ICCPP-STATISTICS

- McNemar Test

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Quinn McNemar (1901-1986)

McNemar Test

Definition

- The McNemar test is a non-parametric test for paired nominal data.
- Linear regression is a linear approach to modelling the relationship between a scalar response and one or more explanatory variables.

Formula

$$\chi^2 = \frac{(b-c)^2}{b+c}$$

- If the sum of cell c and b is sufficiently large, the χ 2 value follows a chi-squared distribution with one degree of freedom.

Use

- It's used when you are interested in finding a change in proportion for the paired data.
- It could also be used to analyze an experiment where two treatments are given to matched pairs. This test is sometimes referred to as McNemar's Chi-Square test because the test statistic has a chi-square distribution.

Assumptions

The three main assumptions for the test are:

- You must have one nominal variable with two categories (i.e. dichotomous variables) and one independent variable with two connected groups.

Assumptions

- The two groups in your the dependent variable must be mutually exclusive. In other words, participants cannot appear in more than one group.
- Your sample must be a random sample.

Calculating the Test

- In order to run a McNemar test, your data should be placed into a 2×2 contingency table, with the cell frequencies equaling the number of pairs.
- For example, a researcher is testing a new medication and records if the drug worked (“yes”) or did not (“no”).

Calculating the Test

- A table is set up with the count of individuals before and after being given the medication. The cell labels a-d are in blue:

		Drug 1				
		No		Yes		
Drug 2	No	80	a	100	b	180
	Yes	10	c	110	d	120
		90		210		300

Calculating the Test

- Cells b and c are used to calculate the test statistic; these cells are called "discordant."
- The McNemar test formula is:

$$\chi^2 = \frac{(b-c)^2}{b+c}$$

Calculating the Test

- For the set of data above, we have

$$= (100\text{-}10)^2 / (100 + 10)$$

$$= 90^2 / 110$$

$$= 73.63$$

Calculating the Test

- You have several options for calculating the McNemar test using technology, including:
- This online calculator will calculate the McNemar test using inputs for any 2×2 contingency table that you provide input for.
- SPSS: The binomial distribution is used for the McNemar test. You can find excellent instructions here on the SFU website.

References

McNemar, Quinn (June 18, 1947). "Note on the sampling error of the difference between correlated proportions or percentages". Psychometrika. 12 (2): 153–157. doi:10.1007/BF02295996. PMID 20254758.

Spielman RS; McGinnis RE; Ewens WJ (Mar 1993). "Transmission test for linkage disequilibrium: the insulin gene region and insulin-dependent diabetes mellitus (IDDM)". Am J Hum Genet. 52 (3): 506–16. PMC 1682161. PMID 8447318.

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