MUSEUM OF TROPICAL QUEENSLAND

PERCEPTION DECEPTION

DEVELOPED BY QUESTACON

Education Kit

This Education Kit has been developed by the Museum of Tropical Queensland to provide teachers with resources to plan a successful visit to *Perception Deception* at the Museum of Tropical Queensland from 21 July 2012 to end July 2013.

The kit includes a detailed description of each exhibit and pre- and post-visit activities linked to the students' visit. While the kit is aimed at years 5-12 it has material that could be used for other year levels. Teachers may copy material in this kit for educational purposes.

Acknowledgements

This Education kit was developed by Claire Speedie, Learning Activities Officer, Museum of Tropical Queensland, using material developed by Questacon.

Perception Deception is a travelling exhibition produced by Questacon—the National Science and Technology Centre, Canberra, Australia.

QUEENSLAND MUSEUM NETWORK · Queensland Government · Questacon The National Science and Technology Centre

Teacher Notes

Perception Deception is a highly interactive and engaging series of exhibits that allows students to explore how their brain copes with the immense volume of sensory signals they receive every second by editing, prioritising and sometimes even adding information. It includes many familiar 'magic' tricks, and clearly demonstrates that we all perceive reality in different ways.

Perception Deception is on display at the Museum of Tropical Queensland, 70-102 Flinders Street, Townsville from **21 July 2012 until 7 July 2013.**

Visits to *Perception Deception* may be either Museum staff or teacher led.

Costs

Self-led visits to the exhibition are free to community pass schools[1].

Led programs, facilitated by an education officer, are $5.50 per student for community pass schools, $7.50 per student for all other schools.

Teachers, carers and accompanying adults at a ratio of 1: 5 for school groups will be admitted **free of charge**. Groups may opt to pay prior to their visit, pay on the day of the visit, or be invoiced on the day of the visit for the number of students attending.

The Exhibition

Perception Deception is a hands-on science exhibition based on the difference between what is real and how our brain sees reality. We assume that what we see, hear and feel is real. However, our brain only creates a model of our surroundings based on our sense of perception.

Through 15 individual interactive exhibits, containing 37 interactive experiences, and 10 optical illusion artworks, the exhibition explores the themes of:

- **Multisensory perception**, ranging from the way your senses interact and merge their signals, through to tactile illusions with your skin and muscles
- **Visual perception**, including change blindness, binocular rivalry, stereovision and brightness contrast.

Exhibition location

The exhibition is located along the ramp leading to the MindZone gallery and in the MindZone gallery.

[1] Schools in Townsville, Burdekin, Charters Towers and Hinchinbrook Councils.

Description of individual exhibits

Each exhibit has an interactive element with clear ‘what to do’ instructions. Graphics behind the tabletop exhibits display additional visual illusions and perception tests. Some of the exhibits require two people.

Do your eyes make your body sway?

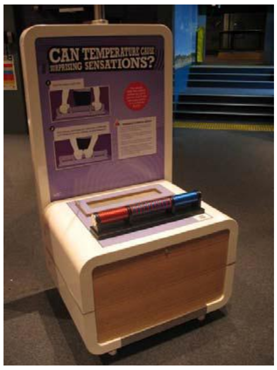
Visitors stand up close (on one foot or two feet) to a swinging black and white striped board. Some people may begin to feel a little off-balance while they adjust their body’s position to compensate for what they are seeing.

<u>What’s happening?</u>

Your sense of balance is strongly influenced by what you see. When you see that your world is swaying and shaking, your reference point becomes difficult to rely upon and your body may adjust itself in response, even though the ground is completely still beneath you feet.

<u>Topics</u>: visual-vestibular /multisensory perception, proprioception

Can temperature cause surprising sensations?



Visitors touch individual copper coils at safe temperature of about 40°C or 19°C. In one section, coils at these same temperatures alternate hot-cold-hot-cold. Touching these mixed coils generates a strange perceptual illusion of tingling or slight pain.

<u>What’s happening?</u>

This thermal grill illusion (discovered in 1896) is still a mystery to scientists, but it seems to involve pain receptors in your skin being activated when you feel a mixture of ‘safe’ temperatures.

<u>Topics</u>: tactile/multisensory perception, thermal grill illusion, thermoreceptors, nocioceptors

Visual illusions kiosk

This multimedia kiosk was developed for ACEVS (the ARC Centre of Excellence in Vision Science, the Australian National University node) and contains 19 multimedia visual illusions with visual perception explanations about each illusion.

<u>Topics:</u>

Visual perception

Does the grey ring grow darker?

A light grey ring (called a Koffka ring) is printed across two separate panels. The visitor slides one half panel upwards (so the grey ring splits in half) and they will notice that one half of the ring appears to grow darker.

