

Introduction

Can you spot the difference?

Do you like playing "spot the difference" between two images? We hope so because this is exactly what this quiz will be! You will be asked to detect small differences in colour between images. The better you are, the more points you will get! You will be able to see your score at the end of the survey. The survey takes about 15-25 mins to complete and you will receive 4 credits. Please do it on a computer or tablet, not on a phone, and maximize the browser to ensure the pictures are all visible at once.

Before we get to the main section of this quiz, you will have the opportunity to read the participant information. We will need your consent to participate in this study, if you don't agree with the conditions of this study, you can just close this website.

Participant Information

Study Title: Why Blue Bananas Look Blue

Researchers: Christoph Witzel (supervisor), Haden Dewis (student)

What is the research about?

My name is Haden Dewis and I am an undergraduate Psychology student in my final year at the University of Southampton in the United Kingdom. I am inviting you to participate in a study on the perception of object colours. This study was approved by the Faculty Research Ethics Committee (FREC) at the University of Southampton (ERGO Number: 65220).

What will happen to me if I take part?

This study involves completing an anonymous questionnaire which should take approximately 15-25 minutes of your time. If you are happy to complete this survey, you will need to tick (check) the box below to show your consent. As this survey is anonymous, the research team will not be able to know whether you have participated, or what answers you provided.

Why have I been asked to participate?

Anybody can participate in this study, and there are no expectations on participants' background. I am aiming to recruit around 400 participants for this study.

What information will be collected?

The questions in this survey ask for some demographic information (gender, age, and if you have colour deficiency). In the main part, you will be asked to indicate which of four object images differ in colour from the other three. Accuracy and timing of your responses will be recorded, and you will be asked to indicate the confidence about your responses.

Are there any benefits in my taking part?

If you decide to take part in this study, you will not receive any direct benefits; however, your participation will contribute to knowledge on colour perception. In addition, you will receive 4 credits. Please note that credits will be awarded only on completion of the study.

Are there any risks involved?

It is expected that taking part in this study will not cause you any psychological discomfort and/or distress, however, should you feel uncomfortable you can leave the study at any time or contact the following resources for support: Christoph Witzel, C.Witzel@soton.ac.uk

What will happen to the information collected?

All information collected for this study will be stored securely on a password protected computer and backed up on a secure server. In addition, all data will be pooled and only compiled into data summaries or summary reports. Only the researcher and their supervisor will have access to this information.

Deidentified results of this study will be reported as part of a larger research program, in academic conferences and/or journals, so you'll remain anonymous in all stages of the research. If you wish to receive a summary of the research findings, please contact Christoph Witzel at c.witzel@soton.ac.uk; the research team will email you the summary report once it's ready.

The University of Southampton conducts research to the highest standards of ethics and research integrity. In accordance with our Research Data Management Policy, data will be held for 10 years after the study has finished when it will be securely destroyed. If results are published in scientific journals, the anonymous data will be made publicly available in a scientific data repository.

What happens if there is a problem?

If you are unhappy about any aspect of this study and would like to make a formal complaint, you can contact the Head of Research Integrity and Governance, University of Southampton, on the following contact details: Email: rgoinfo@soton.ac.uk, phone: + 44 2380 595058.

Please quote the Ethics/ERGO number above. Please note that by making a complaint you might be no longer anonymous.

More information on your rights as a study participant is available via this link:

<https://www.southampton.ac.uk/about/governance/participant-information.page>

For more information on this study, please contact Christoph Witzel at c.witzel@soton.ac.uk ([homepage here](#)). You may also contact him after you've finished the study for questions, concerns, and feedback.

Thank you for reading this information sheet and considering taking part in this research.

Please check below before starting the experiment. Otherwise you can simply close the website.

- Please tick (check) this box to indicate that you have read and understood information on this form, are aged 18 or over and agree to take part in this survey.

Warm-up

Warm-up questions

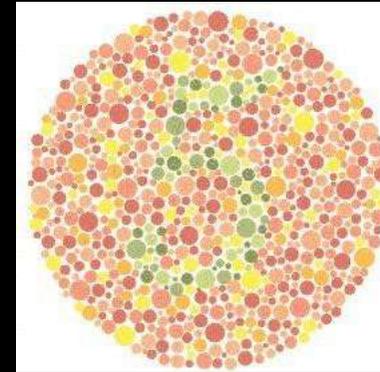
What is your gender?

- Male
 Female
 Other

What is your age?

Have you any known colour deficiencies in your vision?

Colour deficiency is often tested using images like the coloured one below showing a number 5.



- I don't know
 No, as shown by a colour vision test.
 No, but never tested
 Yes, I have colour vision deficiencies

Please note...

...that this task will be particularly difficult if you have any colour deficiencies. It would be helpful for us to obtain your data, but it may also be frustrating for you if you cannot see the differences. So, feel free to opt out at this point by closing the window. If you choose to continue, that is also fine and it does not matter if you can't always see the difference.

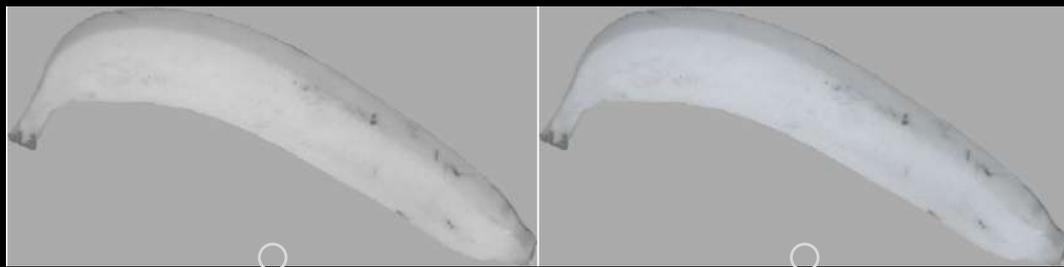
Memory Colour Section

PURE GREY

Before we start with the main part, let's see what pure grey looks like for you.

Which of these bananas looks totally grey?

One of these two bananas looks purely grey, whilst the other may appear to have colour mixed in. If neither looks purely grey, choose the most grey one.



Instructions

INSTRUCTIONS

On the following slides you will be presented with four images, one of these images will be slightly different in colour from the other three. All you need to do is select the image that you believe to be different from the other three by clicking it with your mouse, after this, use the slider to select how confident you feel about the answer you gave. You can now practice this with

the following two practice trials!

Example - Pumpkin

Please select the image that you believe is different from the others



Please use the scale below to select how confident you feel

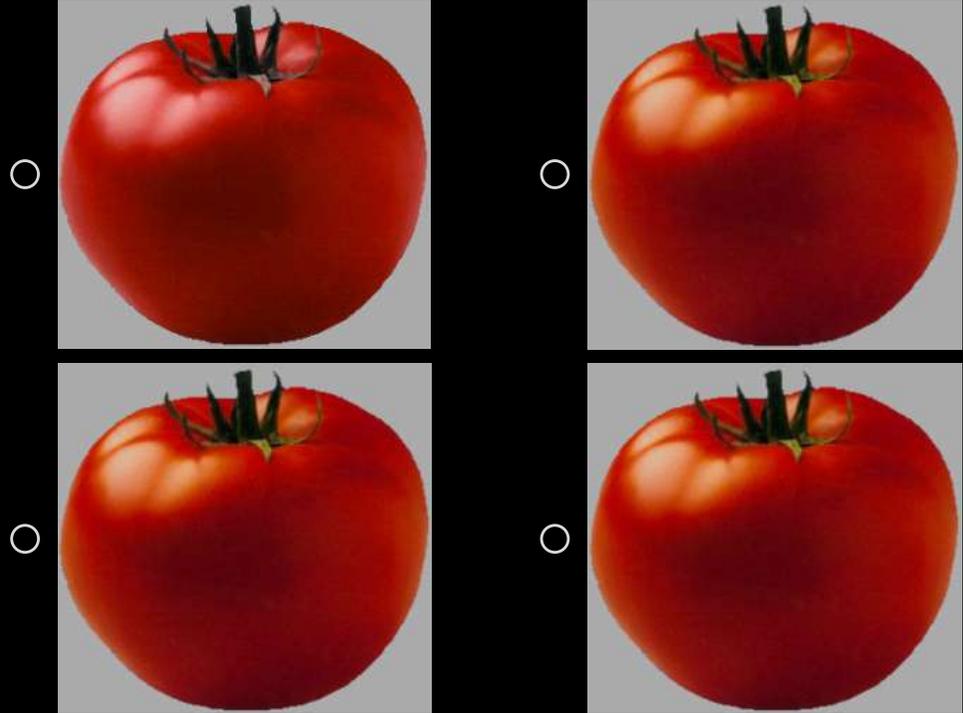
0 = Not at all confident

100 = Very confident

0 10 20 30 40 50 60 70 80 90 100

Example - Tomato

Please select the image that you believe is different from the others



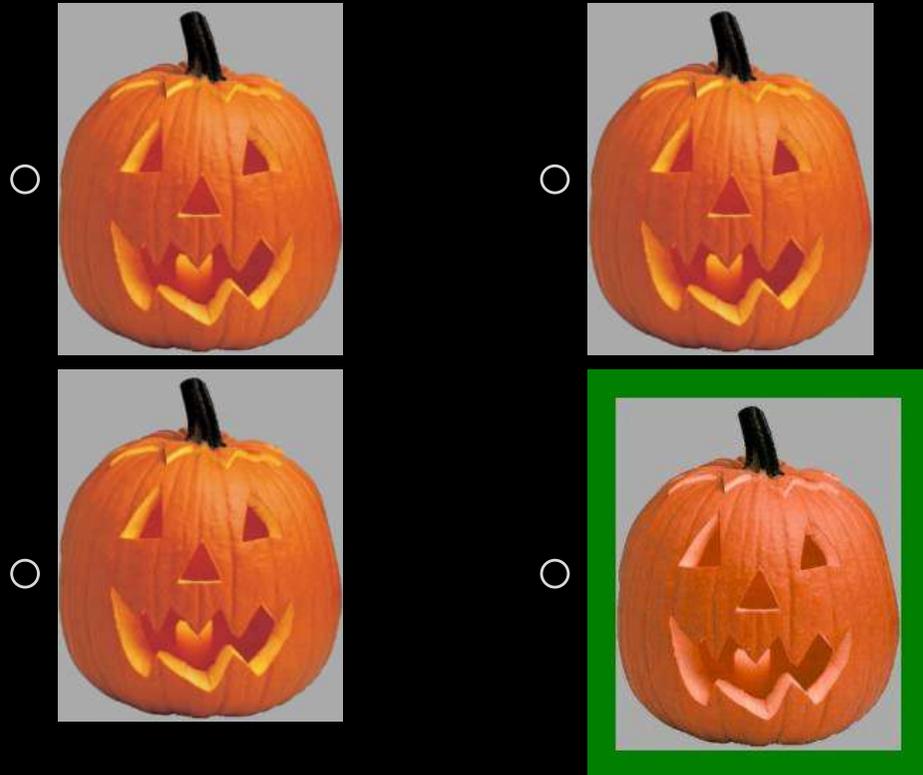
Please use the scale below to select how confident you feel

0 = Not at all confident

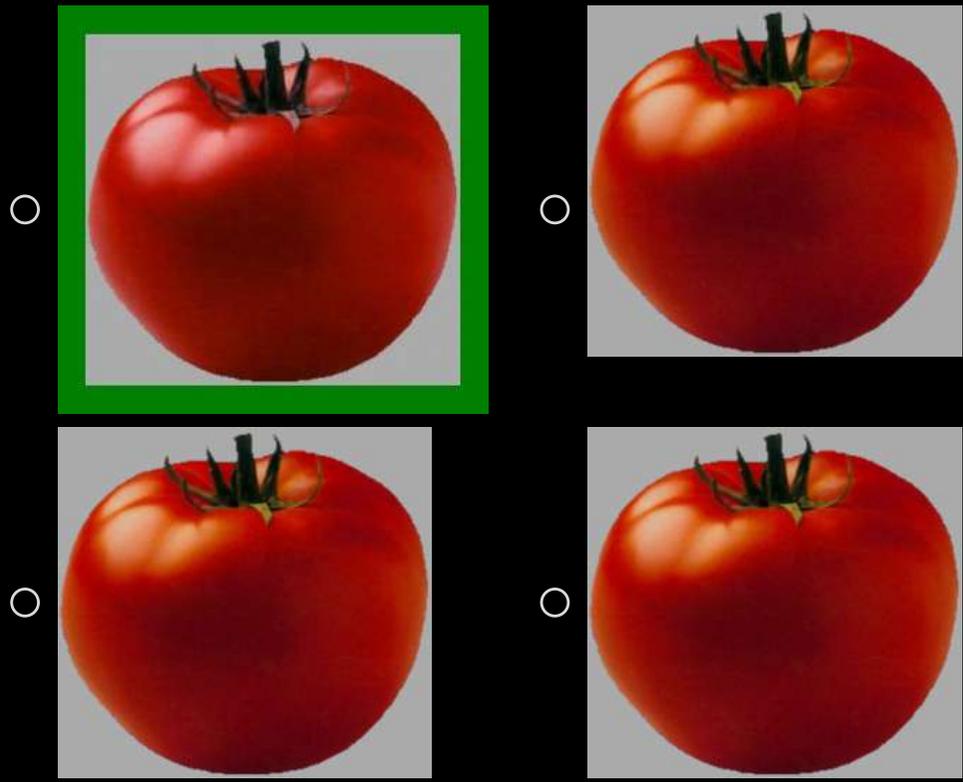
100 = Very confident

0 10 20 30 40 50 60 70 80 90 100

And the correct answer is...



