



# Enlightenment and Current Situation Analysis of the Development of Children's Sensory Integration Training

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## Abstract

With the increasing number of children with sensory integration disorder, this paper makes an in-depth analysis of the concepts related to sensory integration and the development status of sensory integration training, and explores the fundamental value of sensory integration training according to the main causes and potential manifestations of sensory integration disorder, in order to provide an effective reference for enhancing children's physical and mental development.

## Subject Areas

Physical Education

## Keywords

Children, Sensory Integration, Sensory Integration Training, Sensory Integration Disorder

## 1. Introduction

In today's society, with the rapid development of all aspects, although the physical and mental development of children is paid attention to, but also by parents and relatives of parenting methods and environment and other aspects of interference, resulting in children's physical and mental development is limited, seriously hindered the basic ability of normal growth of their life. And with a timid, active, serious shy, slurred speech, inattention, clumsiness, poor physical activity not harmonious, self-adaptive phenomenon [1], confirmed by a large number of scientific research, it is probably closely related to children sensory integration disorder [2], and in many cities in our country in recent years the in-

idence of sensory disorder in children is rising [3] [4].

As sensory integration theory is put forward, more and more researchers begin to pay great attention to all aspects of related research, from the beginning of the 20th century in China have been someone to feel in each category in the field of integrated discussion, and the deepening of the research on basic theory analysis, the feeling also gradually enrich the content and practice in the field of integration. People are more and more aware of the value and importance of children's sensory integration training, and some people continue to carry out relevant training and treatment of children's sensory integration. Children's sensory integration training for children's healthy growth is the key influence, through various forms of exercise to let children's brain to eyes, nose, ear, tongue, sensory organs such as skin, muscle and joint in the received the signal applied to integrate, feel integrative training on brain science and the particularity of relationship between children's physical and mental development, Pay attention to the comprehensive exercise of sensory ability and body motor function, so as to promote the healthy development of children's body and mind [5].

## 2. Sensory Integration

Feeling integration is mutual cooperation between the brain and the body of the learning process, it refers to the body itself by using organs of perception in the natural environment, with different feeling pathway to obtain a large amount of information, and then enter the brain, the brain to process the information), and finally completed the ability of adaptive response, hereinafter referred to as "system" [6].

Sensory Integration Theory was founded by Jean Ayres, a clinical psychology expert at the University of Southern California [6]. She believes that children's inattention and dissonance are probably caused by various functional barriers of Sensory Integration. In physiology (neurology), disorders of sensory integration can refer to disorders of integration of all basic functions of the brain stem (diencephalon, midbrain, brain stem, medulla oblongata) and spinal cord (inferior brain). The basic function of an organism (brainstem spinal cord system), only when its performance is reasonably and completely developed, can life begin, and can various activities be realized purposefully, that is, to produce human activities and behaviors. Once the development stagnates in the infant period, the newborn period or the functional stage such as the brain nerve tissue in the childhood stage, it is easy to have the functional disorder on the behavior ability. Since the theory of sensory integration was put forward, the concept of sensory integration has been interpreted in different ways with different ages. Sensory input—brain integration—behavioral output, this process is sensory integration.

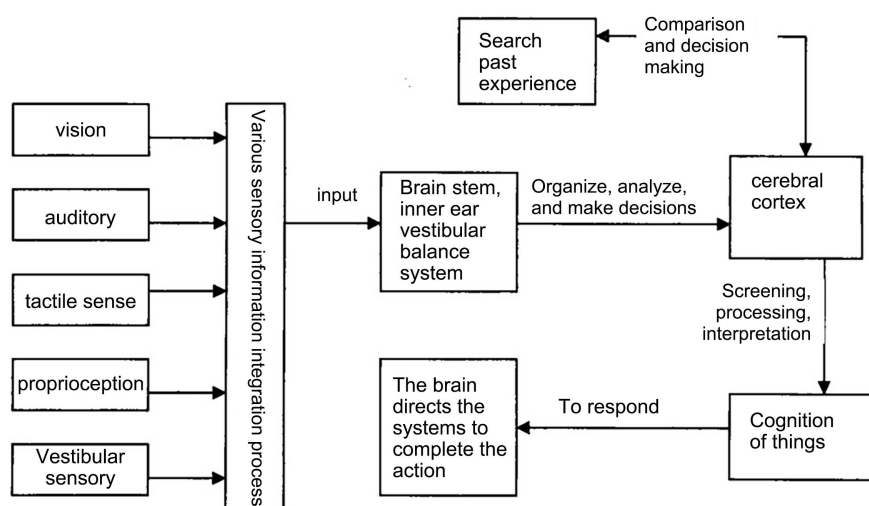
### 2.1. Brain Mechanisms of Sensory Integration

