

Investigate the effect of a limited range of motion of your knee and elbow joints on running performance.

Aim:

what is the objective of your study?

- To investigate...
- what is the effect of...
- says what you are changing, what you are measuring or counting and is precise

Hypothesis:

- State your prediction with an explanation as to why this will happen.
- Says what will happen to the variable you measure as you increase or decrease the variable you change.

Variables:

- **Dependent variable:** *The variable which is measured in the experiment and which is studied in relation to other variables. Its value depends on the independent variable.*

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- **Independent variable:** *The manipulated variable in an experiment, whose effects on a dependent variable are measured.*

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- **Controlled variable:** *List as many variables as you can think of that would affect the dependant variable if not kept the same (with numbers). Discuss your choice of variables i.e. Why they would affect your results.*

What do you need to control?	How will you control the variable?	Why do you need to control this variable?

- Confounding variables: list any variables that you think may have an influence but that you are unable to control.

Data Collection: Table showing the running times (sec ± 0.01 sec) of year 12 students over 20 m (± 1 cm) with restricted and unrestricted knee joints.

Names:										
Running Times of students over 20m with restricted and unrestricted knee joints										
Joint Mobility	Trial	Person 1	Person 2	Person 3	Person 4	Person 5	Person 6		Average	Std Dev
Normal	1									
	2									
	3									
	4									
	5									
Limited Mobility	1									
	2									
	3									
	4									
	5									
Average Normal										
Average Limited										
Std Dev Normal										
Std Dev Limited										
Qualitative Data: (Observable)										

Method: You are going to investigate how varying the range of motion at several joints can influence a person's performance.

Materials:

- stop watches
- tape measure
- cones
- braces

Procedure:

- Measure out a distance of 20 meters and mark it with cones.
- Have students complete a warm up of aerobic action followed by stretching.
- Have students run this distance 2 different ways while being timed. The first way is normal and the second is with straight limbs (braced knee joints and elbow joints using cardboard braces which are taped to the body). Repeat this 5 times for each person for each condition.
- Split the group in 2 and have $\frac{1}{2}$ the group start with one condition and the other half begin with the braced condition.

Results:

- **Table:** Showing the raw data with averages and units. Label the columns.
- **Graph:** Plot the averages only along with error bars (use the std dev and indicate this in a key). Include line of best fit.

Conclusion/ Analysis of results:

1. State your hypothesis and whether it was proven or not with the evidence for this.
2. Describe the trend shown with the graph with numbers.
3. Explain why this relationship occurred and compare your results to those from similar experiments.

Evaluation:

4. Are there any anomalous (irregular, abnormal) results; How consistent were the results (calculate the mean and standard deviation for each condition). What do these tell you?
5. How close were the points to a line of best fit and the expected results?
6. How successful were you at controlling the variables you identified; what went wrong; how did this affect the results?
7. How could you improve the experiment if you were to repeat it?