And the correct answer is...



Main Part

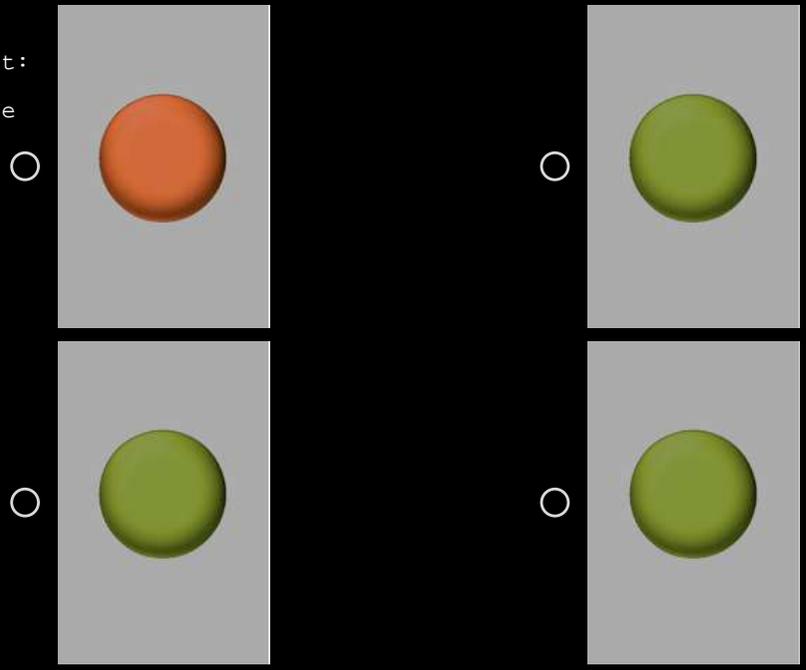
START

Ok, now its getting serious! Please try to answer as quickly as you can while making sure you choose the correct one ... well, if you can spot the odd one at all; some of these trials are really difficult! Anyway, have fun and good luck!

Catch Trial 1

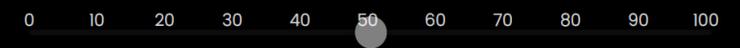
Please select the image that you believe is different from the others

Top Left:
Correct
Response



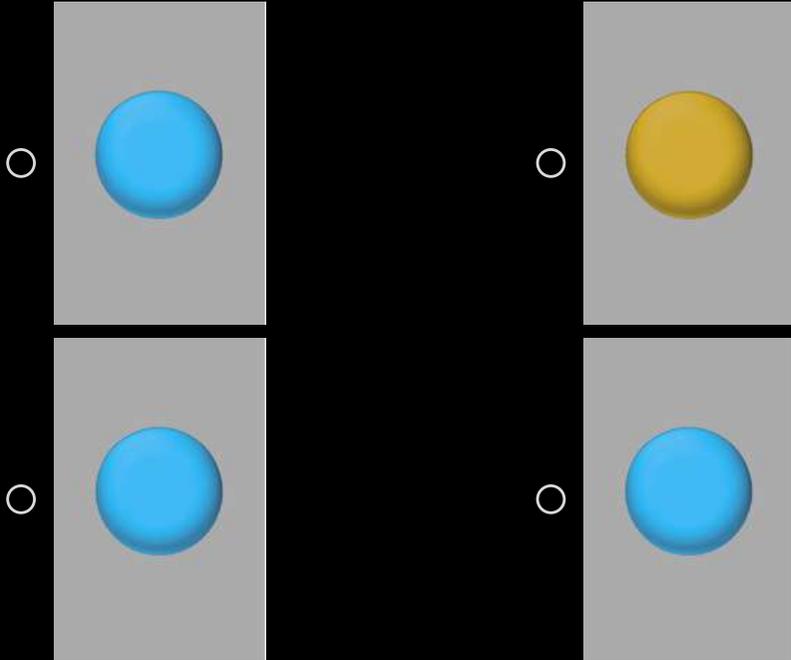
Please use the scale below to select how confident you feel

0 = Not at all confident 100 = Very confident



Catch Trial 2

Please select the image that you believe is different from the others



Top Right:
Correct
Response

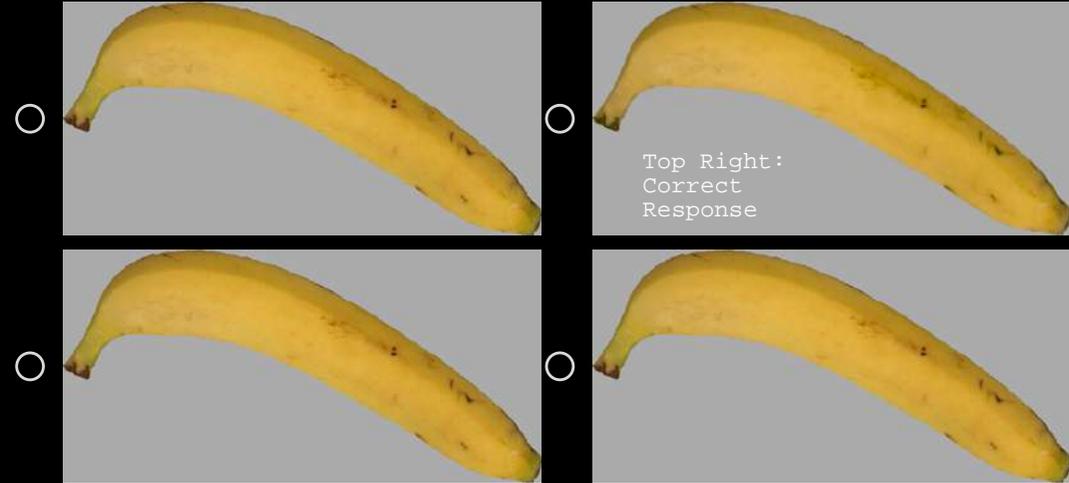
Please use the scale below to select how confident you feel

0 = Not at all confident 100 = Very confident

0 10 20 30 40 50 60 70 80 90 100

Banana - One Hue

Please select the image that you believe is different from the others



Top Right:
Correct
Response

Please use the scale below to select how confident you feel

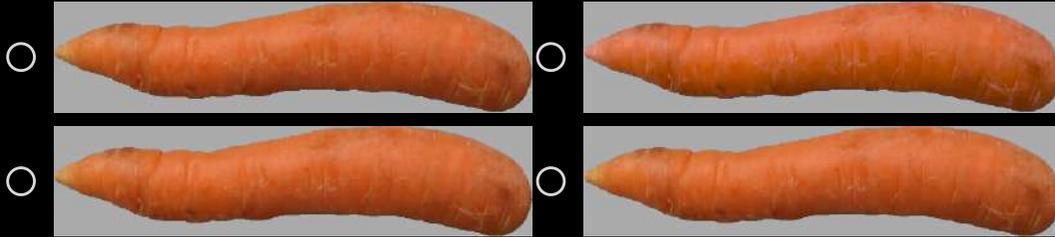
0 = Not at all confident 100 = Very confident