<u>What's happening?</u>
Your brain can't take accurate measurements of light, like an electronic light meter. Instead, your brain judges the 'brightness' of a shape by comparing it against its background or surroundings. So, something generally looks brighter or lighter if it's next to something dark and vice versa. This effect is called brightness contrast.

<u>Topics</u>: visual perception, brightness contrast, lateral inhibition, Koffka ring illusion

Can you wipe away a friend's face?

(Requires two people)
One person places their nose against the edge of a mirror. One eye sees the reflection of their moving hand against a white wall while their other eye sees the second person's face. The first person may get the illusion that they are slowly erasing parts of the second person's face, leaving eyes or a smiling mouth floating in mid-air. This effect is sometimes called 'The Cheshire Cat' illusion, alluding to the habit of the Cheshire Cat in Alice in Wonderland to slowly disappear, except for a smiling mouth.

<u>What's happening?</u>
The back of your eyeballs (retinas) have millions of light receptors, except in one spot where your optic nerve and attaches to your eye ball. This spot—known as your blind spot—cannot detect any light, but you don't notice this gap in your vision, because your brain 'patches over' the gap by duplicating the colours and patterns being detected by receptors around the blind spot.

When you use the exhibit, your right eye sees the white wall in the mirror and your brain 'fills in' your right eye's blind spot with white. When you sweep your hand across the white wall, your brain pays more attention to your moving hand in the mirror than it does to your friend's stationary face—and your brain erases parts of their face by your moving hand. Your left eye sees your friend's face, while your right eye sees the white wall and your hand in the mirror, so each eye feeds your brain with two very different views. Your brain tries to put these two views together in a way that makes sense, choosing part or all of the view from one eye or the other. This is called perceptual or binocular rivalry.

<u>Topics</u>: visual perception, binocular rivalry, blind spot, peripheral vision

Do you see the same yellow?

Visitors choose the yellowish ping-pong ball in the circle that most closely matches the yellow ping-pong ball in the centre. No two yellow balls are exactly the same and people will argue about the best matching pair.

<u>What's happening?</u>
We all differ in our colour perception, thanks to differences in our genes and trichromacy, which is the technique humans use to perceive millions of colours.

Light receptors (or cones) in your eyes detect certain wavelengths of light and generate colour responses in your brain. So your brain 'sees' or perceives colour rather than your eyes. Your eyes can only actually detect three wavelengths of light:

- Light at around 480 nanometres is seen as 'violet' by your brain
- Light at around 530 nanometres is seen as 'green' by your brain
- Light at around 650 nanometres is seen as 'red' by your brain

However, you can see so many more colours than just red, green and violet. Although there are no 'yellow' cones, we can still see 'yellow'. How? Light at 570 nm is interpreted by your brain as 'yellow' and mixing red and green spotlights creates light which your brain also interprets as yellow. Your cones which respond to 530nm ('green') and 650 nm ('red') wavelengths of light are both being stimulated when you see 570 nm light. Your brain combines the nerve signals from these two sets of cones and you perceive yellow. The light itself doesn't change, but your brain processes the information differently so you perceive colour.

Our genes also play a role in how we see colour. Because we all have slightly different genes, we also have slightly different amino acids called photo pigments in our cones. This tiny molecular difference produces the differences in colour perception between people.

<u>Topics</u>: visual perception, trichromatic vision, colour perception, genetic variation

Can wire feel like velvet?

Visitors gently rub their hands over strands of wire to generate the Velvet Hand Illusion, which is a tactile illusion where a hard wire feels like a velvety, oily or jelly-like sensation.

<u>What's happening?</u>
As you rub your hands around the wires, the gaps between the touch receptors in your skin may be 'filled in' by your brain, so it feels velvety. This is called the fill-in phenomenon.

<u>Topics</u>: tactile/multisensory perception, velvet hand illusion

Which row of chess pieces is darker?

Pictures show two rows of chess pieces with one row appearing to be darker than the second row. When the visitor slides a plain grey panel across the chess pieces they will notice that the rows of chess pieces are actually the same.

What's happening?

Every time you look at an object, your brain assesses the illumination, reflectance and transparency of something to determine how light or dark it is. The rows of chess pieces in this Perception Deception exhibit are the same, but they're placed against black fog or white fog surroundings. Because your brain compares the chess pieces to their foggy surroundings, you mistakenly (but understandingly) assume that the rows of chess pieces must be darker or lighter than each other. Therefore, to make something look brighter, place it next to something that is darker! (Your teeth look whiter if you wear dark red lipstick!)

Topics: visual perception, brightness contrast, transparency, illumination

Do you feel a phantom hand?

(Requires two people)
One person places their hands on either side of a mirror (palms facing upwards) and watches their hand's reflection in the mirror. A second person strokes the first person's palm in an alternating pattern, which may make the first person fell confused or unsettled by what they are seeing and feeling.

What's happening?

