

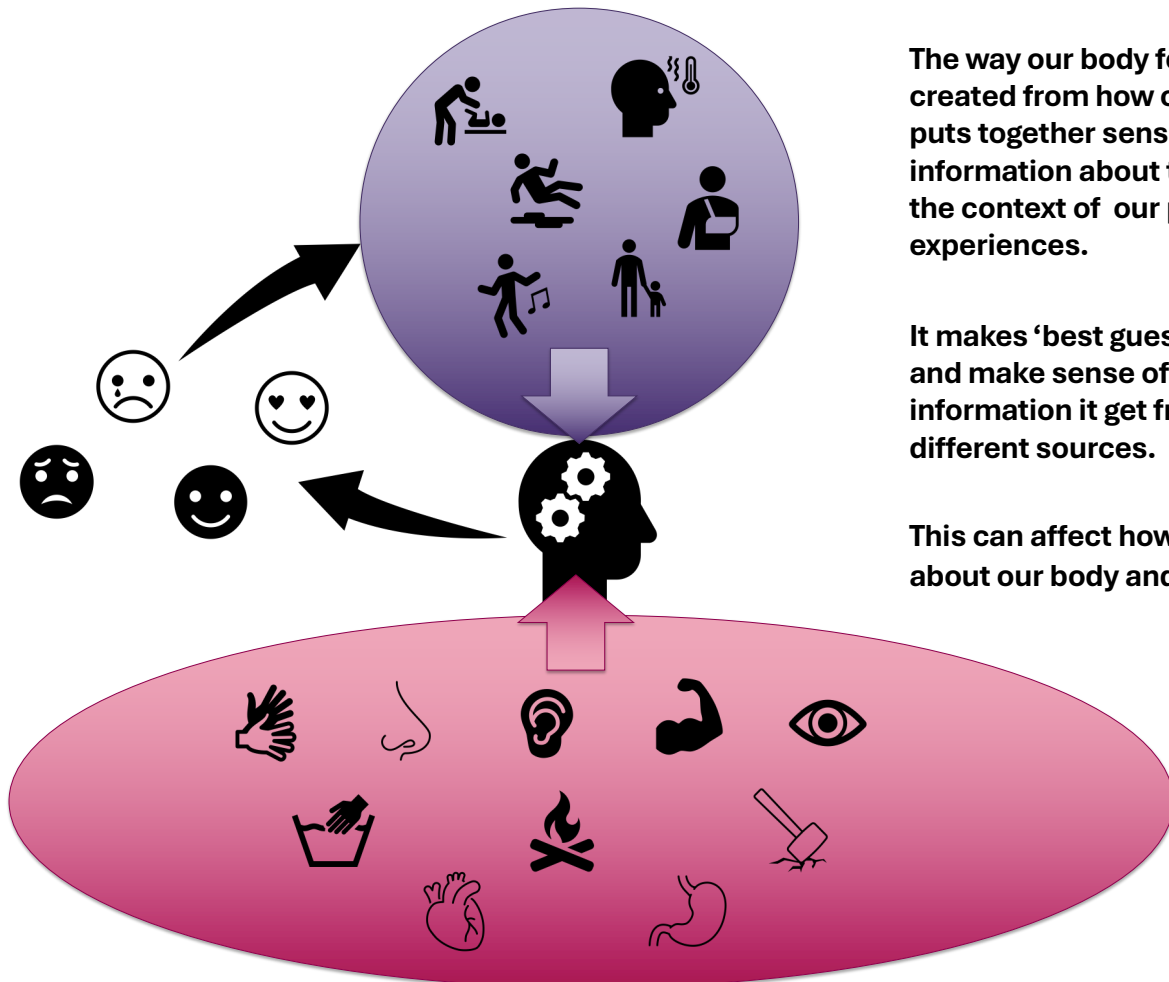
UNDERSTANDING BODY PERCEPTION with a fun body illusion suitable for all ages

Dr Roger Newport, Reader in Engaged Approaches to Psychological Science

What does my body feel like today?



It can often feel different in terms of size, shape, health, or in other ways.