0 10 20 30 40 50 60 70 80 90 100

Carrot - One Hue

Please select the image that you believe is different from the others

Top Right:
Correct
Response



Please use the scale below to select how confident you feel

0 = Not at all confident

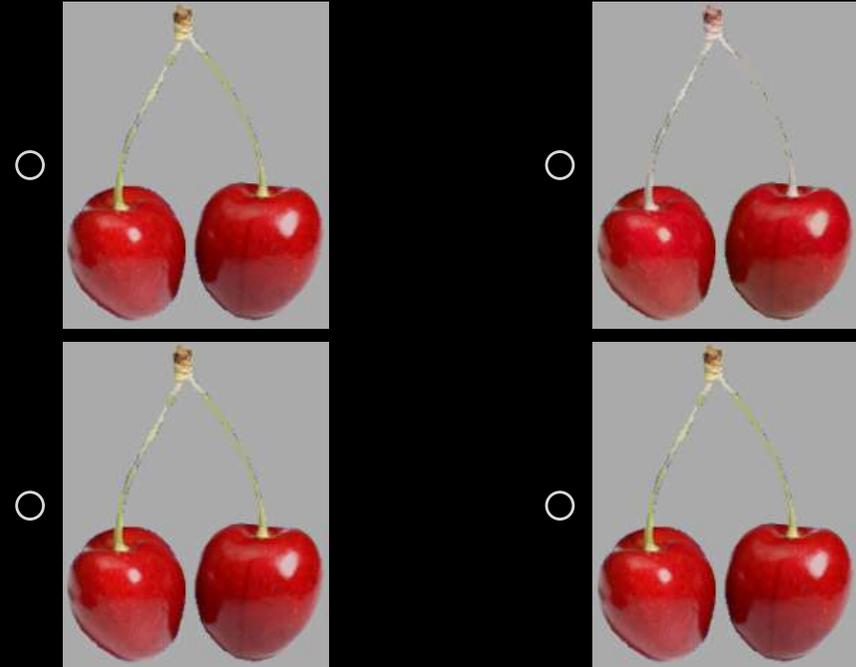
100 = Very confident

0 10 20 30 40 50 60 70 80 90 100

Cherries - One Hue

Please select the image that you believe is different from the others

Top Right:
Correct
Response



Please use the scale below to select how confident you feel

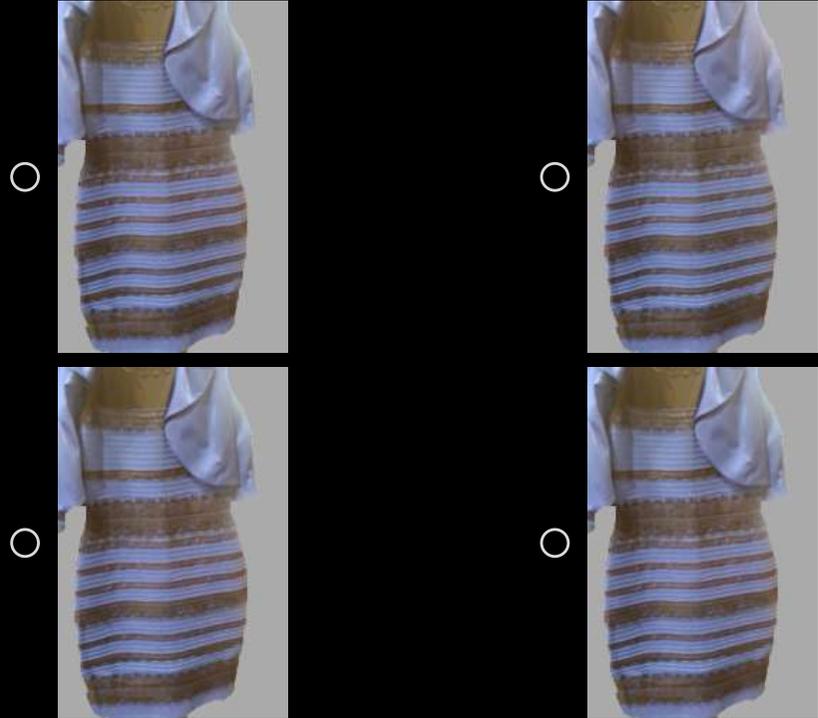
0 = Not at all confident

100 = Very confident

0 10 20 30 40 50 60 70 80 90 100

Dress - One Hue

Please select the image that you believe is different from the others



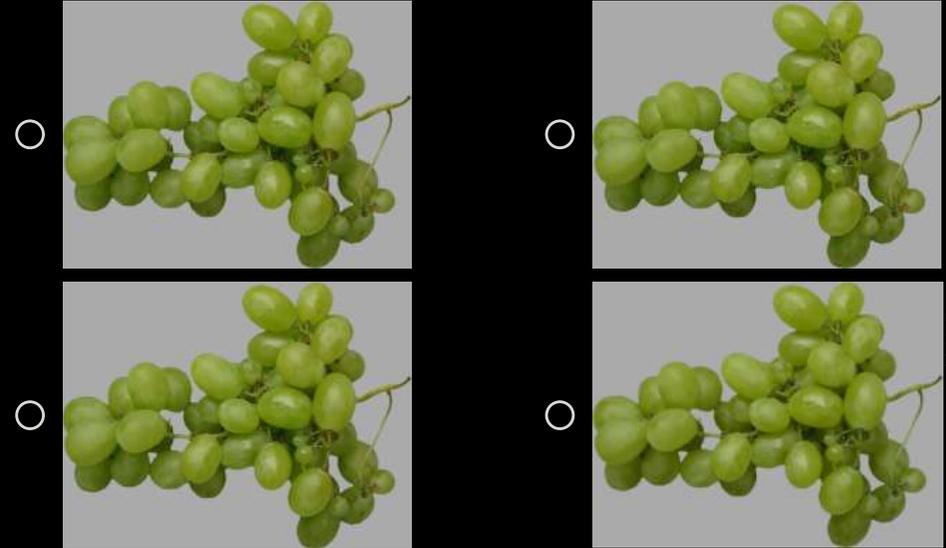
Top Right:
Correct
Response

Please use the scale below to select how confident you feel



Grapes - One Hue

Please select the image that you believe is different from the others



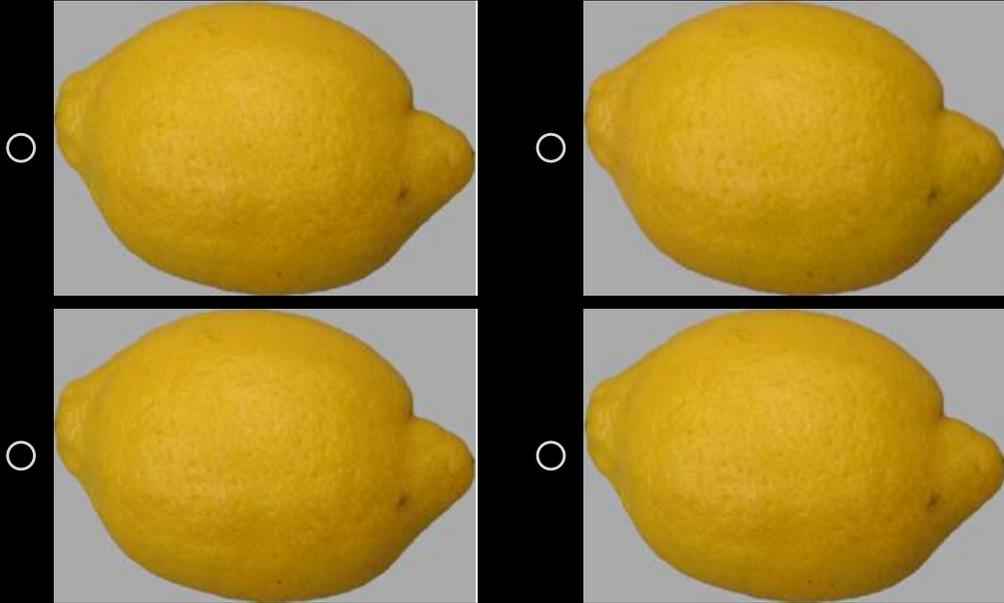
Bottom Right:
Correct
Response

Please use the scale below to select how confident you feel



Lemon - One Hue

Please select the image that you believe is different from the others



Top Right:
Correct
Response

Please use the scale below to select how confident you feel

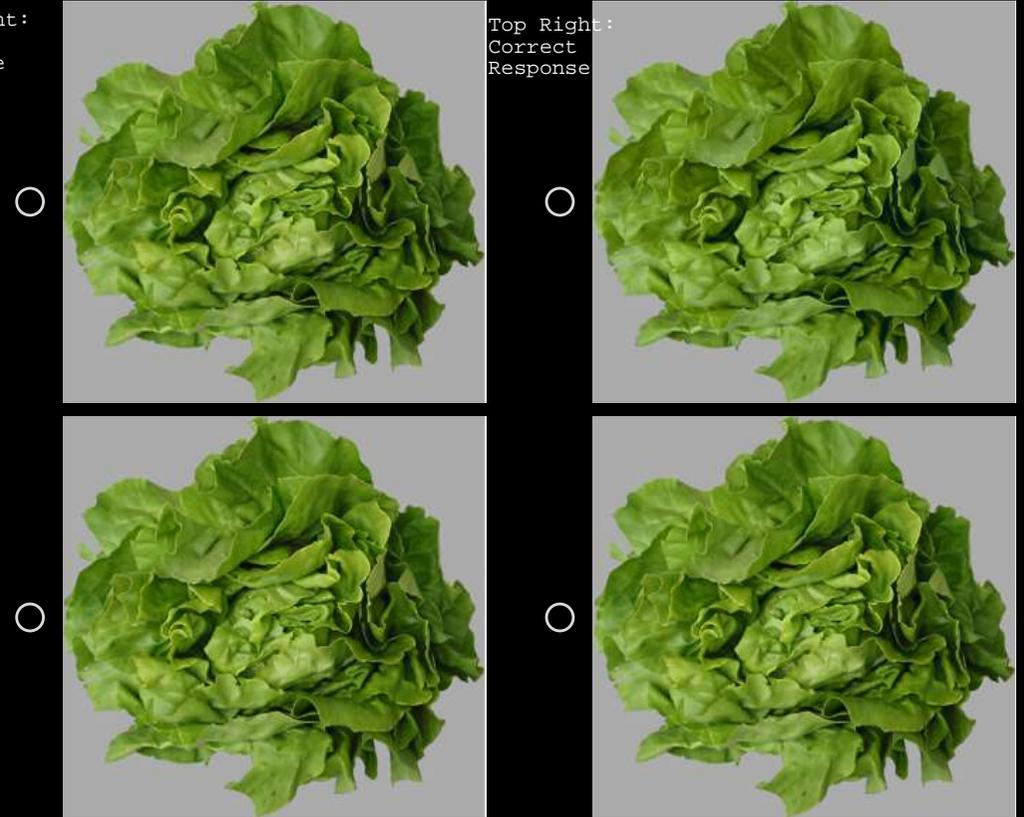
0 = Not at all confident

100 = Very confident

0 10 20 30 40 50 60 70 80 90 100

Lettuce - One Hue

Please select the image that you believe is different from the others



Top Right:
Correct
Response

Please use the scale below to select how confident you feel

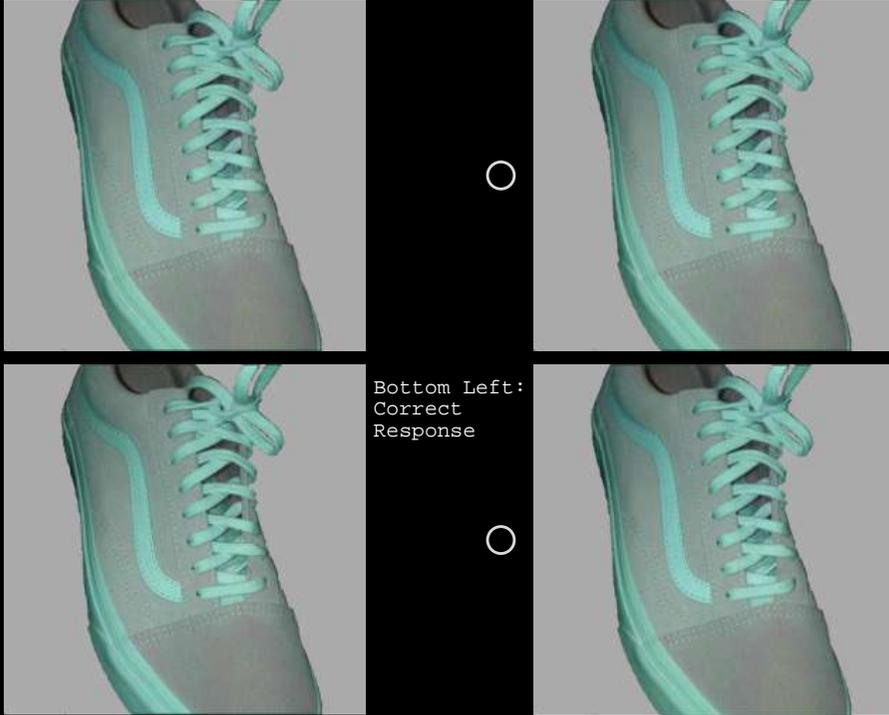
0 = Not at all confident

100 = Very confident

0 10 20 30 40 50 60 70 80 90 100

Shoe - One Hue

Please select the image that you believe is different from the others



Please use the scale below to select how confident you feel

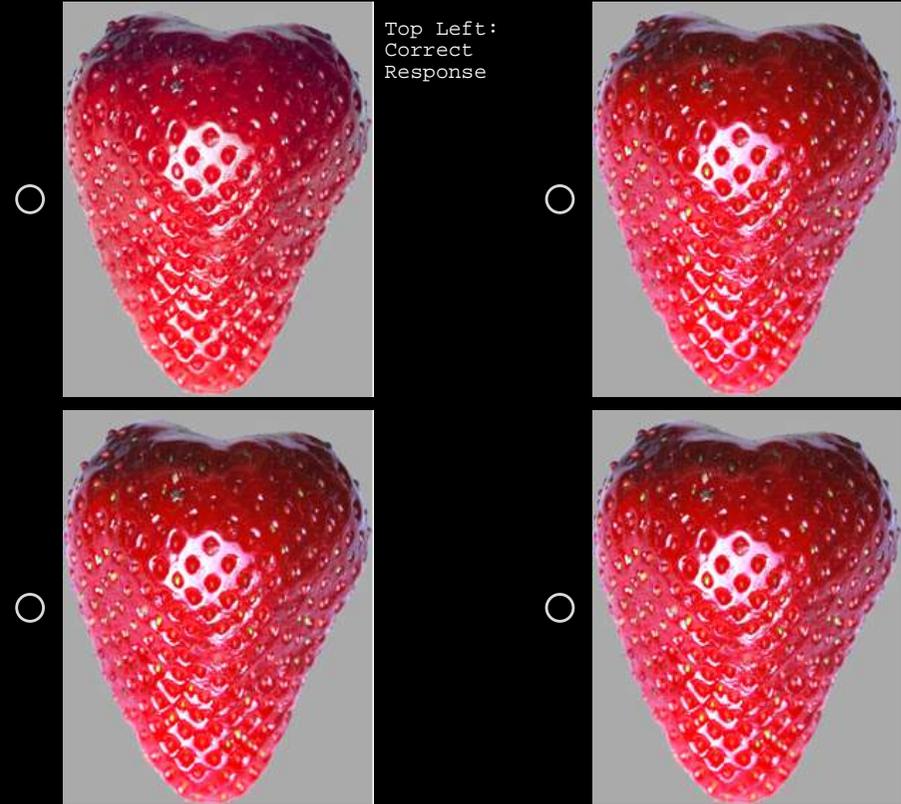
0 = Not at all confident

100 = Very confident

0 10 20 30 40 50 60 70 80 90 100

Strawberry - One Hue

Please select the image that you believe is different from the others



Please use the scale below to select how confident you feel

0 = Not at all confident

100 = Very confident

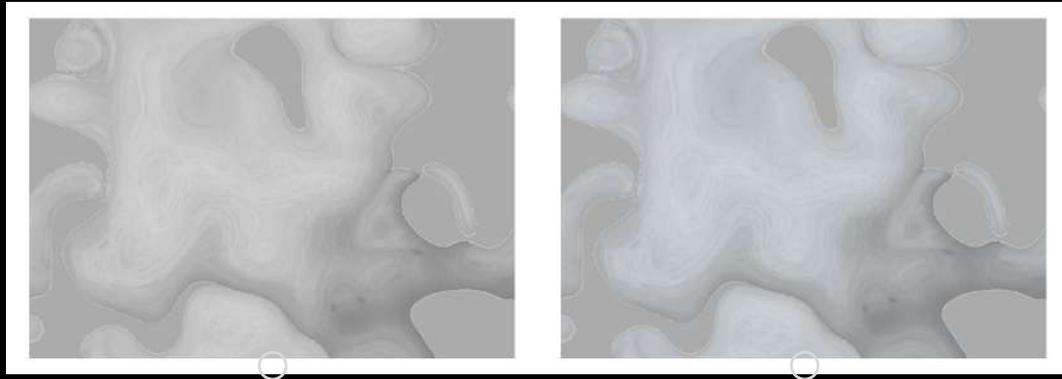
0 10 20 30 40 50 60 70 80 90 100

HAVE A BREAK, CHECK A GREY...

