Static Electricity: Can Different Hair Types Affect it?

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Purpose:

To determine if different hair textures and hair thicknesses affect the amount of static electricity hair can carry.

Question:

How much static electricity can different hair types carry?

Hypothesis:

When the balloon is rubbed on the hair, the finer hair will carry the most static electricity.

Independent Variable:

Different hair types (based on texture and thickness of hair).

Dependent Variable:

The amount of static electricity produced.

Controlled Variable:

The same size balloon, the same amount of times the balloon is rubbed on the hair, the same place on the wall to stick it on, the same amount of participants for each texture and thickness, the same instruments to measure the hair and blow up the balloon and the same way the texture and thickness is measured.

Materials

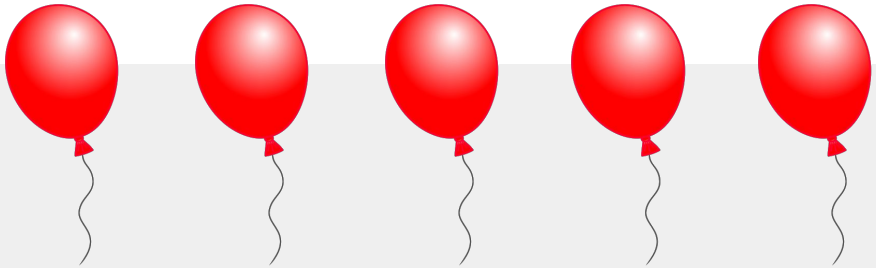
- 10 test subjects
- 10 balloons
- Balloon pump
- Sewing thread
- Hair bands
- Measuring tape
- Stop watch
- Pencil
- Tape
- Chart

Procedure

1: Measure the texture of the hair by taking a single strand and placing it next to a line of sewing thread. If the hair is wider than the thread, the hair is classified as coarse; if it is narrower than the thread it is classified as fine.

2: Measure the density of the hair by placing the hair into a ponytail with the band wrapped around three times and measure the distance around the band. If it is more than three inches, it is classified as thick; if it is less than three inches it is classified as thin.

Procedure (continued)



3: Categorize the hair into four types: fine and thin, fine and thick, coarse and thin and coarse and thick. Record each subject's category on the chart.

4: Blow up the balloons with 10 pumps in each so the balloons are the same size.

5: Place a piece of tape on the wall for a reference showing where to place the balloon each time.

Procedure (continued)

6: The test subject will rub a balloon on their head 5 times in a circular motion.

7: Place the balloon on the wall just below the tape.

8: As soon as the balloon touches the wall start the stopwatch.

9: When the balloon falls from the wall, stop the watch and record the time in the chart.

10: Repeat steps 6-9 for all test subjects and record the results.

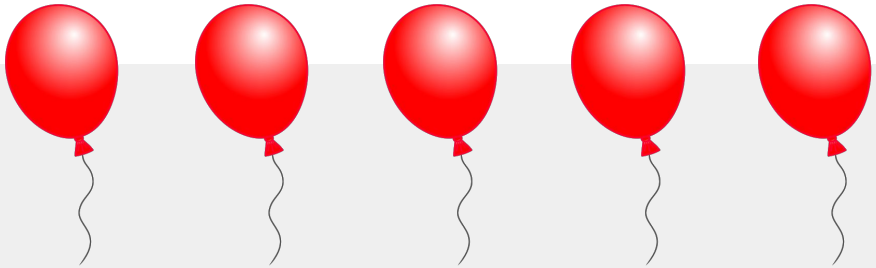
Results:

→ Tables

Table 1: Time (min) a balloon remained on a wall after being rubbed on hair of different textures (fine and coarse) and thicknesses (thin and thick)

Hair Texture	Hair Thickness	Time (min)
Fine	Thick	21.41
Fine	Thick	14.32
Fine	Thin	12.37
Fine	Thin	9.32
Fine	Thin	13.54
Coarse	Thick	14.49
Coarse	Thin	2.41
Coarse	Thick	5.31
Coarse	Thin	0.22
Coarse	Thick	4.53

Results (continued)



→ Tables

Table 2: Number of participants, mean, median, variance, standard deviation and range of time (min) that a balloon remained on a wall after being rubbed on different types of hair (coarse, fine, thick and thin hair)

Statistics	Coarse	Fine	Thick	Thin
n	5	5	5	5
Mean	5.392	14.192	12.012	7.572
Median	4.53	13.54	14.4	12.37
Variance	29.791	19.899	0.076	0.873
Standard Deviation	0.469	3.053	0.951	0.725
Range	14.27	12.09	16.1	9.28

Results (continued)

