



Our balance is maintained through the interaction of the **visual, vestibular and sensory systems**. These systems function individually and in combination with each other. We can experience imbalance if there is a disturbance of any one of these systems.

The visual (sight) system makes us aware of our surroundings and the position of our bodies in relation to our surroundings.

The vestibular system lies in the inner ear and detects the movement produced when we engage in actions such as stopping, bending or turning.

The sensory system keeps track of movement and tension in our muscles, tendons and joints as well as of the position of our body in relation to the ground.

When signals are received from these systems the brain processes all the information and produces a sensation of stability.

In order to have a good sense of balance we need to be able to see where we are and be aware of the position of certain parts of our bodies in relation to the things around us. Balance is a learnt process. If one or more of our balance systems does not work very well then the body is very good at compensating for this.

A crucial aspect of the efficiency of the balance system is that our brains can control balance by using the information that is best suited at any one point in time. For example: when information conveyed by our eyes is reduced or unreliable, such as when in darkness, our brains will use more information from our lower limbs and inner ear. If, on the other hand, we are walking on a sandy beach or on uneven ground during the day the information coming from our legs and feet will be less reliable and we will need to use our vision and vestibular system more.

NF2 and balance difficulties

Vestibular Schwannomas (the benign tumours which are the most common sign of NF2) can cause damage to the vestibular system in the inner ear as they grow. Nerve fibre damage and interference to the blood supply can be the reason for this.

However, the brain compensates over time by ignoring the changing signals from the damaged vestibular system and concentrating on the information from the other ear, and from the visual and the sensory systems. Damage to the brain can be caused by pressure by the tumour on the brainstem and on the cerebella where the centre for co-ordination lies.

We rarely have to rely solely on the information provided by the vestibular system and that is why even people who have lost the function of the nerves of both inner ears do not entirely lose their sense of balance.

It should also be noted that information from the visual system will be less effective if a person has poor vision. Tingling or numbness in the legs or feet can impair the messages going to the brain from the sensory system.

What can you do about these difficulties?

- It is very important to remain as active as possible. Unless we are using our balance system the brain cannot relearn how the balance system has changed or become impaired.
- Try not to avoid doing things that make you feel dizzy or unbalanced. By continuing to do these, the compensation process will take place more quickly.
- If possible avoid using walking aids as the brain will relearn how to balance using the aid but you will not be able to balance without it.
- Wear spectacles where prescribed as it is important that your vision is as good as possible.
- You can do special exercises at home that will make the balance system work better and the compensation process happen more quickly. The exercises need to be done regularly.

Balance exercises

Some people benefit from exercises that involve eye, head and body movements and are designed to provoke mild dizziness. The brain learns how to cope with the change in information it receives under different circumstances.

The exercises should initially be carried out under the supervision of a Physiotherapist. Ask your Audiologist or Physiotherapist if you would benefit from these exercises.

- Apart from the eye exercises, they should initially be done with the eyes open. As the dizziness improves they should be done with eyes closed.
- Start by doing the exercises about five times each to begin with, eventually building up to about twenty.
- It is more effective to do the exercises several times each day.
- If you are seen by a Physiotherapist for Balance Rehabilitation the exercise programme would be tailored to the individual needs and abilities.

If you try any of these exercises at home you might find that initially you feel more dizzy or unbalanced. This is quite normal. You could be doing things that you have previously avoided, for example: if you start going to the gym your body might ache but gradually feel better as you persist with the exercises.

Eye Exercises (with eyes open)

- Look up then down as fast as you can.
- Look from side to side as fast as you can.
- Watching your finger all the time, focus on your finger at arms length, move your finger to touch your nose.

Head exercises

- Bend your head forwards then backwards as fast as you can.
- Turn your head from side to side as fast as you can.

Sitting exercise

- Sitting in a chair bend forwards and touch the floor. Return to the sitting position.

Standing Exercise

- Start by sitting in a chair, then stand up. Return to the sitting position.

Lying down exercises (on the floor or bed)

- Turn your head from left to right and back again.
- Turn your whole body right over on to the right then right over on to the left.

General Stability Exercises

These are standing exercises. You can hold on to something to start with but as your stability improves then try without holding on. They should be done with eyes open but as your stability improves, then try with your eyes closed.

- Stand with your feet apart and count to ten.
- Stand with your feet together and count to ten.
- With your feet apart lift your toes off the ground so that you are standing on your heels. Hold for as long as you can. Then try this with your feet together.
- Stand with one foot in front of the other, heel to toe. Then try with the other foot in front.
- Try lifting one foot off the ground for as long as you can.

You might also find some of the following useful in maintaining your balance:

- Do not turn your head too quickly (unless it is part of an exercise programme).
- If you want to look to one side turn your whole body, not your head only.
- When picking something up from the floor, stand slightly in front and to the side of the object, then, keeping head upright, bend knees and still looking forward, pick up object by feel: do not look down.
- Try to avoid bright light and sunlight. Try wearing tinted glasses, sun glasses or glasses with side shades.
- Balance is particularly poor in the dark and when you are tired, so walk slowly and carefully.
- Hard and even ground such as the pavement is easier to walk on than uneven ground or grass.
- When walking look up, fix eyes on a distant spot. Do not watch your feet or the pavement.
- Wear low-heeled or flat shoes as they give a larger contact area for the feet.

- A walking stick or long umbrella may help you to balance but make sure it has a rubber tip.
- When standing for any length of time remember that a wide base is more stable than a small one. Do not stand on one foot. Stand with feet apart.
- In the home always hold the bannister rail when using the stairs and a light touch on the walls and furniture will help when moving around the room.
- Get up slowly after sitting or lying down for any length of time. When getting out of bed do not hurry – sit on the side of the bed for a few moments before standing up.
- Turning over in bed too quickly may cause the room to spin. Lie still and give your balance mechanism time to adjust.
- If you feel you may imbalance and fall remain still until it passes.
- If giddiness appears worse after a period of intense concentration take regular breaks.
- When stretching or reaching up for something above head height, do so gradually.
- Tiredness / fatigue may affect balance. Take breaks.
- Watching rapid movements can aggravate giddiness. For example, in a fast moving car or train it will be better to look at the horizon than at the close landscape. Avoid rapid movements or flashing on the television.
- Check with your Hearing Therapist or Physiotherapist whether a planned exercise programme could help you.

Produced
with financial
support from



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