The way our body feels to us is created from how our brain puts together sensory information about the body in the context of our previous experiences.

It makes 'best guesses' to try and make sense of all the information it gets from different sources.

This can affect how we feel about our body and ourselves

Only we can feel how our own body feels. The Anne Boleyn Illusion can help us to a) understand how our own body feels and b) understand how other people might feel different to how they look.

If you get stuck with the illusion or the interpretation, or would like more illusions, email the inventor at r.newport@lboro.ac.uk

UNDERSTANDING BODY PERCEPTION

with a fun body illusion suitable for all ages



Dr Roger Newport, Reader in Engaged Approaches to Psychological Science

BODY PERCEPTION – A Group Activity for Psychology and PSHE at KS3/4

This activity can also be used for Science Week, enrichment, or just for fun!

It uses an illusion called the Anne Boleyn Illusion that makes people feel as though they have an extra finger, just by using a mirror. Anne Boleyn was rumoured to have six fingers (but she didn't) which is how this illusion got its name.

Topics covered

How we perceive our own body.

How perception of the body can be changed.

How the way a person's body feels can be very different to how it looks.

Take-home messages

Psychology: Understand how your brain makes sense of your own body (and the world around it) by putting together sensory information and your previous experiences.

PSHE: Understand how you, or someone you know, can feel like their body is completely different to how it looks to other people.

Notes for teachers

This lesson plan involves group or paired work and comes with full instructions (below). It provides a fun, yet thought-provoking, approach to perception, the experience of our own body, and how this relates to the way our body feels to us.

This is important for understanding perception, for understanding how we feel about our body, and for understanding how others might perceive their body differently to the way we do.

For Psychology, this lesson extends ideas from visual illusions that inform our understanding of human perception by introducing and demonstrating interactive illusion experiences that use more than one sense (multisensory). The demonstrations provide surprising and memorable learning moments that students can share with other students, as well as with friends and families. The discussion can be extended to consider conscious experiences (and our perception of reality).

For PSHE, the lesson allows students to gain insight to what makes their body feel the way it does, and how someone who looks healthy or unhealthy on the outside can feel completely the opposite on the inside, providing an empathetic learning experience for all. We all know, or have heard about, people whose body does not feel quite right to them, but it is very difficult for others to understand that – looking in from the outside. The demonstrations here can provide surprising and enlightening insight to that issue.

You will need

1 x safety mirror – approx. A4 in size

Any reflective surface should work, but it needs to be safe (so not glass that can break easily). You can buy acrylic mirrors quite cheaply on the internet, or you could stand a framed wall mirror up between some books or other anchors – or a third person could hold it.

We have heard of people being able to do this successfully with a tablet camera – the angle won't be quite right and there might be a tiny lag on the image, but it's worth trying if you can't get hold of a suitable mirror.

UNDERSTANDING BODY PERCEPTION

with a fun body illusion suitable for all ages



Loughborough
University

Dr Roger Newport, Reader in Engaged Approaches to Psychological Science

Suggested lesson plan and background - Psychology

The framing for this lesson plan is around **perception**. You might have covered Gregory vs Gibson in their approaches to indirect (top-down) and direct (bottom-up) perception.

This illusion can be used to stimulate students' thinking about these two approaches because it represents an interesting challenge between top-down and bottom-up processing.

Brief suggested outline

1. Ask students about their hands – potentially ask them to sketch their hand.
2. Ask how many fingers they have. Would expect to feel an extra one?
3. Get them to try out the Anne Boleyn Illusion on each other.
4. How does this fit with either Gregory's or Gibson's theories of perception?
5. If they didn't feel the illusion (some don't), is that because they have a bias towards top-down knowledge (that they could not possibly have an extra finger) or a bias towards accurate bottom-up sensation (that they felt the touch in its real location, on their little finger)?

Discussion points

Visual illusions are often used as evidence for Gregory's theory of perception because it is our top-down knowledge that shapes interpretation of the sensory input (e.g. in the Muller-Lyer Illusion).

However, if we look at the Anne Boleyn (six fingers) Illusion, it seems to violate top-down knowledge about our body.

