

Depth Perception



What is depth perception?

Your ability to judge how **near** or how **far** an object is **from you**. For you to have this remarkable ability, requires you to see the world in **3D – three dimensional!**

Your nose helps you to see 3D!



The **bridge of your nose** creates a small distance **between** your **eyes**. This means that even though each eye may be looking at the **same object at the same time**, they will **each** be seeing a slightly **different picture**. When the brain processes these two **subtly dissimilar images**, it is able to combine them to form a single 3D image (**stereopsis**). It is vital that the eyes **work together as a team** and that each eye must see clearly for this to occur.

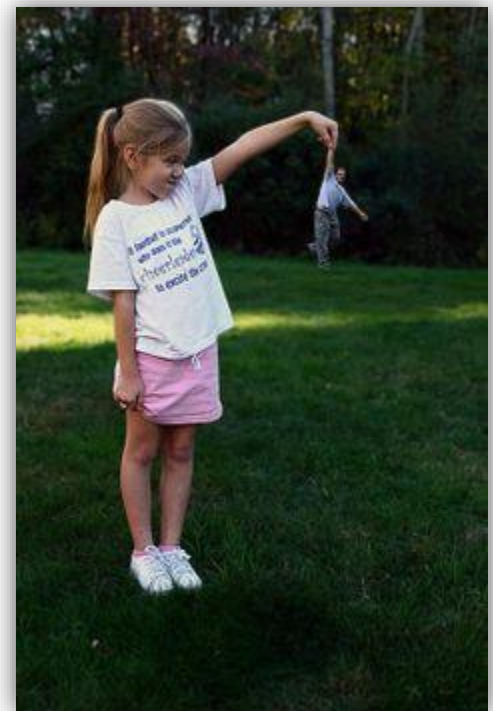
How do we see depth?

The **brain** is able to use "**sign posts**" to warn it that the objects it is looking at, (for example a horse standing in front of a house), are **not actually next to each other**, but are **separated** by a certain **distance; one in front of the other**.

Fortunately, not only can two eyes working as a team find these signposts, but so can one eye on its own (**monocular vision**). A single eye can use the **clue of the size of the object** to work out **how far away it is**. The **brain learns** that the **smaller** an object is, the **more likely** it is to be **further away**.

Texture can also be used.

For example, your brain learns that when it can **see** the **fine detail** on an object, that object is likely to be **closer** than an object that



Did You Know?

Humans aren't born with the ability to see in 3D?



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simply appears as an **amorphous blob**.

Lighting and shading can also help. The way that light falls on an object and reflects off its surfaces, and the shadows that are cast by objects provides a clue to the brain to determine just how close that object may be.

Some people who have had good vision in one eye for a long period of time may find they have an acceptable appreciation of depth. This is because their brain has adjusted in various ways to learn how to estimate depth without the use of binocular vision.

What is interesting is that up to **5% of the population cannot** see in **three dimensions** and by using these strategies to assist in the judgment of depth they are able to perform equally well in situations where depth perception is used i.e. *catching a ball*. However, some people **who rely on vision primarily in one eye**, may sometimes **struggle with depth perception**.

Fortunately, there are very **few occupations**, which require a **high degree of 3D vision**, such as **being a pilot or an eye surgeon**.

There are several **conditions** which can affect one or both the eyes of a child, **disrupting 3D vision development** and the **ability to see depth**.

Some examples include **trauma, nearsightedness, misaligned eyes (squint), nerve conditions** and **amblyopia**.

When do we develop the ability to see in 3D and to see depth?



Humans are **not born** with the ability to see in 3D or perceive depth. This process only begins at around the **3-6 months of age** and continues for a further **6 to 7 years**.

This time span is critical for the development of 3D vision (stereopsis) and depth perception. If one or both of the eyes are adversely affected in some way during this time period, the child may rapidly lose this ability.

We develop the ability to see depth over several years; from 3 - 6 months to 6 -7 years of age.

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This is why it is important to test children's eyesight at **various determined points** during their growth and to have a child immediately **assessed** by an **expert** if the structure of the eye or degree of vision **changes**.

Unfortunately, if the condition has been present for some time it **may not be possible** to restore a child's stereopsis.



How does one test for stereopsis and depth perception?

We can test stereopsis in the clinic in a number of different ways. For example, If a child can see in 3D and perceive depth, specially designed glasses will enable that child to see a 3D image 'arise' out of a flat 2D surface. The child's excitement at seeing a picture come to life in front of them is usually evident. Children without this ability will not react to the flat image.

Children as young as 12 months of age will often show a positive response to a stereo test, if they have stereopsis.

Did You Know?

Developing a **squint** can put a child at risk of losing the ability to see in 3D.

