

Niko Tinbergen (1907-1988) was a Swedish Ethologist (animal behaviorist) famous for studying animals in their native habitats. One of his classic experiments involved a bird called the black-headed gull (*Larus ridibundus*). Black-headed gulls build nests of twigs on the ground and lay light brown eggs that are covered with dark brown spots. However, the inside of the egg is white in color. Tinbergen noticed that adult gulls pick up the eggshells shortly after a chick has hatched, and fly them to a location far from the nest, where they are left. Since this behavior required expending energy and time that could have been spent feeding and protecting the chicks, Tinbergen wanted to know why the birds did this.

**Problem:** Why do black-headed gulls remove eggshells from the nest?

**Hypothesis:** The white interior of the shell is not camouflaged and attracts predators to the nest. Therefore, the gulls remove the shells to decrease predation.

**Test:** Tinbergen and his co-workers collected gull eggs and painted 69 of them white and left 68 of them with their natural color. (Statistically, these numbers are close enough to be considered equal.) The researchers then scattered the eggs next to a gull breeding area and observed from a nearby blind. Predation rates were recorded for white versus natural colored eggs.

<b>Data:</b>	<b>Original Number of Eggs</b>	<b>Eggs Taken by Predators</b>	<b>Eggs Not Taken</b>
<b>White Eggs</b>	69	43	26
<b>Natural Eggs</b>	68	13	55

a. Do the results of this experiment support the hypothesis? Why, Why not?

b. Are you 100% sure (without a doubt) that your hypothesis is correct? (Is it proven?)

c. If you were working with Tinbergen, what would you suggest be done next?

d. Identify the experimental and dependent variables

You are conducting an experiment to determine if increased ultraviolet radiation from the decrease in the ozone layer is killing off frog tadpoles. After examining all of the data available in the library, you decide to go with a hypothesis that increased ultraviolet radiation from the sun is killing off the tadpoles.

You design an experiment with a control and an experimental group. Your control group (group 1) involves 100 tadpoles in a five gallon container of water, that is covered by glass (knowing that the glass will filter out the ultraviolet radiation). The experimental group (group 2) will be set up exactly like group 1, except that instead of being covered with glass, it is covered with an acrylic plexiglass, which will not filter out the U.V. radiation. You then place the groups outside for a period of a month, and observe the results.

	<u>Results</u>	
	<u>Group 1</u>	<u>Group 2</u>
<b>Number of tadpoles started with</b>	100	100
<b>Number finished</b>	96	96

Using this information, answer the following questions.

- a. What is the experimental variable and what is the dependant variable?
  
  
  
  
  
  
  
  
  
  
- b. Does the information from this experiment support the hypothesis?
  
  
  
  
  
  
  
  
  
  
- c. If no, then what might be causing the decrease in frog populations?
  
  
  
  
  
  
  
  
  
  
- d. Which is the control group, and which is the experimental group?
  
  
  
  
  
  
  
  
  
  
- e. What is the difference between the two groups? Should they be different in any other way?