If you were to ask your students how many fingers they have on one hand, most of them will say 5 (5 digits, so including the thumb), and that they have always had 5, and that it would be very unlikely that they would suddenly have a 6th. That sums up their top-down knowledge about the structure of their hand. Rather surprisingly, when they do the Anne Boleyn Illusion, the sensory input (from vision and touch) should make them feel like they suddenly have an extra finger – which their top-down knowledge would say is not a plausible interpretation of sensory input. How does that fit with Gregory? Does it seem to fit more with Gibson and direct perception? On the other hand (no pun intended) they will have interpreted the sensory input as an extra finger - they did not interpret it as a pen, or stick, or any other object? Why not? Could that be because the sensory input (as unusual as it was) was interpreted within the top-down context and experience of fingers being part of hands? That is, they felt touch and saw touch that seemed to belong to a single object – and that object was right next to the five digits that had just been stroked, so how would the brain make sense of that using a top-down interpretation? What else could it be but another finger?

It might not be easy, or possible, to disentangle top-down from bottom-up influences on perception. The information our brain receives from the senses can tell us about our own body and the world around it, but **perception is a two-way process**. How sensory information is interpreted can depend on our prior expectations (based on previous experiences and learning). At the same time, our experience of the world, which feeds into future prior expectations, can be shaped by the sensory input we get.

UNDERSTANDING BODY PERCEPTION

with a fun body illusion suitable for all ages



Dr Roger Newport, Reader in Engaged Approaches to Psychological Science

Suggested lesson plan and background - PSHE

This lesson can be used alongside lessons on **body image** to stimulate thoughts and discussions about the difference between how a person's body looks and how it might feel to that individual.

Brief suggested outline

1. Ask students about their hands – potentially ask them to sketch their hand.
2. Ask how many fingers they have. Would expect to feel an extra one?
3. Get them to try out the Anne Boleyn Illusion on each other.
4. Does their body suddenly feel different to how it looks (and really is)?
5. Can they apply that to thinking about what that means for how their own body feels, as well as how other people's bodies might feel to them?
6. If they didn't feel the illusion (some don't), this just demonstrates how everyone interprets sensory information differently.

Discussion points

There are two main reasons why understanding how our own body feels and understanding that another person's body might feel different to how it looks is important. The first can help us to have more positive thoughts about ourselves, the second helps us have greater empathy for others.

A) Our own body: What does our body feel like to us? Does it feel healthy? What shape am I? Are these feelings always accurate? The answer to that is NO, how our body feels to us is not accurate. Just like any other kind of perception, it is made up of how the brain interprets sensory signals within the context of our pre-existing expectations. Sometimes we feel that our body is unhealthy (or other undesirable state) when in fact the opposite is true. Not feeling great about the state of our body can have a negative impact on our emotions towards ourselves, how we think about our body, and what we do with our body (like how much we think we can go out, exercise, or engage in positive behaviours). The Anne Boleyn Illusion teaches us that there can be a big difference between how we feel at any given moment and the true state of our body. While the state (shape, health etc.) of our body always feels **real** to us, it isn't necessarily always accurate.

B) Others' bodies: Do you know someone, or have you heard about someone, who feels like their body isn't quite right? They might say that they are not happy with the way their body is – even though they look fine to you. How is it that they can look one way to us, but report that they feel completely different to how we see them? As above, this can happen because the way someone's body feels to them is not always an accurate reflection of how it looks (to everyone else) and sometimes that can result in negativity. Just like any other kind of perception, how someone's body feels to them is made up of how the brain interprets sensory signals within the context of pre-existing expectations. Crucially – only we have access to how our own body feels, and that's the same for everyone else. It is important that we can understand how a person can feel that their body is one thing when it looks totally different to us.

The Anne Boleyn Illusion teaches us that there can be a big difference between the body feels at any given moment and the true state of that body. This insight, that people can feel very different to how they look – and that those feelings are real (even if they are not accurate) - provides a window of empathy with others.

