MASK EFFECTIVENESS

INTRODUCTION

This task involves researching and undertaking an experiment that will test the effectiveness of different types of masks. These include: cloth masks, surgical masks, N95 masks as well as masks with exhalation valves.

This is an important experiment to do because there are so many different options of masks and having the most effective one will have significant effects on many different people.

Masks are used on a daily basis by so many people due to the recent Covid-19 pandemic and have played a significantly large role in decreasing the spread of Covid-19. They are able to protect the user as well as others from catching and transmitting diseases. By finding out which mask is best, people will have new insights and therefore live a happier and healthier life.

A micron is a unit of length that is 1 millionth of a metre and sneeze particles are 74.4 microns. Therefore masks filtration systems should be able to capture particles of this size.

AIM

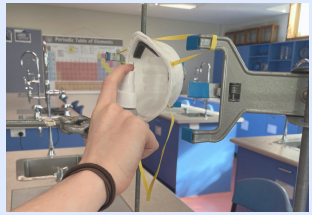
To determine what material and structure of a mask is the most effective when absorbing sneeze particles.

HYPOTHESIS

If the mask's structure is changed to include a high efficiency particulate air (HEPA) filter, then the mask will absorb more water resulting in it being more effective. This is because the built in filtration system (HEPA) was designed to filter particles at the size of 0.3 microns and a sneeze particle is 74.4 microns. This means that this filtration system should capture all sneeze particles. Therefore, it is evident that the N95 will absorb the most water as it includes this filtration system.

EQUIPMENT

- Spray bottle - 50ml
- Retort stands x3
- Surgical mask x4
- N95 mask x3
- Cloth mask x3
- Mask with exhalation valves x3
- Scale (sensitive)
- Water x50ml
- 15cm Ruler
- Plate 25cm (diameter)
- 100ml measuring cylinder



VARIABLES

Dependant Variable: The amount of water that the mask can absorb (ml)
Independent Variable: The type of mask which is being tested. (Surgical, N95, Cloth and Masks with exhalation valves)
Controlled Variables:
- the amount of water sprayed into the mask (3.82ml)
- the distance that the retort stands are from each other (mask stands: 20cm apart and spray stand: 4cm away from mask)
- the rate at which the water is sprayed (2 spray per second)
- the air around the mask (same temperature and no wind)
- the liquid being sprayed (water)

METHOD

1. 60ml of water was measured using a measuring cylinder
2. Water was poured from measuring cylinder into spray bottle
3. Plate was placed on scales and scales were tared
4. Spray bottle was weighed with the water inside using the scales
5. Results were recorded
6. 22 sprays were sprayed into a sink
7. Spray bottle was weighed again
8. Results were recorded and difference was calculated
9. Steps 4-8, were repeated two more times
10. Retort stands were set up. 2 facing each other 20 cm apart and one 4cm back making a triangle.
11. Surgical mask was weighed on the scales
12. Mask was attached to retort stands
13. Spray bottle was attached to retort stand
14. Retort stand positioning was checked
15. Bottle was sprayed 22 times
16. Mask was weighed again
17. Difference was calculated
18. Results were recorded in table
19. Steps 11 - 18 were repeated 2 more times for the surgical mask
20. Steps 11-18 were repeated 3 times using N95 mask
21. Steps 11-18 were repeated 3 times using cloth mask
22. Steps 11-18 were repeated 3 times using mask with exhalation valves
22. Averages were calculated.
24. Column graph was constructed using averages.

DISCUSSION

Explanation: The results from this experiment show that the cloth mask was the most effective in holding and absorbing the most water, this is because it is the thickest and is made of the most absorbent material. This was respectively followed by the N95 mask, mask with exhalation valves and finally the surgical mask which proved to be the least effective at absorbing water. The cloth mask absorbed around 3 times more water than the amount of water that was absorbed by the surgical mask. All the masks that were tested had results within 0.5ml of each other apart from the surgical mask which had a difference of 2ml from the mask which absorbed the 3rds highest amount. The cloth mask absorbed 3.7 ml of the 4ml of water sprayed into it, the P2 mask absorbed 3.7ml, the mask with exhalation valves absorbed 3.3 ml and the surgical mask absorbed 1.3ml.

Validity: This experiment was valid because the method was followed, it linked to the aim and tested the hypothesis. The experiment had one dependent variable (the amount of water each mask absorbed) whose result was affected based on the independent variable (the different type of mask). The results were not affected by anything other than the independent variable because the rest of the experiment was controlled.

Reliability/Accuracy: For accuracy, the experiment was repeated 3 times, each time producing similar results. The results from each trial were then averaged. Because the method was followed, the results were reliable and will be the same no matter who carries out the test. It was also reliable because a scale was used to record the weight of each mask before and after the test and a ruler was used to measure the distance between the retort stands.

RESULTS TABLE

AMOUNT OF WATER THAT DIFFERENT MASKS ABSORB

Type of mask	The Amount of Water that is Absorbed (ml)			
	Trial One	Trial Two	Trial Three	Averages
N95	4.0	3.5	3.7	3.7
Cloth	3.7	3.7	3.8	3.8
Surgical	1.6	1.1	1.6	1.3
Mask with Exhalation Valves	3.1	3.2	3.6	3.3

CONCLUSION

After completing the experiments, it was concluded that the cloth mask absorbed more water than the N95, the surgical and the mask with the exhalation valves. As a result of the data findings, the hypothesis was not supported, and it is evident that the thicker the material of the mask the more water it will hold as there is more area for the water to be absorbed.

RESULTS GRAPH