Could You Please Stand Still?!!!

Student Information Page 2F

Problem Statement: What effect does performing various tasks have on your balance?

Introduction:

Have you ever lost your balance? Did you feel dizzy? Did you trip? Did you fall? Balance is the ability to balance all of the opposing forces acting on your body. Distractions, medical conditions, malnutrition, fatigue, or neuropathy can all affect your balance. You have sensors called proprioceptors that help your muscles, bones and brain maintain your body's position relative to things in your environment. In this lab, you will observe whether a person is able to stand perfectly still. You will also **test** how balance is affected while different tasks are being performed, **graph** your results, and **compare** this data to the rest of the class.

Hypothesis: (per group)

Write a hypothesis that predicts what effect closing your eyes might have on your balance. Be sure to explain *why* you think closing your eyes might have this effect.

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Hypothesis: (per group)

Write a hypothesis that predicts what effect standing on one leg might have on your balance. Be sure to explain *why* you think standing on one leg might have this effect.

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Materials: (per group)

- Stabilometer*
- Bicycle helmet with slot or hole in crown
- Water-based marker
- 4 sheets of graphing paper
- Meter stick
- Doorway
- One copy of the Task Card set (4 cards)
- One copy of the *Student Data Page* (per student)

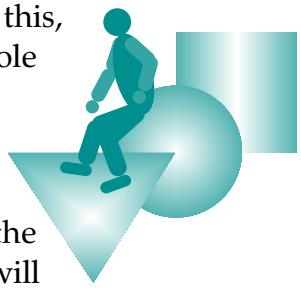
* Instructions for assembling a Stabilometer are included in packet

Procedure: (Check each step as you read and complete it).

❒ 1. Choose a member of your group to be the *Balancer*. Have other group members choose the roles of *Reader*, *Timekeeper*, and *Measurer*. Give each person the appropriate task card.

❒ 2. The *Reader* will read all instructions and check off each step of the procedure as it is read and completed.

3. The ***Balancer*** needs to prepare the helmet to be used in the lab. To do this, the ***Balancer*** should place a water-based marker, point up, in slot or hole in the crown of the so that the marker is in an upright position. The ***Balancer*** will then place the helmet on his or her head. Make sure that the helmet fits securely and won't move or fall off.



4. The ***Measurer*** needs to tape the corners of the first graph paper onto the "smooth side" of the stabilometer fiber board. This is where the data will be collected. Using a meter stick or tape measure, the ***Measurer*** then needs to measure the total height of the ***Balancer***, who is wearing the helmet with the marker, from the floor to the tip of the water-based marker.

5. After this is done, the ***Measurer*** escorts the ***Balancer*** to the assigned doorway and places the stabilometer approximately one inch above the ***Balancer's*** measured height. (For example, if your ***Balancer*** measured 70 inches with the bicycle helmet and marker, the ***Measurer*** must place the stabilometer 71 inches above the doorway.) See ***Figure 1 Using the Stabilometer***.

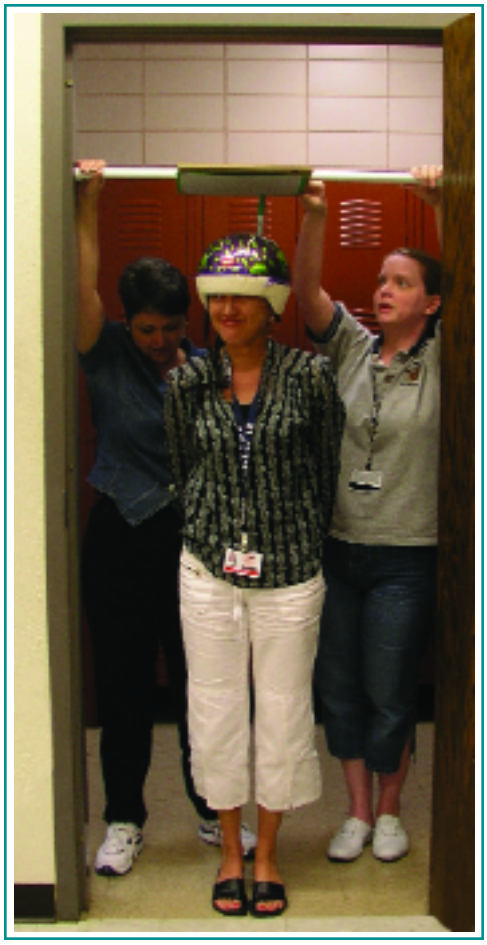


Figure 1 Using the Stabilometer

6. The ***Timekeeper*** must get his stopwatch and all group members must take their positions near the doorway. The ***Balancer*** must stand in the center of the doorway, the ***Timekeeper*** needs to make sure that the ***Balancer*** is ready to start with the correct position, and the ***Measurer*** must be ready to collect and label the graphing paper.

7. Conduct the four assessments described below.

Assessment 1 –
Eyes Open and standing on two feet

- With group members in place, the ***Balancer*** must stand with feet at shoulder width and keep eyes open.
- The ***Measurer*** will lower the stabilometer carefully so that it touches the tip of the marker.
- The ***Timekeeper*** will say "Start" and start the stopwatch. The ***Balancer*** will be timed for one minute while trying his or her hardest to stand still. While the ***Balancer*** is standing "still", the marker will be writing on the graph paper.
- After one minute has passed, the ***Timekeeper*** will say "Stop". The ***Balancer*** must bend his or her knees slightly so that he or she does not mark on the graph paper anymore.
- The ***Measurer*** must remove the graph paper off of the stabilometer and label it "Both Feet, Eyes Open". The markings on the graph paper are ***stabilograms***.

