Learn By Doing Activity

Scenario: TV Watching and Gender

The purpose of this activity is to give you guided practice in checking whether the conditions that allow us to use the two-sample t-test are met.

Background

A researcher wanted to study whether or not men and women differ in the amount of time they watch TV during a week. In each of the following cases, you'll have to decide whether we can use the two-sample t-test to test this claim or not.

1. A random sample of 40 adults was chosen (22 of whom were women and 18 of whom were men). At the end of the week, each of the 40 subjects reported the total amount of time (in minutes) that he/she watched TV during that week.

Below are two histograms to view the data for men's and women's weekly TV watching time.

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Can we use the two-sample t-test to test this claim?

Your Answer:

I don't think so, because even if it satisfies that both are independently sampled, the sample sizes are too small, and both distributions do not look normally distributed.

Our Answer:

Let's check the two conditions: (i) Since the 40 subjects were chosen at random, we can assume that the two samples are independent. (ii) Since the sample sizes (22 and 18) are not large, for the two-sample t-test to be reliably used the two populations need to be (at least close) to normal. In practice, we check by looking at our two samples using histograms and making sure that we don't see any gross violation of the normality assumption. However, both histograms display clear violations of the normality assumption in the form of extreme skewness and outliers. In conclusion, the two-sample t-test cannot be reliably used.

Resubmit Reset

A random sample of 400 adults was chosen (191 women and 209 men). At the end of the week, each of the 400 subjects reported the total amount of time (in minutes) that he or she watched TV during that week.

Below are the two histograms men's and women's weekly TV watching time for this sample.

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Can we use the two-sample t-test to test this claim?

Your Answer:

Yes, because even if both samples are not perfectly normally distributed, their sample sizes are large enough. They were also both independently sampled.

Our Answer:

(i) Since the 400 subjects were chosen at random, we can assume that the two samples are independent. (ii) Since the sample sizes (191 and 209) are large, we can proceed with the two-sample t-test regardless of whether the populations are normal or not. In conclusion, we can reliably use the two-sample t-test in this case.

Resubmit Reset

A random sample of 25 women and another random sample of 25 men was chosen. At the end of the week, each of the 50 subjects reported the total amount of time (in minutes) that he or she watched TV during that week.

Submit and Compare (1/1 point)

Can we use the two-sample t-test to test this claim?

Your Answer:

I think yes, because they are both roughly normally distributed even though the sample sizes are both less than 30. They were also both independently randomly sampled.

Our Answer:

(i) Since each of the samples is random, we can assume that the samples are independent. (ii) Since the sample sizes (both 25) are not large, for the two-sample t-test to be reliably used the two populations need to be (at least close) to normal. Indeed, when we look at the histograms of the samples, we see no violations of the normality assumption. On the contrary, both histograms have a shape which is close to normal. In conclusion, we can reliably use the two-sample t-test in this case.

Resubmit Reset

A random sample of 50 married couples was chosen, which was split into a sample of 50 men and a sample of 50 women. At the end of the week, each of the 100 subjects reported the total amount of time (in minutes) that he or she watched TV during that week.

Learn By Doing (1/1 point)

Can we use the two-sample t-test to test this claim?

Your Answer:

No, because even though both sample sizes are large enough, these aren't independent samples.

Our Answer:

(i) This is a case where the two samples are not independent. Since each subject in one sample is linked (by marriage) to a subject in the other sample, these samples are dependent. The two-sample t-test is therefore not appropriate in this case.

Resubmit Reset