

Stat 301 – Day 20
Investigation 3.5: Dolphin Therapy Replacement

[Antonioli and Reveley \(2005\)](#) investigated whether swimming with dolphins was therapeutic for patients suffering from clinical depression. The researchers recruited 30 subjects aged 18-65 with a clinical diagnosis of mild to moderate depression through announcements on the internet, radio, newspapers, and hospitals in the U.S. and Honduras. Subjects were required to discontinue use of any antidepressant drugs or psychotherapy four weeks prior to the experiment, and throughout the experiment. These 30 subjects went to an island off the coast of Honduras, where they were randomly assigned to one of two treatment groups. Both groups engaged in one hour of swimming and snorkeling each day, but one group (Dolphin Therapy) did so in the presence of bottlenose dolphins and the other group (Control) did not. At the end of two weeks, each subject's level of depression was evaluated, as it had been at the beginning of the study, and each subject was categorized as experiencing substantial improvement in their depression symptoms or not. (Afterwards, the control group had 1-day session with the dolphins.)

(a) Did this study involve random sampling? Why is it important to know that the subjects were *randomly assigned* to the two groups? Why is it important to know that all other conditions were kept as consistent as possible? Why is it important that all subjects were allowed to swim with dolphins at the conclusion of the study?

The following two-way table summarizes the results of this study:

	Dolphin Therapy	Control Group	Total
Showed substantial improvement	10	3	13
Did not show substantial improvement	5	12	17
Total	15	15	30

(b) What proportion of all subjects showed substantial improvement?

What proportion of subjects in the dolphin therapy group showed substantial improvement?

What proportion of subjects in the control group showed substantial improvement?

(c) Calculate the difference in the conditional proportions of substantial improvement (dolphin – control).

(d) Do the data appear to support the claim that dolphin therapy is more effective than the control program?

(e) Suppose swimming with dolphins is no more effective than swimming alone. What could be another possible explanation for the difference in these two sample proportions?

We must ask the same questions we have asked before – is it *possible* that this difference has arisen by random chance alone if there was no effect of the dolphin therapy? But now *random chance = random assignment to treatment groups*. If so, how surprising would it be to observe such an extreme difference between the two groups?

(f) Explain how we could design a simulation to answer this question.

So under the null hypothesis, we are assuming that there is no difference in the *treatment effect* between the two treatments. In other words, whether or not people improved is not related to which group they are put in. One way to model this situation is by assuming 13 of the 30 people were going to demonstrate substantial improvement regardless of whether they swam with or without dolphins. Then the key question is **how unlikely is it for the random assignment process alone to randomly place 10 or more of these 13 improvers into the dolphin therapy group** (that is, a difference in the conditional proportions that improve of 0.467 or larger)? If the answer is that this observed difference would be very surprising if the dolphin and control therapies were equally effective, then we would have strong evidence to conclude that dolphin therapy *is* more effective than the control treatment.

To model the chance variability inherent in the random assignment process assuming the null hypothesis is true:

- Take a set of 30 poker chips, one for each participant in the study
- Use one color for the 13 improvers
- Use another color for the 17 non-improvers

(g) What colors did you use?

Improvers:

Non-improvers

Place the poker chips in a bag and mix them up. Then blindly pull out 15 poker chips, as if these were the 15 subjects assigned to Dolphin Therapy.

(h) How many improvers did you pull for the dolphin therapy group? How many non-improvers?

So how many improvers does that leave you for the control group?

(i) Complete the following two-way table to show your “could have been” result under the null hypothesis.

Simulation Repetition #1:	Dolphin Therapy	Control Group	Total
Showed substantial improvement			13
Did not show substantial improvement			17
Total	15	15	30

Also calculate the difference in the conditional proportions (dolphin – control) from this first simulated repetition.