

## ***The Built Environment***

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*Many members have commented on how various aspects of the environment adversely affect their Meniere's. We are fortunate to be able to reprint the following article from SPIN 64 which explains why this happens. We wish to acknowledge the kind permission of the Editor of SPIN (the journal of the Meniere's Society, UK) and the permission of the author.*

People with Meniere's disease (and many other balance disorders of the inner ear) are often affected by the built environment. In Spin 57, autumn 2006, we asked members to write in and tell us if they were affected by the built environment. The thirty two detailed replies were collated and summarised by Andrew Clements in Spin 59.

### **Eight kinds of environmental problems were encountered:**

Supermarkets (incl shopping malls)	100%	(32/32)
Flooring	50%	(16/32)
Lighting	31%	(10/32)
Noise (loudness or type)	25%	(8/32)
Walls/Corridors	25%	(8/32)
Stairs (spiral or open faced steps)	12%	(4/32)
Escalators or Lifts	12%	(4/32)
Specific Places (see below)	34%	(11/32)
– Airports	15%	(5/32)
– Museum, Art Gallery, Library	19%	(6/32)

### **Why do these environments make me dizzy?**

Your balance system works by coordinating information about your balance from the balance organ in your inner ear, your eyes, and sensors in your body. People with Meniere's disease have a problem with their inner ear, and so must rely more on information coming from their eyes and the sensors in their body. Each of the eight environment problems reported above can cause dizziness due to slightly different reasons, and so will be discussed in turn below.

#### **1. Supermarkets**

Your eyes get their information about balance from the environment.

However, your balance system can become overloaded when you take in more visual information than you are used to dealing with. There are several aspects of

supermarkets that mean that your balance system can be overloaded with visual information.

The first of these is complex and repetitive patterns. Supermarkets have long high and narrow aisles that restrict your wider field of vision. The aisles are filled with lots of shelves that are stacked high with many shapes and colours. There may also be a pattern on the floor or it could be particularly shiny and reflective. The metal bars on the baskets and trolleys also create a striped pattern. Together, these provide a very complex visual environment, which can overload your balance system.

Secondly, your balance system works best when it can take its visual cues from things close to you, but the length of the aisles mean you are using your depth perception more than usual. This has a similar effect to looking down from a height, and can cause dizziness and unsteadiness, making the visual information less reliable.

Thirdly, dizziness can result from looking at a busy and moving environment. Supermarkets are usually crowded places with people continuously moving across your field of vision at varying speeds. This also has more of an effect on you if there is lots of movement beside you, as well as directly in front of you. All this rapidly changing intense visual information makes your balance system work harder as it has to keep integrating the new information from your eyes. As you also walk around a supermarket to get your shopping, the shelves are also moving slowly through your field of vision, and when you get to the checkouts, the conveyor belts also move. Both these fast and slower movements in the visual environment are against the back drop of the complex patterns of the aisles and shelves.

Fourthly, because the aisles are narrow and there are lots of different things to look at to find the items on your shopping list, you are often scanning the shelves, moving your head back and forth and up and down. This stimulates the balance organ in your inner ear which can make you dizzy if you are not used to making those movements in such a busy and complex visual environment.

Fifthly, supermarkets often have fluorescent lighting, and fluorescent lighting flickers. Although the flickering may be so fast you are not aware of it, your eyes can still detect it (see section below on lighting).

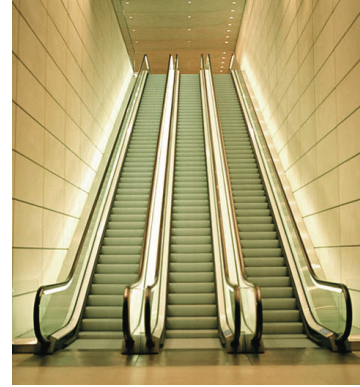
Finally, supermarkets are also usually very noisy places due to people talking all around you, piped music and announcements (see section below on noise).

## **2. Flooring**

The types of flooring that affected people the most were herringbone paving, black and white tiles, and coloured zigzags, stripes or swirls on a carpet. These types of flooring are all examples of complex and repetitive patterns that can overload your balance

system if you are not used to them. The effect of this on your balance can be made worse if the floor is sloping.

Sensors in your skin, muscles and joints around your body also send information to your balance system. Sloping surfaces means that your body provides less familiar and reliable information to your balance system than flat surfaces, which is why it is harder to maintain your balance on sloping surfaces.



### 3. Lighting

Stable lighting is important for your balance system. Just as darkness or dim lighting prevents your eyes from getting enough information about your environment, lighting that flickers also means that your eyes are not getting reliable information about your visual environment. Because your brain has a limited capacity for what it can attend to at any one time, concentrating on the change in lighting means that your brain has less capacity to co-ordinate your balance. This can result in dizziness and unsteadiness.

Other environments that involve flickering lighting include travelling in a car when the sun is shining through the trees or at night when the oncoming car headlights are flickering, and shops or other places that use fluorescent lighting.

Programmes on television and older types of computer screens can also flicker (but so fast that you may not be aware of it).