Your brain can adapt and remap what it accepts as belonging to your body, what is alien and how your body is positioned in space. This is known as body schema. This exhibit provides your brain with conflicting feedback from touch and visual channels. Your body schema gets confused and your brain finds it difficult to calculate where your (hidden) arm is located.

Topics: visual-tactile/multisensory perception, phantom limb illusion

Do any lines feel longer or shorter?

Visitors close their eyes and feel, rather than look, at six raised Müller-Lyer lines. These lines are all the same length but have arrowheads or other lines on each end.

What's happening?

Many people will be familiar with Müller-Lyer lines as an optical illusion. But the same effect is experienced when feeling these lines. The brain is interpreting the straight edges of the lines like the corner of a box. Your brain uses size-constancy to calculate the size of a shape, based on the size of the image it projects (or imagines) onto your retina, as well as how far away (or nearby) your brain believes the object to be.

Topics: tactile/multisensory perception, Müller-Lyer illusion, vision impaired illusion

Do you see bumps or dents?

Two images are printed onto separate discs. Visitors spin each disc around which changes whether the pictures look like bumps that pop up or dents that press in.

What's happening?
Your brain uses the position and darkness of shadows to figure out shapes. Your brain is hard-wired to guess that light comes from the top of your visual field. Shadows are one of the first things our visual system processes when we're trying to work out the shape of something. Simple clues such as the placement and angle of shadows are automatically processed by your brain so you know the depth of a hole, or the height of a bump.

When you look at the images you see holes or bumps depending on where the shadows fall. However, when the picture is turned upside down, the shadows change position, but your brain still thinks that light is shining from the top of your visual field. So according to your brain, bumps turn into dents and dents turn into bumps.

Topics: visual perception, shape, shading, shadows

Watch the spinning disc and see things expand

Visitors stare into the centre of a spinning spiral for 30 seconds or so then look at a nearby toy or a friend's face. They will appear to expand, twist or wobble.

What's happening?
This effect is called the visual motion after effect, and is caused by how cells represent motion in your brain, particularly in your visual cortex. Watching continuous motion in a certain direction leaves us with a bias in the other direction—an after effect. Possibly the motion-sensitive cells in your brain become fatigued by looking at the continuous motion.

The motion after effect works if you see movement in part of your visual field, rather than your whole visual field. For example, when you are driving down the highway in your car, you see everything moving and you don't get a motion after effect when the car stops. When you're riding in a train, however, you only notice movement through a smaller window, while the carriage seats and walls seem to be still. When you train stops, the station platform can sometimes appear to move backwards as the motion after effect in your brain continues while your motion cells are resetting.

Topics: visual perception, motion after effect

Look through this hyperscope
Look through this pseudoscope
(Two exhibits)
Visitors look through these scopes at shapes located a few metres away or at other people in the gallery. Objects and people look strange. If you look at someone who has their arm extended full length towards you, their arm looks very long and their hand looks tiny.

What's happening?
The **pseudoscope** uses mirrors to create the illusion that your eyeballs are 35.75cm apart (instead of the usual 6.5cm) and your eyes have swapped sides. This alters your stereovision so that the background becomes foreground, and the foreground recedes.

The **hyperscope** also uses mirrors to create the illusion that your eyes are 41.5cm apart (near the side of your head). This creates a much more three dimensional world.

With both these illusions, your brain receives different signals form each eye and it fuses they signals to create an image with exaggerated stereoscopic depth. The Hyperscope and Pseudoscope also alter your sense of size constancy, which is how your brain judges the size of things that are nearby or far away. When you look at something that is far away, the object projects an image onto your retina. If the object moves closer, the image on to your retina grows much larger, but your brain allows for the distance before assuming that the object is gigantic. Your brain, therefore, combines information about retinal images and distances to generate an idea of the real size of the object.

Topics: visual perception, stereovision

Can you saturate you eyes?
Visitors stare at a picture on the screen while receptors lining their retinas become saturated. When the picture changes many visitors will perceive an after image which fades as their receptors readjust.

What's happening?
When you stared at red patches in the picture, certain cones in your retina underwent chemical

responses and sent signals to your brain which it interpreted as “I’m seeing red”. But because you kept staring, the cones became overstimulated and less sensitive to the red. Then, when your overstimulated receptors see white in the black and white picture, they sent a signal to your brain about white, minus the colour that overstimulated them in the first picture (such as red). This is interpreted by your brain so it sees the inverse colour (such as green for the red overstimulation). Your brain thinks it is looking at those inverse colours until the receptors settle back down to normal and you see the second picture for what it really is—black and white.

Topics: visual perception, saturation after image

Does brightness change how you see speed?
Blue and yellow squares on the screen appear to glide along together or step along like a pair of walking feet depending on whether the background is grey or striped. This illusion was developed by Dr Stuart Anstis, University of California.

What’s happening?
When the blue (dark) square passes over a white stripe, they contrast strongly against each other and the blue square appears to speed up. As the blue (dark) square passes over a black stripe there is low contrast between the two and the square appears to slow down.