Sensory integration means that the brain organizes, analyzes, and makes deci-

sions through the brainstem and vestibular system of the inner ear to feed information into the cortex. After the cerebral cortex compares and compares past experiences, filters, processes and makes decisions to form cognition and response to things, the command system completes corresponding actions. Any problems in this process can lead to sensory integration problems. For example, if there is a problem in the thalamus during the process of sensory input into sensation, allergy or hypoesthesia can occur, affecting the whole sensory integration process. Sensory integration is not only an important prerequisite for cognitive, social, emotional and self-development, but also an important learning process for overall brain development. It can be divided into two levels: one is the primary integration function, including bilateral body coordination, hand-eye coordination, attention, emotional stability and purposeful activities; The second is higher integration function, including concentration ability, organization ability, self-control ability, learning ability, inductive ability and reasoning ability. The interaction of various sensory information, namely the ability of the central nervous system to integrate information from different sensory channels contributes to the synthesis, detection and recognition of coordinated information from different sensory modes for response, as well as the integration of disorganized information from different sensory modes [7]. In general, when a stimulus occurs, the same neuron can cause both excitation and inhibition, which is achieved by connecting temporary connections [8]. Sensory information integration plays an important role in human learning. Studies on children with learning disabilities have shown that sensory integration disorder is an important cause of many learning problems in children with learning disabilities [9] [10] (Figure 1).

## 2.2. Measurement of Sensory Integration

Ayres first developed the Sensory Integration Scale for the test of children with learning disabilities [11]. Taiwan's Zheng Xinxiong also effectively referred to the Chinese cultural background, compiled the "children's sensory integration checklist", in the test of the scale, showed that the children's sensory integration checklist has good validity and reliability. In China, Ren Guiying and Wang Yufeng *et al.* introduced and revised the Taiwan version of sensory Integration Scale (6 - 14 years old version), and showed that the scale had good face validity and construct validity with good test-retest reliability, split-half reliability and homogeneity reliability. By measuring school-age children in urban areas of Beijing, they believe that the rate of sensory integration disorder is 35.9% [12] [13]. The reliability and validity of their application studies were also satisfactory in school-age children in urban areas of Beijing. Wang Yufeng, Huang Yueqin and other scholars tested the revised Sensory Integration Rating Scale (from Taiwan) in a large number of children in mainland China, and believed that the rating scale had good reliability and validity, and could be used as a screening and auxiliary tool for the diagnosis of sensory integration disorders in children aged 3 - 6 years [14]. Since then, researchers have been using the sensory integration



**Figure 1.** Brain mechanism of sensory integration

scale to test, and the results show that the rate of sensory integration disorders in school-age children is between 19% and 35%, which is slightly higher than the results of foreign studies. According to scholar Yu Suhong's investigation and research on mentally retarded children in Shanghai, the rate of sensory integration disorder in mentally retarded children reaches 60.6% which is significantly higher than that of children with normal intelligence [15].

### 3. Sensory Integration Disorder

Sensory integration disorder refers to the inability of the external sensory stimulation information to effectively combine with the neural activity of the brain of children, so that the body cannot operate in harmony. After a long time without correction or exercise, various obstacles will occur and eventually impair the physical and mental health of children [16]. "Children's sensory integration disorder" means that children's brain lacks the ability to regulate and integrate various organs of the human body, which will reduce the body's perceptual ability and social adaptation ability to different degrees, thus delaying human social process.