...as at the very beginning.

Which of those "things" looks totally grey?

One of these two structures (or "things") looks purely grey, whilst the other may appear to have colour mixed in. If neither looks purely grey, choose the most grey one.



Main Part 2

PART 2

Ok, great you finished the first part! Here comes the second part; the task remains the same.

Remember:

Please try to answer as quickly as you can while making sure you choose the correct one ... well, if you can spot the odd one at all; some of these trials are really difficult!

Catch Trial 3

Please select the image that you believe is different from the others

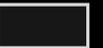


Please use the scale below to select how confident you feel

0 = Not at all confident

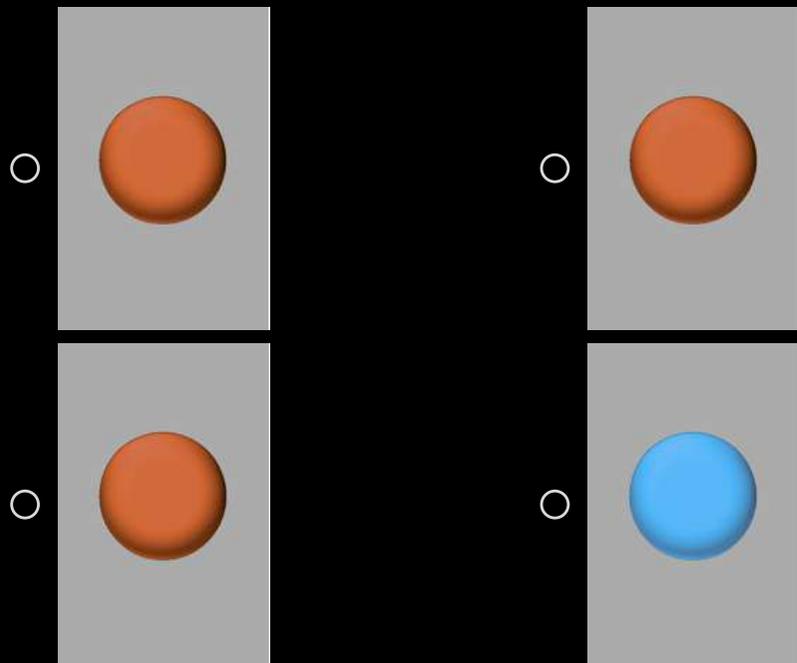
100 = Very confident

0 10 20 30 40 50 60 70 80 90 100



Catch Trial 4

Please select the image that you believe is different from the others



Bottom Right:
Correct
Response

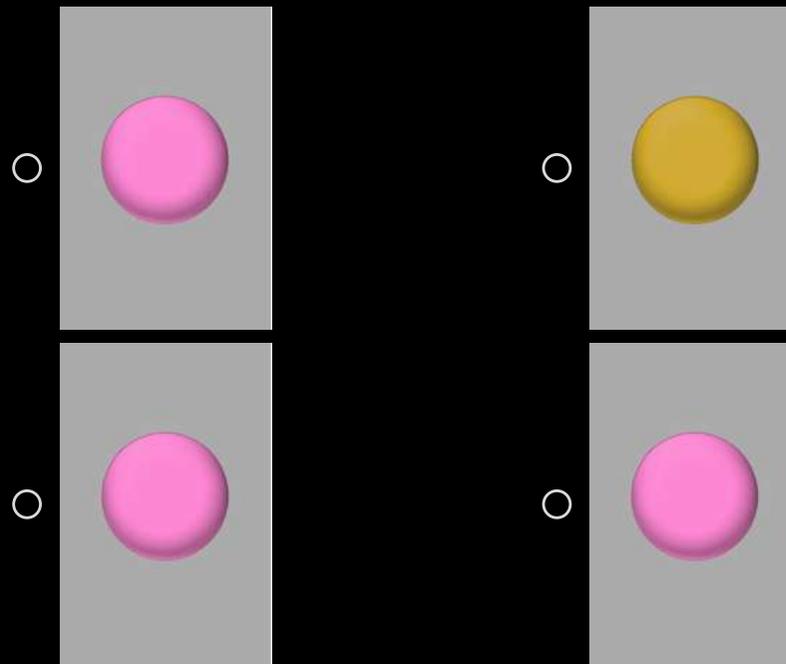
Please use the scale below to select how confident you feel

0 = Not at all confident 100 = Very confident

0 10 20 30 40 50 60 70 80 90 100

Catch Trial 5

Please select the image that you believe is different from the others



Top Right:
Correct
Response

Please use the scale below to select how confident you feel

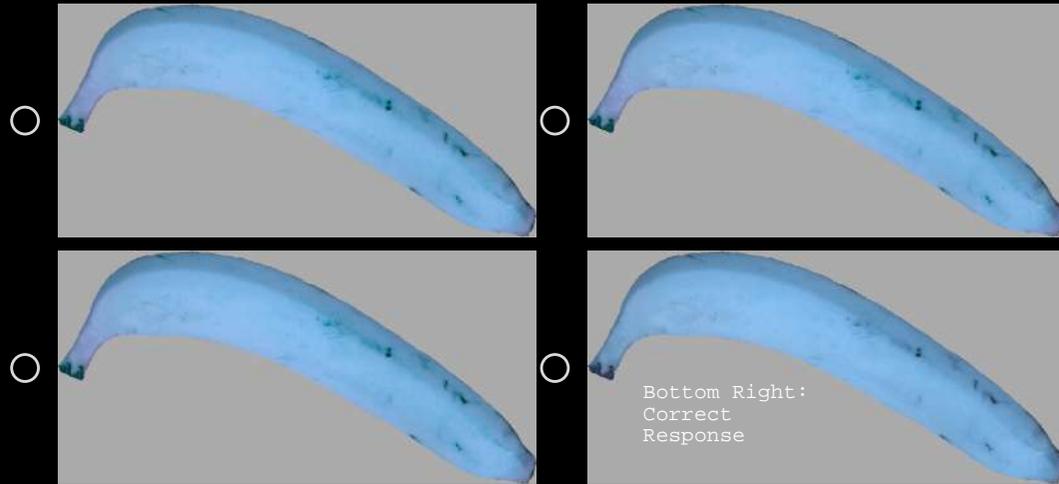
0 = Not at all confident 100 = Very confident

0 10 20 30 40 50 60 70 80 90 100



Banana - One Hue Inverted

Please select the image that you believe is different from the others



Bottom Right:
Correct
Response

Please use the scale below to select how confident you feel about the answer you gave

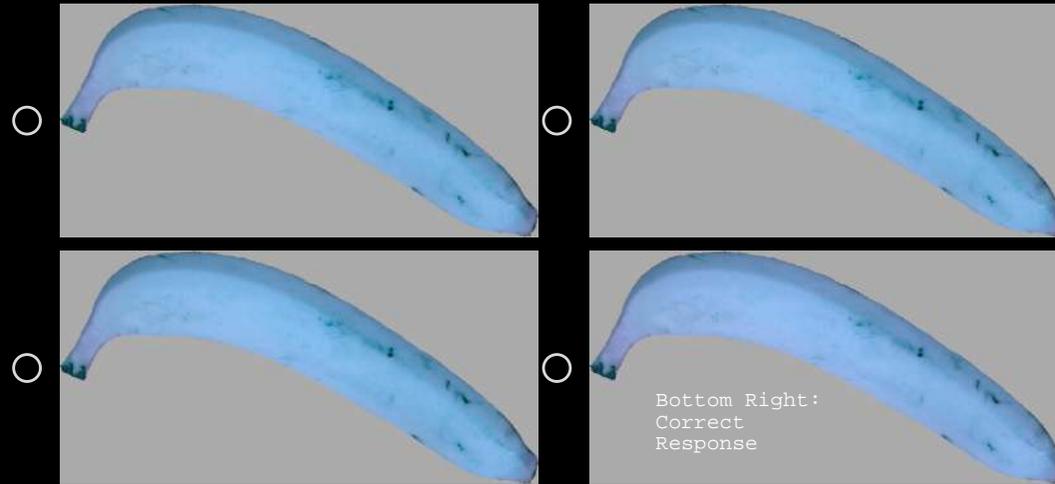
0 = Not at all confident

100 = Very confident

0 10 20 30 40 50 60 70 80 90 100

Banana - Positive Inverted

Please select the image that you believe is different from the others



Bottom Right:
Correct
Response

Please use the scale below to select how confident you feel about the answer you gave

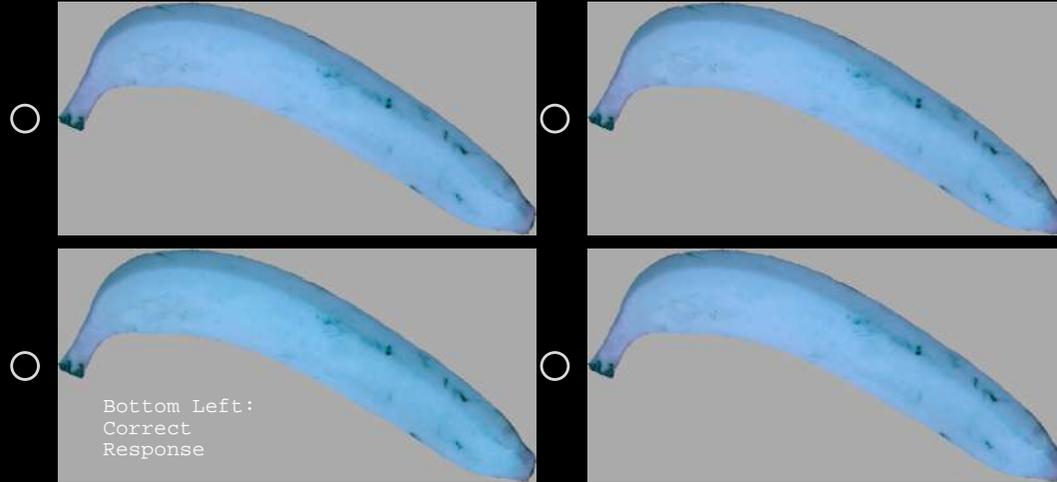
0 = Not at all confident

100 = Very confident

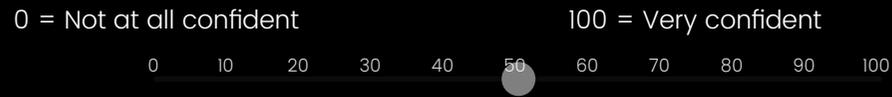
0 10 20 30 40 50 60 70 80 90 100

Banana - Negative Inverted

Please select the image that you believe is different from the others

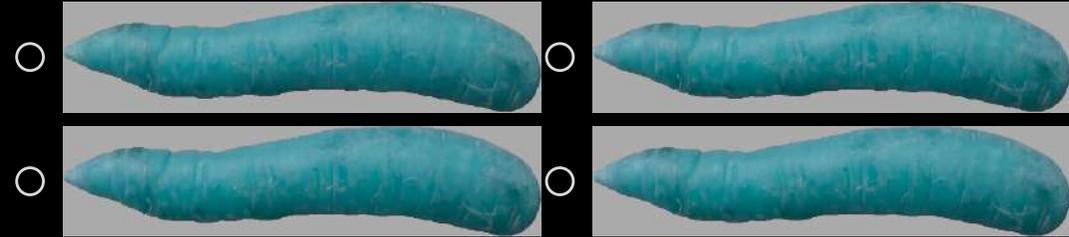


Please use the scale below to select how confident you feel about the answer you gave