Detecting motion and speed is particularly strong in your peripheral vision and it is easier to notice things in your peripheral vision if they contrast strongly. Low contrast patterns generally produce a weaker response in the motion-sensitive parts of your brain.

Topics: visual perception, brightness contrast, stepping illusion

Which way do they turn?
Dots shaped into nine hollow spheres are animated so they seem to spin on the screen. Some people perceive the spheres to change their direction of spin.

What’s happening?
When you see something that could be interpreted in two different ways, your brain’s visual system ‘flips’ each interpretation back and forth, because it can only handle one interpretation at a time. This is called perceptual rivalry.

Topics: visual perception, perceptual rivalry, switching brain hemispheres

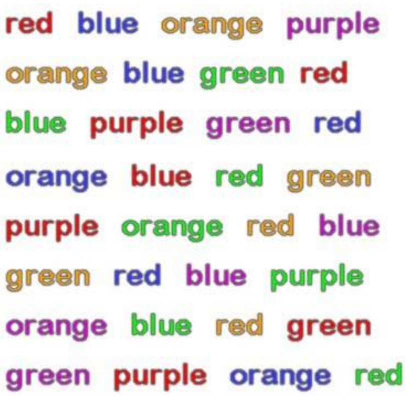
Are you observant?
Visitors watch a video of Professor Richard Wiseman performing a colour changing card trick. On first viewing, most people think that the trick is a little obvious but Professor Wiseman reveals what you missed seeing before your eyes.

What’s happening?
[Spoiler alert!]
Viewers are so absorbed in trying to detect when the cards change colour that they usually don’t notice the set work or presenter’s clothing changing colour. Our eyes and our brains can only handle so much information. They need to be selective about what we pay attention to and we compensate for any information gaps by ‘editing’ together our impressions, rather than taking an exact ‘recording’. This is called change blindness. Magicians frequently use change blindness to their advantage.

Topics: visual perception, change blindness

Colour words

Visitors say out loud the name of the coloured ink that each word is printed in, rather than the colour name described by each word. It is harder than it looks!



What’s happening?

The words themselves have a strong influence over your ability to say the colour. The interference between the different information (what the words say and the colour of the words) your brain receives causes a problem. There are two theories that may explain the Stroop effect:

1. Speed of Processing Theory: the interference occurs because words are read faster than colours are named.
2. Selective Attention Theory: the interference occurs because naming colours requires more attention than reading words.

Topics: Stroop effect

Bird in a cage

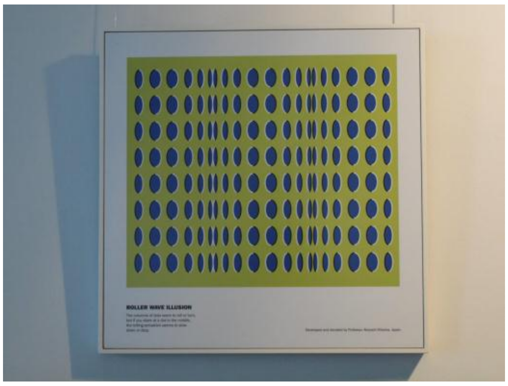
Visitors stare at the red bird for 20 seconds (or more) then look at the bird cage. They will briefly see the ghostly apparition of a green bird in the cage. Try staring at the cage first, then the bird. What do you see?

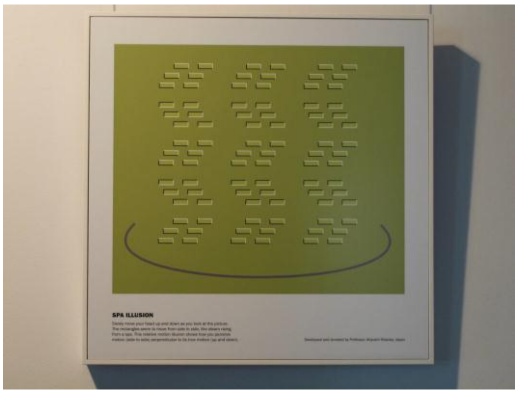
What’s happening?
When you stare at red, your eye-brain system becomes tired of seeing red. If you then look at white, you see it without some of its red component. White without red is a blue/green colour.