→ Figures

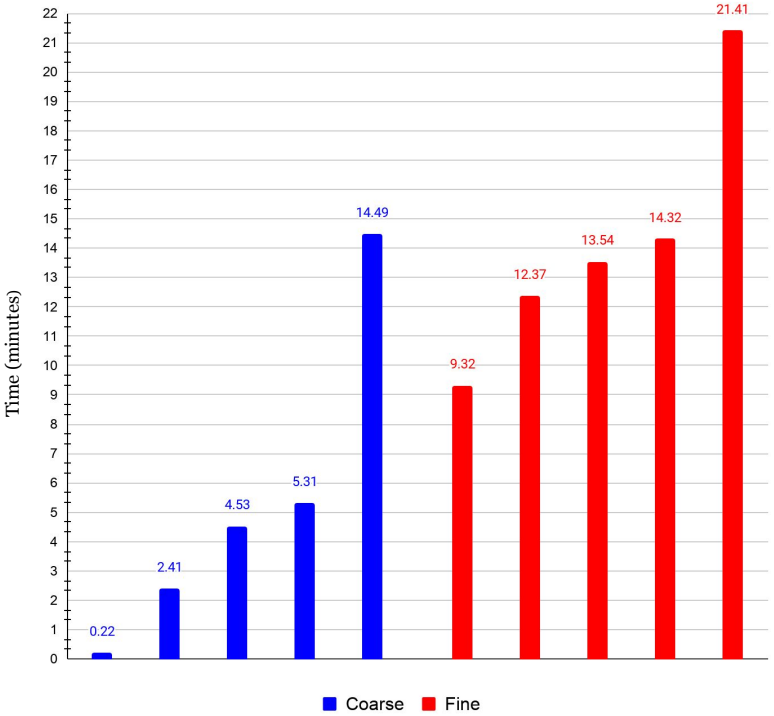


Figure 1: Time (min) a balloon stayed on the wall after being rubbed on different textures of hair (coarse and fine)

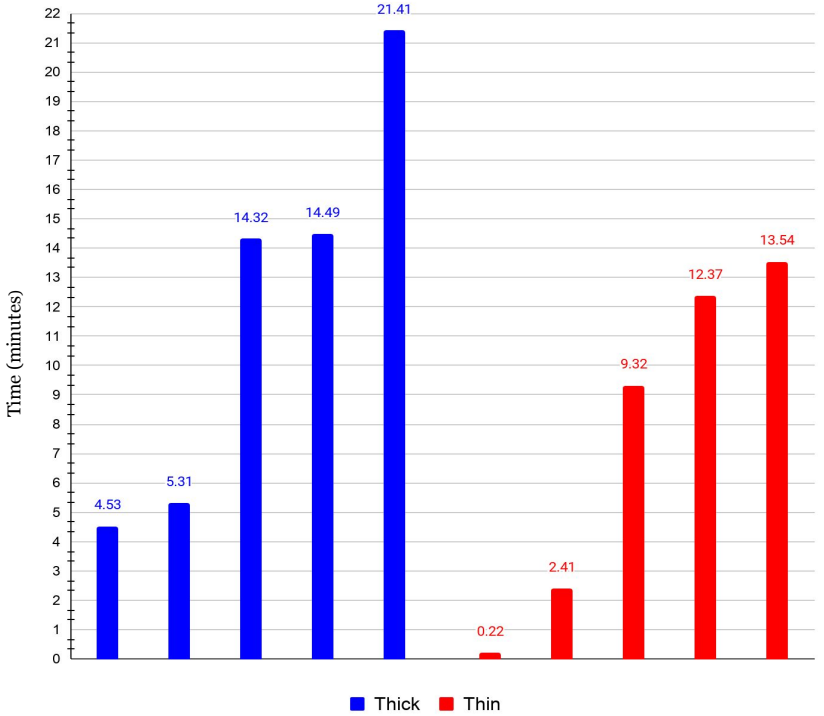


Figure 2: Time (min) a balloon stayed on the wall after being rubbed on different thicknesses of hair (thick and thin)

Results (continued)

