HSCC 470
Research Methods and Data Analysis in Health Sciences

Using SPSS: The Wilcoxon Signed Rank Test

Unit Objectives

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

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

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 ***t*** test	ANOVA	Paired ***t*** 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 Wilcoxon Signed Rank Test

- **Ranked data**
- **Data measured on an ordinal level**
- **Only 2 groups are being compared**
- **The groups are dependent**
- **Data need not be drawn from a normally distributed population**
- **Comparing ranks**
- **May be used on interval level data when assumptions of paired *t* test have been violated (e.g., data are not normally distributed)**

Examples of the Wilcoxon Signed Rank Test

– Test for differences in paired (dependent) samples measured on an interval scale when normality assumption is violated

Daily Urine Production (ml/day)				Rank of	Signed Rank
Patient #	Before Drug	After Drug	Difference	Difference	Difference
1	1600	1490	-110	5	-5
2	1850	1300	-550	6	-6
3	1300	1400	100	4	+4
4	1500	1410	-90	3	-3
5	1400	1350	-50	2	-2
6	1010	1000	-10	1	-1

Examples of the Wilcoxon Signed Rank Test continued

- **Test for differences in paired (dependent) samples when data are ordinal level**
  – Would you be willing to perform CPR on a total stranger?

1	2	3	4
Never	Possibly	Probably	Always

Willingness to Perform CPR				Rank of	Signed Rank
Respondent #	Before Video	After Video	Difference	Difference	Difference
1	2	3	1	2	+2
2	3	3	0	1	+1
3	1	4	3	4	+4

Conducting a Wilcoxon Signed Rank Test Using SPSS

- **Assumptions**
  - Scale of measurement
    - Ordinal or higher
  - Population distribution
    - Any distribution
  - Method of sampling
    - Randomized, 2 dependent samples
  - Sample size
    - Before N = 50
    - After N = 50
    - (same individuals)

Conducting a Wilcoxon Signed Rank Test Using SPSS

- **To what extent do you agree with the following statement?**
  - In terms of mastery of content, on-line learning is equivalent to traditional classroom learning.

1	2	3	4
Strongly Agree	Agree	Disagree	Strongly Disagree

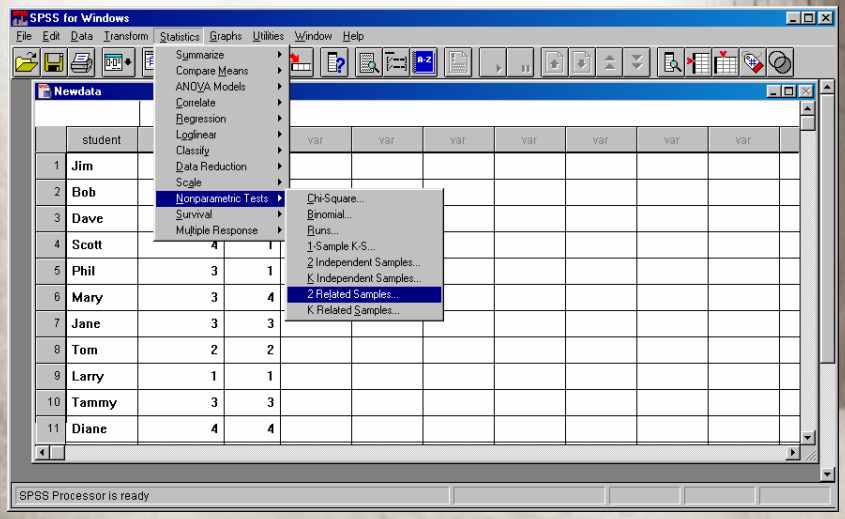
Conducting a Wilcoxon Signed Rank Test Using SPSS

- **Hypotheses**
  - Null
    - There is no difference in paramedics' attitude toward on-line learning before and after taking an on-line course.
  - Alternative
    - There is a difference in paramedics' attitude toward on-line learning before and after taking an on-line course.
  - Alpha = 0.05
- **Test statistic**
  - Wilcoxon signed rank test

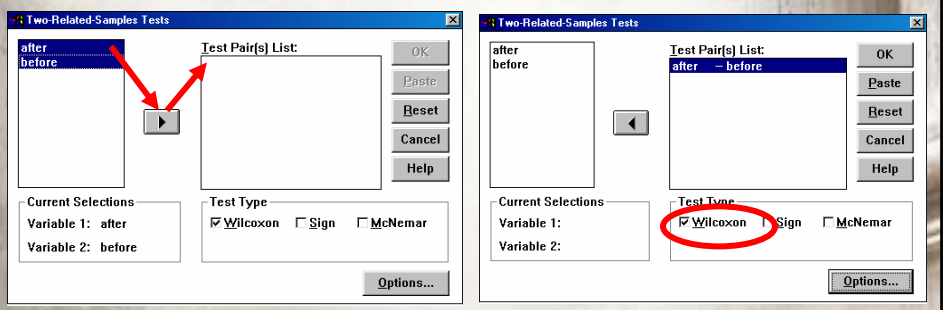
Conducting a Wilcoxon Signed Rank Test Using SPSS

- ***P*-value**
- **Conclusion**

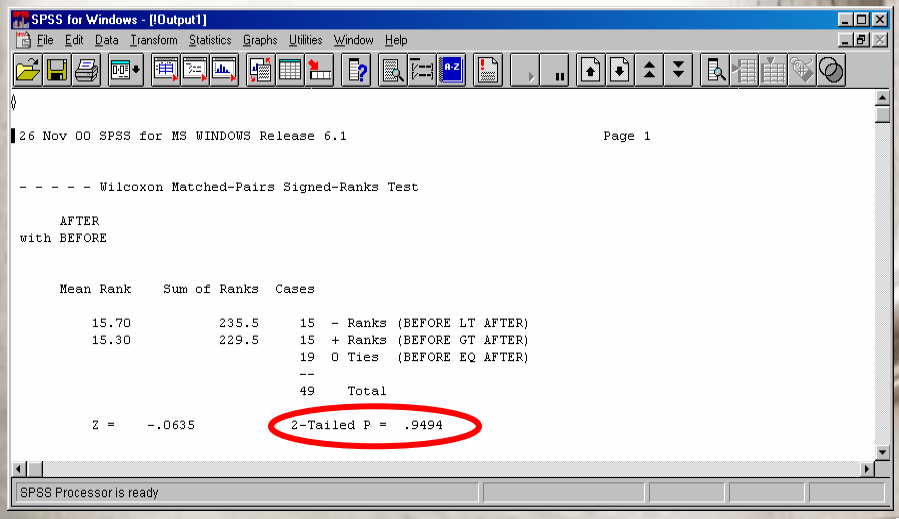
Conducting a Wilcoxon Signed Rank Test Using SPSS



Conducting a Wilcoxon Signed Rank Test Using SPSS



Conducting a Wilcoxon Signed Rank Test Using SPSS



Conducting a Wilcoxon Signed Rank Test Using SPSS

- ***P*-value**
  - ***P*** = 0.9494
- **Conclusion**
  - ***P*** value is greater than alpha. Therefore, we cannot reject the null hypothesis and conclude that there is not a difference in paramedics' attitudes towards on-line learning before and after taking an on-line course.