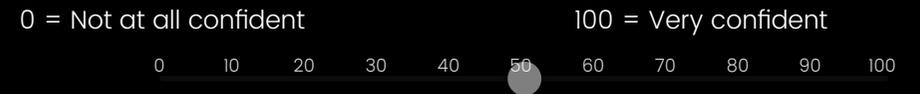
Carrot - One Hue Inverted

Please select the image that you believe is different from the others



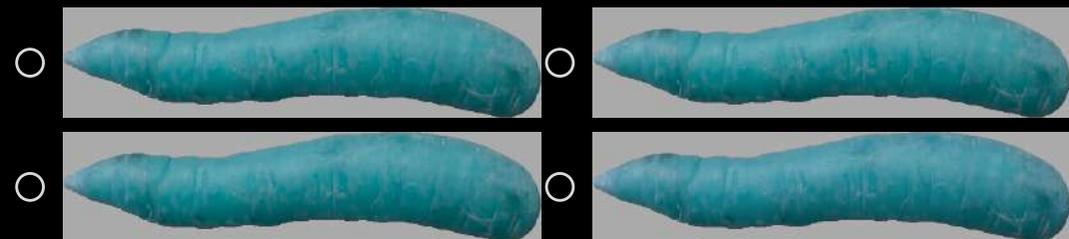
Please use the scale below to select how confident you feel about the answer you gave

Top Left:
Correct
Response



Carrot - Positive Inverted

Please select the image that you believe is different from the others



Bottom Right:
Correct
Response

Please use the scale below to select how confident you feel about the answer you gave

0 = Not at all confident

100 = Very confident

0 10 20 30 40 50 60 70 80 90 100

Cherries - One Hue Inverted

Please select the image that you believe is different from the others



Bottom Left:
Correct
Response



Please use the scale below to select how confident you feel about the answer you gave

0 = Not at all confident

100 = Very confident

0 10 20 30 40 50 60 70 80 90 100

Carrot - Negative Inverted

Please select the image that you believe is different from the others

Top Left:
Correct
Response



Please use the scale below to select how confident you feel about the answer you gave

0 = Not at all confident

100 = Very confident

0 10 20 30 40 50 60 70 80 90 100

Cherries - Positive Inverted

Please select the image that you believe is different from the others



Bottom Left:
Correct
Response



Please use the scale below to select how confident you feel about the answer you gave

0 = Not at all confident

100 = Very confident

0 10 20 30 40 50 60 70 80 90 100

Cherries - Negative Inverted

Please select the image that you believe is different from the others



Top Left:
Correct
Response



Please use the scale below to select how confident you feel about the answer you gave

0 = Not at all confident

100 = Very confident

0 10 20 30 40 50 60 70 80 90 100

Dress - One Hue Inverted

Please select the image that you believe is different from the others



Top Left:
Correct
Response



Please use the scale below to select how confident you feel about the answer you gave

0 = Not at all confident

100 = Very confident

0 10 20 30 40 50 60 70 80 90 100



Dress - Positive Inverted

Please select the image that you believe is different from the others



Top Left:
Correct
Response



Please use the scale below to select how confident you feel about the answer you gave

0 = Not at all confident

100 = Very confident

0 10 20 30 40 50 60 70 80 90 100



Dress - Negative Inverted

Please select the image that you believe is different from the others



Top Right:
Correct
Response



Please use the scale below to select how confident you feel about the answer you gave

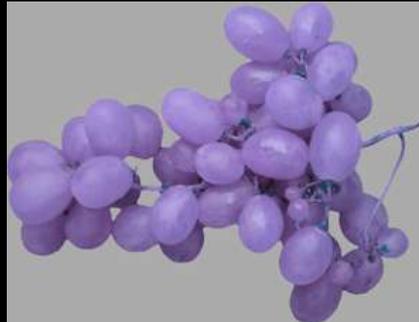
0 = Not at all confident

100 = Very confident

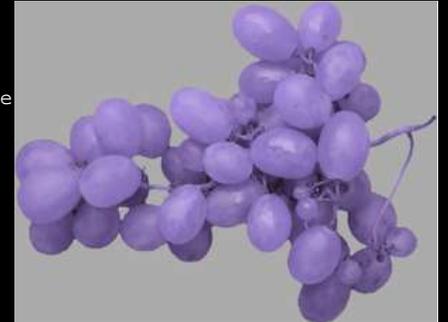
0 10 20 30 40 50 60 70 80 90 100

Grapes - One Hue Inverted

Please select the image that you believe is different from the others



Bottom
Right:
Correct
Response



Please use the scale below to select how confident you feel about the answer you gave

0 = Not at all confident

100 = Very confident

0 10 20 30 40 50 60 70 80 90 100

Grapes - Positive Inverted

Please select the image that you believe is different from the others



Top Left:
Correct
Response



Please use the scale below to select how confident you feel about the answer you gave

Grapes - Negative Inverted

Please select the image that you believe is different from the others



Bottom
Right:
Correct
Response



Please use the scale below to select how confident you feel about the answer you gave

0 = Not at all confident

100 = Very confident

0 10 20 30 40 50 60 70 80 90 100

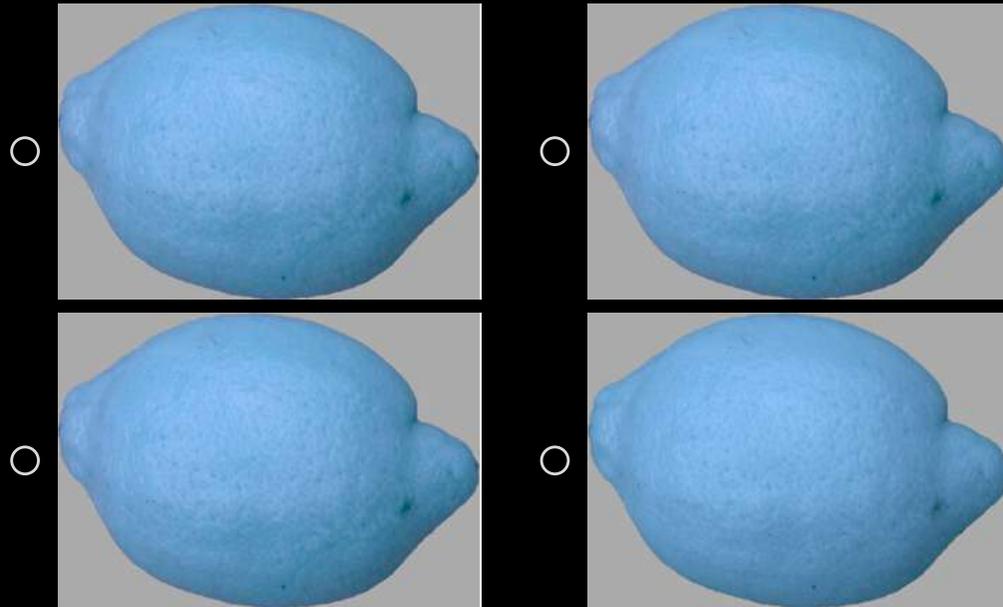
0 = Not at all confident

100 = Very confident

0 10 20 30 40 50 60 70 80 90 100

Lemon - One Hue Inverted

Please select the image that you believe is different from the others

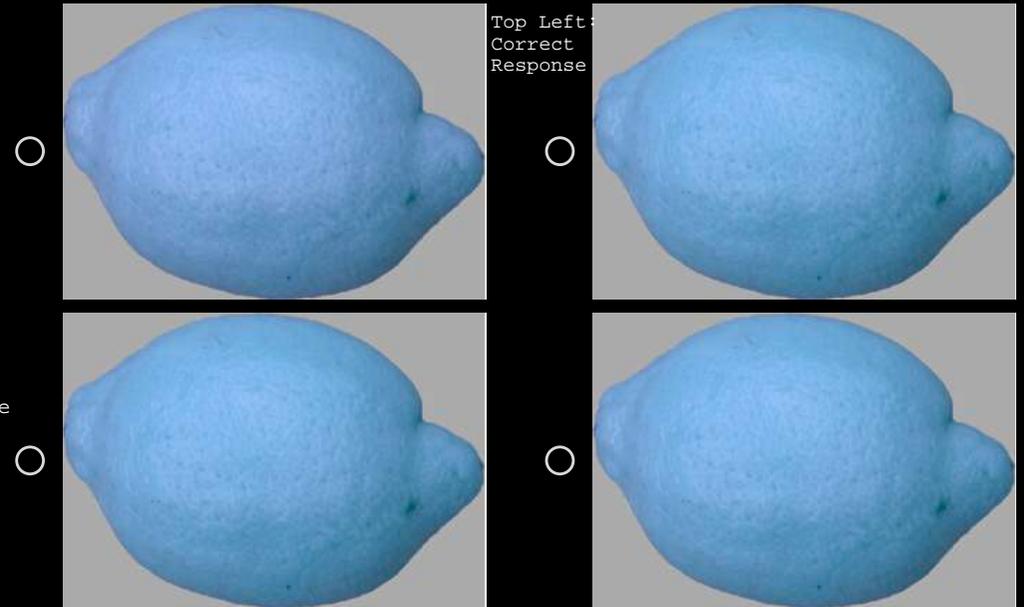


Bottom Right: Correct Response

Please use the scale below to select how confident you feel about the answer you gave

Lemon - Positive Inverted

Please select the image that you believe is different from the others



Top Left: Correct Response

Please use the scale below to select how confident you feel about the answer you gave

0 = Not at all confident

100 = Very confident

0 10 20 30 40 50 60 70 80 90 100



0 = Not at all confident

100 = Very confident

0 10 20 30 40 50 60 70 80 90 100



Lemon - Negative Inverted

Please select the image that you believe is different from the others



Top Left:
Correct
Response



Please use the scale below to select how confident you feel about the answer you gave

Orange - One Hue Inverted

Please select the image that you believe is different from the others



Bottom Right:
Correct
Response

Please use the scale below to select how confident you feel about the answer you gave

0 = Not at all confident

100 = Very confident

0 10 20 30 40 50 60 70 80 90 100



0 = Not at all confident

100 = Very confident

0 10 20 30 40 50 60 70 80 90 100



Orange - Positive Inverted

Please select the image that you believe is different from the others



Top Left:
Correct
Response



Bottom Left:
Correct
Response



Please use the scale below to select how confident you feel about the answer you gave

Please use the scale below to select how confident you feel about the answer you gave

Pig - One Hue Inverted

Please select the image that you believe is different from the others

0 = Not at all confident

100 = Very confident

0 10 20 30 40 50 60 70 80 90 100



Top Left:
Correct
Response



Please use the scale below to select how confident you feel about the answer you gave