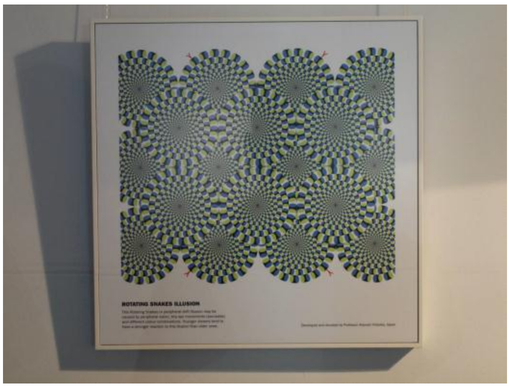
Topics:
Visual perception, change blindness

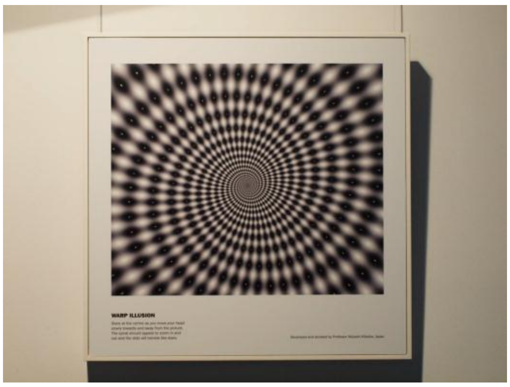
Illusions Images

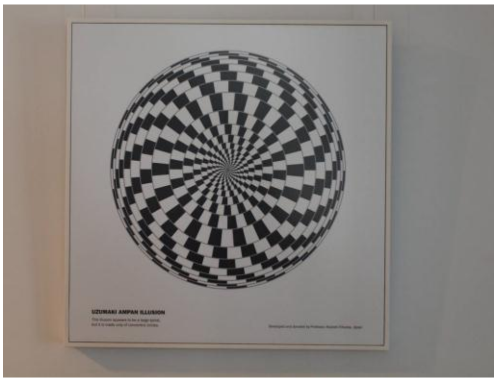
Japanese vision scientist Professor Akiyoshi Kitaoka developed these 10 illusions to study people's eye and brain activity while viewing the illusions.

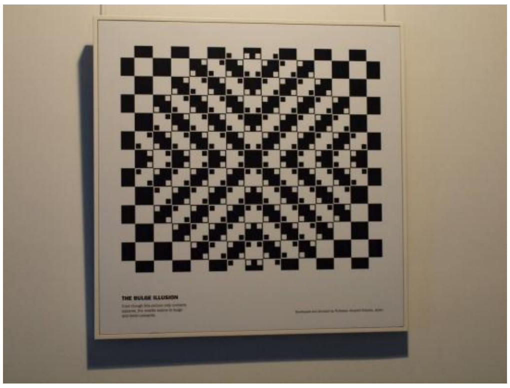












Warning: These illusions may cause dizziness, nausea or epileptic seizures in some people. If students start to feel unwell, tell them to cover one eye with their hand and look away. Do not close both eyes as this may worsen the attack.

<u>What's happening?</u>
Our brains 'see' some illusions because of the way our eyes make tiny, involuntary twitches (saccades). Other illusions are generated by our peripheral vision and some colour illusions depend on the way our brains compare colours against each other.

Curriculum links

The Perception Deception exhibition has direct links to the Australian science curriculum in years 5-9. However, as children of all ages are interested in how their senses work, and are intrigued by the science behind 'magic', the exhibition would be relevant to all ages.

<u>Australian Science Curriculum Links</u>

Year 5

Science Understandings	**Perception Deception exhibits**
Biological Sciences • Living things have structural features and adaptations that help them to survive in their environment (ACSSU043)	All exhibits

Year 8

Science Understandings	**Perception Deception exhibits**
Biological Sciences • Multi-cellular organisms contain systems of organs that carry out specialised functions that enable them to survive and reproduce (ACSSU150)	Various exhibits show how human sensory organs integrate with areas of the brain, such as the visual system (starting from the eye's retinas through to the visual cortex). They also demonstrate how your sensory systems respond to your environment, such as how you detect movement, brightness, shape, proprioception (your body's position in space), temperature, speed of moving objects, etc.)

Year 9

Science Understandings	Perception Deception exhibits
Biological Sciences • Multi-cellular organisms rely on co-ordinated and interdependent internal systems to respond to changes in their environment (ACSSU175)	**All exhibits**

Activities

The following hands-on perception activities use minimal or no equipment and are easy to try in the classroom. Some replicate exhibits in the exhibition.

1. Hollow face illusion

Things you need

- Rigid plastic face mask (like those sold in a joke or party shop)
- Torches or spotlights
- Table
- Turning disc like one you would find on a dinner table (a Lazy Susan)

What to do

1. Mount the mask onto the stick and mount the stick onto the turning disc.
2. Adjust torches or lights around the mask, so you can see shadows falling around its nose and eyes.
3. Slowly turn the disc, so the attached face mask rotates and you see the back of the mask as well as the front. Does the back of the mask look hollow, or does it look like another normal face?

What's happening?

This is a similar effect to the "Do you see bumps or dents?" exhibit.

See www.youtube.com/watch?v=S_vtZXELRK8 for a video of the effect.

