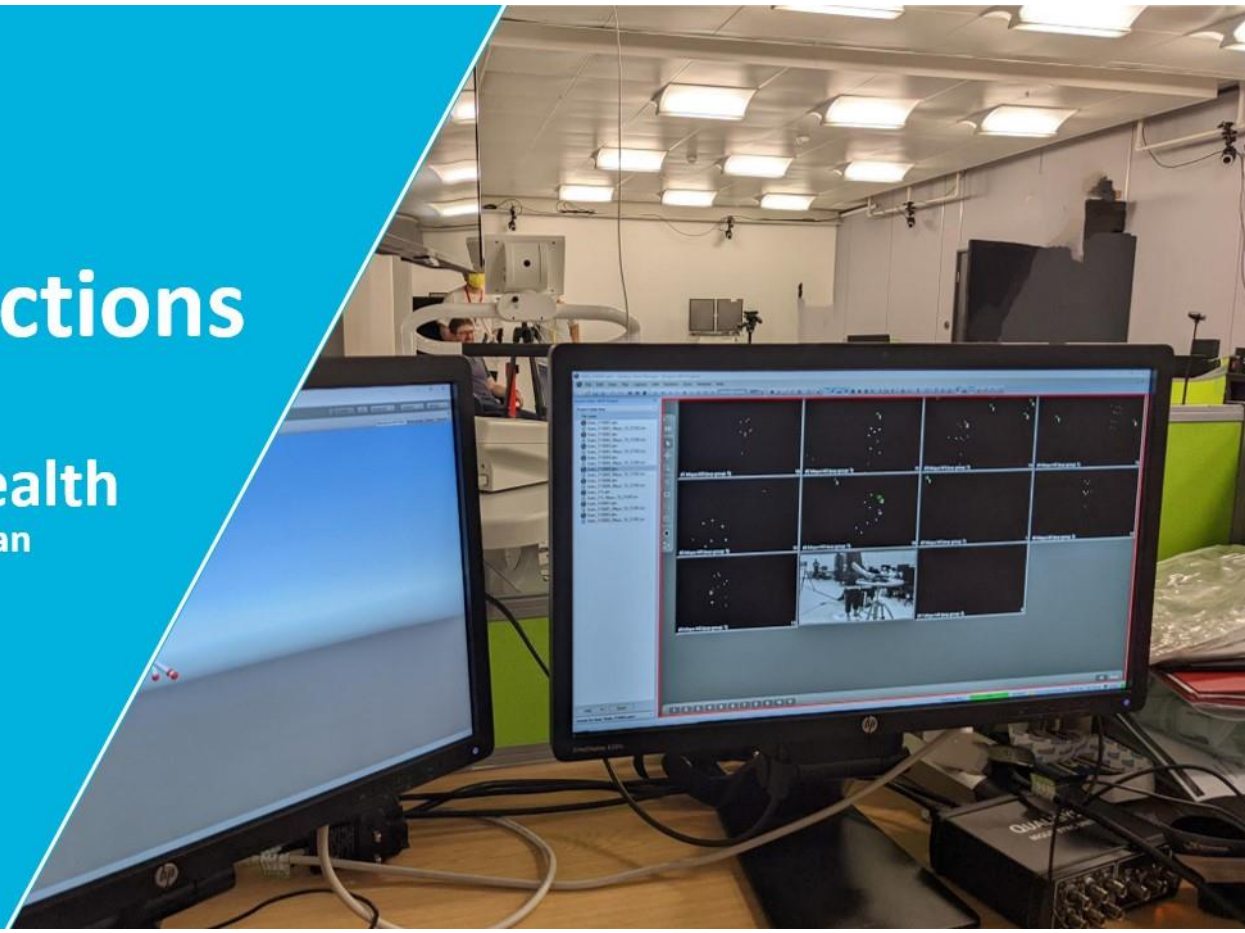
STEM Connections

Digital Health

Dr Tom Goodman



How does motion capture work? 2
How to make your own muscle machine 3
Ideas to explore the concept further 7

How does motion capture work?

Motion capture has various techniques that are used to record movements and translate it to data which can be interpreted and represented by the computer. Optical-passive motion capture uses retroflective markers which are attached to the person or object and these reflect the infrared light generated by the camera. The computer can then analyse the light to produce a 3D image of the movement. While optical-active motion capture uses markers that emit LED light which are then captured by the camera and analysed in a similar way. Inertial motion capture doesn't rely on cameras and instead use inertial movement units with built in sensors to detect position and movement. Markerless motion capture doesn't require cameras and uses multiple depth sensitive cameras to record the movement which can then be reconstructed into the 3D image. The method used is dependent on the application.

Motion captures can be used to design characters and their movements in video games. It can also be used to play video games by monitoring players movements and using that to control the game. These techniques are also used in medicine to track patients movements to help with treatments of injuries.

How to make your own muscle machine

Suitable year groups: Year 5, Year 6, Year 7, Year 8, and Year 9

Learning Objectives:

- To understand how muscle plays an important role in the motion of the arm. (KS2)
- To understand how forces are used to cause objects to stop or start moving. (KS3)
- To understand biomechanisms such as the interaction between skeleton and muscle. (KS3)
- To identify the measurement of force extorted by different muscles. (KS3)

Materials required:

- Cardboard
- Scissors
- String
- Pins
- Straws
- Tape
- Glue
- Toilet paper or kitchen roll tube
- Paper
- Pencils or markers

Estimated time: 40 minutes

Step by step instructions:

1. Draw out the 3 parts of the arm or download and print out the template

2. Cut out the 3 sections and trace them out on cardboard then cut them out again.

3. Mark the locations of the holes on the cardboard using a marker

4. From the template cut out the circle which has a diameter of 2 cm. Trace and cut out 8 circles from the cardboard. Cut four piece of straw of length 1 cm. We'll call these cardboard bobbins.

5. Use glue to attach each end of the straw to a circle of cardboard. You should have 4 pieces in the end.

6. From the template, cut out the biceps and the triceps. You can colour this in or used coloured paper.

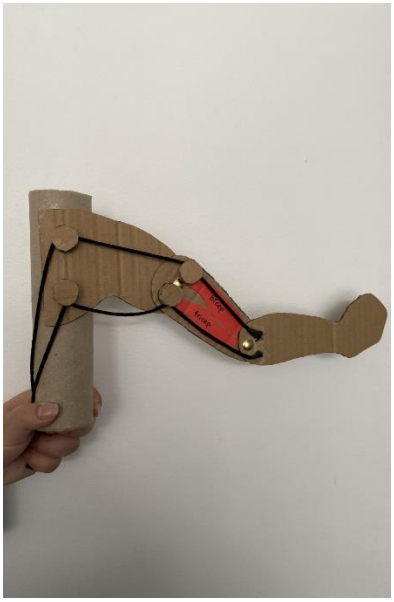
7. Stick the 4 cardboard bobbins made in step 4 onto the dots as shown in the picture.

8. Use two split pins to attach the sections together.

9. Cut two pieces of string of length 45cm. Attach one end of the strings using tape.

10. Thread the string around the cardboard bobbins. The bottom string clockwise and the top string anticlockwise.

11. Use toilet paper or kitchen roll tube as the base and attach your arm to it using glue. Test out how your arm moves!



Ideas to explore the concept further

- How is the muscle machine different from the actual arm? What can you notice about it?
- Could you design a similar machine for a leg?
- What happens when you pull both strings at the same time? What does this represent?