

Using big data analyze to improvement of the attention ability of the bone conduction headset in the children with autism

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Abstract-Children with autism have high sensitivity, so when they feel too much noise, they can't concentrate, and as time passes, they become isolated and autistic. High-sensitive pointers often present a self-protection behavior, perhaps by covering their hands with their own ears or by making a higher frequency noise, which is a way of comforting and stabilizing themselves when they are confronted with a strong disorder. It lowers the child's sensitivity to sound by conveying the voice directly through the body through bone conduction. By reducing sensitivity to the outside world and adjusting the interaction of sensory organs, this improves the ability of autistic children to focus less. In this paper, the comparison of auditory perception between bone conduction headphones and traditional headphones is further understood to understand whether the use of bone conduction is helpful to the improvement of the concentration of autistic children.

I. INTRODUCTION

The ear is the most powerful sensory integrator of the human body. More than 80% of the stimulation our brain receives comes from our ear. On one hand it has a major role in the cerebral stimulation of the brain, and on the other hand it has a positive action on the cerebral plasticity of the brain [1].

Bone conduction is the mechanical vibration that converts sound into different frequencies, using human skull, inner ear lymph, auditory nerve, and auditory center to transmit sound waves.

Studies have shown that a large number of autistic people may be allergic to or overly insensitive to daily audio-visual or other sensory stimuli. In a special study of autistic children, 65% of children are sensitive to noise stimuli. Scientists have found that the autonomic nervous system of autistic children, regardless of whether they hear the noise, appears to be more intense than other children. This more intense physical feedback may cause them to react more strongly to these sound stimuli. By reducing sensitivity to the outside world and adjusting the interaction of sensory

organs, this improves the ability of autistic children to focus less.

Auditory processing through bone conduction means that sound enters the ear and enters the nervous system directly through the skeleton, thereby enhancing the ability to focus, eye contact, language, understanding and body sensory function.

The way of bone conduction can reduce the frequency response caused by sound transmission in air. It also lowers the child's sensitivity to sound by conveying the voice directly through the body through bone conduction.

II. BACKGROUND

Bone conduction technology can be traced back to the 1977, Bone anchored hearing aid (Baha Bone Implant Hearing system) is a hearing aid designed for people who cannot wear traditional air-guide hearing aids. The titanium metal retainer and the pedestal are implanted through surgery to connect the sound processor.

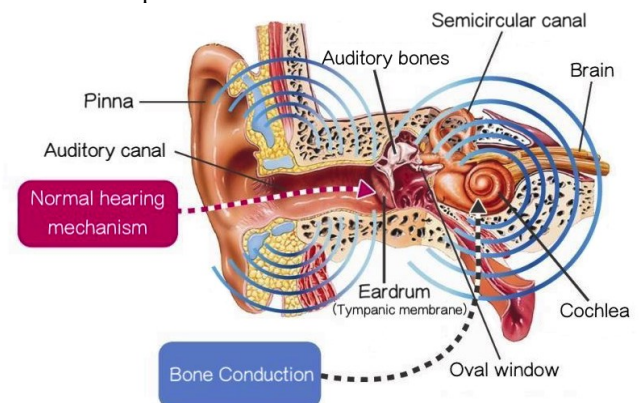


Fig. 1 Normal hearing mechanism and bone conduction

The most important feature of bone conduction is that it can be transmitted to the inner ear by the skull on either side of the skull without having to plug the ear. Let users in any situation, such as water, jogging, war, can hear the sound of headphones and clearly distinguish the sound of the external environment.

The current theory is that Tomatis Method stimulates the myelination of the auditory pathways [2] which improves the speed of processing of the auditory signals [3]. In addition, the auditory stimulation results in a better integration between the different sensorial systems and in a more harmonious balance between the para- and sympathetic nerve system [4].

Tomatis believes that the benefits of bone conduction are [5]:

- a) Supports stress reduction and regulation of the “fight or flight” response, to help achieve a state of calm and relaxed/alertness; especially helpful for people with sensory sensitivities.
- b) Two modes of listening help improve sensory awareness, supporting brain functions responsible for posture, balance, muscle movement, and motor skills.
- c) Using The Listening Program with combined bone and air conduction offers internal and external sound stimulation, which increases vocal awareness and supports the development and refinement of language and communication skills.

Since 1964, the Autism Research Institute has collected over 17,000 of its Diagnostic Questionnaire Form E-2 from parents of autistic children worldwide. The Form E-2 data show that approximately 40% of autistic children are reported to exhibit some symptoms of sound sensitivity [6].

III. THE ATTENTION ABILITY OF THE BONE CONDUCTION HEADSET IN THE CHILDREN WITH AUTISM

Alfred A. Tomatis found that 85% of our brain nerve pathways were stimulated through the ear. In the ear, there are two main nerves: auditory (cochlear) nerves, which carry auditory information and vestibular integrators between the inner ear and the brain, which control coordination, balance and control of bodily functions. Auditory processing through bone conduction means that sound enters the ear and enters the nervous system directly through the skeleton, thereby enhancing the ability to focus, eye contact, language, understanding and body sensory function [7].

According to a number of studies, the following are the effects that can be expected after wearing a bone conduction headset:

- a) The middle ear muscles help the body to effectively filter and ignore background sounds. Wear bone conduction headphones to exercise muscle tension in the middle ear to improve hyperacusis.
- b) Clearly identify the source of sound and enhance

auditory processing, accurate reception of sound and effective understanding of instructions, can help learn more effective and good communication.

- c) To make the reticular activating system more active in the brain, can be more focused on the completion of work.

In this paper, we'll explore it in big data that the bone conduction is able to isolate the sound from the environment while outputting the filtered sound from the system.

IV. RESULTS & DISCUSSION

More than half of parents are satisfied with the way the most mainstream intervention is to wear earplugs or play music headphones, according to the latest research. However, the use of bone conduction headphones in Taiwan is mostly expensive and time-consuming for most autistic parents (3-5 days a week, at least 2 hours). They still want to be able to develop a complete set of equipment that can be easily operated at home to show children's sensitivity to sound and the pain associated with it. This is also the most important goal of the study.

It is hoped that through the study of big data, we can know more about the performance of bone conduction in improving special children's ability.

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