

# Diversity of Digestive Tract Microflora in Children with Autism Based on Sensory Integration Training

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**Abstract:** Autism is also called autism, and the full name is autism spectrum disorder (ASD). After anatomical techniques and research and analysis of complex brain activities, it is generally believed that the cause of autism is mainly due to complex brain development disorders caused by. It is mainly manifested in the stereotypes of interpersonal and social communication and language communication barriers, as well as narrow hobbies and activities. This article aims to study the diversity of the digestive tract flora of children with autism based on sensory integration training, and analyze the impact of sensory integration disorders on children with autism, the etiology of autism spectrum disorders and the treatment of autism. On the basis of this, this article selects the case information of a child care outpatient department in a hospital, and includes the first confirmed autism children patients who meet the research standards before the treatment of autism. The children after the autism treatment and healthy children are used as controls to further understand the patients with autism. The diversity of children's digestive tract flora. The results of the study showed that in the analysis of the bacterial diversity index, the comparison between CB and CA were both  $P < 0.05$ , which was statistically significant.

**Keywords:** sensory integration training, children with autism, digestive tract flora, flora diversity

## 1. Introduction

Autism is an unexplainable neurodevelopmental disorder, usually manifested in three major clinical manifestations: communication dysfunction, delayed language development, and repetitive stereotyped behaviors [1-2]. As an increasingly common disease, ASD has received widespread attention from the community and academia. In the ASD-affected group, the researchers paid the most attention to the child, but due to its long cure period and poor curative effect, it caused great economic and psychological pressure on the family and the community. However, in recent years, more scientific studies have confirmed that the intestinal flora is one of the main pathogens of ASD, and the formation and function of the intestinal flora can also be regulated by dietary management measures, which can reduce ASD to a certain extent. The morbidity of the disease, and reduced the corresponding clinical symptoms [3-4].

The research on sensory integration has been carried out later in China than abroad. Some scholars believe that sensory integration disorders are information received by the human body. For various reasons, it cannot be effectively integrated and processed into the central nervous system. As a result, the human body cannot respond to the information it exposes, and the human body cannot operate effectively. This phenomenon is called sensory integration disorders [5-6]. Some scholars have also found through research that whether it is normal children, children with mental retardation, or other problematic children, it is very likely that sensory integration is problematic. It is found that more than 90% of children with autism have sensory integration. The incidence of problems is much higher than that of other children [7-8]. More and more researchers should regard the signs of sensory integration disorder as one of the main symptoms of children with autism, and further use it as a criterion for judging whether it is autism. Children with autism have obvious sensory integration disorders due to their unique characteristics, such as slow movement, rigid behavior, and slow response. Some researchers are using this study to investigate the differences in sensory integration disorders between normal children and autistic children. Studies have shown that children with autism are not only slow to respond to external sensory stimuli, but also have obstacles to sense of smell and taste. Normal children are significantly better than children with autism in receiving external stimuli information

[9-10]. Comparing the studies of many researchers, it can be seen that sensory integration education has a great influence on the development of children's physical functions, and sensory integration education contributes to the healthy development of children. Some people believe that sensory integration training provides children with a relatively relaxed and pleasant game scene. Having fun games can release bad emotions and promote healthy development [11-12]. Existing research shows that sensory integration education has a significant impact on the intervention of children with sensory integration disorders. Analyze the child's sensory integration state. In order to find the problem as soon as possible, the general sensory integration disorder can be better corrected to help children grow better.

Based on a large number of relevant domestic and foreign references, this article combines the influence of sensory integration disorders on children with autism, the causes of autism spectrum disorder and the treatment of autism, and selects case information from a child care clinic in a hospital. Include children who meet the research criteria for the first time confirmed autism before treatment, and use children after autism treatment and healthy children as controls to further understand the diversity of the digestive tract flora of children with autism.