### 4. Noise (loudness or type)

The hearing loss that results from Meniere's disease means that you have to concentrate to make sense of the remaining sounds you can hear. Just like coping with flickering lights, having to concentrate to make sense of sounds can also limit the capacity of your brain to co-ordinate your balance. This is much harder in busy environments where there is lots of background noise or music.

Additional discomfort can be caused by unexpected loud noises, such as a staff announcement in a shop, especially if you wear a hearing aid.

Some additional factors may or may not also be relevant to some people. The damage to the hearing organ may cause some people with Meniere's disease to become over-sensitive to certain sounds. Sounds which don't seem to bother other people may seem unpleasantly loud to you, and difficult for you to tolerate. The medical term for this is hyperacusis.

Sounds do not normally affect the balance organ, however, excessively loud sounds experienced over a long period of time (such as in industrial work) may cause damage to the balance organ as well as the hearing organ. Rarely, some people with Meniere's disease may also experience dizziness or vertigo symptoms when they hear loud noises. This is known as the Tullio phenomenon, and is thought to occur because Meniere's disease weakens the balance organ in the inner ear. In some people, this can make their balance organ more sensitive to the effects of loud noises.

## **5. Walls/Corridors**

Just like flooring, complex and repetitive patterns on walls can also overload your balance system if you are not used to them. Mirrored, glass or reflective walls can distort and multiply patterns, flickering lights, and movement if you are in a busy and moving environment (see the section on supermarkets for more information about these). Your eyes get their information about which way up you are from vertical structures that are close to you. Therefore walls that are leaning can confuse your balance system.

Corridors have a similar effect on your balance system to long supermarket aisles. The amount of available visual information that is close to you is limited when you are in a long corridor. Instead, much of the visual information available to you comes from your depth perception, which causes you to sway.

## **6. Stairs (spiral or open faced steps, not escalators)**

Stairs can result in unsteadiness and dizziness for several reasons. The first is that visually, the rows of stairs are a complex and repetitive pattern (especially if the stairs are covered in patterned carpet or have the edges painted or marked for safety reasons).

Open faced or glass steps add an extra dimension to this complex and repetitive pattern, because you can also see between the steps.

Secondly, stairways can also often be long corridors (see the sections above about depth perception in corridors and supermarkets).

Thirdly, because the purpose of stairs is to move you upwards or downwards, you are moving your head upwards or downwards. Stairs that require you to turn to get to the next flight of steps also make you move your head from side to side. These movements of your head back and forth and up and down activate the balance organ in your inner ear, which can make you dizzy and unsteady if you are not used to these movements.

Spiral stairs add further complications for your balance system. Because spiral steps are wide at one end and narrow at the other, you often have to concentrate more than usual to make sure you are putting your feet on the wider side of the step. Whilst doing this, you are moving whilst looking down, which activates the balance organ in your inner ear and can make you dizzy if you are not used to it. In addition to this you are looking down at the complex and repetitive patterns of the steps.

Sensors in your body also send information to your balance system. On spiral steps, you are forced to keep both feet in front of each other at the wide end of the step, meaning that you have to walk along a narrow surface, or have your foot not completely on a step, making it harder to balance. On normal steps you can at least keep your feet shoulder width apart.

## **7. Escalators or Lifts**

Escalators are particularly challenging, as your balance system has to deal with conflicting information between your balance senses. Your balance organ in your inner ear can sense that you are moving forwards and vertically (up or down), but the sensors in your legs and feet are telling your balance system that you are not walking. The sensors in your legs and feet can, however, tell that you are on a wobbly surface, and sends information to your balance system that this is an unreliable surface.

Escalators can also have all the same effects as stairs (see section on stairs), but in addition to this, the grid and lined pattern on each metal step creates an even more complex and repetitive pattern.

Posters and advertisements at the sides of your vision on the walls above escalators also create a strong stimulus for movement. Your balance system has to cope with the information from your eyes about everything that is moving slowly past you (see the section above on the busy and moving environment in supermarkets).

Lifts affect your balance system differently to escalators. In closed lifts that you cannot see out of, your eyes and sensors in your body are telling your balance system that you are not moving, but the balance organ in your inner ear can detect that you are moving.

Your brain has to deal with this conflicting information between your balance senses, which can result in dizziness and unsteadiness. (This is similar to when you sit on a stationary train and the train next to you begins to move. In this case your balance

organ and body tell your brain you are still, but your eyes tell your brain you are moving).

In open glass lifts, this conflict between your balance senses is still present, and being able to see out can mean that your balance system is being overloaded with unreliable visual information as well.

8. Specific Places (such as Airports, Museums, Art Galleries, and Libraries) Airports, Museums, Art Galleries, and Libraries are the sorts of places that combine many of the issues discussed above all in once place!

They are often large spaces filled with complex and repetitive patterns on the walls and flooring, with dim or fluorescent lighting. They are often noisy and busy places, with people moving across your field of vision (see the section on busy and moving environments in supermarkets).

Very often in these sorts of places you are frequently moving your head back and forth and up and down to look at signs or at specific objects. This stimulates the balance organ in your inner ear which can make you dizzy if you are not used to making those movements in such a busy and complex visual environment.

As these are often large buildings, you often have to use stairs, escalators or lifts.

Libraries are also similar to supermarkets in that they can have narrow aisles filled with items from floor to ceiling.