PSYC122 – Week 14: Chi-square – Overview of materials and activities

This document provides an overview of the materials and activities we expect you to engage with this week. Some parts should be completed before you attend the lab session (watching lectures, reading chapters, pre-lab activities). All the links to the different materials and activities are also in the 'to-do list' for this week on Moodle. By clicking on the little blue square and arrow symbol ( ) it should open the link in a new window. Lecture slides, R-scripts and any other files you need are in the folder 'Week 14 – files' on Moodle.

Lectures

The lecture material for this week:

1. Associations between categorical variables (~ 23 min; see here: https://web.microsoftstream.com/video/bbf4a074-41b7-493e-b1d2-078fe9c442ab)
2. How to do chi-square in R (~ 19 min; see here: https://web.microsoftstream.com/video/3735ac4c-9ba4-4a88-9acd-f949ebbc14f6)

Reading

The reading that accompanies the topic this week is Chapter 20: Chi-square from the following textbook: Greene, J. and D'Oliveira, M (2006). Learning to Use Statistical Tests in Psychology (3rd Edition). Maidenhead, UK: Open University Press.

This text is available as an e-book in the Lancaster University library through this link: https://onesearch.lancaster-university.uk/permalink/f/q4m1ia/44LAN_ALMA_DS51144300650001221

Prelab activity 1 : Calculating chi-square by hand and interpreting results

Is there a relationship between the number of people that smoke and the number of people that drink? Note 1: The question is the number of people (frequency) and not how much people drink/smoke. Note 2: These are ficticious data. Note 3: A table of critical values can be found in the 'Week 14 – files' folder.

	Smoke	Don't smoke	**Total**
Drink	50	15	**65**
Don't drink	20	25	**45**
Total	**70**	**40**	**110**

Pre-lab activity questions:

a) Complete the Pearson's chi-square test by hand using the data above and fill in the blanks:

First determine expected frequencies:
Smoke/drink: (70 x 65) / 110 = 41.36
Smoke/don't drink (70 x 45) / 110 = 28.63
Don't smoke/drink (40 x 65) / 110 = 23.63
Don't smoke/don't drink (40 x 45) / 110 = 16.36

Then calculate chi-square:
Smoke/drink: (50-41.36)2 / 41.36 = 1.80
Smoke/don't drink: (20-28.63)2 / 28.63 = 2.60
Don't smoke/drink: (15-23.63)2 / 23.63 = 3.15
Don't smoke/don't drink: (25-16.36)2 / 16.36 = 4.56
1.80+2.60+3.15+4.56 = 12.11

χ^2 (1 , *N* = 110) = 12.11 , *p* <.01

b) Can you reject the null hypothesis? **Yes.**

Pre-lab activity 2: Prepare for the lab

To make the lab run more smoothly, please do the following before your lab session:

- Make sure you can access R Studio reliable on your computer (via AppsAnywhere or via mylab.lancaster.ac.uk).
- Download the data files (`fighting_TV.csv and RTA_study1.csv`) and the R-scripts (`stats_chisquare_howToExample.R and 122_wk14_labAct2.R`) from Moodle (Week 14 – files) and put them somewhere you can easily work with.
- Read through lab activities 1 and 2 below.

Pre-lab activity 3 (optional): Working with RStudio

To ensure your learning and understanding of statistics can progress, it is really important you know how to:

- Open RStudio
- Set your working directory
- Load relevant packages with the `library()` function
- Read in a data file to work with

If you don't feel confident doing these things, please have a look at these resources:

A. On preparing for your lab (incl., setting your working directory): https://web.microsoftstream.com/video/5449c71a-7739-425d-a990-2936b7bf6d75?referrer=https:%2F%2Fmodules.lancaster.ac.uk%2Fmod%2Fchecklist%2Fview.php%3Fid%3D1477620

B. For the very basics about RStudio: https://moderndive.netlify.app/1-getting-started.html (particularly, sections 1.1, 1.2 and 1.3).

C. A bit more on RStudio: https://swcarpentry.github.io/r-novice-gapminder/01-rstudio-intro/index.html

Lab activities

In this lab, you'll gain understanding of and practice with:
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- conducting Pearson's chi-square in R
- interpreting Pearson's chi-square in R
- reporting the results in APA format
- when and why to apply Pearson's chi-square to answer questions in psychological science

Lab activity 1: Understanding the application of chi-square tests

1. How does Pearson's chi-square differ from Pearson's correlation?
   Pearson's chi-square assesses whether there is a relationship between categorical (or nominal) variables. Pearson's correlation assesses whether there is a relationship between continuous (or interval/ratio) variables.

2. Chi-square test of independence would be appropriate when testing the following questions:
   a. What is the relationship between gender and soft drink preference?
      True / False
   b. How do males and females compare in terms of wanting to be a psychologist when they leave school?
      True / False

3. Write the chi-square formula below.

***χ2* = (O-E)^2 / E**

4. What were your answers to the pre-lab activity 1 questions? Please compare them with other students in your group. **See under 'Pre-lab activity 1' for the answers.**
   a. Complete the Pearson's chi-square test by hand using the data above and fill in the blanks:

   χ^2 (, N =) = , p

   b. Can you reject the null hypothesis?

5. Why is it recommended to opt for multiple 2 x 2 chi-squares instead of chi-squares larger than 2 x 2?
   Easier to interpret and require smaller sample size.

6. How could you 'modify' the contingency table below for chi-square analysis to aid subsequent interpretation of the data/results?

	Interest in Engineering		
	Interested	Somewhat Interested	Not interested
Male	8	12	10

Female	6	6	22

By combining 'interested' and 'somewhat interested' or by partitioning (doing multiple 2 x 2 chi-squares, while using Bonferroni correction to account for running multiple tests.

Lab activity 2: Reminders through association

For this lab, we're going to use data from Rogers, T. & Milkman, K. L. (2016). Reminders through association. Psychological Science, 27, 973-986. You can read the full paper online but the short version is that the authors looked at how people remember to follow through with the intention of doing something. Although there are lots of potential reasons (e.g., some people may lack the self-control resources), Rogers and Milkman (2016) propose that some people fail to follow through simply because they forget about their good intentions. If this is the case, the authors argue, then having visual reminders to follow through on their intentions may help people remember to keep them. For example, a person may choose to put a sticker for their gym on their car window, so that every time they get in the car they remember to go to the gym.

In Study 1, participants took part in an unrelated experiment but at the start of the task they were asked to return a small stack of paper clips to the reception of the building at the end of the study and if they did so the researchers would donate $1 to a charity. They were then asked if they intended to do this. Those in the reminder-through-association (RTA) condition read "Thank you! To remind you to pick up a paper clip, an elephant statuette will be sitting on the counter as you collect your payment." This message was followed by a picture of the elephant statuette. Those in the control condition simply read "Thank you!".

What we want to do is to run a chi-square analysis to determine whether those in the RTA condition were more likely to remember to return the paper-clips than those in the control condition. Open the '`122_wk14_labAct2.R`' script in RStudio and work your way through it.

See for the answers the script '122_wk14_labAct2_withAnswers.R'