



McNemar's Test

1) Introduction

The McNemar test is used to determine if there are differences on a dichotomous dependent variable between two related groups. A dichotomous variable is a categorical variables with two categories only. It can be considered to be similar to the paired-samples t-test, but for a dichotomous rather than a continuous dependent variable.

2) Presentation of the Data and Research Question

A researcher wants to investigate the impact of an intervention on smoking. In this hypothetical study, 50 participants were recruited to take part, consisting of 25 smokers and 25 non-smokers. All participants watched an emotive video showing the impact that deaths from smoking-related cancers had on families. Two weeks after this video intervention, the same participants were asked whether they remained smokers or non-smokers.

Individual scores for each participant

	Before	After	var
1	Non-Smoker	Non-Smoker	
2	Non-Smoker	Non-Smoker	
3	Non-Smoker	Non-Smoker	
4	Non-Smoker	Non-Smoker	
5	Non-Smoker	Non-Smoker	
6	Non-Smoker	Non-Smoker	
7	Non-Smoker	Non-Smoker	
8	Non-Smoker	Non-Smoker	
9	Non-Smoker	Non-Smoker	
10	Non-Smoker	Non-Smoker	
11	Non-Smoker	Non-Smoker	
12	Non-Smoker	Non-Smoker	
13	Non-Smoker	Non-Smoker	
14	Non-Smoker	Non-Smoker	
15	Non-Smoker	Non-Smoker	
16	Non-Smoker	Non-Smoker	

Total count data (frequencies)

	Before	After	Freq
1	Non-Smoker	Non-Smoker	20
2	Non-Smoker	Smoker	5
3	Smoker	Non-Smoker	16
4	Smoker	Smoker	9
5			
6			
7			
8			
9			
10			

Figure 1. Presentation of the data.

3) Assumptions

The McNemar test has three assumptions that have to be met before running the test:

- **Assumption 1:** You have **one categorical dependent variable with two categories** (i.e., a dichotomous variable) and one **categorical independent variable with two related groups**.
- **Assumption 2:** The two groups of your dependent variable must be **mutually exclusive**. This means that no groups can overlap: a participant can only be in one of the two groups!
- **Assumption 3:** The cases (e.g., participants) are a random sample from the population of interest.

4) Procedure on SPSS

The three steps below show you how to analyze your data using a McNemar's test in SPSS Statistics. Click **Analyze > Nonparametric Tests > Legacy Dialogs > 2 Related Samples...** on the main menu (as shown below).