## **2. Research on diversity of digestive tract microflora in children with autism based on sensory integration training**

### ***2.1 The impact of sensory integration disorders on children with autism***

The sensory integration ability of autistic children is defective, which has a serious impact on the children's social, language and behavioral functions. Specifically in:

(1) Proprioceptive integration disorder: Patients with proprioceptive integration disorder usually manifest as uncoordinated speech movements and stuttering. Poor motor coordination is the result of sensory integration damage, which further causes children's learning disabilities.

(2) Children with tactile integration disorders are generally sensitive to contact with others, and are easily afraid, anxious, and hyperactive. Some children feel dull. Touch tests performed on children with sensory integration disorders often show strong physical and emotional responses, as well as overreactions.

(3) Children with hearing impairment are often deaf or too sensitive to small sounds.

(4) Structural and spatial perception obstacles: mainly visual perception obstacles, manifested as blurred left and right perception and inaccurate perception of spatial distance. This performance is usually related to somatosensory processes and also related to right brain dysfunction.

(5) Balance and integration disorders: Children usually like to draw circles without feeling tired. They have poor coordination and cannot accurately judge the direction and distance.

### ***2.2 Causes of autism spectrum disorder***

#### **(1) Genetic factors**

Many literature reports that genetic factors play an important role in the pathogenesis of ASD. A study of twins of ASD patients found that twins of autistic patients are susceptible to infection. Studies of families with ASD have shown that siblings with ASD are at higher risk than the general population. Studies have shown that if there are children with ASD in the family. In this case, the prevalence of infants is 5% to 10%. If there are multiple children with ASD, the chance of a newborn is as high as 35%. However, not all gene transfer models proposed by researchers so far can fully explain the frequency of these ASD patients. In fact, genetic studies have reported hundreds of genes that may be related to ASD, and these are certainly self-evident. The gene is currently unknown. But it is worth noting that the genetic model does not completely eliminate the factors in environmental conditions.

#### **(2) Environmental factors**

Children with autism spectrum disorder mainly occur during the fetal period, perinatal period and after birth. During this period of time, the individual is at an important stage of growth and development, and is extremely vulnerable to environmental factors. Some studies have shown that smoking, drinking alcohol and taking recreational drugs during pregnancy can also cause autism in newborns and lead to abnormal brain structures. Other environmental factors that are likely to cause

autism spectrum disorders include eating disorders, exposure to air pollutants, maternal infections during pregnancy, exposure to chemicals, infant nutrition, diet, and food intake. In general, the role of environmental factors in the development of autism spectrum disorder is an important research direction, which has received great attention from researchers in recent years.

### **2.3 Treatment methods for autism spectrum disorder**

#### **(1) Drugs**

Currently, there is no specific medicine for autism. However, the drugs currently used are not all aimed at the underlying conditions of autism, and most of them are antipsychotics, which change the structure of the central nervous system, such as 5-HT and dopamine. Used to prevent anxiety, depression, obsessive-compulsive disorder, etc. It only includes part of the manifestations of autism. Although the use of secretin to interfere with autism has achieved some results, follow-up studies have shown that the effect of secretin is not significant, and there may be a placebo effect. Therefore, it has not been promoted. However, this hormone produced in the intestine may finally arouse people's attention to the influence of the intestine on the brain, bringing new hope for the treatment of autism. Although doctors will prescribe drugs for autistic patients, the drugs do not actually cure the core problems of autism, such as social and communication disorders. Moreover, the effectiveness of these drugs is not as good as other types of diseases, because they all have certain side effects, and clinical experience in pediatric medication is still insufficient. Therefore, doctors should limit or implement a large number of long-lasting medication therapies for patients with autism.

