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Sensory Motor Function in Deaf Children

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ABSTRACT

Deafness or hearing loss is a partial or total inability to hear. Childhood deafness is a common chronic condition that may have a major impact on sensory motor development. Deafness is a world-wide problem that causes the most serious limitation that can befall a child, as it prevents his optimal development. It has to be viewed as a multifaceted condition as a variety of factors determines the effect of deafness on child's development. The focus of evaluation and treatment for these children is primarily on the language development. Therefore in order to minimize the adverse effects on normal development of hearing disorders, it is crucial to carry out screening examinations and appropriate interventions of sensory and motor deficits, which enable early detection of these dysfunctions, which are often either not noticed or under estimated. It is also important to re-evaluate sensory motor function in these children during the course of their childhood in order to assure early intervention.

KEYWORDS: Deafness, sensory motor function.

Introduction

Childhood deafness is a significant public health problem. Children progress through gross motor skills in a fairly consistent pattern—93% of children who are deaf without vestibular problems develop gross motor skills at the same rate as hearing children . The only exception is when a specific cause of the deafness affects balance or vision. Risk factors for hearing loss can overlap with risk factors for developmental delays. Even children whose hearing loss is not associated with developmental concerns can still have other risk factors for developmental delays.

Delays that are likely not explained by deafness include:

- Favoring one hand before 12 months of age (due to weakness or difficulty using both hands)
- Crossing midline to pick up a toy (children under 1½ years should reach for object with hand closest to the object rather than use the opposite hand, crossing over the midline)
- Fisting of the hands beyond 4–6 months of age
- Persistent primitive reflexes beyond 4–6 months of age
- Log roll (rather than segmental roll)
- Muscle tone (low or high)
- Scissoring of the legs (when a child is picked up, the legs should be slightly apart rather than crossing over each other)
- Conditions with deafness that "may" include motor involvement
- Inner ear malformations
- Post-meningitis with vestibular involvement

In children with motor difficulties, positioning can be important in the success of treatment and interventions. Children who require a lot of energy to stay upright may be unable to attend to communication-related tasks. A child needs good trunk control for respiratory control. Seating devices, positioning, and other adaptations for children with low muscle tone may promote more success in developing communication skills. Physical therapists are an excellent resource for identifying strategies to help children improve their functional motor skills. Sensory integration is a theoretical framework for understanding how the brain develops the capacity to perceive, learn, and organize behavior. As the senses take in information, the brain processes and organizes it for responses. The sensory systems help establish arousal states, helping to attend, contributing to emotional state, and promoting action on the environment. Many deaf children have some difficulties with sensory integration, but not to the degree that affects daily function. For a deaf child developing spoken language, a motor basis for production difficulties may be seen in: difficulties with chewing and swallowing; presence of drooling; difficulty with automatic lip closure or lingual mobility; oral asymmetries; difficulties coordinating speech movements; prolonged use of simple syllables and restricted number of consonant sounds; and prolonged use of open syllables and difficulty with multiple syllable words.Motor difficulties also may interfere with sign development for some deaf children. Such difficulties may express themselves in six areas: isolated signs and simple phrases that are poorly articulated (by 3 to 3.5 years of age, most deaf children produce intelligible signs); difficulty in isolating fingers to form handshapes; errors in sign orientation or movement; difficulty with bilateral coordination; problems with signs that require crossing of the midline; and problems with smooth coordination of multiple signs in a message.