The development of sensory integration can be influenced by internal and external factors. First of all, the physical and mental development of the individual, especially the functional development of the central nervous system, plays a key role. For example, the compensation and plasticity of the nervous system can be affected by various factors such as the level of social intervention and age. The younger the age, the earlier the intervention, and the better the effect of neurological function development rehabilitation. Secondly, the social environment that children receive also has this important influence on physical and mental development, which is also an indispensable key factor for the development and development of children's sensory integration. Some factors that are not conducive to children receiving abundant stimuli will affect the healthy development of children. As early as possible for children to pertinence and various sensory

stimulation, and can create multi-sensory interactive teaching atmosphere, provide more children and external environment to achieve a good communication and interaction with others the knowledge of space, through flexible and varied forms to master all kinds of knowledge content, essential for children sensory integration ability development.

Sensory integration disorder is not a disease. It occurs in all children, but there are differences in degree. Even adults have behavioral manifestations of sensory integration disorders, such as motion sickness and fear of heights, which are manifestations of sensory integration disorders. Sensory integration disorders are generally divided into 3 degrees: mild, moderate and severe. Sensory dysfunction can be prevented and corrected, so parents need to pay attention to it. The best prevention period is before the age of 3, and the best golden correction period is between the ages of 3 - 12.

### 3.1. Causes of Sensory Integration Disorders

#### 1) Environmental factors

Sensory integration disorder in children is the result of the interaction of many factors. In the family environment where children grow up, parents' educational level, emotional state, family educational structure, educational methods and other environmental factors have an important impact on the development of children's sensory integration function. Children brought up by their parents or babysitters are less likely to participate in the interaction between peers and team games; Modern miniaturization of family education, resulting in children's entertainment space reduced, lack of outdoor sports and all kinds of physical exercise; Parents' excessive care or strict management of children and other factors reduce the sensory stimulation received by children and become the main factor leading to sensory integration disorder [17].

#### 2) Physiological factors

The birth and case history of children are closely related to the occurrence of sensory integration disorder. Maternal emotional stress during pregnancy, fetal malposition, threatened abortion, medication during pregnancy will affect the development of children's sensory integration function.

The dysregulation of sensory integration in children is closely related to the content of trace elements in human body. From the level of neurotransmitter metabolism, it is specifically related to the imbalance of metabolism of norepinephrine, catecholamine and dopamine in the body. The research shows that the incidence of sensory integration disorder in boys is significantly higher than that in girls, and there is no obvious gender difference among different age groups. Among the dimensions of sensory integration disorder, the incidence of cognitive awareness and vestibular dysfunction in boys is higher than that in girls, and there is no significant gender difference in the prevalence of tactile overdefense and ontological dimension [17].

In addition, different delivery modes also affect children's sensory integration

ability. Premature delivery and Caesarean section may lead to children's lack of tactile learning. According to the investigation, the incidence of sensory integration disorder in infants born by cesarean section is much higher than that in children born naturally, and the degree of disorders in children with vestibular disorder and excessive tactile defense is also higher. Behavioral deficits in children are also closely related to sensory integration disorders. The incidence of sensory integration disorders in children with behavioral problems is significantly higher than that in children without behavioral problems, and children with behavioral problems are often accompanied by symptoms such as vestibular coordination difficulties or cranial neural development delay [17].

### 3.2. Manifestation of Sensory Integration Disorder

From the perspective of nervous system, sensory integration disorders include vestibular dysregulation, proprioceptive dysregulation and tactile dysregulation. However, dysregulation of vestibular perception can be divided into dysregulation of vestibular balance and dysregulation of vestibular momentum, dysregulation of proprioception can be divided into dysregulation of left-right brain balance and dysregulation of movement coordination, and dysregulation of tactile system can be divided into dysregulation of tactile sensitivity and dysregulation of tactile sensitivity [16].

#### 1) Vestibular sensory disorders

The sensory organ of vestibular sensation is located inside the inner cochlea. It mainly detects gravity and senses changes in body spatial orientation. Vestibular function develops earliest and the process is longer, which may last from the whole infant period to the growth period of children. Children's most basic body coordination function (such as sitting, standing, walking), movement and accurate expression of action (the most basic motor development) and the development of brain function, are inseparable from the influence of vestibular sensation. Vestibular sensation is the most central sense in sensory integration. Vestibular perception disorders will lead to poor balance, walking, often hit objects, clumsy movement, neck straightener than children of the same age, often drop the head; The problem that children can't determine the spatial structure of visual field is easy to happen, and children often can't determine the distance and orientation. In writing, it is easy to write numbers, fonts, text side, or backward reading phenomenon; Children's eye movement is not smooth, the eye is not easy to follow the rotating target, resulting in children's movement, playing ball and line drawing difficulties, affect the normal development of children's visual field cognitive ability; Children with vestibular difficulties have many small activities and are prone to distraction in the teaching process, which affects the concentration in teaching [18]. Children's vertigo is affected in the process of movement, and the specific performance is to like rotation, and rotation time is very long and do not feel vertigo, children love sports, play rotating objects, often like climbing, running while jumping.