→ Figures

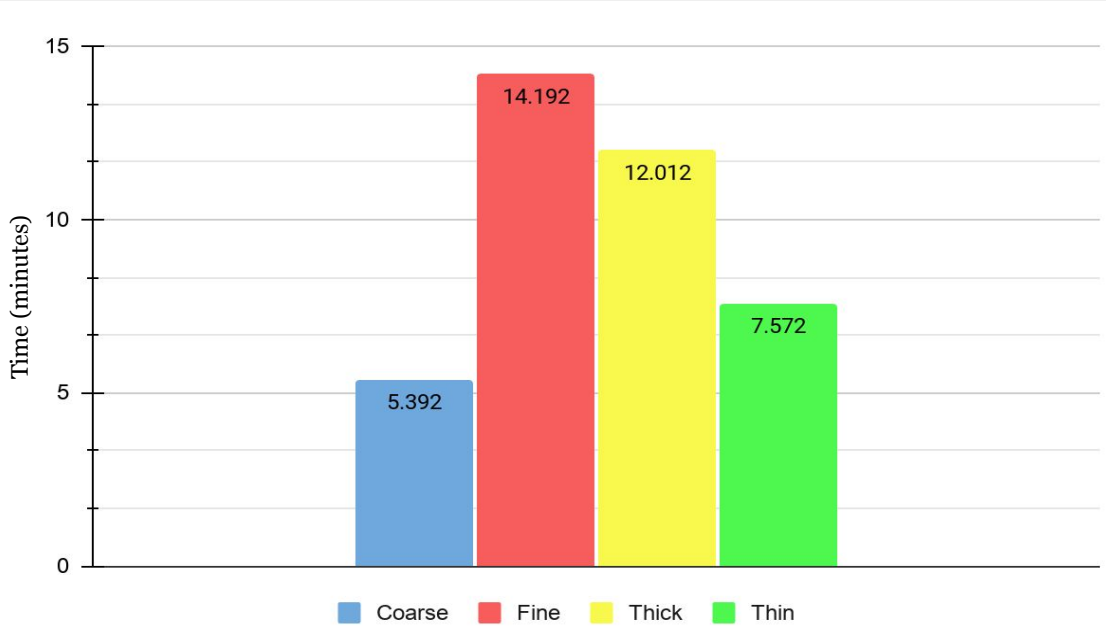


Figure 3: Mean time (min) a balloon stayed on the wall after being rubbed on different types of hair (coarse, fine, thick and thin)

Results (continued)

→ T-Tests

The time for fine hair (M=14.192, SD=3.053) compared to the time of the coarse hair (M=5.392, SD=0.469) demonstrated significantly longer times, t=-2.79, p=.012.

There was no significant effect for thick and coarse, t=-0.58, p=.29 despite the times of thick (M= 12.012, SD=0.951) being longer than coarse (M=5.392, SD=0.469)

The time of the thin hair (M=7.572, SD= 0.725) compared to the time of the coarse hair (M=5.392, SD=0.469) demonstrated significantly longer times, t=-1.99, p=.041

Results (continued)

→ T-Tests

There was no significant effect for fine and thick, $t=-0.58$, $p=.29$) despite the times of fine ($M=14.192, SD=3.053$) being longer than thick ($M= 12.012, SD=0.951$)

The time of the fine hair ($M=14.192, SD=3.053$) compared to the time of the thin hair ($M=7.572, SD= 0.725$) demonstrated significantly longer times, $t=-1.99$, $p=.041$

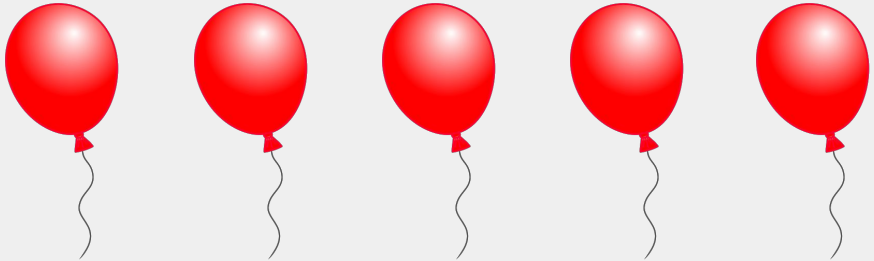
There was no significant effect for thick and thin, $t=1.07$, $p=.16$) despite the times of thick ($M= 12.012, SD=0.951$) being longer than thin ($M=7.572, SD= 0.725$)

Discussion

- The hypothesis for this experiment was "when the balloon is rubbed on the hair, the finer hair will carry the most static electricity". This was supported by the data collected since the balloon did stay on the wall a longer time after being rubbed on the fine hair

Discussion (continued)

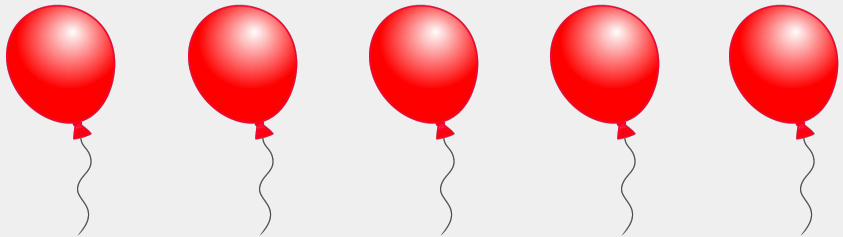
- The longer times for the fine hair were due to it carrying more static electricity. This is because fine hair is lighter in weight therefore it moves easily and attracts the opposite charge.



- The shorter times for the coarse hair were due to it carrying less static. This is because it is heavier, causing it be less able to be moved and attract the opposite charge.