Deaf children with sensory integration difficulties respond in atypical ways to their world. Different environments can prompt different responses. A professional who understands a deaf child's difficulties can modify the environment and help the child develop more appropriate responses.Deaf children with difficulties in sensory integration need team collaboration that includes families, school, and an occupational therapist. Understanding a child's sensory needs and how to adapt the environment for success can be particularly rewarding. If a child has—or seems to have—multiple challenges, several questions can be asked: Has the child had consistent access to services? Have the therapeutic, technologic, and educational strategies been appropriate for the child's hearing? And has the family structure been able to support the child's developmental needs? As routine screening does not include assessment of sensory and motor deficits, physical therapy services are not included in the educational programme, unless obvious neurological or orthopedic disorders are diagnosed. Butterfield ,S.A.(1986) found that teachers and parents of these children often report inco-ordination, clumsiness and sensory motor deficits which may hinder the child's optimal performance . Moreover, many pediatric health care providers are often too busy or inadequately trained in conducting elaborate developmental screening tests during the regular clinics. These tests are performed only when the deaf child has an obvious deficit (Dickens et.al ,O.2007). Consequently, sensory and motor deficits in childhood are an overlooked entity and intervention to ameliorate these impairments is not provided. There is paucity in investigations of intervention for sensory and motor performance deficits in deaf children. Hence there is a need to study the sensory and motor function in the deaf children.

Review of related literature

It is necessary to understand the neurophysiology of postural control and motor development to get a clear construct of dysfunction. According to Shumway,C. A and Woollacott M.H(1995) the ability to maintain a static posture (eg. sitting, standing) and dynamic posture (eg. walking) is operationally defined as static and dynamic balance respectively. Both the static and dynamic postural control are very important and necessary to execute movement . The development and maintenance of postural control are known to be a pre-requisite for the performance of skilled movement. Simple or complex gross and fine motor tasks necessitate a person to maintain his or her center of gravity over the base of support. The development and maintenance of postural stability are a complex process that necessitates the involvement of multiple systems such as sensory system, central nervous system processing and co-ordination of motor output and the vestibular system. Three sensory systems contribute to provide information from somatosensory, visual, and vestibular sources to maintain postural control, which is achieved by coordinated motor outputs. The visual and

somatosensory system gathers information from the environment (eg. position in relative to other objects) and the vestibular system provides an internal reference (eg. head's orientation in space). Maturation of the vestibular system is responsible for the stabilization of eyes, head and body in space that helps to maintain an upright posture. The vestibular system is composed of two parts; (i) the vestibular ocular system, which maintains the visual stabilization, (ii) the vestibular-spinal system, which is responsible for the orientation of the body in space and maintenance of the postural tone, which is necessary for the development of motor milestone. It is normal for a human to have a certain amount of postural sway for various age groups. However, the child imitates the adult pattern of postural control by the age of seven to ten years. According to the sensory systems' perspective, young children depend on the visual system to maintain balance. As they grow older, there is a progressive domination of the somato-sensory system and the vestibular system (Weisz, S .1938).

Delayed postural development and motor development is a common sensorimotor impairment in profoundly deaf children. Kimitaka kaga (1999) reported that the vestibular end-organ and cochlea are closely related both anatomically and functionally. Therefore, injury or trauma prenatally, perinatally, or postnatally may cause damage to one or both systems. Moreover, damage to portions of the vestibule-cochlear nerve is a presumed cause of sensorineural hearing loss, may include damage to both cochlear apparatus as well as the vestibular afferents (Siegel, J.C. 1991). The vestibular system is also critical for gaze stabilization.It was studied by Rine, R.M. (2009) that the damage to vestibular system causes gaze and balance impairments. Potter and Silvermann (1984) stated that many deaf children compensate for vestibular deficits through visual and kinesthetic systems to maintain static balance with eyes open or closed. Cushing, S.L.(2008) stated that damage to vestibular structures is known to cause the balance deficit, which may interfere with normal motor development, it has been postulated as the primary cause of motor deficit . Crowe and Horak(1988) in a cross-sectional study found that hearing impaired children with sensory organization deficits have poor balance and motor proficiency in many areas . Hartman Esther et. al(2011) examined the motor performance in deaf elementary school children and found that deaf children had significantly more borderline and definite motor problems than the normative sample . Butterfield S.A.(1986) evaluated and summarized the gross motor development of 132 hearing impaired children between the ages of 3 and 14 yr. The subjects were individually evaluated on the 11 gross motor items of the Ohio State University Scale of Intra Gross Motor Assessment. Delays were noted in catching, kicking, jumping, and hopping. It was determined that gross motor skill performance was not related to etiology of deafness or to the sex of the subjects.

