

# HSCC 470

## Research Methods and Data Analysis in Health Sciences

### Using SPSS: The McNemar Test

HSCC 470 Using SPSS: McNemar's Test

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## Unit Objectives

**Upon completion of this unit, the student will be able to:**

- List the assumptions of the McNemar test.
- Describe when the McNemar test is appropriate for testing a hypothesis.
- Use SPSS to conduct a McNemar test and correctly interpret the output.

HSCC 470 Using SPSS: McNemar's Test

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# Statistical Methods to Test Hypotheses

Scale of Measurement	Two Treatment Groups Consisting of Different Individuals	Three or More Treatment Groups Consisting of Different Individuals	Before and After a Single Treatment in the Same Individuals	Association Between Two Variables
Interval	Unpaired <i>t</i> test	ANOVA	Paired <i>t</i> test	Linear Regression and Pearson Correlation
Nominal	Chi-square	Chi-square	McNemar's test	Contingency Coefficients
Ordinal	Mann-Whitney rank-sum test	Kruskal-Wallis statistic	Wilcoxon signed-rank test	Spearman Rank Correlation



## Assumptions of the McNemar Test

- Comparing frequencies or proportions
- Data measured on nominal level
- 1 group being compared before and after a treatment or intervention
- The groups (before and after) are the same individuals and therefore are dependent
- May be used as a measure of inter-rater agreement of scoring the same individuals
- Data need not be drawn from a normally distributed population



## Examples of McNemar's Test

- **2 X 2 contingency tables**
- **Inter-rater agreement on ACLS Megacode**

	Pass	Fail
Examiner 1	24	12
Examiner 2	20	16



## Examples of McNemar's Test

- **2 X 2 contingency tables**
- **Before and after test in the same individuals**
- **Analogous to paired t test, but used for nominal level data**

	Pass	Fail
Pretest	24	12
Post-test	20	16



## Conducting McNemar's Test Using SPSS continued

- **Assumptions**
  - Scale of measurement
    - Nominal
  - Population distribution
    - Any distribution
  - Method of sampling
    - Randomized, 1 dependent sample



## Conducting McNemar's Test Using SPSS continued

- **Hypotheses**
  - Null
    - There is no difference in the pass rates on the NREMT-P practical exam between two evaluators evaluating the same registry candidates
  - Alternative
    - There is a difference in the pass rates on the NREMT-P practical exam between two evaluators evaluating the same registry candidates
  - Select Alpha Level
  - Alpha = 0.05
- **Test statistic**
  - McNemar



# Conducting McNemar's Test Using SPSS continued

- *P*-value
- Conclusion



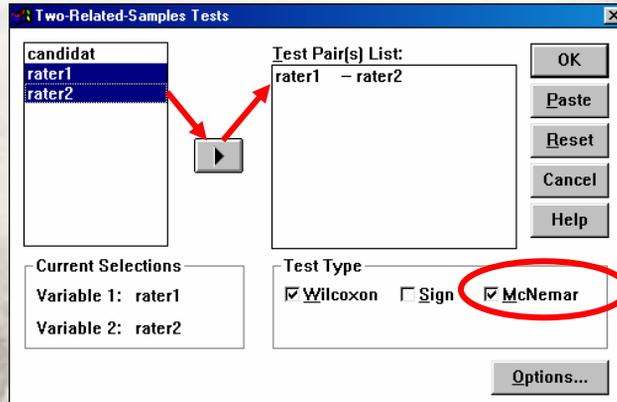
# Conducting McNemar's Test Using SPSS

The screenshot shows the SPSS for Windows interface. The 'Statistics' menu is open, and the 'Nonparametric Tests' sub-menu is selected. Within this sub-menu, '2 Related Samples...' is highlighted. The background shows a data editor window with a table containing 10 rows and 2 columns labeled 'candidate' and 'var'.

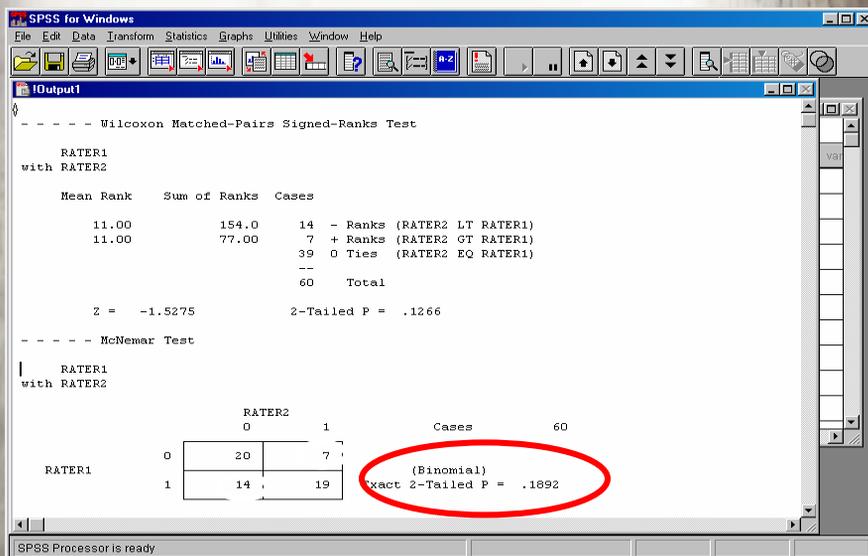
	candidate	var
1	1	
2	2	
3	3	
4	4	1 1
5	5	0 1
6	6	1 1
7	7	0 0
8	8	1 1
9	9	0 0
10	10	1 1



# Conducting McNemar's Test Using SPSS continued



# Conducting McNemar's Test Using SPSS continued



## Conducting McNemar's Test Using SPSS continued

- ***P*-value**
  - $P = 0.1892$
- **Conclusion**
  - *P* value is greater than alpha. Therefore, we cannot reject the null hypothesis and conclude that there is no difference in the pass rates on the NREMT-P practical exam between two evaluators evaluating the same registry candidates



## Conducting McNemar's Test Using SPSS continued

- **Hypotheses**
  - Null
    - There is no difference in the proportion of paramedics favoring an AAS degree requirement before and after receiving their degree.
  - Alternative
    - There is a difference in the proportion of paramedics favoring an AAS degree requirement before and after receiving their degree.
  - Select Alpha Level
  - Alpha = 0.05
- **Test statistic**
  - McNemar



# Conducting McNemar's Test Using SPSS continued

- *P*-value
- Conclusion



# Conducting McNemar's Test Using SPSS continued

The screenshot shows the SPSS for Windows interface. The 'Statistics' menu is open, and the 'Nonparametric Tests' sub-menu is selected. The '2 Related Samples...' option is highlighted. In the background, a data editor window is visible with a table containing two columns: 'before' and 'after'. The data rows are as follows:

	before	after
1	0	0
2	1	1
3	1	0
4	1	1
5	0	1
6	0	1
7	0	0
8	1	0
9	0	0
10	1	1



# Conducting McNemar's Test Using SPSS continued

SPSS for Windows

File Edit Data Transform Statistics Graphs Utilities Window Help

Output1

```
----- Wilcoxon Matched-Pairs Signed-Ranks Test
1:at
  AFTER
with BEFORE
1
  Mean Rank    Sum of Ranks  Cases
2
  19.00        513.0      27 - Ranks (BEFORE LT AFTER)
3
  19.00        190.0      10 + Ranks (BEFORE GT AFTER)
4
  23 0 Ties (BEFORE EQ AFTER)
5
  60 Total
6
  Z = -2.7948      2-Tailed P = .0052
7
----- McNemar Test
8
  AFTER
with BEFORE
9
10
          BEFORE
          0      1      Cases
AFTER  0      13      27      Chi-Square = 6.9189
       1      27      10      Significance = .0085
SPSS Processor is ready
```

# Conducting McNemar's Test Using SPSS continued

- ***P*-value**
  - $P = 0.0085$
- **Conclusion**
  - $P$  value is less than alpha. Therefore, we reject the null hypothesis and conclude that there is a difference in the proportion of paramedics favoring an AAS degree requirement before and after receiving their degree.

