

Answer on Question #72803 – Math – Statistics and Probability

Question

Come up with a hypothesis about the correlation between college stress and college self-efficacy. Tell me if you think there is a positive, negative, or no correlation between these variables.

Solution

People mainly experience stress when they are not sure of their ability to manage something. Any kind of stress, be it either college stress or other types of stress, is caused by some demands from one's environment. Each demand, which can also be called a stressor, could be evaluated as a "threat" or a "challenge".

Obviously, self-efficacy, which is the way a person feels about his or her competence to handle a task, affects how some stressor is perceived. If one is self-confident enough to think of a given task as of a challenge, he or she is more likely to be persistent and effective in managing the task. Naturally, coping with the stressor excludes getting stressed out.

The other way, college stress can be depressing students' self-efficacy. For example, psychological pressure caused by having multiple tests in a short time can make a person feel uncertain about being able to cope with all the tasks.

Considering the above, higher self-efficacy about college tasks usually lowers their stressfulness and vice versa - stress can lower student's self-efficacy. Thus stress and self-efficacy in college should have a negative correlation.

Considering the received hypothesis to be the object of testing, performing a hypothesis test should include the following steps.

1. State the null and the alternative hypotheses.

The null hypothesis is as follows: correlation between college stress and college self-efficacy is negative. The alternatives are positive correlation or absence of correlation. Since the above problem analysis shows that there is a certain degree of correlation between given items, the alternative hypothesis is: correlation between college stress and college self-efficacy is positive. Formally written, $H_0: r < 0$, $H_A: 0 < r$, where r is some correlation coefficient.

2. Collect the data.

The way to get the needed data is to get a set of college students (preferably 200 or more to increase the accuracy of testing) to rate their confidence in doing tasks related to college. They also rate the stressfulness of the tasks from the same set of tasks. Ratings are done in the same scale (e.g. from 1 to 10).

3. Process the data.

The next operation is calculating the correlation coefficient for datasets: $\{s_1, \dots, s_n\}$ and $\{e_1, \dots, e_n\}$ where s_i and e_i are rates for stressfulness and self-efficacy respectively for i -th task

from the set of n tasks. The common choice for correlation calculus is Pearson correlation coefficient. Applied to collected data, the formula for the coefficient is:

$$r = \frac{\sum_{i=1}^n (s_i - \bar{s})(e_i - \bar{e})}{\sqrt{\sum_{i=1}^n (s_i - \bar{s})^2} \sqrt{\sum_{i=1}^n (e_i - \bar{e})^2}}, \text{ where } \bar{s} = \frac{1}{n} \sum_{i=1}^n s_i, \text{ and analogously for } \bar{e}.$$

4. Analyze the resulting data.

According to r value, we reject or not reject the null hypothesis. We can also evaluate the significance of correlation. The common interpretation of the absolute r value is as follows: 0-0.09 means no correlation; 0.1-0.3 means a low degree of correlation; 0.3-0.6 means a moderate degree of correlation; 0.6-1.0 means a high degree of correlation.

Sources

-research on self-efficacy, stress, and academic success in college:
<http://www.princeton.edu/~tje/files/files/Self%20Efficacy%20and%20Stress%20Zajacova%20Lynch%20Espenshade%20Sept%202005.pdf>

-basic hypothesis test sequence example: <http://support.minitab.com/en-us/minitab-express/1/help-and-how-to/basic-statistics/inference/supporting-topics/basics/example-of-a-hypothesis-test/>

-Wikipedia article on Pearson correlation coefficient:
https://en.wikipedia.org/wiki/Pearson_correlation_coefficient