Objectives of the study:

1. To study the difference in performance between the deaf children and the normal children in some sensory motor functions.
2. To find the relationship between different sensory motor tests used for both deaf and normal children.
3. To find the relationship between intelligence and sensory motor test scores for both deaf and normal children.

Method of Study

Tools used for the study:

The tools used for the study are as follows**:**

1. O'Connor Finger Dexterity Test
2. Minnesota Rate of Manipulation Test having the following subtests
   a.Placing Test.
   b.Turning Test.
   c.Displacing Test.
d. One hand, turning and placing Test.
e. Two hand turning and placing Test.

3.Raven's Progressive Matrices

Sampling

The sample size was 60 children in the age group of 10 to 15 years. Out of these 60 children, 30 were deaf children and the remaining 30 were normal children**.**The sample was drawn randomly from different schools of Mysore city**.** Raven's Progressive Matrices Intelligence Test was administered to both deaf and normal children. O'Connor Finger Dexterity Test and Minnesota Rate of Manipulation Test were administered individually to both deaf and normal children. The results were taken down and compared.The method of equivalent grouping or matching by pairs was used.In this method of equivalent grouping the matching was done initially by pairs so that each deaf child in the first group had a match with a normal child in the second group.

Findings of the study:

The following were the findings of the study:

1. The normal children were definitely superior to the deaf children in their sensory motor abilities.
2. In the deaf group the correlation between intelligence and sensory motor tests used were negligible and they were not statistically significant.
3. In the normal group expect for the two tests namely Placing Test and One Hand Turning and Placing Test they were not significantly correlated with intelligence.
4. In the deaf group, finger dexterity was significantly correlated with all the sub tests of Minnesota Rate of Manipulation Test except the Turning Test.
5. In the normal group the correlation between the finger dexterity and sub tests of Minnesota Rate of Manipulation Test was not significant in four sub tests except for one test i.e., displacing Test the correlation was significant.
6. Correlation between intelligence and sensory motor test scores was very low.
7. The two sensory motor tests used measured the same sensory motor function to some extent.

REFERENCES

• Butterfield SA: Gross motor profiles of deaf children. Percept Mot Skills 1986, 62:68-70. | • Crowe TK, Horak FB: Motor proficiency associated with vestibular deficits in children with hearing impairments. Phys Ther 1988, 68(10):1493-9 | • Cushing SL, Papsin BC, Rutka JA, James AL, Gordon KA: Evidence of vestibular and balance dysfunction in children with profound sensorineural hearing loss using cochlear implants. Laryngoscope 2008, 118(10):1814-23. | • Dickens Omondi, Calistus Ogol, Syprine Otieno, Isaac macharia: Parental awareness of hearing impairment in their school-going children and health care seeking behaviour in kisumu district, Kenya. Int J Pediatr Otorhinolaryngol 2007, 71:415-423. | • Hartman Esther, Houwen Suzanne, Visscher Chris: Motor Skill Performance and Sports Participation in Deaf Elementary School Children. APAQ 2011, 28(2):132-145. | • Horak FB, Nashner LM, Doemer HC: Postural strategies associated with somatosensory and vestibular loss. Exp Brain Res 1990, 82:167-78. | • Kimitaka kaga: Vestibular compensation in infants and children with congenital and acquired vestibular loss in both ears. International journal of pediatric otorhinolaryngology 1999, 49:215-224. | • Potter CN, Silverman LN: Characteristics of vestibular function and static balance skills in deaf children. Phys Ther 1984, 64(7):1071-5 | • Rine RM: Growing evidence for balance and vestibular problems in children. Audiological medicine 2009, 7(3):138-142. | • Shumway-Cook A, Woollacott MH: Motor Control: Theory and Practical Applications. Baltimore, Md: Williams & Wilkins; 1995. | • Weisz S: Studies in equilibrium reaction. J Nerv Ment Dis 1938, 88:150-162. |