#### **(2) Antibiotics**

After discovering some of the intestinal symptoms of autism, people began to try to use antibiotics to treat the intestinal symptoms, which also helped to alleviate the symptoms of autism. Some patients with autism have achieved a certain degree of cure after oral administration of two widely used vancomycin and metronidazole to prevent and treat anaerobic infections. Among them, vancomycin mainly acts on gram-positive anaerobes, and high concentrations of vancomycin can also eliminate *Clostridium difficile* and most gram-negative anaerobes. When vancomycin is used to treat autism, its effectiveness is short-lived. When it is stopped, it will reappear, and the interruption will occur again during any treatment. There may be some microorganisms in the intestines, including the disappearance of anaerobic particles in the intestines after vancomycin treatment. Oral vancomycin cannot enter the blood and is rarely absorbed by the body. It mainly works by affecting intestinal bacteria. After stopping the drug, intestinal bacteria may form spores. After vancomycin was discontinued, the spore bacteria continued to affect the intestines and nervous system, the most suspicious being the seed-producing *Clostridium*. Some antibiotics are not absorbed by the body, but enter the bloodstream when inflammation, ulcers or other abnormalities occur in the intestines. In addition, vancomycin and gentamicin are often used for serious diseases when other antibiotics are ineffective. They are considered to be the last line of defense against resistant strains, and improper use can easily cause bacterial resistance. Therefore, such antibiotics should be carefully selected for the treatment of autism.

#### **(3) Food**

Traditional treatments for autism are usually based on a combination of behavioral therapy, diet, and medication. Compared with other therapies, diet is easier to understand, the risks and side effects are relatively small, and can be combined with other therapies and easier to adopt. Proper nutrition helps patients relieve pain and improve psychological and gastrointestinal symptoms. At present, there are many ways of food intervention, including gluten-free/casein foods, special low-carbohydrate diets, gastrointestinal and psychological syndrome foods, low oxalate foods, ketogenic diets, and high-precision foods. Certain dietary habits have a certain alleviating effect on autism, and have won the favor of some patients' families.

## **3. Experiment**

### **3.1 Research objects**

This article selects case information from a child health outpatient clinic of a hospital from March 2019 to March 2020, and includes 25 children with autism before treatment that meet the research criteria for the first time. As a group A, there are 19 male children and 19 female patients, 6 children,

and the children whose severity has been significantly relieved after a period of treatment, are regarded as group B; 25 cases of healthy control group are regarded as group C. Stool samples were collected from all children who met the enrollment conditions, and 16SrRNA high-throughput gene sequencing was performed to analyze the differences in the diversity of the digestive tract flora of the three groups of samples.

### 3.2 DNA extraction

For the purified bacterial solution from the conventional culture, use a pipette to transfer 2 mL to the EP tube, and perform DNA extraction on the purified single strain according to the instructions of the TIANamp Bacterial Genome Extraction Kit. For real-time sequencing of molecules, use the QIAamp DNA Stool Mini Kit to extract genomic DNA from stool samples. Use agarose gel electrophoresis and microplate reader to check the quality of DNA extraction.

### 3.3 Statistical methods

SPSS19.0 statistical software was used for data analysis, and Student's t-test and Wilcoxon's sign rank test were used for pairwise comparison, and  $P < 0.05$  was considered statistically significant. A test formula for t can be defined as:

$$t = \frac{\bar{X} - \mu}{\frac{\sigma_x}{\sqrt{n-1}}} \quad (1)$$

If the sample is a large sample, it can also be written as:

$$t = \frac{\bar{X} - \mu}{\frac{\sigma_x}{\sqrt{n}}} \quad (2)$$

Here,  $\bar{X}$  is the sample average,  $\mu$  is the overall average,  $\sigma_x$  is the sample standard deviation, and n is the sample size.

## 4. Discussion

The Sort function divides the sequence into multiple groups based on the similarity, and the set is OTU. According to different similarity levels, each sequence can be split into OTU or deleted according to the difference in similarity, without re-copying each sequence. Generally, 97% of similar OTUs will be merged and removed during the grouping process chimera to obtain a representative OTU sequence. Create an OTU table by assigning all optimized sequences to OTU representative sequences and selecting sequences that are 97% or more similar to the OTU representative sequence. According to this principle, the OTU chart of this article is shown in Table 1 and Figure 1.

