Eyepatch Challenge

Think of a pirate in your head… are they wearing an eyepatch? Pirates may have worn eyepatches to cover up a gruesome scar or a lost eye. Or *maybe* they were just using them to improve their night vision. Complete the eyepatch challenge and find out for yourself!

PROCEDURE

In a room where you can control the lights, set up a short obstacle course using objects from around the house.

With the lights on, walk the course and record how long it takes to complete it. Repeat two more times, then calculate the average time it took using the formula below:

$$\frac{Time\ of\ Attempt\ 1\ +\ Time\ of\ Attempt\ 2\ +\ Time\ of\ Attempt\ 3}{3\ Attempts} = Average\ Time$$

Turn the lights off and complete the course in the dark three times through. Record and calculate the average time it took with the lights off!

Now, wear an eyepatch over one eye for 20 to 30 minutes. You can wrap a scarf, buff, or banana around your head if you don't have an eyepatch. Make sure it is completely covering your eye at all times!

After waiting, **turn the lights off and remove your eyepatch.** Keep the lights off and complete the course three times through. Record and calculate the average time it took with the lights off after wearing an eyepatch!

Compare your results from all three tests: lights on, lights off, and lights off after eyepatch. Think about how an eyepatch may have helped pirates at night.

Which attempts were easy? Which were challenging?
How do your times compare? Which were faster or slower?
Did the eyepatch help or hinder? Why do you think that is?
What else did you feel or notice during these challenges?

MATERIALS

- Dark room with light control
- Eyepatch material
- Obstacle course materials: furniture, stuffed animals, soft items, etc.
- Timer
- Data sheet (page 2)

EXTENSIONS

Cover **both** eyes, then complete the course in the dark three more times.

Try this activity **outside** on a dark night instead of indoors.

Predict how long it will take for your eyes to adjust to the dark unassisted. Try it and **time** how long it takes.

TEST 1: LIGHTS ON / NO EYEPATCH

ATTEMPT	TIME TO COMPLETE	AVERAGE TIME TO COMPLETE (Total of all 3) ÷ 3 = (Average time)
#1		
#2		
#3		
TOTAL OF ALL 3 ATTEMPTS		

TEST 2: LIGHTS OFF / NO EYEPATCH

ATTEMPT	TIME TO COMPLETE	AVERAGE TIME TO COMPLETE (Total of all 3) ÷ 3 = (Average time)
#1		
#2		
#3		
TOTAL OF ALL 3 ATTEMPTS		

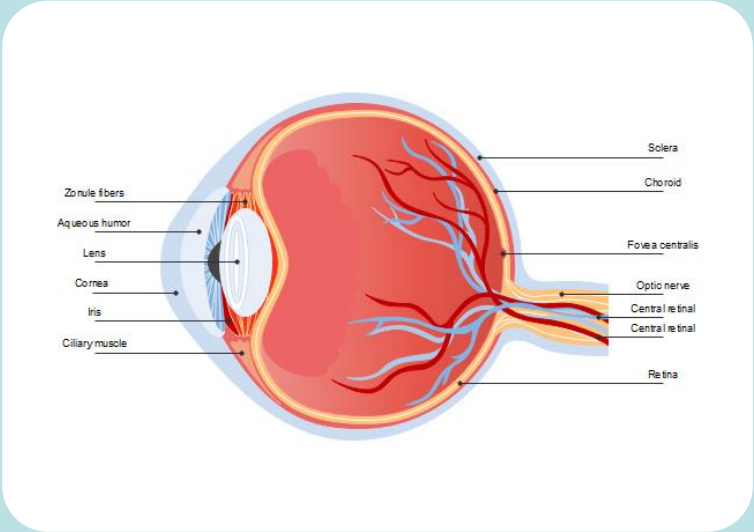
TEST 3: LIGHTS OFF / AFTER EYEPATCH

ATTEMPT	TIME TO COMPLETE	AVERAGE TIME TO COMPLETE (Total of all 3) ÷ 3 = (Average time)
#1		
#2		
#3		
TOTAL OF ALL 3 ATTEMPTS		

HOW DO HUMANS "SEE" LIGHT?

The human eye relies on light to see color, shape, depth, and fine detail of one's surroundings. The retina, which is a thin membrane located at the back of the eye, contains millions of photoreceptor cells that are responsible for detecting light. These cells are light sensitive, meaning that light must actually reach them in order for them to respond and process it.

In order for light to reach the retina, it must pass through several other complex parts of the eye, including the cornea, iris and pupil, crystalline lens, and the vitreous. Each of these steps helps process the light being perceived, either by focusing, narrowing, or refracting the light so that it can reach the retina. Once it finally does, the photoreceptor cells detect the image and translate the image into a series of electrical signals to be sent to the brain for processing (or seeing).



HOW DO HUMANS "SEE" AT NIGHT?

At night, there is less light available to the retina in the eye. This makes it challenging for humans to make out their surroundings in the dark. Luckily, several parts of the eye can adjust to allow more light in to adjust at night. The first is the iris, which opens up wide in low light. As it opens wider, the pupil dilates and allows more light into the eye for processing by the retina. Once this light reaches the retina, specialized cells called rods help process the small amount of light present.

Rods are a type of photoreceptor cell that function best in low light conditions. Rods contain pigment cells, called rhodopsin, which are hyper sensitive light receptors. In darkness, the chemical response by rhodopsin allows even the smallest amount of light to be processed, but it can take about 20 minutes to fully function. That is why, when the lights are first turned off, it can take some time to adjust to the darkness. Cone cells, the retinal cells responsible for color detection, are not as powerful as detecting low light so they "turn off" at night, making things seem colorless.

HOW DOES THE EYEPATCH HELP US AND/OR PIRATES?

The benefits of wearing an eyepatch is that it allows the covered eye to adjust to the dark ahead of time. By simulating darkness for one eye, it causes the pupil to dilate and for rhodopsin production to begin. This makes it so that once the light is turned off, that eye is already adjusted to the dark and the wearer can skip the 20-minute adjustment period to the low light conditions. In this activity, you may have noticed that it was much easier to see the obstacle course in the dark after wearing the eyepatch. That is because your eye had already adjusted, making it easier to see things in the dark.

It's possible that pirates could have used this simple trick to their advantage. By wearing an eyepatch over one eye during the day, they may have trained their eyes to switch quickly to night vision during pitch black nights out at sea. A ship is full of complex ropes, doors, and ladders that one must be able to move around, even in darkness. They may have also needed to move under cover of darkness, without lanterns giving them away while they overtook other ships or moved onto land unseen. Wearing an eyepatch may have been one easy step to help them get a (peg) leg up on the competition at night.