

Case Study 4

Why are assumptions so important?

In the language of data, assumptions refer to **statistical assumptions**, which are the rules that underlie statistical tests and enable the mathematical equations to calculate a solution or answer accurately. **Assumptions** refer specifically to the data, the variables of interest and the scores or values available for each variable. Assumptions describe the things about the data that must be true in order for the statistical test to work correctly. You can think of assumptions as pre-requisites for using each statistical test. There are usually 3-4 assumptions for each statistical test, and they must all be “true” for the results of the test to be valid.

Case Presentation:

For this case study, read the following abstract and think about the assumptions or prerequisites of the selected statistical tests. What would you assume to be true about the sample of participants?

Background: The purpose of this study was to investigate the effects of aromatherapy on the anxiety, sleep, and blood pressure (BP) of percutaneous coronary intervention (PCI) patients in an intensive care unit (ICU).

Methods: Fifty-six patients with PCI in ICU were evenly allocated to either the aromatherapy or conventional nursing care. Aromatherapy essential oils were blended with lavender, roman chamomile, and neroli in a 6:2:0.5 ratio. Participants received 10 inhalation treatments before PCI, and the same essential oils were inhaled another 10 times after PCI.

Results:

- The aromatherapy group showed significantly lower anxiety ($t = 5.99, p < .001$) and improved sleep quality ($t = -3.65, P = .001$) compared with conventional nursing intervention.
- The systolic BP of both groups did not show a significant difference by time or in a group-by-time interaction; however, a significant difference was observed between groups ($p = .036$).
- The diastolic BP did not show any significant difference by time or by a group-by-time interaction; however, a significant difference was observed between groups ($p = .011$).

Conclusion: The aromatherapy effectively reduced the anxiety levels and increased the sleep quality of PCI patients admitted to the ICU. Aromatherapy may be used as an independent nursing intervention for reducing the anxiety levels and improving the sleep quality of PCI patients.

Discussion 1a:

What type of statistical test do the authors use to compare anxiety?

Answer:

Discussion 1b:

What is a t-test used for?

Answer:

Discussion 1c:

What are the two groups being compared in the t-test?

Answer:

Digging deeper (methods):

The symbol ' t ' is used to describe a t-test and implies that the scores or responses to each of the dependent variables are measured at the interval or ratio level, and are normally distributed. The background and methods sections below are copied from the abstract.

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Discussion 2a:

By reading the background and methods section of the abstract, what are the dependent/outcome variables in this study?

Answer:

Ratio level data are similar to interval level, but the value "zero" has meaning.

- For example, variables like height and weight are ratio variables. The value of 0.0 for height is equal to "no height."

Interval level data includes: SCALES of data in which the values exist on a scale and the degree of difference between items is meaningful and equal across all items, but the ratio of the difference between them is not in relation to an absolute zero.

- For example, the difference between a temperature of 90 degrees and 100 degrees is the same as the difference between 40 degrees and 50 degrees. The "interval" of 10 degrees is the same.
- Temperature is not ratio because the value ZERO does not mean 'there is no temperature.'

Discussion 2b:

Which one of the three dependent variables is typically measured as interval level data?

Answer:

Discussion 2c:

We have established that blood pressure is ratio level data.

The two other dependent variables are anxiety and sleep. Are either of these two variables interval level data?

Answer:

Digging deeper (results):

In the results section below, the authors begin to use a variety of symbols associated with the language of data:

Results: Patients' state anxiety, sleeping quality, and BP. The aromatherapy group showed significantly lower anxiety ($t = 5.99, P < .001$) and improved sleep quality ($t = -3.65, P = .001$) compared with conventional nursing intervention.

- The systolic BP of both groups did not show a significant difference by time or in a group-by-time interaction; however, a significant difference was observed between groups ($p = .036$).
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Discussion 3a:

Which of the abbreviations or symbols used in the results section of the abstract represent a statistical concept?
Which represent a relationship between variables?

Answer:

Discussion 3b:

Which of the probability values above indicate the results were not due to chance?

Answer:

Coming to consensus

The complete abstract is provide below

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Conclusion: The aromatherapy effectively reduced the anxiety levels and increased the sleep quality of PCI patients admitted to the ICU. Aromatherapy may be used as an independent nursing intervention for reducing the anxiety levels and improving the sleep quality of PCI patients.

Discussion 4a:

The conclusion in the abstract states that anxiety was reduced and sleep quality was improved by the intervention. What was the average, mean, or median amount of anxiety and sleep in these subject?

Answer:

Discussion 4b:

If you were to read the full text of the article, what symbol would you look for to find the mean or the average value for anxiety or sleep quality?

Answer:

Discussion 4c:

For the variable “anxiety” the authors report the following statement in the full article: Anxiety prior to aromatherapy from ($\bar{X} = 12.3, SD 4.77$) compared to after aromatherapy ($\bar{X} = 15.7, SD 7.81$) was significantly lower ($t = 5.99, P < .001$).

What do the symbols “ \bar{X} ” and “SD” indicate?

Answer: