

PART III: EFFECTIVE INTERVENTION OR TREATMENT FOR VESTIBULAR RELATED IMPAIRMENTS IN CHILDREN

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ARTICLE SUMMARY

Children with vestibular related impairments respond favorably to vestibular and balance therapy, tailored to their age and goals.

When disruption of vestibular system function occurs in children it results in symptoms of vertigo or dizziness, oscillopsia or gaze instability, and delayed development or diminished balance and other motor abilities.¹⁻⁶ Children who present with these symptoms or who have a diagnosis known to potentially disrupt vestibular system function should have screening of vestibular system function by a professional who has completed specialty competency training in vestibular rehabilitation, or a comprehensive diagnostic evaluation. Based on results of screening and/or diagnostic testing, treatment, both medical and rehabilitation, should be prescribed. ^{4,5}

MEDICAL INTERVENTION

Medical intervention for damage to the vestibular system is limited to pharmacological agents or surgical intervention as warranted, and is dependent on the actual diagnosis or causal factors.

Children with migraine should undergo complete ophthalmological testing, followed by neurological examination if vision concerns are ruled out. Treatment is directed at eliminating trigger factors (e.g. eye problems, fatigue, stress) and psychological counseling and treatment, if necessary. Simple analgic treatments to lessen pain (e.g. paracetamol, single or combinations of anti-inflammatory drugs, aspirin) may be warranted. This therapeutic approach alone is often sufficient to diminish the frequency and intensity of crises.

In the case of labyrinthitis, treatment consists of obtaining a bacteriological sample, and antibiotic therapy as warranted. The objective is to avoid or minimize damage to the cochlea-vestibular complex and avoid spread of the infection (e.g. mastoiditis, facial paralysis, septicemia, meningitis and extra-petrous septic diffusion). ^{5,6}

The treatment for cholesteatoma is surgical and should be preceded and followed by complete cochlea-vestibular testing.

Any child with dizziness or oscillopsia following mild head trauma or concussion should have complete vestibular testing, and appropriate medical treatment as warranted.

Once the acute phase of any condition has passed, and delayed development or disruption of motor and balance abilities persist, or if Dynamic Visual Acuity tests are positive, rehabilitation is warranted and has been shown to be efficacious. ^{3,7-13}

REHABILITATION

Rehabilitation to improve or alleviate the oscillopsia, dizziness or vertigo, and imbalance has been shown to be efficacious in adults. ¹⁰⁻¹³ Rehabilitation for children is similar to what is provided for adults, but modified for the person's age and interest. Treatment should be focused on adaptation, habituation and/or substitution depending upon diagnosis and test results. ^{8,9,14}

The challenge is modification of activities to maintain interest and cooperation, and to motivate the child. All activities must be age appropriate and fun. Similar to adults, the treatment for BPPV would be repositioning and will not be elaborated upon here. The focus here will be on hypofunction (unilateral and bilateral), irritative lesions (i.e. fistula) and central disorders.

Mechanisms for recovery from vestibular related functional impairments (gaze stability and balance) are habituation, adaptation, substitution and motor learning. If the loss of vestibular function occurred at or shortly after birth, the impairments will include delayed development of the use of vision and somatosensation for balance, and thus intervention must address enhancement of the development of these abilities, particularly for children with bilateral hypofunction. If the hypofunction occurs after the critical period of balance development (approximately 6 years of age) ¹⁵ then retraining and substitution should be sufficient, with

rapid improvements seen.

Rine et al ⁸ reported that children with bilateral vestibular hypofunction had significantly improved balance and motor development following intervention. Children participated in a 12-week exercise intervention focused on substitution and habituation, three times weekly, 30 minutes per session, under the direction of a physical therapist. The progressive motor development delay was halted, and balance improved.

Braswell and Rine ⁷ also reported improved scores on measures gaze stability following 6 weeks of gaze stabilization training adapted for children done 3 times per week, 20 minutes per session.

D'Agostino, Melagrana and Tadorelli ¹⁶ reported a case of horizontal canal BPPV in a 10-year-old child, with 'spontaneous' recovery following short term hospitalization and repeated mobilization (e.g. roll side-to-side) in supine.

Balance and habituation training activities must be modified to the child's level of cognitive maturation and interest, with particular consideration to the caregiver.

Unlike adults, the child is dependent upon parents, caregivers and therapists to carry out the program and assure compliance. Therefore, the use of toys, games, and other items to facilitate visual tracking, or the use of swings to provide movement during visual stabilization activities, is important to maximize the child's participation and cooperation.

Instead of letters, which are not motivating or fun, line pictures, moving balls, or animals with symbols or letters may be used during visual stabilization training.

This cooperation and effort is critical to the effectiveness of the exercise regimen.

Typically, when acute symptoms have subsided and appropriate medical treatment is rendered (e.g. surgery to repair fistula), children are eager to resume play and other age appropriate activities. It is critical to monitor progress and provide short term, daily training to be carried out at home with caregivers (e.g. visual tracking exercises, visual stabilization regime, balance and movement activities to resume age appropriate levels of activity). ^{9,14}

REHABILITATION FOR CENTRAL DISORDERS

Although reports of vestibular deficits of central nervous system origin in children are rare, reports in the literature do note:

- Children with learning disabilities present with sensory organization and balance deficits ¹⁷,

and

- Balance deficits are evident in children with cerebral palsy, and vestibular rehabilitation does improve motor and visual abilities in children with central nervous system deficit, autism, and low birth weight premature infants. **18-22**

Treatment can be developed to either facilitate the use and integration of systems intact but not used, or to facilitate compensatory mechanisms. For example, a child with hypertonicity and developmental delay, as well as evidence of visual stability and balance problems, should participate in programs that include facilitation and improvement of visual stabilization, movement tolerance and balancing during visual stabilization, and balance training under varying environments. Habituation, gaze stabilization, and balance and vision therapy may also be efficacious to improve symptoms of dizziness and balance problems in children with concussion. **23**

CONCLUSION

In summary, children with vestibular related impairments respond favorably to vestibular and balance therapy, tailored to their age and goals. Vestibular deficits may be peripheral or central in nature, and if peripheral, may include disruption of one or both sides (uni- and bilateral vestibular hypofunction, respectively). Comprehensive testing of signs and symptoms is critical for appropriate diagnosis, which is critical to the identification and implementation of appropriate rehabilitative and medical interventions. Rehabilitation programs should be based on appropriate diagnosis, and evaluation and interventions should be completed by a therapist who has successfully completed competency training.

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