2. Which eye is dominant?

Things you need

- Your eyes
- Your finger
- Something to look at in the distance (about 5-6 metres away), such as a light globe

What to do

1. With both eyes open, point your finger at an object in the distance, so your arm and finger are in alignment with the middle of your face (or your nose).
2. Close each eye in turn and notice how far the object seems to 'jump' across in your vision.
3. The eye that can still see you finger pointing right at the object is your dominant eye!

What's happening?

Most people have a dominant eye, or one eye that works harder than the other eye. Most people automatically use their dominant eye when looking through a camera eyehole or telescope. Eye dominance does not always correlate with hand-dominance.

3. Colour words

Things you need

- Square shaped mirror
- Colour print out of the Stroop Effect words
  http://faculty.washington.edu/chudler/words.html

What to do

1. Look at the colour print out.
2. Try to same the name of the coloured ink that each word is printed in, rather than the colour name described by each word.
3. Was that easy?!
4. Now, hold the mirror next to your print out and say the coloured inks again. Was that easier or more difficult? Why?
5. Try the test with very young children who know their colours, but cannot yet read.
6. Turn the words upside down or rotate them 90 degrees.
7. Would it be easier if the words were in a foreign language or non-colour words such as ‘dog’ or ‘house’ or nonsense words such as ‘kiw’ or ‘thoz’?

What’s happening?

See explanation under ‘Colour words’ in the exhibition description. This adds an extra dimension to the “Colour Words” exhibit in the exhibition.

4. Which hand has better rhythm?

Things you need

- Good sense of rhythm!
- Your hands

What to do

Note: Many left-handers get the same result as right-handers on this test, so it’s not a test for ‘handedness’.

1. Start tapping a regular 1-2-3-4 beat with your left hand on the table or on your thigh. Start tapping a fancy rhythm beat at the same time with your right hand. Easy?
2. Try tapping the regular 1-2-3-4 beat with your right hand and after a few rounds, start the fancy beat with your left hand. You should find this more difficult.

What’s happening?

Your brain’s left hemisphere which controls your right hand is able to handle complex rhythms better than your brain’s right hemisphere (which controls your left hand).

5. Does one hand look bigger?

Things you need

- Your eyes
- Your arms

What to do

1. Stretch one arm out and hold your hand up like you're telling someone to "stop". Hold your other arm mid-way (next to your elbow) with this hand also in the "stop" position. Do your hands look the same size?
2. Now, keep your hand near your elbow, but move it across your arm, so you see it overlap your other hand slightly. Does your hand near your elbow seem to look slightly bigger than before?

What's happening?

When you overlap your hands, it fools your brain's normal scaling techniques which it uses when judging the size constancy of things nearby and far away.

6. Visual updating

Things you need

- Large mirror
- Friend

What to do

1. Ask your friend to look up close into the mirror.
2. Watch your friend's eyes in the mirror's reflection. You should see their eyes making tiny, jittery movements or saccades.

What's happening?

The tiny eye movements are important for updating your brain with fresh visual information.

7. Moses illusion

Things you need

- Friend

What to do

1. Ask your friend: "How many animals of each kind did Moses take on the Ark?" and listen to what they say.
2. Most people say "two", even though they probably know that Noah, not Moses, is associated with the Ark.

What's happening?

This is called the Moses Illusion, where people have a tendency to overlook distortions in statements.

8. Müller-Lyer illusion

Things you need

- Chalk
- Outdoor paving area

What to do

1. Draw some Müller-Lyer illusion lines along the ground. Make sure all of the lines are the same length (e.g. 3 metres long) and the arrowheads point outwards and inwards.
2. Ask people who didn't draw the lines to estimate how many footsteps or hops it would take you to walk along each line.
3. Do some lines look as though they will need more footsteps than others?

What's happening?

This is a similar effect to the "Do any lines feel longer or shorter?" exhibit.

9. Movement after effect

Things you need

- Treadmill

What to do

1. Walk on the treadmill for 2 minutes, then step onto solid ground.
2. What effect do you feel? Is it similar to when you walk along a travelator in an airport?

What's happening?

This is a 'movement after' effect. Your brain and muscles adapt to the movement stimulus. When the stimulus stops, it can feel a little odd while your brain and muscles are readjusting.

10. Can you read the words when you shake your head?

Things you need

- Book (or a page with words printed on it)
- Your eyes

What to do

1. Hold up the book (or page of printed words). Read the words as you normally would.
2. Now, keep the book still and gently shake your head from side to side (as though you are saying "no") while you try to read the words. Can you still read the words?
3. Keep your head still, but move the book from side to side. Can you read the words now? If not, how is this different to when you shook your head?

4. Another thing to try is to ask a friend to VERY gently shake your head from side to side while you keep the book still and try to read it (instead of you consciously shaking your head).

What's happening?
These activities show how messages from your inner ear (vestibular system) are fed through to ocular reflex control areas of your brain, so your eyes move in the opposite direction to your head.

