

Binocular vision

Binocular vision is vision in which both eyes are used together. The word binocular comes from two Latin roots, bini for double, and oculus for eye. Having two eyes confers at least four advantages over having one.

First, it gives a creature a spare eye in case one is damaged.

Second, it gives a wider field of view. For example, humans have a maximum horizontal field of view of approximately 180 degrees with two eyes, approximately 120 degrees of which makes up the binocular field of view (seen by both eyes) flanked by two unocular fields (seen by only one eye) of approximately 30 degrees.

Third, it gives binocular summation in which the ability to detect faint objects is enhanced.

Fourth it can give stereopsis in which parallax provided by the two eyes' different positions on the head give precise **depth perception**.

Such binocular vision is usually accompanied by singleness of vision or binocular fusion, in which a single image is seen despite each eye's having its own image of any object

Singleness of vision

Once the fields of view overlap, there is a potential for confusion between the left and right eye's image of the same object. This can be dealt with in two ways: one image can be suppressed, so that only the other is seen, or the two images can be fused. If two images of a single object are seen, this is known as double vision or diplopia.

Stereopsis

Stereopsis is an ability to make fine depth discriminations from parallax provided by the two eye's different positions on the head.

What causes loss of binocular vision?

There are lots of reasons why binocular vision might become reduced or lost altogether. Reasons include:

- Reduced vision in one eye

- Loss of coordination of movement between the two eyes (squint)
- Problems with the brain comparing images from both eyes

1-Reduced vision in one eye

The brain needs clear images from each eye to compare any slight differences. The differences allow the brain to work out depth and speed of movement. If the sharpness of vision from one eye becomes poor the brain will be less able to do this. Binocular vision will become poorer. If the image becomes very blurred binocular vision may become lost altogether.

2-Loss of co-ordination of movement between the two eyes

The brain needs images of the same visual scene to compare any slight differences. The differences allow the brain to work out depth and speed of movement. If the eyes do not point in the same direction then the visual scenes will be too different. The brain will be unable to work out depth and speed of movement. Binocular vision will be lost.

When the eyes point in different directions it is called squint or strabismus.

There are many different causes of squint. One of them is itself loss of binocular vision.

3-Problems with the brain comparing images from both eyes

There is a special part of the brain that compares the slight differences in the images coming from both eyes. If this bit of the brain does not develop properly or becomes damaged binocular vision may become lost. There are many different causes of poor development or damage to this part of the brain. Most of the time no cause can be identified

Eye dominance

When each eye has its own image of objects, it becomes impossible to align images outside of Panum's fusional area with an image inside the area. This happens when one has to point to a distant object with one's finger. When one looks at one's fingertip, it is single but there are two images of the distant object.

When one looks at the distant object it is single but there are two images of one's fingertip. To point successfully, one of the double images has to take precedence and one be ignored or suppressed (eye dominance). The eye of the image that takes precedence is called the dominant eye.