0 = Not at all confident

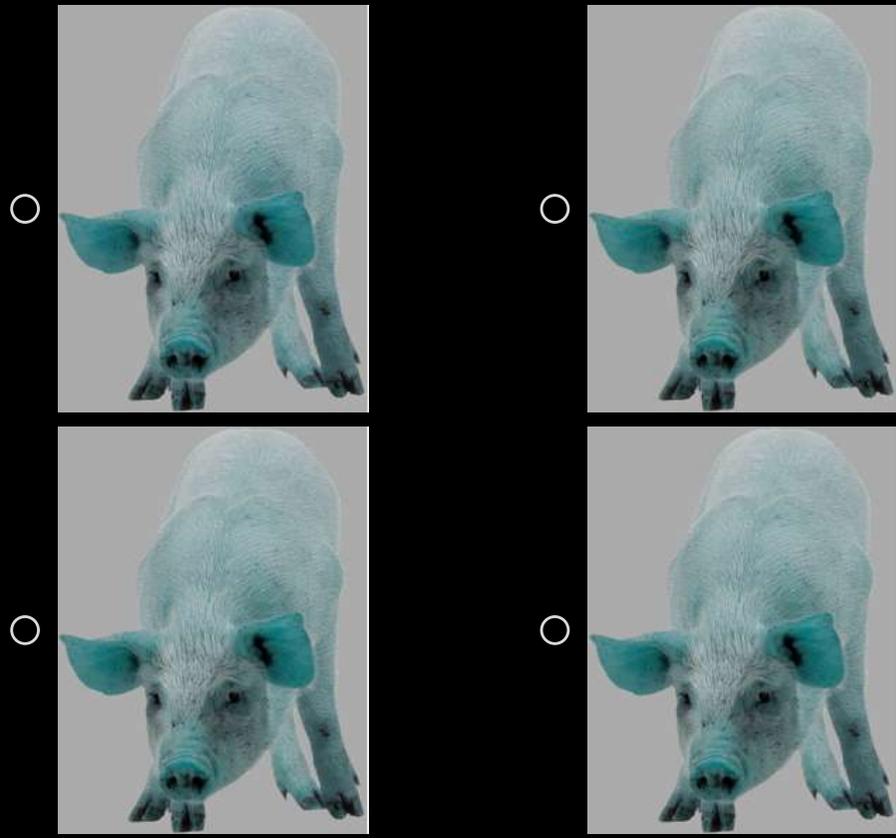
100 = Very confident

0 10 20 30 40 50 60 70 80 90 100



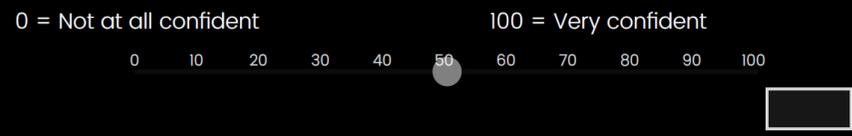
Pig - Positive Inverted

Please select the image that you believe is different from the others



Top Right:
Correct
Response

Please use the scale below to select how confident you feel about the answer you gave



Pig - Negative Inverted

Please select the image that you believe is different from the others



Bottom Left:
Correct
Response



Please use the scale below to select how confident you feel about the answer you gave

0 = Not at all confident

100 = Very confident

0 10 20 30 40 50 60 70 80 90 100



Lettuce - One Hue Inverted

Please select the image that you believe is different from the others



Top Right:
Correct
Response



Please use the scale below to select how confident you feel about the answer you gave

0 = Not at all confident

100 = Very confident

0 10 20 30 40 50 60 70 80 90 100



Lettuce - Positive Inverted

Please select the image that you believe is different from the others

Top Left:
Correct
Response



Please use the scale below to select how confident you feel

0 = Not at all confident

100 = Very confident

0 10 20 30 40 50 60 70 80 90 100



Lettuce - Negative Inverted

Please select the image that you believe is different from the others



Top Left:
Correct
Response



Please use the scale below to select how confident you feel

0 = Not at all confident

100 = Very confident

0 10 20 30 40 50 60 70 80 90 100



Strawberry - One Hue Inverted

Please select the image that you believe is different from the others



Top Right:
Correct
Response



Please use the scale below to select how confident you feel

Strawberry - Negative Inverted

0 = Not at all confident 100 = Very confident

0 10 20 30 40 50 60 70 80 90 100

Please select the image that you believe is different from the others



Top Right:
Correct
Response



Please use the scale below to select how confident you feel

0 = Not at all confident

100 = Very confident

0 10 20 30 40 50 60 70 80 90 100

Strawberry - Positive Inverted

Please select the image that you believe is different from the others



Top Left:
Correct
Response

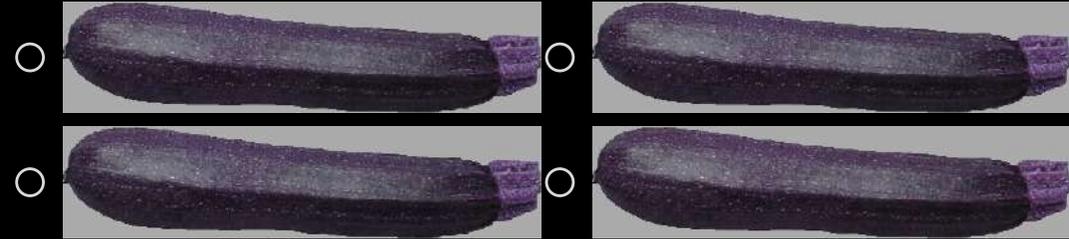


Please use the scale below to select how confident you feel

Zucchini - Positive Inverted

Top Right:
Correct
Response

Please select the image that you believe is different from the others



Please use the scale below to select how confident you feel

0 = Not at all confident

100 = Very confident

0 10 20 30 40 50 60 70 80 90 100

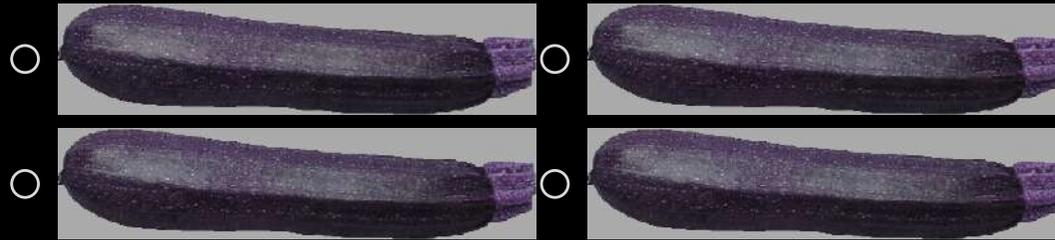
0 = Not at all confident

100 = Very confident

0 10 20 30 40 50 60 70 80 90 100

Zucchini - One Hue Inverted

Please select the image that you believe is different from the others



Bottom Right:
Correct
Response

Please use the scale below to select how confident you feel

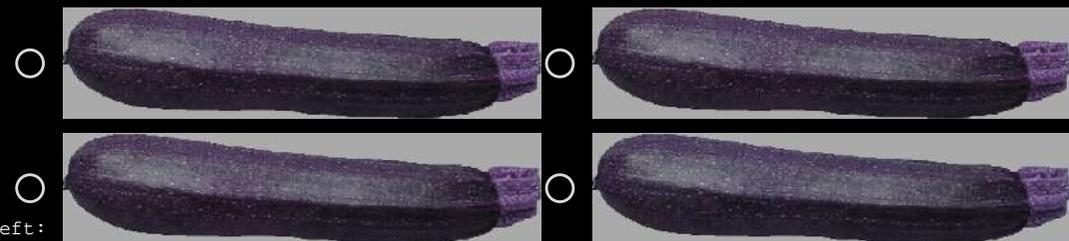
0 = Not at all confident

100 = Very confident

0 10 20 30 40 50 60 70 80 90 100

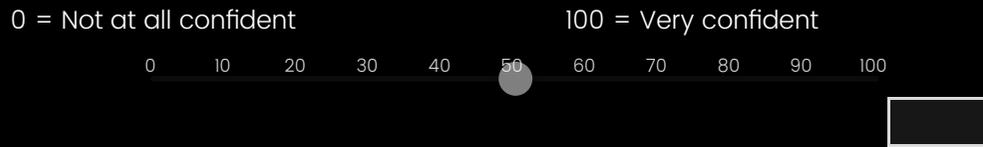
Zucchini - Negative Inverted

Please select the image that you believe is different from the others



Bottom Left:
Correct
Response

Please use the scale below to select how confident you feel



Memory Colour Section - Lemon

ANOTHER BREAK WITH A GREY JUDGEMENT...

Which of these lemons looks totally grey?

One of these two lemons looks purely grey, whilst the other may appear to have colour mixed in. If neither looks purely grey, choose the most grey one.



searching for the colour changes by yourself!

Almost there! In this third, shorter part, we will make it easier by highlighting the areas where the colour changes occur. You will be asked to rate how confident you are that you can see the colour change in those illustrations (see example of pumpkin below). Once this is done for an image, you will then be presented with the same task as before (four images and you pick the odd one out), but now, you know what to look for in those images.

For example...

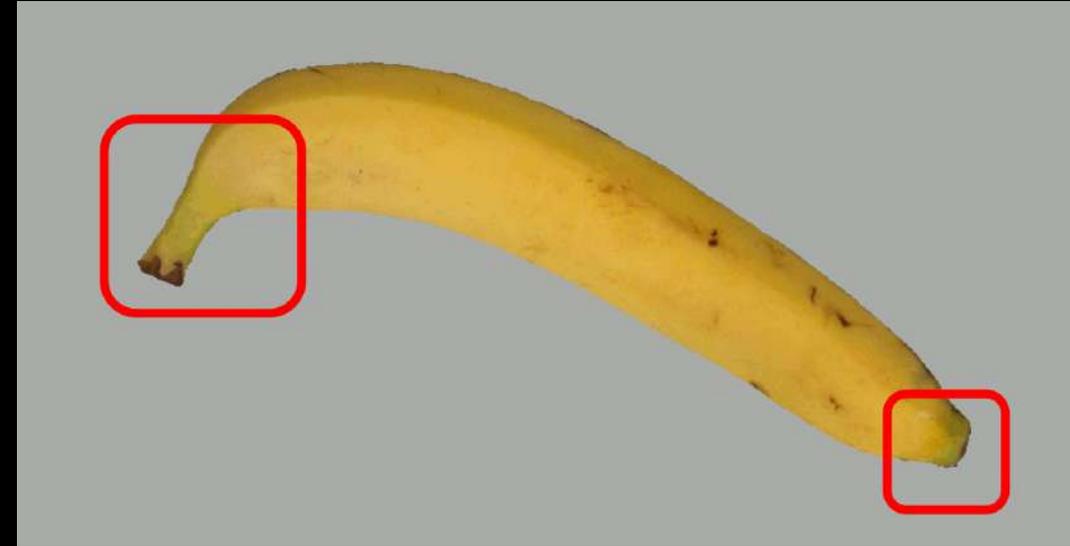
Instructions of GIFs

Congratulations, you have completed the most difficult part...

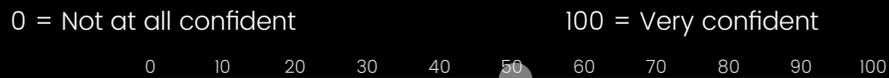


Banana_One_GIF SCORE = 1

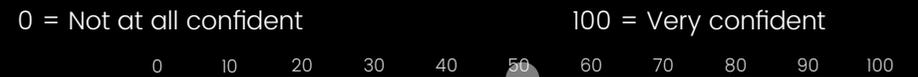
In this image of a banana, the colour change is most visible at both ends (red squares). The greenish tint of those ends disappears. Can you see that?



Please use the scale below to indicate how confident you are that you can see the change in the rectangle of the animated image.