## 2) Proprioceptive disorder

Proprioceptors are found throughout the body and are often simply described as “the sense of being, the way people feel about themselves”. Somatic disorders cause children clumsy limbs, poor movement coordination ability, slow and sluggish, its consciousness and self-control is poor, logical and weak, mathematics learning, especially in mathematics vertical counterpoint learning will be affected. In addition, the brain nervous system that regulates small muscles and hand-eye coordination is the same as the nerves that regulate the tongue, labial muscles and breathing vocal cords. Therefore, for children with inadequate sense of body, the brain’s regulation of tongue, lip and vocal cords is not flexible enough, which will affect the development of language. Serious people will have unclear pronunciation, stuttering and other phenomena. In a word, the sense of ontology is the most basic sense of the human body. It can affect people’s standing posture, spatial perception, coordination, attention development, emotional control, rhythm, language logic, learning speed and many other aspects.

## 3) Tactile system disorders

The sensory organ of touch is the skin, the most extensive sensory organ in the human body. Skin is an important information acquisition channel for communication and cognitive learning between individuals. The sense of touch is the first channel for people to understand things, which is the main way for people to understand the world in the early stage. Children 1 to 2 months old will be rich in reflex activity to a variety of tactile stimuli. Compared with vestibular and proprioception, touch occurs earlier and matures earlier, but it has far-reaching effects and plays a very important role in human life.

Touch sensitive (excessive defense): due to the new external environment stimulation adaptability is weak, so will be familiar with the inherent life experience, specific performance for clingy, timid around strangers, is not willing to crowded and lack of self-confidence, aversion to all new things to learn, don’t like direct contact with others, easy to dispute with others, friends are very few, often in the lonely; Partial eating, finger sucking, fear of the dark, emotional control problems.

Tactile dullness (lack of response): people with severe dullness will respond slowly, not quickly, and have poor ability of dense movement; Lack of self-awareness, in childhood easy to have no boundary consciousness, the scope of thought is not clear, go one’s own way; Unable to defend themselves, prone to fighting, affecting peer relationships. Very few children will have poor brain recognition and clumsy pronunciation and small muscle movements.

It should be noted that the above disorders are also affected by the actual age and the degree of disorder, and the specific manifestation will have individual differences.

## 4. Sensory Integration Training

Sensory integration training guides the appropriate response to sensory stimuli

according to the children's neural needs. This training will provide stimulation such as vestibular perception, proprioception and touch perception. Its purpose is not to improve the basic motor skills of individuals, but to improve the sensory information and organization structure of human brain and constitute sensory information, that is, to improve the sensory neural function of brain function [18].

Sensory integration exercises give children comprehensive stimulation of sensory perception such as vestibular, skin touch, muscles, joints, sight, hearing and smell, and effectively combine these stimuli with movement. Feeling series training contains the correlation between psychological, brain and body, is more than just a simple kind of physical exercise, children in the process of its training will gradually master the sensory stimulation, enhance self-confidence and self-management ability, and under the guidance of body control itself, gradually will originally anxious mood into joy, on the basis of the active experience slowly dare to challenge. Sensory integration training is based on patience to cultivate children's interests and hobbies, establish self-confidence, so that children feel happy in play, the effect of training varies from person to person, so that children have a variety of sensory stimulation every day.

