treatment effect of stuttering [32].

Stuttering Treatment Intervention Methods and Research According to the current commonly used assessment tools in the world, including stuttering Severity Assessment Tool (SSI), stuttering Severity classification (SR), and children stuttering test (TOCS), these tools can comprehensively and accurately assess the severity of stuttering, and provide a strong basis for clinical diagnosis and treatment [33]. On the basis of SSI-3 and SSI-4 respectively, et al [34, 35]. revised the Chinese version of the assessment tool to make it more compatible with the Chinese expression habit. At present, there is a lack of evaluation tools that meet the standard and regional differences in China. Most of the SSI used in rehabilitation treatment can only be roughly evaluated, and they do not have the ability to evaluate the specific conditions of symptoms. ICF explains and makes functional evaluation of stuttering in physiological function and activity participation process, analyzes the performance of stuttering in speech activity, and provides certain data content for the tool evaluation of patients with stuttering according to [36]. Accurate assessment of stuttering has important implications for intervention treatment. It not only provides an important basis for the diagnosis and differential diagnosis of stuttering, but also determines the severity of stuttering and its impact on individual life. This helps to decide whether intervention is needed, when and

what method to adopt, while providing a reference for stuttering prognosis.

Diagnosis and Evaluation of Stuttering

Stutter evaluation is of great significance, is an important basis for stuttering diagnosis and differential diagnosis, and can help determine the severity of stuttering and its impact, and can also decide whether the timing and method of intervention needs intervention and determine the prognosis of stuttering [37]. Stutter is a disorder of speech fluency, and speech fluency can also be divided into developmental fluency and pathological fluency. Usually the distinction between developmental disfluency and stuttering is important, which has some requirements for diagnostic evaluation. Stuttering group may appear in a certain stage or some state of similar stuttering language performance (stuttering-like disfluencies, SLD), including repetition (syllables, word and phrases) and language rhythm disorder (drag, pause or broken), but this is not fluent generally does not lead to communication and social dysfunction, and fluency disorder refers to social dysfunction speech is not fluent. Fluency refers to the easy and continuous movement of muscles output language, the appropriate speed between words, the proper continuity and connection between words, no physical and psychological stress reaction; fluency disorder refers to the language output speed and continuity disorder, according to Professor Van Riper, the developmental fluency mainly involves the repetition of the whole word or phrase, while stuttering includes the repetition and sentence. Stutter patients are prone to silent pause and improper vocal dynamics, especially when the speech speed is accelerated, the output response to airflow pressure is not smooth. This situation can easily lead them to develop emotional frustration.

Assessment Tools for Stutter Severity Assessment

Stutter Severity Score (SR) was collected by calculating the number of vocal sounds per 100 syllables, the percentage of stuttering syllables (%SS). The researchers collected 350 to 450 syllables in about 30min, and asked the children to play games during the evaluation process, using the app to score and calculate the sample. The number of syllables divided by the total number of syllables was [38].

Stutter severity measurement scale level (scale for rating severity of stuttering) is an 8-point scale, which is the subjective assessment scale of his evaluation. For the Stutter Severity Measurement Scale (SSI-4), SSI-4 mainly evaluated stutter severity grade in terms of stuttering frequency, mean duration of the 3 longest stuttering events, physical symptoms, and nature of speech [39]. In clinical application, it is generally combined with two evaluation scales, and the most commonly used is SSI.

Children Stutter Trial (Test of Child hood Stuttering, TOCS) is suitable for children between 4 and 12 years of age, scoring the degree of stuttering, behaviors related to stuttering, and the consequences of stuttering [40].

ICD-11 analysis of diagnosis and functional assessment of disorders; according to ICD-11 and ICF framework, content analysis of ICD complications and evaluation [41]. ICF explains and makes functional evaluation of stuttering in physiological function and activity participation process, analyzes the performance of stuttering in speech activity, and provides certain data content for the tool evaluation of stuttering patients according to [35].

Intervention Methods for Stuttering

The intervention method of stuttering is, through treatment, in sports, language, social emotion and cognitive function, by reducing the "requirement", that is, the fluent expression goal, and improving the "ability", that is, to achieve the "ability" of fluent expression. For example, in terms of social emotion, accepting stuttering, changing the content of the family talking to the child, and responding to him, avoiding receiving punishment or discrimination. Including parents do not deliberately point out that children are not fluent, to listen to the content of children's speech, the atmosphere as relaxed as possible. In terms of language, let the children use their own words to slowly say what they want to express, do not easily interrupt or urge them, give hints when they express difficulties, parents do slow speed and simple language.