Table 1. OTU clustering

Grouping	Sample size	OTU		
		Mean	Maximum	Minimum
Group A	25	182.13	362	103
Group B	25	180.28	267	116
Group C	25	210.06	270	159

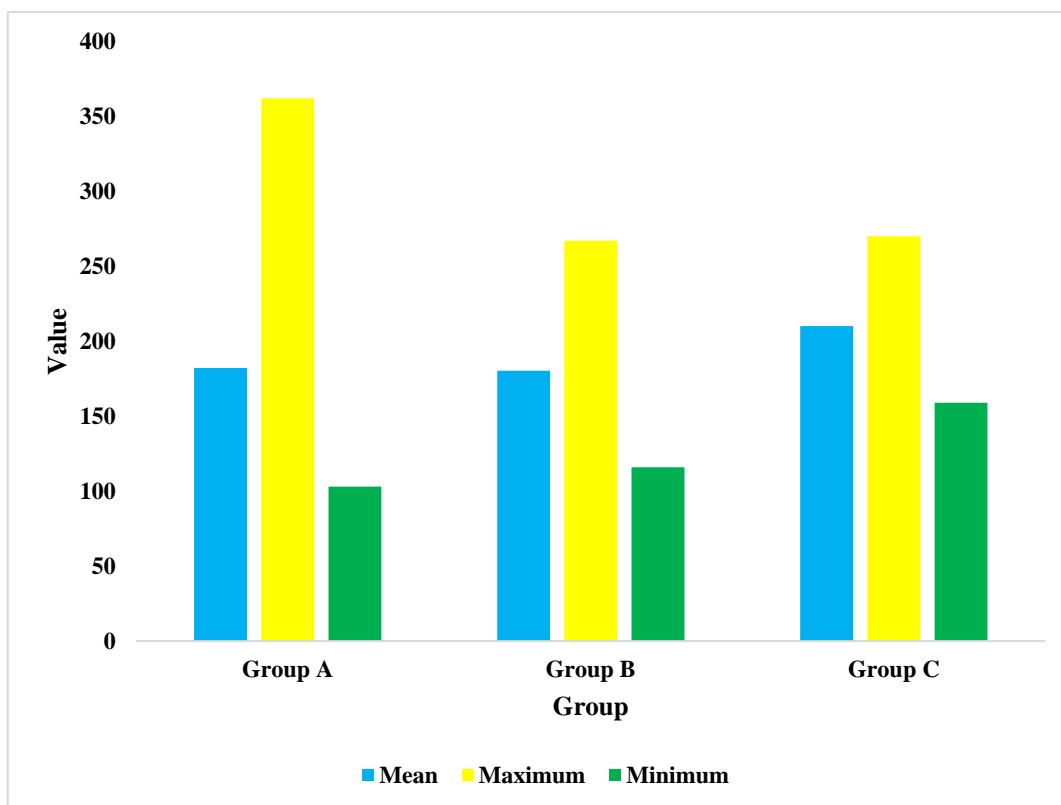


Figure 1. OTU clustering

The study of microbial diversity in community ecology usually uses a single-sample ecological diversity analysis method to reflect the cholesterol content and diversity of the microbial population. It also includes the use of various statistical analysis indicators to predict the ecological cholesterol content and diversity of environmental populations . The main indicators for evaluating the abundance of environmental flora are: Chao and Ace; the indicators for calculating the diversity of bacterial groups are: Shannon and Simpson; and the depth indicators of sequencing technology are: Coverage. The results of the pairwise comparison are as follows.