11. Size-weight illusion

Things you need
- One small (half-sized) aluminium can
- One normal sized aluminium can
- Garden sand
- Digital measuring scales
- Friend

What to do
1. Place the small aluminium can onto the scales and carefully pour in sand until the digital readout says 150 grams.
2. Place the normal can onto the scales and pour in sand until the digital readout says 150 grams.
3. Ask a friend to lift both cans at the same time and tell you whether one of the can feels heavier than the other.

What's happening?
Many people will think that the smaller can feels heavier, even though the cans are the same mass. When two objects are the same mass, but one is larger than the other, your vision unconsciously primes your muscles to lift the larger object with more force or tension compared to the smaller object. Because the large object needs less muscle tension than you unconsciously expected, the larger object feels unexpectedly light. Even though you're getting 'bottom up' signals from your muscles that the shapes weigh the same, you still experience the illusion that the smaller shape is heavier. This size-weight illusion is also known as the Charpentier-Koseleff illusion. If you close your eyes and lift the small and large cans at the same time, the illusion of the smaller can feeling heavier seems to disappear.

12. Does the screen move or the spotlight move?

Things you need
- Dark room
- Torch
- Large, plain sheet of cardboard, to use as a small screen

What to do

1. Prop up the torch on the table so it shines onto the screen.
2. Move the screen from side to side while the torch stays still.
3. Do you perceive the screen to move, or the spotlight?

13. Touchy feely box

Things you need

- Touch box with everyday items of different size, shape and textures
- Blindfold
- Friend

What to do

1. While your friend is wearing the blindfold, hand them an item from the touch box and ask them to identify it.
2. Watch how the blindfolded person feels the object and notice whether they use any of these techniques:
    - Lateral motion: rubs hand or fingertips across the surface of the object
    - Pressure: taps or presses down on the surface of the object
    - Static contact: holds hand or fingertips in static contact with the object
    - Unsupported holding: hefts the object in their hand, unsupported by any other surface
    - Enclosure: places hand or hands around the outside of the object
    - Contour following: uses finger to trace the edge (contour) of the object

14. Points of movement

Things you need

- Few friends
- Sticky/adhesive reflective tape or bike reflectors
- Scissors
- Tape that can be used to apply reflectors
- Dark room with a small pinpoint of light in one corner, like a torch

What to do

1. Stick the reflectors onto your friends' joints (shoulders, elbows, knees, ankles, hips, wrists).
2. Ask you friends to walk around the dark room, so you can only see the reflectors on their joints.
3. Are you able to identify who's who, simply by watching how their body reflectors move? Can you identify their mood by watching their movements as well?

15. Filled-duration illusion

Things you need

- Friend
- Stopwatch
- Quiet room
- Something to play music with (e.g. I-pad, CD player, radio, etc)

What to do

1. Choose a period of time (e.g. 30 seconds) but don't tell your friend what you've chosen.
2. Ask your friend to sit silently while you measure your period of time on your stopwatch. Don't tell you friend how many seconds you recorded.
3. Play some music and measure that period of time on your stop watch again. (Stop the music when you reach the end.)
4. Ask your friend which period felt longer—the silent period of the music-playing period? Or, did each period seem to last about the same length of time?

What's happening?

Many people judge a period of time to feel longer if it's filled with sound or video compared to silence.

16. Can you see a 3D building?

Things you need

- Photograph of a building on a postcard or from a magazine
- Mirror
- Something sharp which allows you to punch a peephole through the postcard

What to do

1. Punch a peephole in the bottom centre of the photo, which is large enough to allow you to peep through with one eye.
2. Hold up the photograph, so the back of the photo is against your face and the building image faces the mirror.
3. Look through the peephole, so you can see the building photo reflected in the mirror. Slowly move your head back and forth a little.
4. Does the building in the mirror reflection change from 2D to 3D?

17. Ebbinghaus illusion

Things you need

- Tabletop
- Colour print out of the Ebbinghaus illusion
  http://en.wikipedia.org/wiki/File:Mond-vergleich.svg

- Scissors
- Pair of tweezers

What to do

1. Cut out all the circles in the Ebbinghaus Illusion and arrange the circles in their original patterns.
2. Use a pair of tweezers to pick up the central (orange) circle. Do you notice yourself readjusting the width of the tweezers as you try to pick up the central circle?
3. Try to pick up the orange circles by themselves (without the surrounding blue circles). Do you change the width of the tweezers as much?

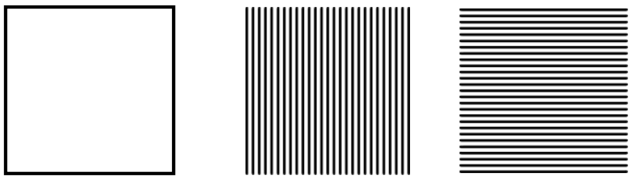
18. Which square is the smallest?