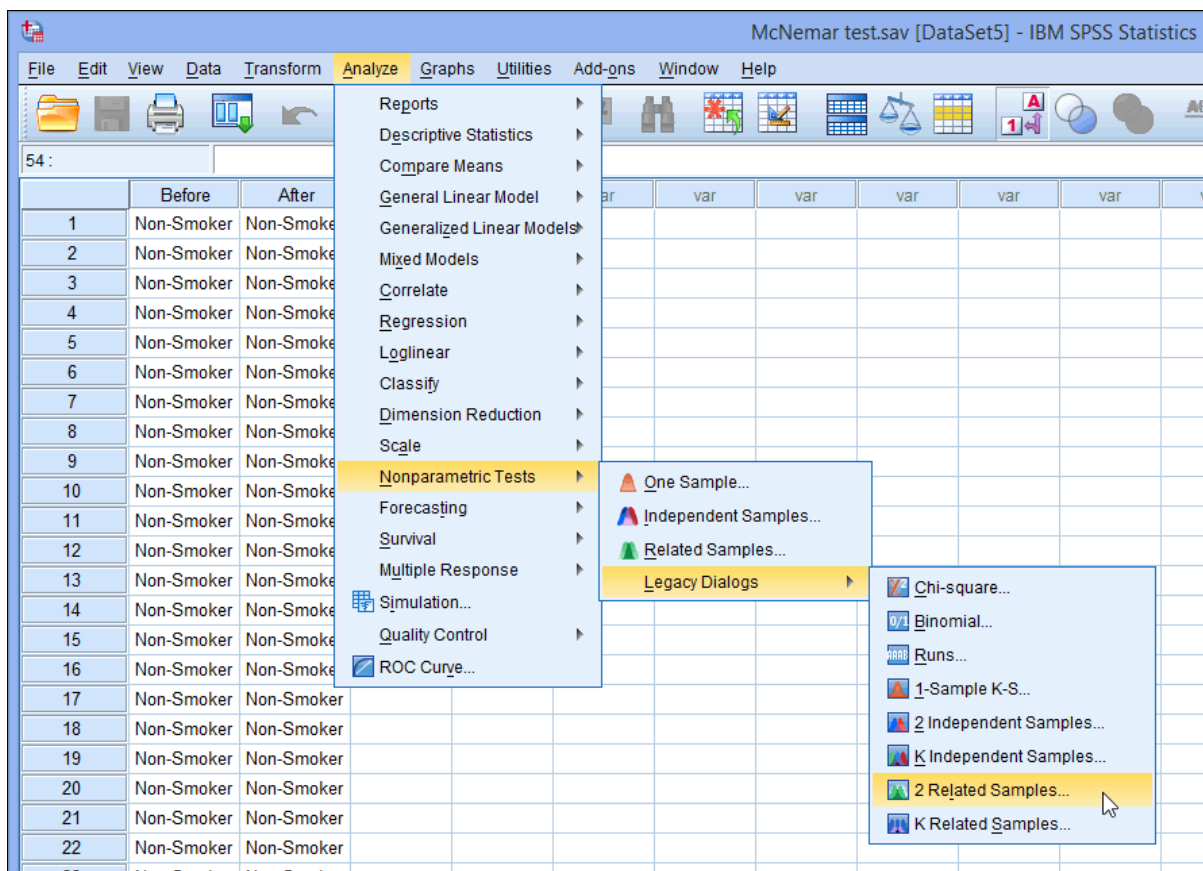


Figure 2. Selecting McNemar's test.

You will be presented with the Two-Related-Samples Tests dialogue box. Transfer the variables "Before" and "After" into the "Test Pairs: " box. Instead of "Wilcoxon", tick "McNemar" in the "Test Type" box.

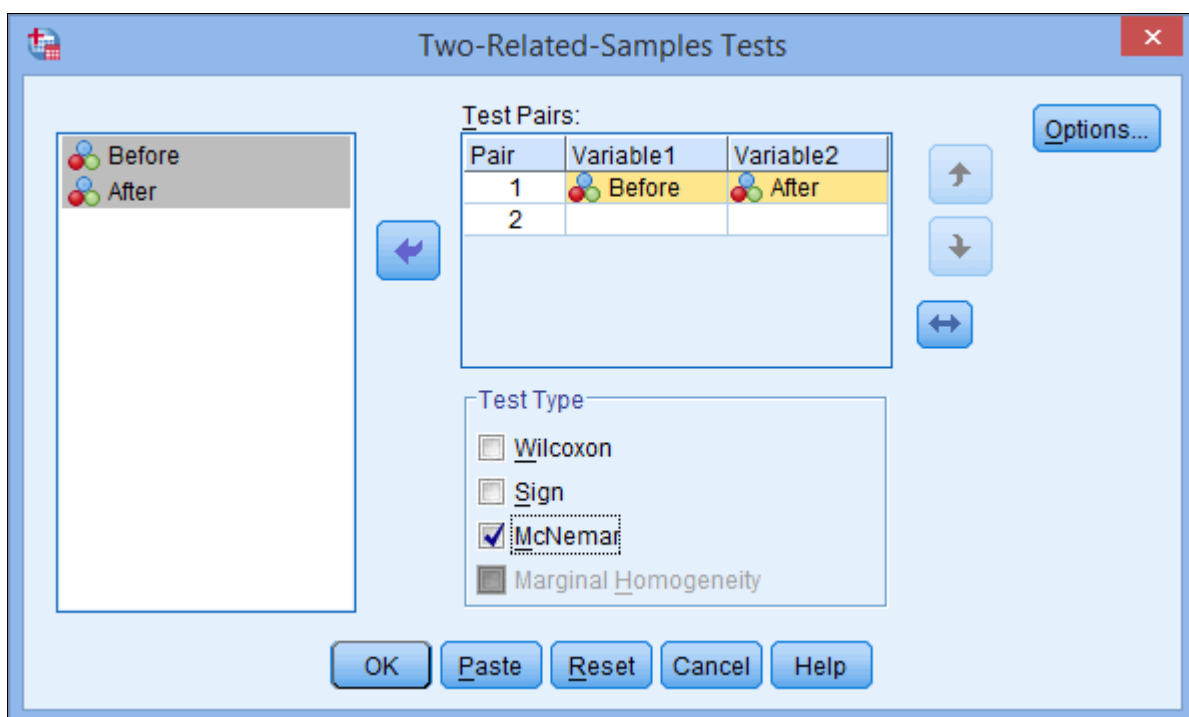
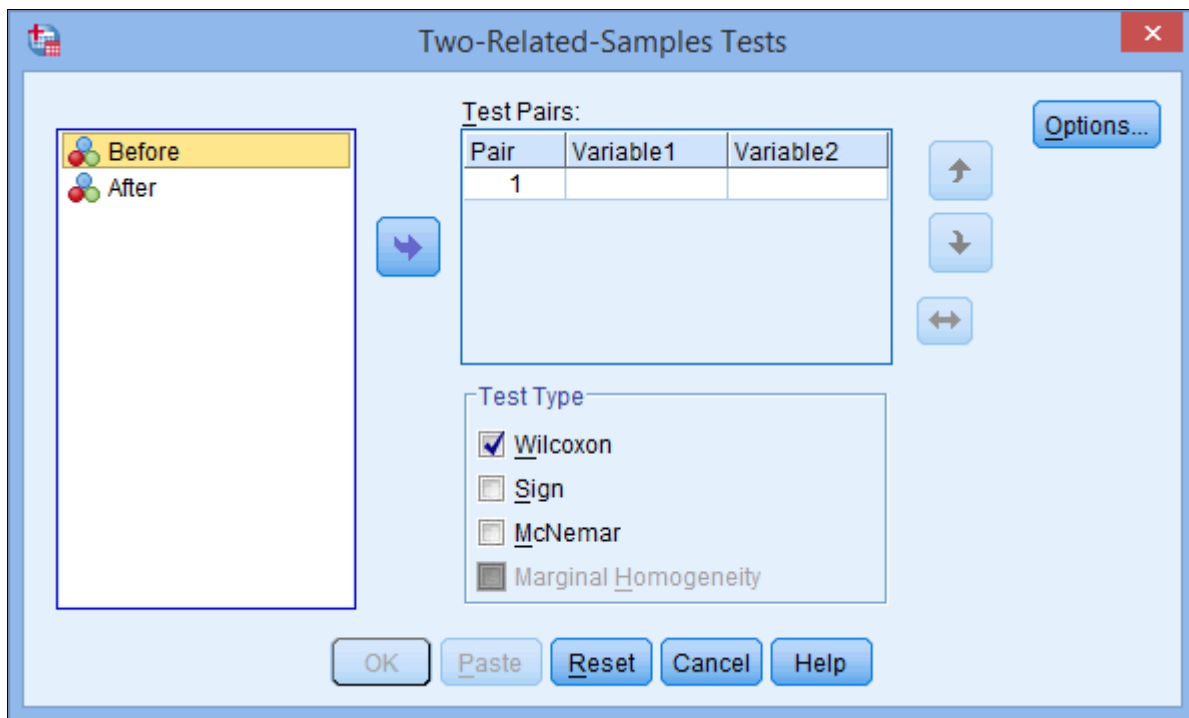


Figure 3. Setting the McNemar's test.

5) Results

It is important when reporting a McNemar's test result that you also interpret and report descriptive statistics in order to get an appropriate description of our data. One important measure that we can report is the proportion of participants that were non-smokers both prior to and after the intervention. This is illustrated in the results generated in the **Crosstabulation** table (called the **Before & After** table in our example), as shown below:

Before & After

Before	After	
	Non-Smoker	Smoker
Non-Smoker	20	5
Smoker	16	9

If the statistical significance level (i.e., p -value) is less than 0.05 (i.e., $p < 0.05$), you have a statistically significant result and the proportion of non-smokers before and after the intervention is statistically significantly different. Alternatively, if $p > 0.05$, you do not have a statistically significant result and the proportion of non-smokers before and after the intervention is not statistically significantly different (i.e., the proportion of non-smokers does not change over the course of the intervention). In our example, $p = 0.027$ (using the exact p -value), which means that the proportion of non-smokers is statistically significantly different after the intervention as compared to before. Put another way, the change in the proportion of non-smokers following the intervention was statistically significant.

Test Statistics^a

	Before & After
N	50
Exact Sig. (2-tailed)	.027 ^b

a. McNemar Test

b. Binomial distribution used.