After exploration, the existing therapeutic interventions for stuttering at home and abroad are mainly divided into the following aspects: stuttering correction method, conditional operation method, auditory delay feedback, fluency shaping method, physical therapy, music therapy, VR scene simulation training, psychological counseling, family recuperation and other ways to improve the fluency of stuttering and speech expression. The general treatment mode is the combination of professional individualized intervention, professional parent intervention, professional parent intervention guidance and professional direct individualized intervention. The conditional operation method requires some direct intervention by professional stuttering therapists and some guiding parents to intervene in the family environment.

Early Intervention

Studies have shown that early intervention has positive effects on the prevention of stuttering and the development of adverse direction. According to the survey, 80% -90% of individual stuttering in China originated before the age of 6, and the onset age range is 2-7 years old. Longitudinal studies indicate that 65% to 85% of children with fluency disorders can recover, and their severity at age 8 years may persist until adolescence and later in [2]. The study found that early intervention can inhibit the development of stuttering, generally within 3 months after detection, the earlier the intervention, and the longer the duration of the intervention, the higher the reduction in the severity of stuttering, but also can prevent the occurrence of chronic stuttering [9]. Einarsdtir et al Examined 23 studies on stuttering and found that the average recovery rate of early intervention was 58%, and the large difference in the reported recovery rate had many aspects, including differences in patient characteristics, family background, age, and treatment methods. The longer the disease, the less likely the success of natural recovery and intervention, the efficacy is related to age; Early intervention can prevent early stuttering, especially when the success rate of timely intervention is higher. In the family life environment, parents and teachers should attach great attention to the stuttering and speech fluency disorder of the children as soon as possible. In order to reduce the child's experience of children's speech frustration, should use a slow, soft, rhythmic tone to communicate with children, encourage them to talk at their own speed [42].

Avoid using stimulating verbal guidance, and maintain a normal attitude, not applying strange eyes. At the same time, parents can demonstrate slow and fluent speech through daily bedtime reading, increase the intimacy with their children through story-telling and gentle tone, improve language fluency, and enhance self-confidence.

Speech Correction Methods of Stuttering

Treatment of stutters the main current treatment is speech rehabilitation therapy, supplemented by physical therapy. Clinical rehabilitation therapists try to use relevant treatment methods in the speech and mouth muscles, including slowing down the speed of speech, inducing pronunciation, applying airflow breathing method and forming rhythmic speech, aiming to slow down the speed of speech and reduce the frequency of speech as the core [43]. For example, beat method, gentle contact method, advance vibration method, extension method, reread four sound method, etc.; or using metro me, delay auditory feedback, etc.

Using auditory delay feedback techniques, individual speech sounds were delayed from 0 to 220ms by a recording device and were reproduced in a short time through earplugs. This method, combined with frequency conversion feedback, helps stutters to gradually adapt to the change of language rhythm. Sydney (Speech easy) particularly emphasizes the importance of slowing down the speed of speech to prevent voice change and feedback stuttering.

The main characteristic of "pronunciation method" is to use slow and slow tone to use the natural speech speed and rhythm of normal people to correct the lack of stuttering. For stutters, the training method of "syllabic speech with timing distance" can effectively encourage them to read evenly according to the syllables and communicate with a stable rhythm. Maintaining an isochronic separation between each syllable and the next helps to slow tension and hesitation when speaking. In addition, following reading is also a common training method, where stuttering people read words with the therapist in a slow or even pace. However, such training often leaves speech of its natural prosodic and emotional components. Therefore, during the training process, the stutter also needs to restore the natural state of speech practice, in order to restore the speech richness and emotional expression [44]. By combining these methods, we can help stutterers better manage their language rhythm and expression. Speech therapy can also be directly intervened, through fluent shaping method, rate control speech extension filler word control phrase / rhythm vibration , easy onset, stuttering-modification, and so on.