Things you need

- Print out of the square lines on pages 22 and 23 (vertical and horizontal)
- Plain sheet of white paper
- Ruler
- Thick, black texta
- Friend

What to do

1. Draw a plain square on white paper, measuring 170mm by 170mm.
2. Arrange the squares similar to the diagram below.
3. Ask your friend to tell you which square appears to be the smallest. (They are all actually the same size!)



19. Grid lines

Things you need

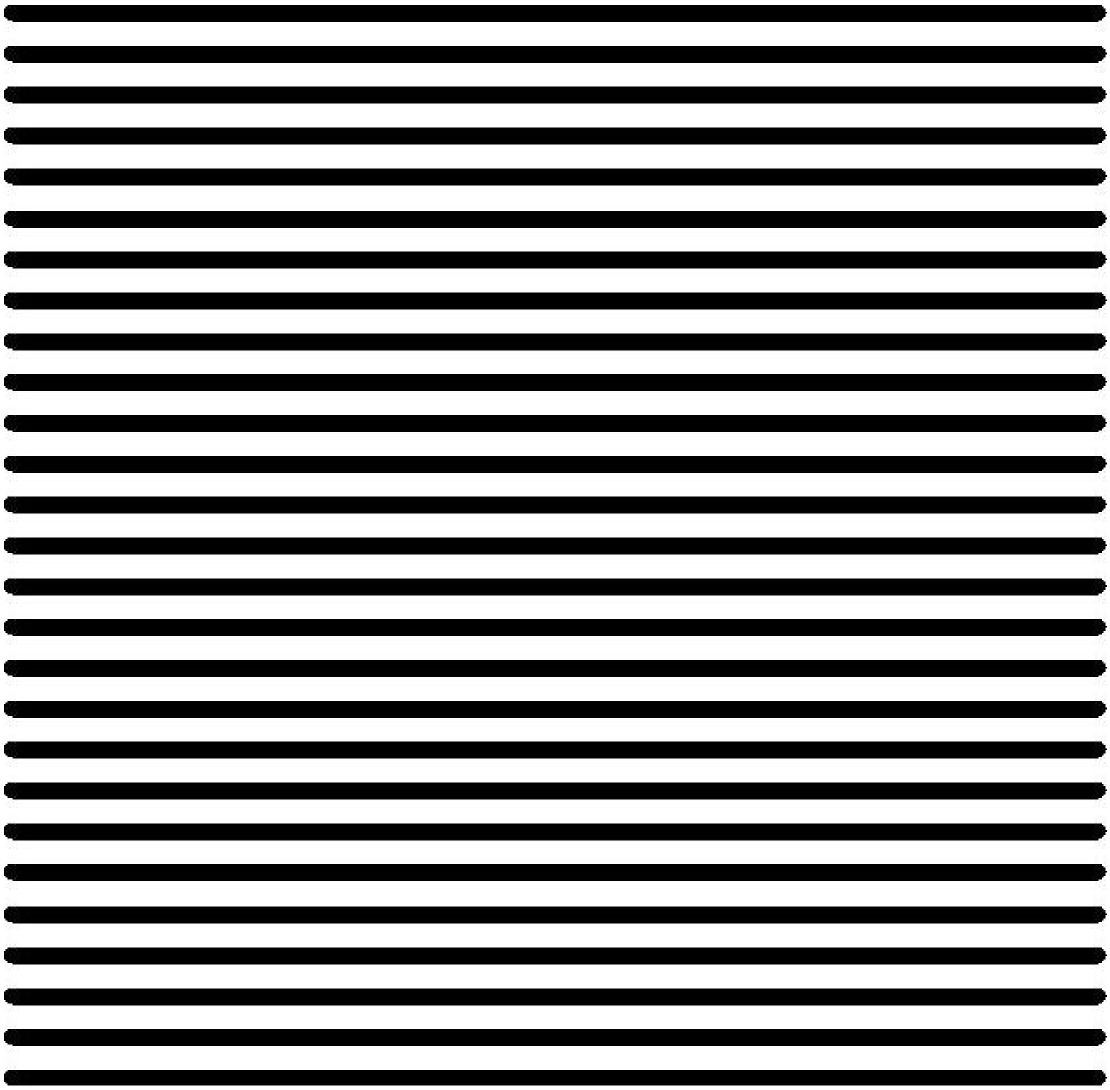
- Print out of the square lines on pages 22 and 23 (vertical and horizontal)
- Your eyes
- Manilla folder, or thin book that can stand on one end (like a partition)
- Scissors

What to do

1. Prop up the manila folder or book on the table, like a vertical partition.
2. Hold the horizontal line and vertical line page on either side of the partition.
3. Put your nose against the partition, so one eye can only see the horizontal lines and your other eye can only see the vertical lines.

4. Stare at the lines a little while.
5. You may see either the stripes alternating or a fluctuating mosaic but not a grid.

Square lines—horizontal



Square lines—vertical