

Name \_\_\_\_\_

Date \_\_\_\_\_

Period \_\_\_\_\_

# Straw Size vs. Heart-rate Lab

## Statistics & Science Fair Unit

### Standards:

#### **Science**

Standard 11 – scientific inquiry: conduct an investigation using scientific method

Standard 12 – interaction of living things and environment

Standard 13 – science + technology: repeat experiment to yield consistent results

#### **Math**

Standard 6 – number sense: apply numbers to working with a variety of situations

Standard 7 – measurement: collect data using estimation and measurement skills

Standard 8 – algebra: use graphing and algebra to solve problems and predict relationships

Standard 10 – statistics: organize, analyze and make predictions from data

### Materials

- Video instructions for using straws and measuring heart-rate
- Stopwatch (1 per group)
- Swizzel stick “small straw” (1 per person)
- Standard straw “normal straw” (1 per person)
- Jumbo straw “big straw” (1 per person)
- Lab with data table

### Procedures

1. Watch video on instructions for lab
2. Divide into groups of 3
3. Make HYPOTHESIS for your experiment
4. Each group receives
  - 1 stopwatch
  - Small straws (1 per person)
  - Medium straws (1 per person)
  - Large straws (1 per person)
5. Assign rotating group roles
  - Breather – sits and breathes to provide heart-rate data
  - Heart-rate recorder – measures heart-rate for 15 seconds on breather & records data
  - Timer – watches and calls out time to start and stop using stopwatch

Everyone will rotate roles during each trial rotation so everyone participates

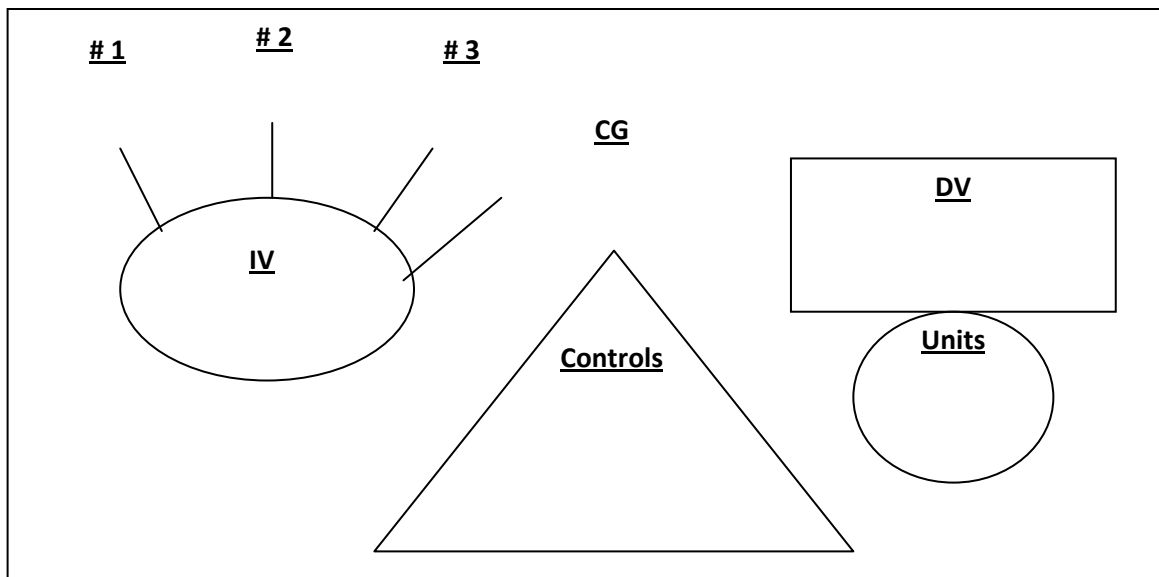
6. Control trial – no straw
  - a. Breather sits in chair and breathes normally (no straw) for 30 seconds
  - b. Timer starts timer
  - c. Recorder records the breather’s heart-rate for 15 seconds
  - d. Timer calls out “stop”
  - e. Recorder records data in data table (each person is recorded ONCE), multiplies by four for heart-rate/minute
  - f. Switch roles so everyone does each role ONCE
    - i. Each person uses new straw
7. Large straw trial
  - a. Breather sits in chair and breathes with LARGE STRAW for 30 seconds

**Repeat steps b to f**
8. Normal straw trial
  - a. Breather sits in chair and breathes with NORMAL STRAW for 30 seconds

**Repeat steps b to f**
9. Small straw trial
  - a. Breather sits in chair and breathes with SMALL STRAW for 30 seconds

**Repeat steps b to f**
10. Put class data on overhead/computer for collection
11. Make STEM & LEAF plot of class data
12. Make HISTOGRAM of class data
13. Calculate MEAN, MEDIAN, MODE of class data
14. Make BAR GRAPH of class data
15. Make BOX & WHISKER of class data
16. Answer post lab questions

**Chunky Monkey**



**Hypothesis**

I predict that \_\_\_\_\_ will come in 1<sup>st</sup> place for \_\_\_\_\_ because \_\_\_\_\_.  
 (IV) (DV)

I predict that \_\_\_\_\_ will come in 2<sup>nd</sup> place for \_\_\_\_\_ because \_\_\_\_\_.  
 (IV) (DV)

I predict that \_\_\_\_\_ will come in 3<sup>rd</sup> place for \_\_\_\_\_ because \_\_\_\_\_.  
 (IV) (DV)

I predict that \_\_\_\_\_ will come in 4<sup>th</sup> place for \_\_\_\_\_ because \_\_\_\_\_.  
 (IV) (DV)

**Data Tables**

My group's data: Record your heart-rate for 15 seconds and then multiply by 4

	Heart-rate per minute (multiply your heart-rate times 4)			
	No Straw (control)	Big Straw	Normal Straw	Small Straw
Person A				
Person B				
Person C				

