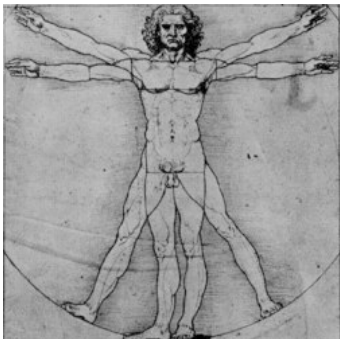
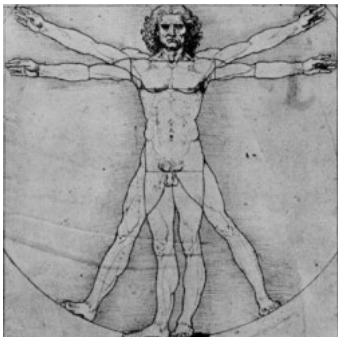


ANATOMY – PHYSIOLOGY

LAB 9-1

Blind Spot Lab

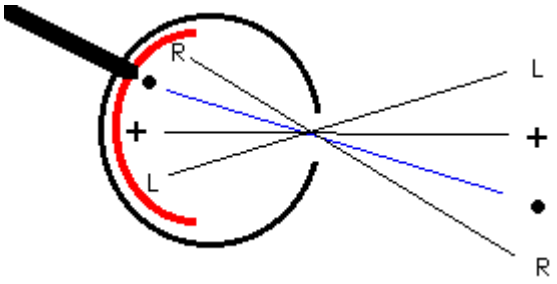


Introduction

Most people (even many who work on the brain) assume that what you see is pretty much what your eye sees and reports to your brain. The question in this lab is:

Do you see what your eye reports to your brain or does your brain add a lot to the report it gets from your eye, so that a lot of what you see is actually "made up" by the brain?

Some special features of the anatomy of the eyeball make it possible to demonstrate this to yourself. The front of the eye acts like a camera lens, differently directing light rays from each point in space so as to create on the back of the eye a picture of the world. The picture falls on a sheet of photoreceptors (red in the diagram), specialized brain cells (neurons) which are excited by light.



The sheet of photoreceptors is much like a sheet of film at the back of a camera. But it has a hole in it. At one location, called the optic nerve head, processes of neurons collect together and pass as a bundle through the photoreceptor sheet to form the optic nerve (the thick black line extending up and to the left in the diagram), which carries information from the eye to the rest of the brain. At this location, there are no photoreceptors, and hence the brain gets no information from the eye about this particular part of the picture of the world. Because of this, you should have a "blind spot" (actually two, one for each eye), a place pretty much in the middle of what you can see where you can't see.

Look around. Do you see a blind spot anywhere? Maybe the blind spot for one eye is at a different place than the blind spot for the other (this is actually true), so you don't notice it because each eye sees what the other doesn't. **Close one eye and look around again.** Now do you see a blind spot? Hmm. Maybe its just a little TINY blind spot, so small that you (and your brain) just ignore it.

Section 1: Exploring the Blind Spot

Part 1. Finding your blind spot.

Use the image below to experience your blind spot.

1. Put the paper on a table and cover your left eye.
2. Hold the paper so your right eye is directly over the + and the circle is to your right.

3. Move your head closer to the paper (Keep looking at the +) until the circle vanishes from your peripheral vision.
4. Repeat this for your other eye. This time you will look at the circle as the + vanishes.

Questions:

A. What causes a "blind spot"?

Part 2. Measuring your blind spot

1. Covering your left eye, hold your head at the distance the circle vanishes and make a series of dots to sketch the area of your blind spot by moving a pencil in and out of the blind region and making a mark at the edge of the visible points.
2. Repeat this for your other eye. This time you will look at the circle as the + vanishes.

Questions:

B. Compare the size of the invisible region for each eye.
C. Compare the size of the invisible region with your partners.

Part 3. Exploring the blind spot. Experimenting with distance.

Dar was wondering if the distance you are away from an object affects the size of the blind spot. Dar thinks that the blind region will get bigger the farther away you are from the focal objects (+ and circle).

Questions:

D. Do you agree with Dar? Explain your reasoning.
E. Design and complete an experiment to test Dar's Hypothesis. Explain your results.

Section1 Conclusion: Is the blind spot small or big? Explain.

Blind Spot Lab
Section 2: How does your body compensate for the blind spot?

So, as you can see, you have a pretty big blind spot. What's particularly interesting though is that you don't SEE it. When the spot disappears you still don't SEE a hole.

Dar thinks that your brain uses images from both eyes to fill in the blind spots.

Questions:

1. Do you agree with Dar? Explain.
2. How could you test this?

Testing the "Two Eyes Fill In" Hypothesis

Questions:

3. What do you see in the place where the circle or + vanishes?
4. Dar thinks your brain just inserts WHITE where the blind spot occurs. Do you agree or disagree? Explain why.
5. How could you test this?

Testing the "white fill in" hypothesis

Use the Colored Blind Spot Sheets and answer the following questions:

Test 1. If you use the "Green-Yellow" Blind Spot Test sheet does white replace the color? What color fills in?
Test 2. If you reverse the colors and use the Yellow-Green Test Sheet what color fills in?

Try to explain what is happening in test 1 and 2?

Test 3: Dar thought a line through the blind spot would disappear.
If you use the "Line" Blind Spot Test what happens to the line as it passes through your blind spot?

Test 4: Dar wondered what would happen if the line enters the blind spot but doesn't come out the other side? Try it yourself. Make the spot disappear and then bring a pencil in from the side so the tip is just into the spot. Explain what happens.

Test 5: If you use the “Dots” Blind Spot Test what happens to the dots and colors that are in your blind spot?

Section 2 Conclusion:

Do you see what your eye reports to your brain or does your brain add very substantially to the report it gets from your eye, so that a lot of what you see is actually "made up" by the brain?

Explain your answer using information from the tests in section 2.

Introduction

Section 1: Exploring the Blind Spot

Part 1. Finding your blind spot

Part 2. How big is your blind spot?

Part 3. How does the distance you are away from objects in visual field affect the size of the blind spot.

Conclusion 1: Is the blind spot small?

Alright, you say, that's kind of neat, but maybe the brain isn't "making it up." It just knows to put white where the blind spot I s. Let's try another situation and see what happens.

Neat, what happens if you switch the yellow and the green?

Alright, so the brain can match surrounding colors, whatever they are. Can it do anything else?

Wild. It not only matches background colors, but completes the line across the blindspot too. I wonder what happens if the line enters the blindspot but doesn't come out the other side? (Try it yourself. Make the spot disappear and then bring a pencil in from the side so the tip is just into the spot). And how about if there are things that don't get interrupted by the blindspot at all? Can they affect what the brain makes up to put there?