Table 2. Diversity statistical analysis

Diversity index analysis	Comparison of two groups	P value	
		Student's t-test	Wilcoxon's sign rank test
ACE	AB	0.923	0.806
	CB	0.123	0.123
	CA	0.139	0.083
Chao	AB	0.938	0.614
	CB	0.080	0.139
	CA	0.156	1.101
coverage	AB	0.406	0.694
	CB	0.645	0.139
	CA	0.053	0.054
Shannon	AB	0.911	0.949
	CB	0.001	0.007
	CA	0.003	0.012
Simpson	AB	0.891	0.825
	CB	0.001	0.005
	CA	0.01	0.008

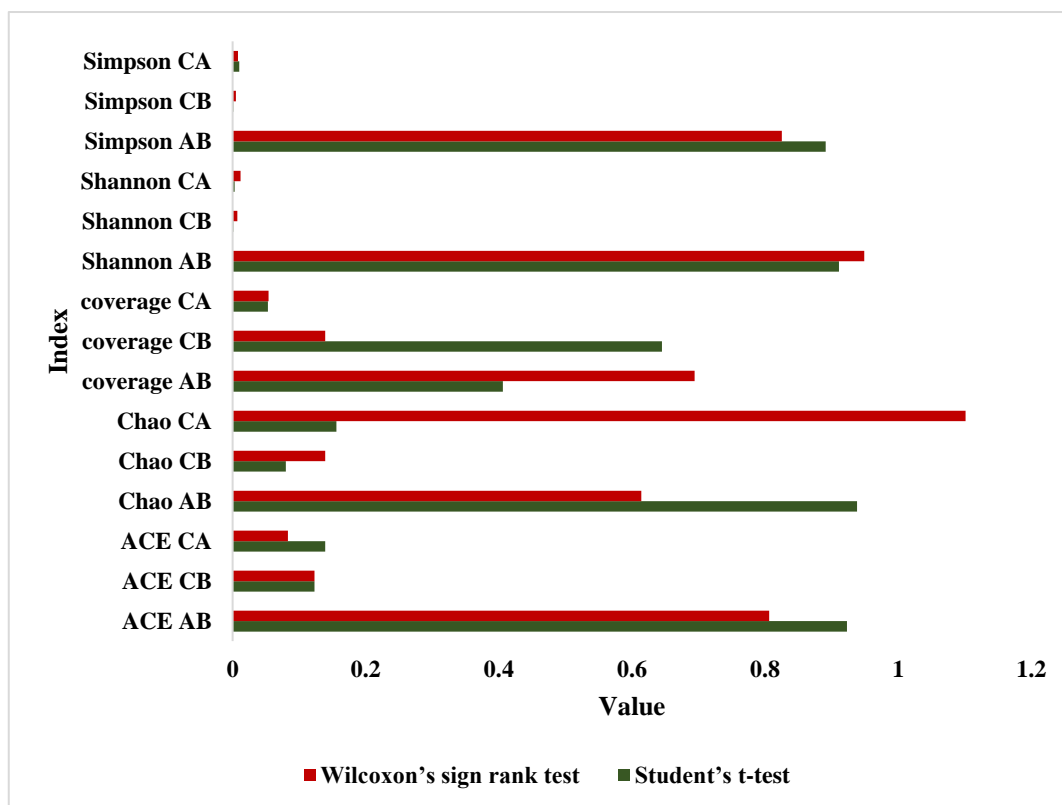


Figure 2. Diversity statistical analysis

It can be seen from Table 2 and Figure 2 that in the analysis of the flora diversity index, the comparison between CB and CA is  $P < 0.05$ , which is statistically significant.

## 5. Conclusions

Disorders of the digestive tract flora are closely related to the occurrence and development of autism. The establishment, determination and micro-ecology of the digestive tract flora of children with autism are characterized by diversity and uncertainty. Although the cause of autism is still unclear, more and more evidences show that the digestive tract plays a role in the pathogenesis of autism. The severity of gastrointestinal symptoms is related to the severity of autism, which strongly implies The interaction between the digestive tract and the brain.

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