UNDERSTANDING BODY PERCEPTION with a fun body illusion suitable for all ages

Dr Roger Newport, Reader in Engaged Approaches to Psychological Science

How to do the Anne Boleyn (Six Fingers) Illusion

1) Stand or sit opposite each other with the mirror upright and lengthways between you. Make sure the shiny side is on your right (and their left). You can do it the other way round but do it this way first.

2) The other person puts their hands palm down, one on either side, and spreads their fingers out. Then they need to lean over, and look into, the shiny side of the mirror, looking at the reflection of their whole hand.



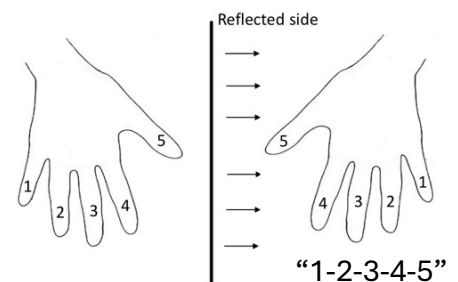
They need to look closely at the reflection – not at the hand in front of them so that they can see a reflection of their hand as if it is the one hidden behind the mirror. They should be able to see a reflection like this.



First Pass

3) Touch each finger on both hands at the same time, starting with the two little fingers. Touch each one until you get to the thumb. Count out loud “1-2-3-4-5” as you do this.

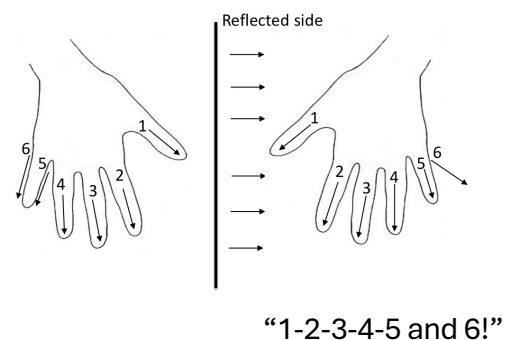
4) Now say “I am going to make it feel like you have a sixth finger on your right hand. You won’t see it, but you will feel it. Count with me!”



Second Pass

5) Then, starting with the two thumbs, stroke the top of each finger from top to tip on both hands, but only as far as the 4th (ring) finger. You will do something different on the little finger. Count “1-2-3-4” as you do so.

6) For the little fingers, you need to touch each one in a slightly different way: On the finger behind the mirror (on your left) stroke it on the inside and then the outside. **At the same time**, on the reflected side (your right) stroke the little finger along the top – then stroke along the table at an angle away from the finger. This is where they should feel the extra finger. As you do this, count out “Five and SIX!”



If they don’t get it first time, try again. Check that they are looking at the hand in the reflection. Remind them that they will only feel the extra finger, not see it. Check that you are touching the fingers in the right way on the correct sides of the mirror and touching them at the same time.

Tip: It sometimes helps to touch the base of the little finger on the right when you start the final stroke and to give both the real (left) and invisible (right) finger a little flick as you come off the tip. You might need to do it 2 or 3 times.

You can see a video of it being done here - at 3:23 in – though they have the mirror the other way round.

<https://www.rigb.org/learning/activities-and-resources/baffling-body-illusions>

If you get stuck with the illusion or the interpretation, or would like more illusions, email the inventor at r.newport@lboro.ac.uk

UNDERSTANDING BODY PERCEPTION

with a fun body illusion suitable for all ages



Dr Roger Newport, Reader in Engaged Approaches to Psychological Science

What should happen?

This illusion makes (almost all) people feel as though they have an extra finger that they **can feel, but not see** on the hand behind the mirror. It's quite quick, so you might have to do it two or three times for them to get it. Some might not get it at all, a few will report seeing an extra finger, and some might say they were not touched on the hand behind the mirror were. This is because everyone processes and interprets sensory information differently.

Why does this illusion work? (the science)

The brain is doing what it does all the time – putting together what you can see with what you feel to make sense of the body. Here, it sees touch on the table, but feels touch on the edge of the finger, so it puts these two together and 'feels' an extra finger in the empty space on the table.

The science

It's all in the brain. This is the brain doing what it does all the time.