#### 1) Body movement training

Body movement exercises mainly train children from three perspectives of vestibular, tactile and proprioceptive perception, so that children can receive different sensory signals and comprehensively apply them to produce correct motor response patterns in their minds, so as to establish comprehensive sense of sensory perception [19]. Skateboarding, skateboard climbing, swinging on the balance table, passing, one-legged stool, balance beam and other ways; In view of the lack of muscle tension and dynamic balance in children, physical training can effectively improve children's ability of audiovisual movement and thinking level. Through the straight jump bag, S-shaped obstacle, crawling, rolling, running on the pebble pad, picking and tactile acupoint massage ball extrusion, to improve children's object recognition ability, control emotion, limit excessive movement behavior; The activities of peanut ball sitting and lying, squeezing, croquet ball jumping, trampoline bouncing, passing, Vientiane group drilling, climbing, jumping, running and so on can improve children's self-confidence and enhance their exploratory cognitive level.

#### 2) Audio-visual and motor integrated training

The development of learning ability is based on the highly harmonious and unified development of sight, listening and movement. Once there are defects and deficiencies in aspects, they will cause obstacles in learning. The method of integrated audiovisual movement training is a teaching method aiming at improving children's overall vision, movement and coordination. The main training courses include jigsaw puzzles, threading, jack boards, Russian jigsaw boards, circular blocks, visual tracking, drawing sequencing, rhythm exercises, similarity detection and auditory and motor response exercises, etc.

#### 3) Audio-visual speaking virtual training



Learning is a process of information processing. Learning process is the basis of information input and output, because most of the information input by see, hear, touch, manner, and the output of the information is mainly accomplished through the way of information (speak), in the visual, listening, speaking (words) and coordination on the information integration of any one aspect if defects or deficiencies, can cause the lack of ability to learn. Audiovisual speaking ability training is a form of training aimed at cultivating children's abilities of seeing, listening and speaking and their coordinated development. It organically integrates vision and hearing and promotes the balanced development of children's left and right brain potential through sensory stimulation. The main training includes recognition of sound differences, corresponding coding, etc.

## 5. The Facilitation of Sensory Integration Training

### 1) Strengthen children's nervous system and sensory perception ability

Sensory integration training has a certain improvement effect on neurophysiological inhibition of the brain. The key to exercise is to give children visual field, hearing, smell, touch, joint, tendon, vestibular and other stimuli at the same time, and combine this stimulus with training. An important symbol of individual life existence is that he and the outside world on the energy, material and information communication, and sensory integration training is provide sensory signals using various stimulation to children, help children's development of the central nervous system, so as to help children control or adjust the sensory signals and promote children's sensory stimulation in the comparison with the structure of the reaction, The goal is to enhance children's organizational ability, learning, attention, mental concentration, and athletic cooperation [18].

Sensory integration training hand-eye coordination through the ascending children strength, make the body movement rate and movement stability are improved, such as power and gyro game activities using rotation, broke the children torsional inertia weight of the past, by adjusting the reconstructed the new equilibrium strength, to assist the force to promote the central nervous system movement. Sensory integration training has significant effects on the development of children's fine operation skills, bilateral cooperative power, visual discrimination power and reaction power. Sensory integration training can not only change children's sensory integration disorder, motor problems and attention problems through grand motor stimulation, but also promote children's intellectual development and normal neuropsychological development.

### 2) To intervene in children's behavioral problems and learning difficulties

Sensory integration training can realize the coordination exercise of hands, eyes and brain by adjusting the strength of coordination between major and minor muscle movements, thus improving the sensory integration function of children. At the same time, strengthening the physical exercise of school-age children can also improve the development of intelligence prevent mental activity disorders, so as to promote the development of sound personality [20]. It is

not only helpful for children's academic performance, but also necessary to change the behavior problems of school-age children. Sensory integration training can be divided into two forms: individual training and group training. Individual training is usually carried out in various training organizations or families, while group training is more often carried out in kindergartens or primary schools. Since sensory integration training is rich in playfulness and interestingness, it is of great benefit to the cultivation of children's sensory integration ability if more personalized training objectives can be put forward according to the individual differences of children.

