

SpongeBob and his Bikini Bottom pals have been busy doing a little research. Read the description for each experiment and answer the questions.

1 – Patty Power

Mr. Krabbs wants to make Bikini Bottoms a nicer place to live. He has created a new sauce that he thinks will reduce the production of body gas associated with eating crabby patties from the Krusty Krab. He recruits 100 customers with a history of gas problems. He has 50 of them (Group A) eat crabby patties with the new sauce. The other 50 (Group B) eat crabby patties with sauce that looks just like new sauce but is really just a mixture of mayonnaise and food colouring. Both groups were told that they were getting the sauce that reduce gas production. Two hours after eating the crabby patties, 30 customers in group A reported fewer gas problems and 8 customers in group B reported having fewer gas problems.

Which people are in the control group? **Group B**

What is the independent variable? **type of sauce in crabby patty**

What is the dependent variable? **reported reduction of gas production**

What should Mr. Krabs’ conclusion be? **Answers may vary. e.g. "The new sauce causes a reduction in body gas."**

Why do you think 8 people in group B reported feeling better?

Likely placebo effect. They were told they were getting the sauce that would reduce gas production, so they thought that they were better even when they were not.

2 – Marshmallow Muscles

Larry was told that a certain muscle cream was the newest best thing on the market and claims to double a person’s muscle power when used as part of a muscle-building workout. Interested in this product, he buys the special muscle cream and recruits Patrick and SpongeBob to help him with an experiment. Larry develops a special marshmallow weight-lifting program for Patrick and SpongeBob. He meets with them once every day for a period of 2 weeks and keeps track of their results. Before each session, Patrick’s arms and back are lathered in the muscle cream, while SpongeBob’s arms and back are lathered with the regular lotion.

Time	Patrick	SpongeBob
Initial Amount	18	5
After 1 Week	24	9
After 2 Weeks	33	17

Which person is in the control group? **SpongeBob**

What is the independent variable? **type of product applied to skin**

What is the dependent variable? **maximum weight that can be lifted (though it is not clear from the info given...too vague.)**

What should Larry’s conclusion be? **Larry could conclude that the muscle cream has no effect on the effectiveness of workouts. However, there are too many confounds to draw any conclusion at all.**

What questions still remain? Are there any confounding variables? How would you improve this experiment?

How was the dependent variable measured and reported? What units?

Need to repeat the experiment on many more test subjects...ideally controlled for initially muscle strength. Failing that, would be best to do the experiment on both Patrick and SpongeBob simultaneously: e.g. on one arm and side of back, put one product; then on the other, put the other product.

Define the workout clearly in the methods. Is far too vague right now.

3 – Slimotosis

SpongeBob notices that his pal Gary is suffering from slimotosis, which occurs when the shell develops a nasty slime and gives off a horrible odour. His friend Patrick tells him that rubbing seaweed on the shell is the perfect cure, while Sandy says that drinking Dr. Kelp will be a better cure. SpongeBob decides to test this cure by rubbing Gary with seaweed for 1 week and having him drink Dr. Kelp. After a week of treatment, the slime is gone and Gary’s shell smells better.

What was the initial observation? **Answers may vary. Gary has slimotosis: his shell develops an odorous slime.**

What is the independent variable? **treatment that is applied**

What is the dependent variable? **prognosis of disease**

What should SpongeBob’s conclusion be? **No conclusion has been drawn. This is not a controlled, single-variable experiment.**

What questions still remain? Are there any confounding variables? How would you improve this experiment?

Need to repeat with more test subjects who suffer from slimotosis; need to isolate natural healing process with the effects of each of the cures (individually). At the moment, cannot be sure what the healing is due to.

4 – Microwave Miracle

Patrick believes that fish that eat food exposed to microwaves will become smarter and will be able to swim through a maze faster. He decides to perform an experiment by placing fish food in a microwave for 20 seconds. He has the fish swim through a maze and records the time it takes for each one to make it to the end. He feeds the special food to 10 fish and gives regular food to 10 others. After 1 week, he has the fish swim through the maze again and records the times for each.

What was Patrick’s hypothesis?

Fish that eat food exposed to microwaves will become smarter.

Which fish are in the control group?

those fed regular food

What is the independent variable?

how food is treated prior to feeding

What is the dependent variable?

speed of maze completion

Look at the results in the charts. What should Patrick’s conclusion be?

Microwaving fish food prior to feeding has no effect on fish intelligence.

Special Food Group (time in minutes: seconds)			Regular Food Group (time in minutes: seconds)		
Fish	Before	After	Fish	Before	After
1	1:06	1:00	1	1:09	1:08
2	1:54	1:20	2	1:45	1:30
3	2:04	1:57	3	2:00	2:05
4	2:15	2:20	4	1:30	1:23
5	1:27	1:20	5	1:28	1:24
6	1:45	1:40	6	2:09	2:00
7	1:00	1:15	7	1:25	1:19
8	1:28	1:26	8	1:00	1:15
9	1:09	1:00	9	2:04	1:57
10	2:00	1:43	10	1:34	1:30

After doing the experiment and crunching the numbers, Patrick is still not sure about his conclusion. What could he do to be more confident in his results?

Repeat the experiment with more test subjects; repeat the maze run with each fish multiple times and record the average.

What questions still remain? Are there any confounding variables? How would you improve this experiment?

How was the fish food fed? What power was the food microwaved at?

Where does Patrick's initial "belief" stem from? Is it from an observation or is it purely a guess?

How were the fish in this experiment selected? Do they have any prior experience with mazes?

What other factors affect maze completion time? Were these controlled for?