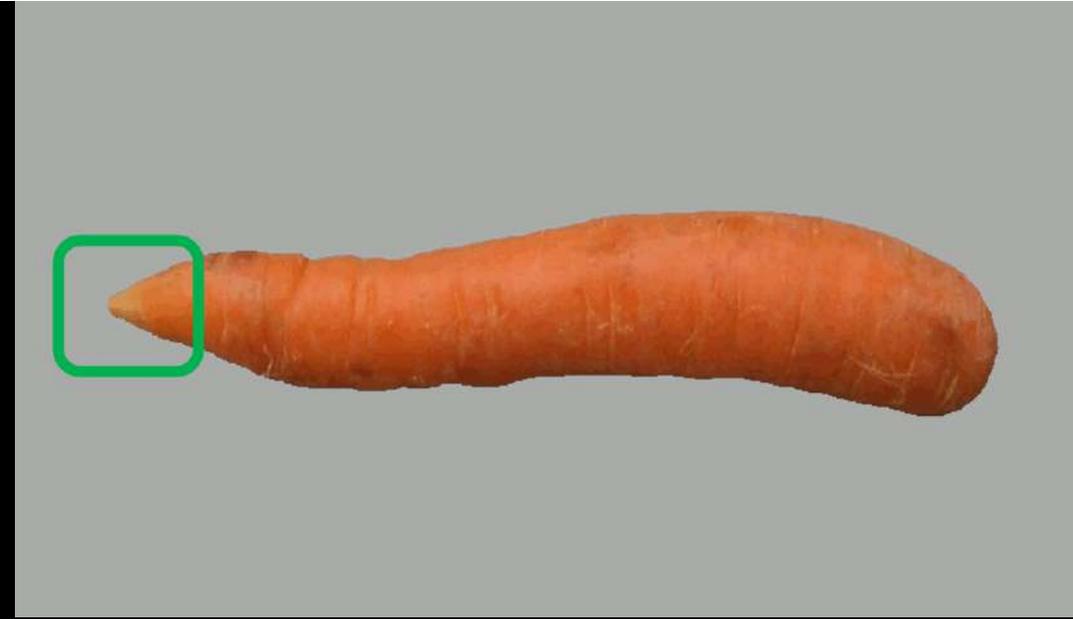
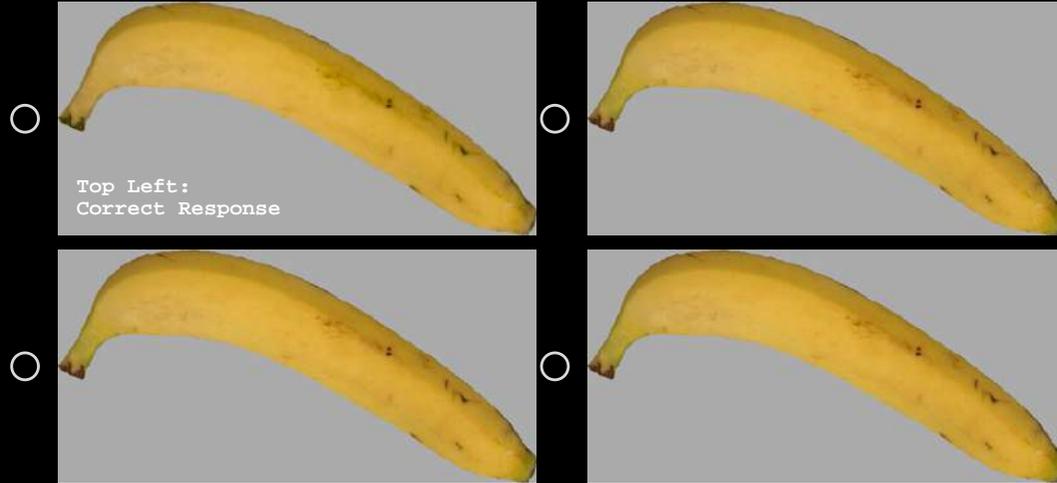


Please use the scale below to indicate how confident you are that you can see the change in the rectangle of the animated image.

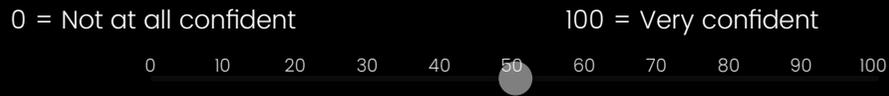


Banana - One Hue

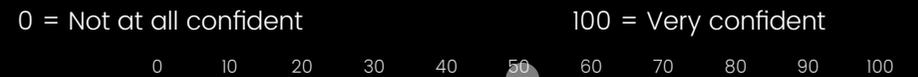
Please select the image that you believe is different from the others



Please use the scale below to select how confident you feel about the answer you gave



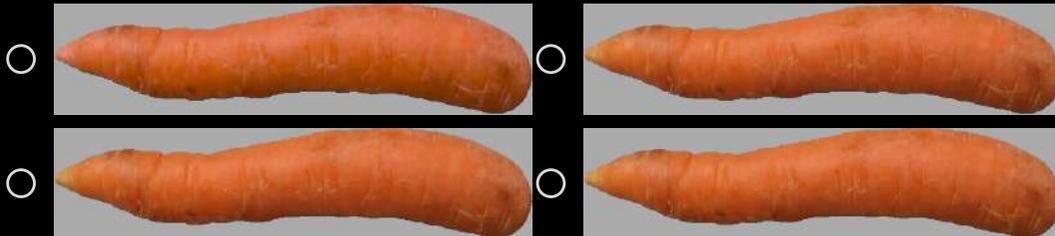
Please use the scale below to indicate how confident you are that you can see the change in the rectangle of the animated image.



Pay attention to the area highlighted with a green square

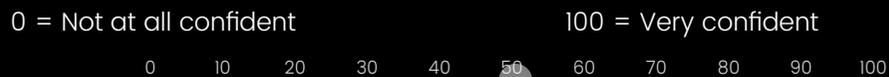
Carrot - One Hue

Please select the image that you believe is different from the others

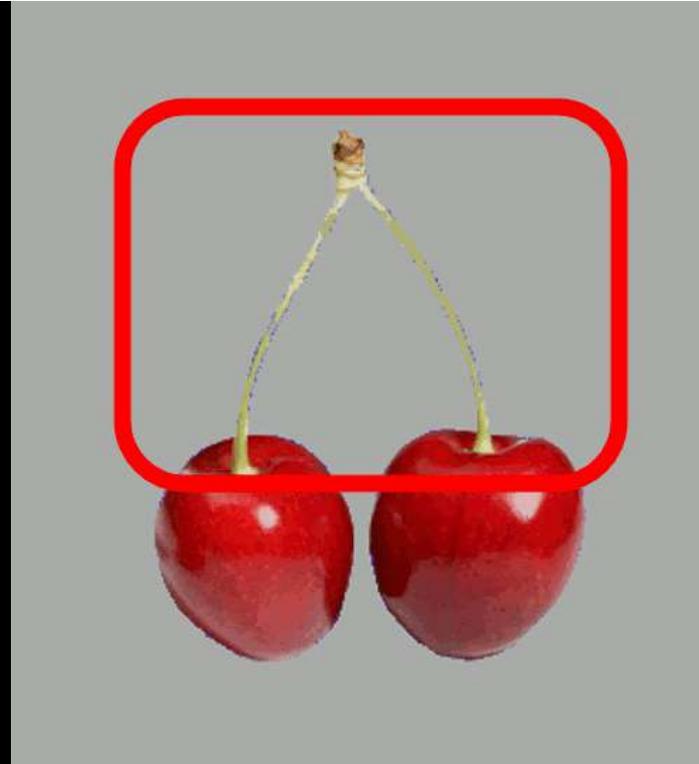


Top Left:
Correct
Response

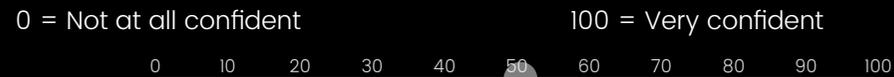
Please use the scale below to select how confident you feel about the answer you gave



In this image of cherries, the colour change is most visible at the stem (red square). The colour changes between slightly green and grey. Can you see that?



Please use the scale below to indicate how confident you are that you can see the change in the rectangle of the animated image.



Cherries - One Hue

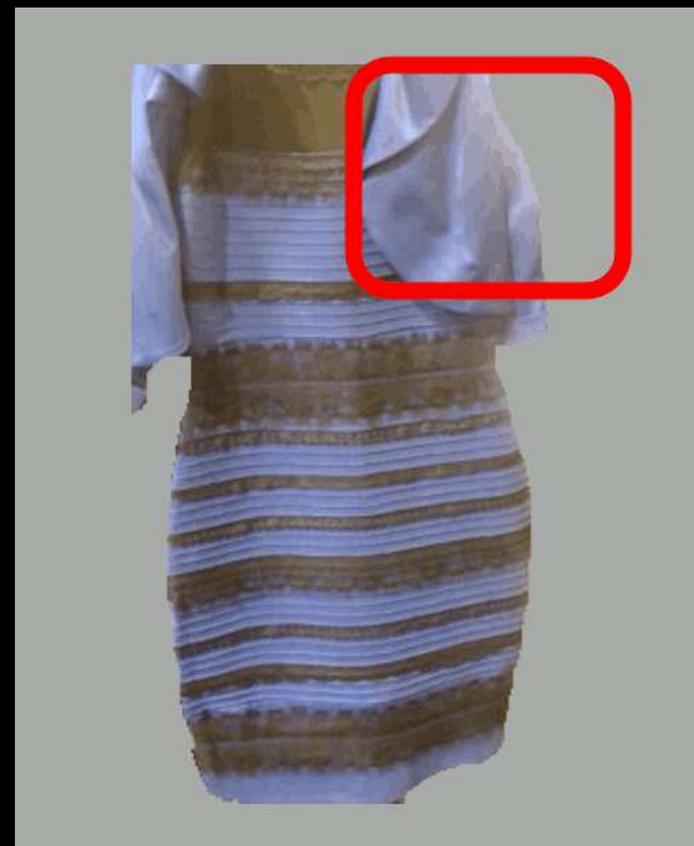
Please select the image that you believe is different from the others



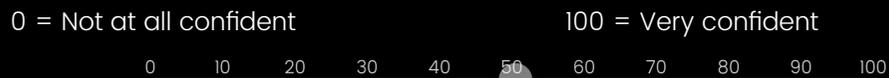
Top Right:
Correct
Response



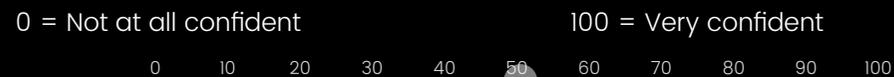
right). The colour changes between a very slight greenish and a slight purplish tint. Can you see that?



Please use the scale below to select how confident you feel about the answer you gave



Please use the scale below to indicate how confident you are that you can see the change in the rectangle of the animated image.



In this image of a dress, the colour change is most visible on the bolero hanging over the right shoulder (red square on the top

Dress - One Hue

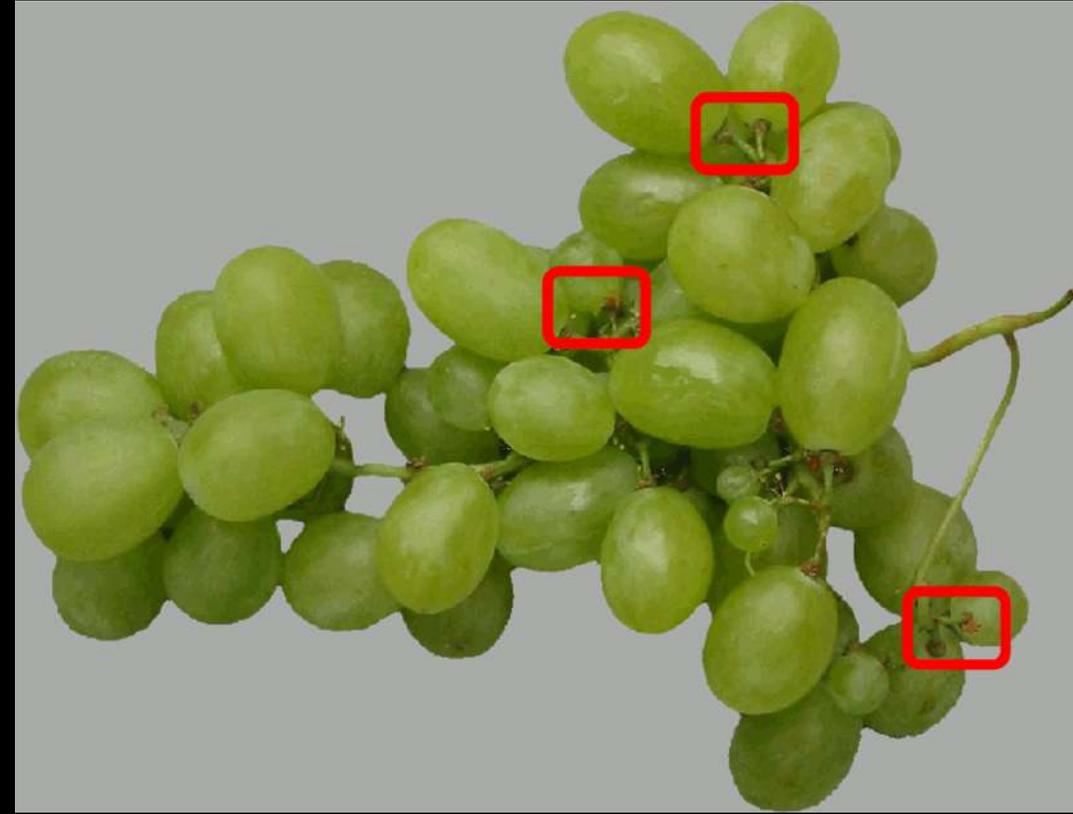
Please select the image that you believe is different from the others



Top Right:
Correct
Response



stem in the small red squares. The colour changes between green and brown(ish). Can you see that?