Discussion (continued)

- The longer times for the thick hair was due to it's density of strands. It had more strands of hair to be attracted to, causing it to be able to carry more static electricity.



- The shorter times for the thin hair was due to its density of strands. It had less strands of hair to be attracted to, causing it to carry less static electricity.

Discussion (continued)

- The mean and standard deviation of fine and thick hair were higher due to their longer numbers and larger range between the numbers, so when added all together and divided by the number of participants, the results would be higher.

- The mean and standard deviation of coarse and thin hair were lower due to their shorter numbers and smaller range between the numbers when added all together and divided by the number of participants, the results would be lower.

Sources of Error

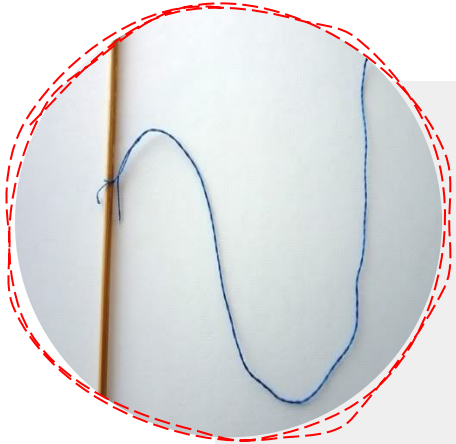
Error #1

On of the test subjects was wearing a hair clip so when the balloon was placed on the wall it fell off. The same balloon was used and with its extra static, it stayed on the wall longer than anticipated.

Error #2

The balloons were not exactly the same size due to the pump. The pump cannot have pumped specifically the same amount of air into each balloon.

Sources of Error (continued)

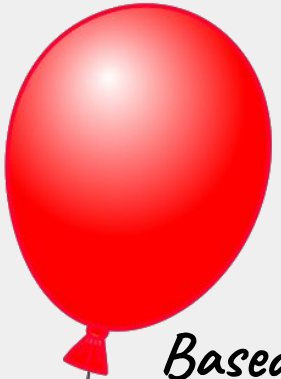


Error #3

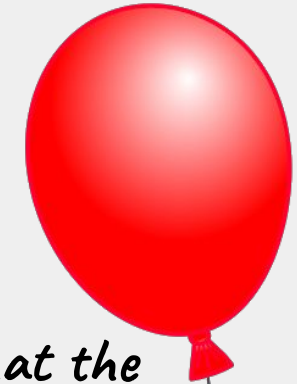
Determining if the strand of hair was wider than the thread was difficult, some may have been misinterpreted.

Error #4

It was hard to stop the timer at the exact second it hit the ground so the times may have been slightly different.



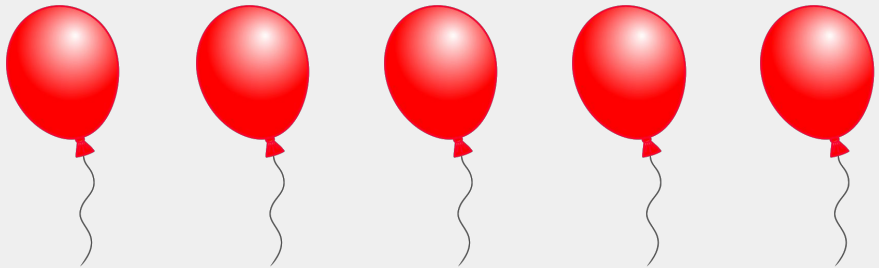
Conclusion



Based on the collected data, it can be concluded that the hypothesis was in fact correct as the fine hair conducts more electricity than coarse hair.

Acknowledgements

I'd like to acknowledge my cdli chemistry teacher Yvonne Dawe. She gave me the advice I needed to complete my project and when I was stuck, not knowing what to do, she gave me guidance and put me on the right path.



Acknowledgements (continued)

I'd also like to acknowledge my friends and test subjects. Without them my project would be incomplete and they helped me push through and get it done.

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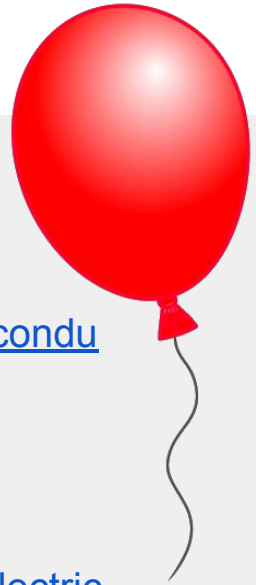

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Appendix: Log Book

Hair Texture	Hair Thickness	Time (min)
Fine	Thick	21.41
Fine	Thick	14.32
Fine	Thin	12.37
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Coarse	Thin	0.22
Coarse	Thick	4.53

The End