### 3) To improve the different types of disorders of special children

Sensory integration training has its basic training form, which is of universal significance to all kinds of special children in this field. In sensory integration training, trainees follow the general application principle and basic operation skills of psychological intervention skills, and select corresponding training strategies and skills according to the particularity of children with disabilities. Due to mental retardation children is the core issue of mental retardation, and often accompanied by poor perceptual experience, clumsy, attention concentration is poorer, and the problem of small memory capacity, by feeling integration training can effectively improve the development level of the perception, enhance the awareness and the coordination and integration between sensory and action between together, So that they can better carry out their daily activities; The perceptual integration training for children with attention deficit hyperactivity Disorder (ADHD) focuses on improving their comprehensive ability of language perception, consciousness and movement, so as to enhance their attention and the continuity and coordination of information collection, processing and transmission. For learning disability children is usually a big sports ability is no problem, but the motion precision is not high, poor coordination, so the integration training for children's emphasis on cultivating their ability of unity between language perception pathway, language, consciousness and action, the integration between the integration between perceptual cognition, so as to improve the overall development of brain function; Children with cerebral palsy generally show central dyskinesia and postural dysplasia, and one or several parts of the visual, auditory, intellectual and speech abilities of the body have different degrees of dyskinesia. Therefore, on the basis of cultivating children's ability of proprioception, touch and vestibular sensation, the function of movement can be enhanced, thus laying a foundation for the improvement of their activity level.

### 4) Cultivate children's interest in participating in sports activities

Sensory integration training is a very interesting exercise training correction method, which uses specific equipment to carry out targeted special training on children and adolescents' sensory perception and motor ability. With high interest, children actively participate in it, and gradually will be interested in physical exercise, like physical exercise, so as to strengthen the body on the basis of interest, and lay a good foundation for lifelong physical exercise.

## 6. Developmental Strategies of Sensory Integration Training

### 1) Sensory integration training in life

Feeling integration training into daily life is children disorder prevention and control of the most effective way, because contemporary children entertainment time accompanied by electronic products through mostly, and peer activities between opportunity is less, easy to cause children decreased visual acuity, feeling ability development of the body organs, prone to sensory integrative dysfunction. Traditional games such as rope skipping, shuttlecock kicking and sandbag throwing are activities that children can carry out at any time in their daily life. They can not only enrich their lives, but also give play to their communication and cooperation with their partners in games, so as to change or prevent children's sensory integration disorder.

### 2) Effective publicity and education by relevant government departments

The training of sensory integration should be popularized and promoted in kindergartens and schools. 3 - 7 years old is a critical period for the development of sensory integration in children and adolescents. During this period, correction training to a certain extent for severely maladjusted sensory integration will effectively reduce the incidence of sensory integration disorders in children.

### 3) Promote the integration of sensory integration training and physical education

Adding teaching content about sensory integration training in primary school physical education curriculum can not only increase the interest of physical education curriculum but also train children's sensory integration. It can better promote the improvement of children's learning ability, interpersonal communication ability and healthy personality development.

### 4) Popularizing relevant knowledge and theories

Feeling integration related researchers and experts to more in-depth analysis in the form of integrative training method, looking for more, more suitable for training to improve the ability of children feel valued as a whole, but also to the parents and children education worker spread feel relevant theory knowledge, parents and education workers should pay much attention to feel integrative knowledge learning, Timely communication with children, participate in more parent-child activities, do not overprotect children, to let children experience everything in the world. At the same time, parents should learn some sensory integration training methods, but also to exercise children to carry out positive guidance, establish a correct outlook on life, values, early detection, early treatment of children's problem behavior, work together to promote the healthy growth of children and adolescents. Only BY "comprehensive TREATMENT" of children's sensory integration disorder can a good effect be achieved, which is a problem that scholars and educators must pay attention to.

## 7. Conclusion

Feel integrative training main characteristic is to pedagogy, psychology, beha-

behavior, physiology, sports and other disciplines teaching content contained in a sports game, the sports training methods with the help of some simple equipment, enable children to in sports game in a planned way, targeted input strong sensory stimulation, so as to improve and promote the normal development of the brain and its functions, Help children physically and mentally. Many research reports on sensory integration disorders in children and their causes have focused on the effectiveness of sensory integration training. At the same time, more education scholars began to pay attention to the interaction between sensory integration training and family environment, parenting style, children's attention deficit and behavior problems. On the whole, although changes in living conditions and social environment may cause children to lack sensory stimulation, sensory integration training should include brain, mind and body, not only physical exercise, but also psychological exercise. Its training effect is worthy of recognition and suitable for large-scale promotion.

### Conflicts of Interest

The author declares no conflicts of interest.

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