Your brain constantly tries to make sense of your body by putting together what it can see and feel, as well as knowing about where your body parts are.

The first pass (finger touching) convinces your brain that the hand in the mirror is really your other hand (the one behind the mirror that you cannot really see). This works because you see a hand that looks right, and is in the right place, and you can feel touch that appears to be in the right place at the right time. Your brain puts these bits of information together – what it can see and feel – and comes to the conclusion that what you are looking at is the hand behind the mirror.

The brain does exactly the same thing on the second pass (the finger stroking) – it tries to make sense of what you see and feel. This is straight forward for the first 4 digits. What happens when we get to the little finger?

In the reflection, on the first stroke on the little finger, what you see is the finger being stroked along the top when you are really being stroked on the inside of your finger. Your brain puts these two together and decides that you have been touched somewhere near the top of the finger.

For the second stroke, we touch the outside of the little finger. Your brain knows that this touch is **further across** than the last touch (which it thought was near the top of your finger). At exactly the same time, you SEE a touch on the table (close to the finger, and also further across from the last touch).

The brain puts those two bits of information together (seen and felt touch further across from the last one) and **feels** the stroke where it can **see** the stroke – as an extra invisible finger.

For the brain, this is the most plausible explanation to make sense of the information it has about your body, even if it is clearly wrong! You can check – you don't really have an extra finger!

If you get stuck with the illusion or the interpretation, or would like more illusions, email the inventor at r.newport@lboro.ac.uk

UNDERSTANDING BODY PERCEPTION

with a fun body illusion suitable for all ages



Loughborough
University

Dr Roger Newport, Reader in Engaged Approaches to Psychological Science

Summary and more fun things to do

What does this illusion tell us?

This illusion makes a person's body feel different to how it normally does. This is done through subtly changing what they see and feel on each hand. The brain then puts that new information together and tries to make sense of it. In most people, the feeling they get is that their body has an extra, invisible finger on one hand.

This research is important because it helps us to understand how the brain represents our own body. By knowing how this works, we can start to understand why it sometimes feels different to how it normally does and, potentially, how it can be changed – if that's what is needed.

Importantly, body illusions like this give people insight to how it is possible for someone to have an unhealthy representation of their own body when it looks perfectly fine from the outside.

KEY MESSAGES

- 1) How your body feels is made up from the sensory signals your brain gets.
- 2) How your body feels can be very different to how you think you look.
- 3) Other people's bodies might feel very different to how they look to you.

SPREAD THE WORD – do this to your friends and family at home. Remember to explain how it works!

Additional fun – beyond the basics: Extra Long Finger (Anne Boleyn) Illusion

Extending the finger: See if you can give people a super long extra finger. Make the last stroke on the table twice as long but take the same length of time to do it as it takes for you to stroke the real finger behind the mirror. Try going backwards and forwards with both strokes, making the reflected one (on the table) a bit longer each time. The time it takes to stroke the table and the hidden finger must be the same. How far can you make it go? Can you make it S-shaped? Some people even claim they can move/wiggle their additional finger – but they have to try really hard.

Additional fun – beyond the basics: Dead or Numb Hand Illusion

Get people to look into the mirror, the same as for the Anne Boleyn. Tell them you are going to see if their hand will go a bit numb.

Touch the back of both hands. Gently circle your fingers round on the back of both hands – enough so that it makes their skin move.

Very slowly lift your finger off the hand hidden behind the mirror while you carry on rubbing the reflected hand (it helps to keep circling with both hands).

They will see you still touching their hand (in the reflection) but won't be able to feel it.

Ask them if their hand feels a bit numb.

Bring the sensation back by circling and slowly reapplying pressure on the reflected hand.

Can you invent a new illusion?

Psychology is a science – are you a budding scientist? Can you invent a new illusion?

See if you can make the hand feel different to how it really is by touching them in different ways.

Fairly interesting facts: This illusion is called the Anne Boleyn Illusion because she was rumoured to have 6 fingers (but didn't in real life). The illusion was invented by Roger Newport and he is still alive today! He is amazing and so lovely – and modest too. You can contact him here: r.newport@lboro.ac.uk