VR Virtual Environment Desensitization Therapy Under the premise of the rapid development of social science and technology, the modern medical field has ushered in the innovative treatment means. With the help of immersive VR technology, patients can be trained by establishing virtual training scenes. Combined with systematic desensitization method, that is, patients are exposed to feared things, increasing from mild to severe stimulation, and finally make the stimulation invalid [45]. Effective treatment of speech disorders such as stuttering. This method achieves the purpose of correcting stuttering by gradually increasing the degree of stimulation, from mild to severe, and down to the stimulation failure. This new treatment method not only promotes the development of speech therapy field, but also realizes the perfect combination of medicine and technology. Patients do not need to be subject to traditional treatment sites, and can switch to different scenarios through VR equipment to meet the training needs of different environments. This treatment has attracted more stuttering patients, giving them new hope. The method can not only help patients to achieve the purpose of correct stuttering, but also promote the development of speech therapy, make the medical field and modern technology clever together, but also can realize by VR equipment switch different scenarios, meet the needs of patients with different environment training, the emerging treatment also attracted more stuttering patients to participate in the treatment of [45].

Music Therapy

Music, with its unique melody and rhythm, has a significant effect of relieving tension and reducing stress, and can regulate emotions and induce relaxation. This is particularly beneficial for people who stutter, which is closely linked to psychological factors. Studies have shown that stutters often have depression and anxiety, and their psychological state is between a variety of psychological disorders and normal levels. Therefore, music therapy has a positive significance for improving the psychological state of stuttering patients. The survey found that music not only has a unique melody, but also can effectively improve the rhythm disorders. Both language and music skillfully combine various elements to convey the deep meaning from the outside to the inside and from the low to the highest level. This way of expression, whether in language or music, can make people deeply understand the thoughts and emotions to be expressed [46]. Music and language have the same idea in their expression. Language needs the support of elements such as vocabulary, tone, grammar and word nature, while music depends on external forms such as rhythm, melody, tone and chord. Both are highly similar in the form of expression, which are both important manifestations of speech level activities. The key to treating stuttering is to remove the language barrier, and music is an effective aid. Music can not only foster emotion, but also promote cognitive activity, including language processing. Through various elements of music, such as the sense of rhythm, beat, rhythm and melody, stuttering patients can strengthen sound perception, and then improve speech fluency [47].

Stutter Medication

In recent years, intensive research on stuttering pathology has continuously driven the progress of stuttering therapy. In terms of drug treatment, it has received more and more attention. In particular, the new atypical antipsychotic azinapine, initially showed the potential for good efficacy in patients with stuttering [48]. Moreover, antipsychotics that block brain dopamine receptors also show positive results in treating stuttering. Although some of the data are from small studies and have limited reference value, it still provides new ideas and direction for stuttering treatment. Szejko et al studies show that physiological medicinal cannabis can effectively treat refractory stuttering, but the feasibility and effectiveness are further studied from the data experimental results [49]. After scientific research, oral administration of clipramine can significantly reduce the severity of stuttering. Haloperidol and magnesium sulfate infusion also have a certain therapeutic effect, but the potential side effects [50]. At the end of the 20th century, Tuttle reported that a patient with anxiety

disorder had a continuous and severe stuttering of 12.5 mg deoxyephedrab, but the subsequent duration was short. Cerciello with amphetamine treatment for severe stuttering, and with psychological, speech correction treatment and family rehabilitation treatment effect are very significant [51]. The effectiveness of antidepressants, anxiolytic, and antipsychotics on stuttering has not been proven, and tricyclic antidepressants, such as clomipramine and dexamepamine, provide a small short-term improvement in stuttering symptoms and reduced avoidance when speaking compared with placebo. However, these trials are only short-term results, and the long-term prognosis and impact are not reflected, so the drug treatment needs to be confirmed by a large number of clinical trials.

Psychological Healing

In the mid-20th century, relevant researchers argued that stuttering was an external manifestation of unintentional psychological conflict, thus affecting partially normal social functioning. Until the end of the 20th century, people changed their perception of stuttering as a psychogenic disorder and as the result of psychological factors. In recent years, psychologists mostly use psychoanalysis therapy and hypnosis method to correct stuttering symptoms. Through the recall method, doctors guide patients to recognize the root cause of the fear, separating the fear from the stuttering phenomenon, so that the fear can be handled independently. Gradually psychological counseling treatment to help patients gradually overcome stuttering barriers, restore confidence and fluent speech expression. In 2005, Liu Xugang et al [44]. believed that although there are many similarities between the regulation level of language development and normal people, they often face more worries, distress and anxiety in their daily interpersonal communication. Mutterers often experience negative emotional reactions in communication, which undoubtedly brings many challenges to their life and work. Regular treatment analysis plays a positive role in regulating some stuttering patients. Psychological therapists use operational conditioning, system desensitization, scenario demonstration, scene reduction and regeneration, and psychological counseling analysis in a variety of methods to explore the problems suitable for different kinds of stuttering patients.