Class Data:

	Heart-rate per minute			
	No Straw (control)	Big Straw	Normal Straw	Small Straw
Person 1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
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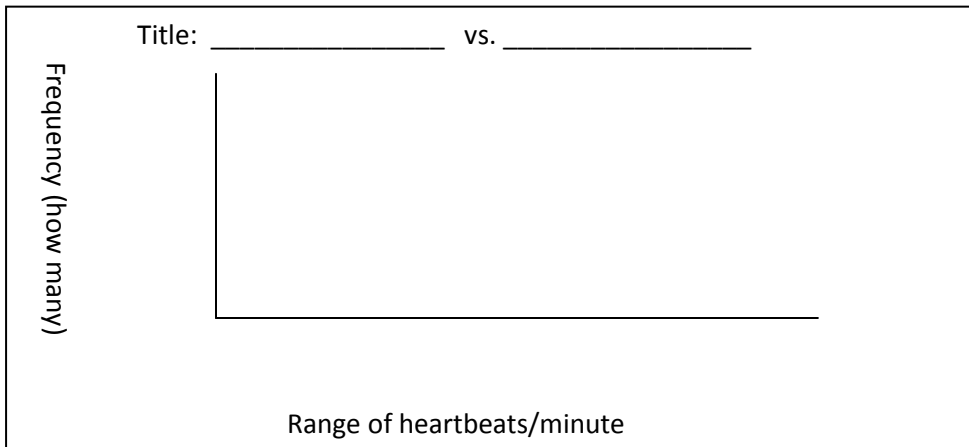
**Data Analysis**

**1. Stem & Leaf plot**

Key	
1	5 =

\_\_\_\_\_

**2. Histogram**

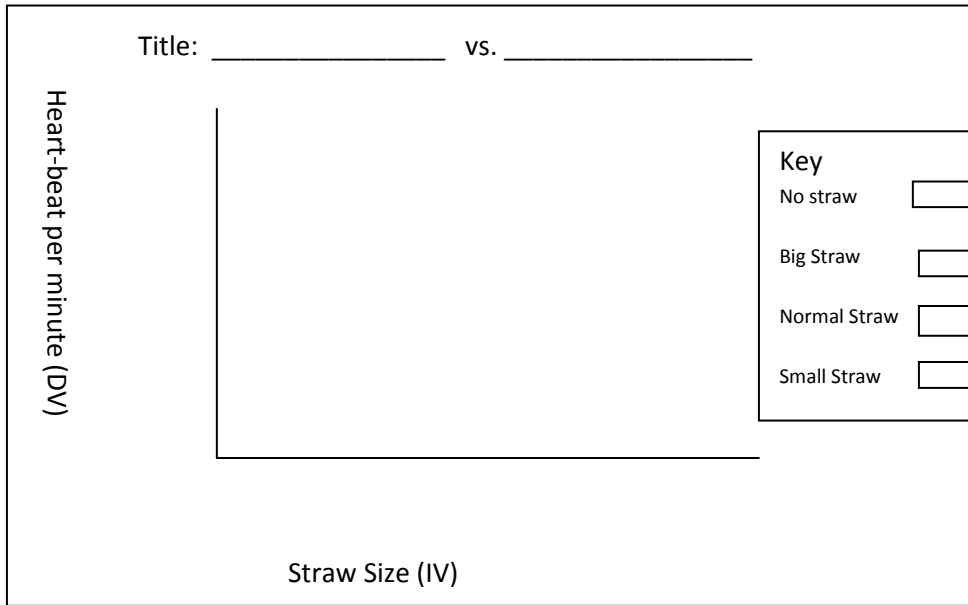


**3. Mean, Median, Mode, Range**

**Class Data**

	Heart-rate per minute			
	No Straw (control)	Big Straw	Normal Straw	Small Straw
Mean				
Median				
Mode				
Range				

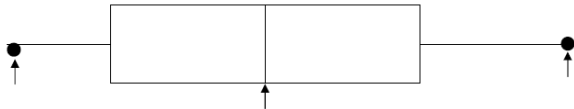
#### 4. Bar Graph



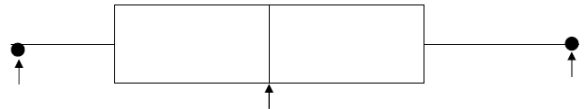
#### 5. Box & Whisker

Only show minimum, median, and maximum for box & whiskers

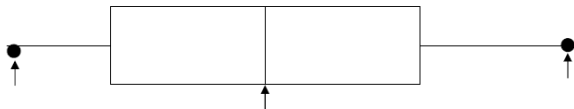
Treatment Group \_\_\_\_\_



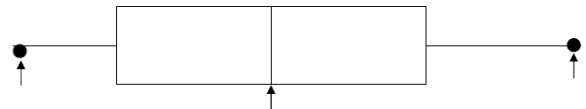
Treatment Group \_\_\_\_\_



Treatment Group \_\_\_\_\_



Treatment Group \_\_\_\_\_



**Post Lab Questions**

1. Answer your research question “how does the size of a straw affect a person’s heart rate?”

Why do you think this relationship exists between breathing and heart-rate?

2. What is the difference between a histogram and a bar graph for displaying data?

Histogram	Bar Graph

3. What is the difference between a stem & leaf and a box & whisker for displaying data?

Stem & Leaf	Box & Whisker

4. Compare your results to your hypothesis prediction. Was your hypothesis correct? Did any of the results surprise you?
5. Were there any sources of error in our experiment? List at least 1 source of error and how it could have affected the results.
6. How could we improve the experiment in the future to better control for sources of error?