Please use the scale below to select how confident you feel about the answer you gave

0 = Not at all confident

100 = Very confident

0 10 20 30 40 50 60 70 80 90 100



Please use the scale below to indicate how confident you are that you can see the change in the rectangle of the animated image.

0 = Not at all confident

100 = Very confident

0 10 20 30 40 50 60 70 80 90 100



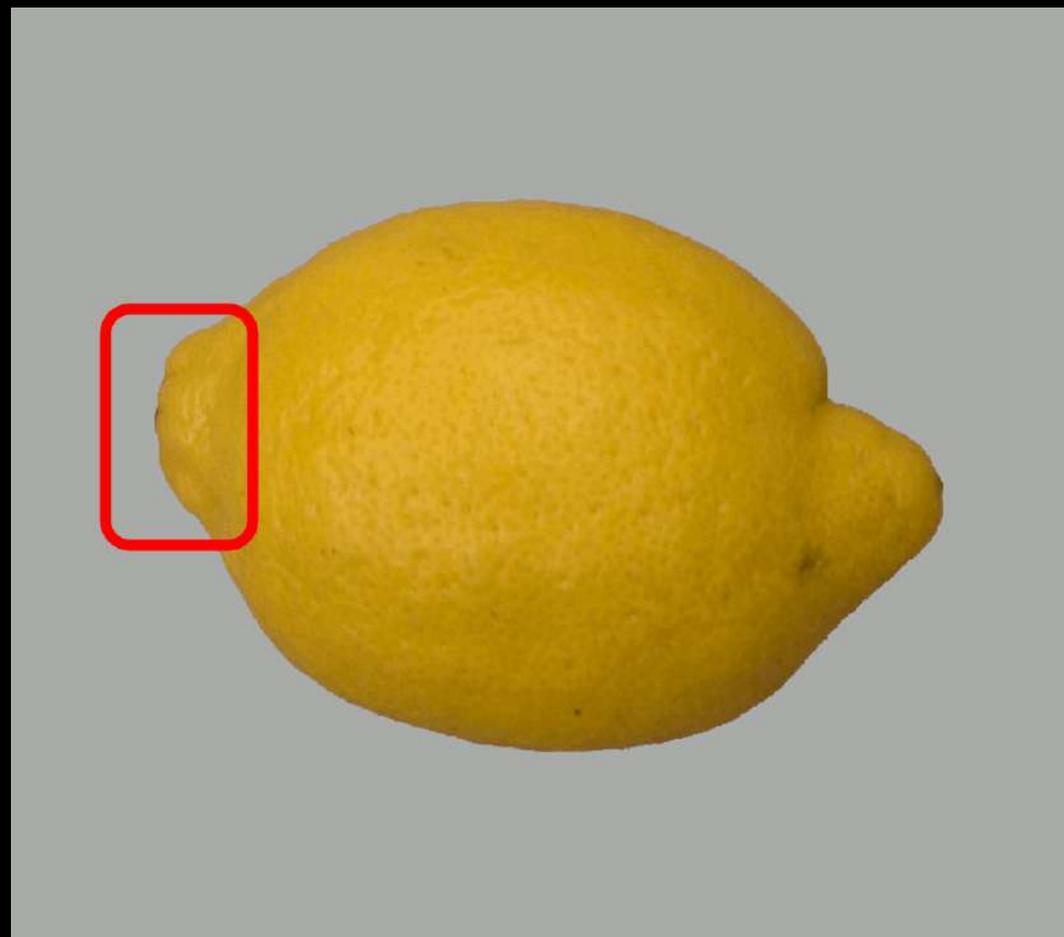
In this image of grapes, the colour change is most visible at the

Grapes - One Hue

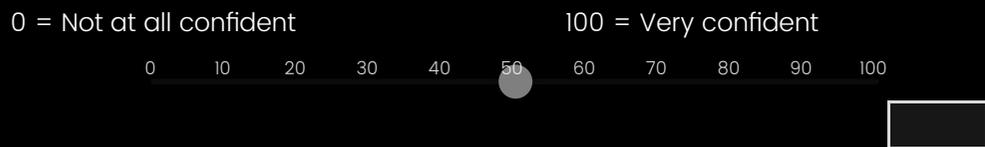
Please select the image that you believe is different from the others



between slightly greenish and more reddish yellow. Can you see that?

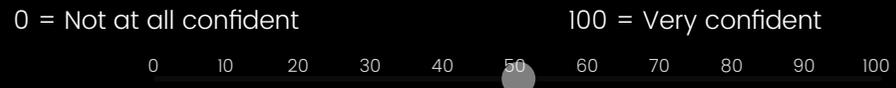


Please use the scale below to select how confident you feel about the answer you gave

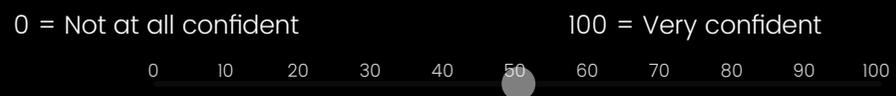


In this image of a lemon, the colour change is most visible in the end/rump in the red square on the left. The colour changes

Please use the scale below to indicate how confident you are that you can see the change in the rectangle of the animated image.



Please use the scale below to select how confident you feel about the answer you gave



Lemon - One Hue

Please select the image that you believe is different from the others

○ 

○ 

○ 

○ 

Top Right:
Correct
Response

In this image of a shoe, the colour change is most visible in the red square on the bottom, where a yellowish patch disappears.
Can you see that?



Shoe - One Hue

Please select the image that you believe is different from the others



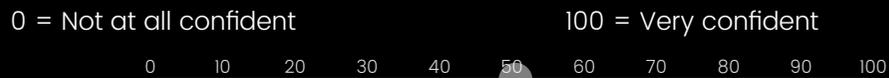




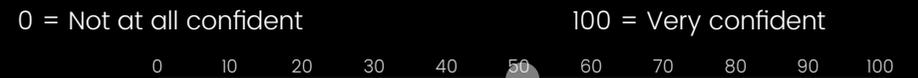


Bottom Left: Correct Response

Please use the scale below to indicate how confident you are that you can see the change in the rectangle of the animated image.

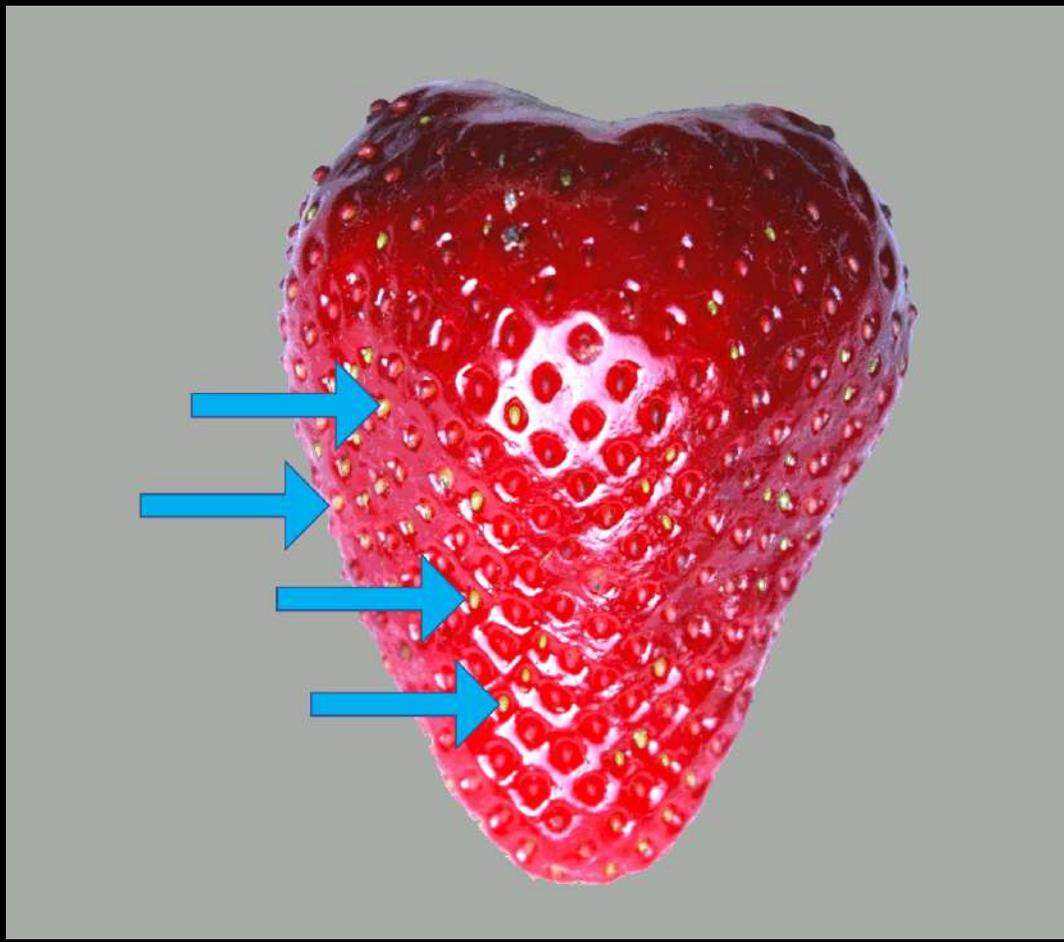


Please use the scale below to select how confident you feel about the answer you gave



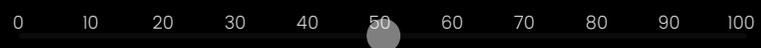
In this image of a strawberry, the colour change is most visible

in the "seeds" (actually called achenes), as highlighted by the blue arrows. They change from yellow to white. Can you see that?



Please use the scale below to indicate how confident you are that you can see the change in the animated image.

0 = Not at all confident 100 = Very confident

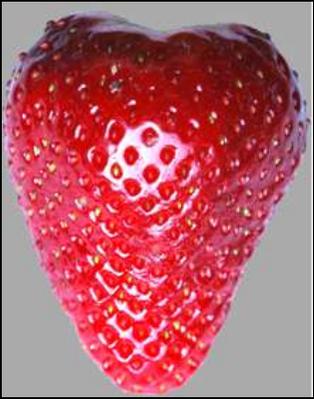


Strawberry - One Hue

Please select the image that you believe is different from the others



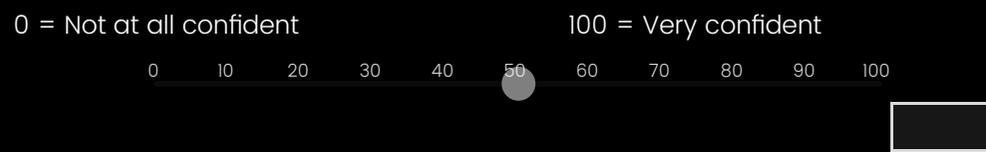






Bottom Right:
Correct
Response

Please use the scale below to select how confident you feel about the answer you gave



Memory Colour - Disk

Before you go...
... last question, promised!

Which of these disks looks totally grey?

One of these two disks looks purely grey, whilst the other may appear to have colour mixed in. If neither looks purely grey, choose the most grey one.