Family Therapy

Parent-Children Interaction Therapy, PCIT is a kind of family therapy, parents 'behavior and family language environment and daily behavior management monitoring are important, parents and family members will directly or indirectly affect the patient's mood and behavior, but also plays an important role in the process of treatment, the management of patients and emotional regulation plays an important role. Theoretical basis: the needs of psychological behavior theory-ability model (DCM), children's social environment to the requirement of the verbal fluency beyond the matching cognitive, language, sports and emotional ability, emphasis to reduce external environment pressure to reduce stuttering, not directly focus on children's stuttering behavior, so the family environment and the positive role of parents has a crucial influence on rehabilitation treatment.

Other Therapies

Stuttering is not only a speech fluency disorder, but also affects personal behavior, mood, mental health and family social status, and makes people have anxiety, inferiority, increase pressure and other emotions, affect the quality of life. Byron Katie The stress-based (IBSR) program developed in 1986, data reality, reduces psychosocial stress and anxiety of stutters. Bioelectric feedback metronome, delayed voice feedback method, sound masking method, etc. These methods mainly improve stuttering symptoms by changing the way of speech and the rhythm of speech. For example, the bioelectric feedback metronome can help patients adjust the timing and intensity of pronunciation; delayed speech feedback helps patients better control the speed and rhythm by delaying the speech feedback time; and the sound masking rule is practicing speaking in background noise to improve the language fluency in different environments [52].

Future Outlooks

At present, there are relatively few studies on the evaluation and treatment of stuttering, and it is of great significance to study the pathology and clinical treatment methods of stuttering from various aspects. In recent years, experts, scholars and clinical workers have been exploring different levels on the causes of disease and related treatment of stutter. In the study of brain function neural mechanism, it is now more based on the brain structure of speech nervous system and brain function imaging, positron transmitter layer photography (PET) technology, external by psychological counseling, family therapy, movement mechanism, speech perception, breathing training, etc., scientific experimental research and clinical case for stuttering patients with late treatment provides a more comprehensive data information, also provides the basis for late clinical rehabilitation [53]. In recent years, the research on stuttering in linguistics and psychology has yet to be developed. In the problems of language grammar, rhythm, phrase category and psychological emotional anxiety, whether the internal potential factors can be studied through psychological counseling and sand table in the later stage. In terms of treatment, scholars at home and abroad have created many methods, including physical therapy, brain mechanism therapy, psychotherapy, biofeedback and speech therapy, etc., but there is still a lack of unity in the training direction and methods of research results. In addition, we need to continue to explore, consolidate the clinical data, and strive to reduce the frequency of stuttering development.

Conclusion

Stuttering remains a complex and multifaceted speech disorder that significantly impacts communication and quality of life. While considerable progress has been made in understanding its neurological, genetic, psychological, and environmental influences, no single cause or universal treatment has been identified. Advances in neuroimaging, genetic research, and cognitive-behavioral interventions have contributed to a deeper understanding of stuttering mechanisms and potential therapeutic approaches.

Globally, research efforts continue to explore innovative treatment options, including pharmacological interventions, neurostimulation techniques, artificial intelligence-assisted speech therapy, and virtual reality-based exposure therapy. These emerging methodologies offer new hope for improving fluency and reducing the psychological burden associated with stuttering.

Despite these advancements, challenges remain in achieving long-term fluency outcomes and accessibility to effective treatments. Future research should focus on personalized treatment approaches, integrating neurological, behavioral, and technological interventions tailored to individual needs. Additionally, raising public awareness and reducing stigma surrounding stuttering can further enhance the social inclusion and confidence of individuals affected by this disorder.

By reviewing both domestic and international progress in stuttering research, this article highlights the importance of continued collaboration among researchers, clinicians, and speech-language professionals. With ongoing scientific advancements, the prospects for more effective and accessible treatments for stuttering continue to improve, offering hope to individuals seeking better communication and an enhanced quality of life.

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