Assessment 2 – Eyes closed and standing on two feet

- The ***Measurer*** will get a 2nd sheet of graph paper and tape it onto the stabilometer.
- The ***Measurer*** will place it in the doorway one inch above the ***Balancer's*** height.
- Once everyone is in place, the ***Balancer*** must stand with his or her feet at shoulder width with eyes closed.
- The ***Measurer*** will lower the stabilometer as described in Assessment 1.
- The ***Timekeeper*** will say "Start" and start the stopwatch. The ***Balancer*** will be timed for one minute while trying to remain perfectly still. After a minute has passed, the ***Timekeeper*** will say "Stop", the ***Balancer*** will lower his/her knees, and the ***Measurer*** will remove the graphing paper.
- The ***Measurer*** will label this ***stabilogram*** "Both Feet, Eyes Closed".

Assessment 3 – Eyes open and standing on one foot

- The ***Measurer*** will then get a 3rd sheet of graph paper, tape it onto the stabilometer and place it back in the doorway one inch above the ***Balancer's*** height.
- The ***Balancer*** must now stand on one foot with eyes open. The ***Measurer*** will lower the stabilometer carefully.
- The ***Timekeeper*** will say "Start" and start the stopwatch. The ***Measurer*** must make sure that the ***Balancer*** does not hold onto anything! After one minute has passed, the ***Timekeeper*** will say "Stop", the ***Balancer*** will bend his or her knees slightly, and the ***Measurer*** will remove the graph paper.
- The ***Measurer*** will label this ***stabilogram*** "One Foot, Eyes Open".

Assessment 4 – Eyes closed and standing on one foot

- The ***Measurer*** will then get the fourth sheet of graph paper, tape it onto the stabilometer and place it back in the doorway one inch above the ***Balancer's*** height.
- The ***Balancer*** must now stand on one foot with eyes closed, the ***Measurer*** will lower the stabilometer carefully.
- The ***Timekeeper*** will say "Start" and start the stopwatch. After one minute has passed, he will say "Stop", the ***Balancer*** will bend his knees slightly, and the ***Measurer*** will remove the graph paper.
- This ***stabilogram*** will be labeled "One Foot, Eyes Closed".

8. All group members will return the materials to their assigned location and take the 4 ***stabilogram*** (graphs) back to their station so that they may analyze the data and answer the ***Student Data Page***.

Results: Check off each step as it is completed.

Students will work as a group to complete the *Student Answer Sheet*.

❒ **I.** You will record your data in the *Stabilogram Data Table* on your *Student Data Page*. When everyone in your group has this completed, begin step II.

❒ **II.** You will now use the *Unit Square Grid* to determine the area of your stabilograms. Each square in the grid has an area of 1 cm^2.

a. *Estimate* the area of your stabilogram by laying the *Unit Square Grid* over the stabilogram. See *Figure 2 Estimating Area of Stabilogram Using Unit Square Grid.*

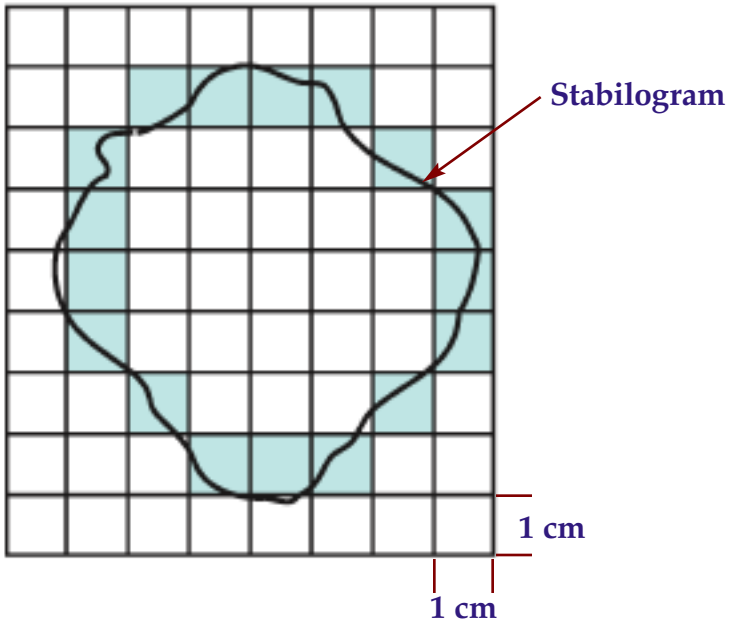


Figure 2 Estimating Area of Stabilogram Using Unit Square Grid

b. Now count the number of **whole** squares within the boundary of your *stabilogram*. Write this number down in the *Stabilogram Data Table* on your *Student Data Page*.

c. Now, go back and estimate the area included in the partial squares within your stabilogram boundary. If 1/2 of a square is included, that represents 1/2 cm^2. If 3/4 square is included, that area is 3/4 cm^2.

d. Add all these partial squares to your number of full squares. *Be sure to keep up with all of the fractions!* Write total area of the partial squares in the *Stabilogram Data Table*.

When everyone in your group has completed estimating the area of their *Stabilograms*, record the result in the *Stabilogram Data Table* and go to step III.

❒ **III.** You will now construct a graph of the data from your *Stabilograms*. The graph must have a complete title, must have both axes labeled and must indicate the units of measurement used. Each square on the unit grid is 1 cm, so the units used to measure the area will be cm^2.

❒ **IV.** Now you will work with the teacher as a class to construct a *Class Data Chart*. This is important because it will allow you to see how your results compared to the results obtained by the other groups in your class.