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# N 536 - Utilization of Nursing Research in Advanced Practice, Summer 2008

Tzeng, Huey-Ming

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### Handout: Summary of Statistical Tests

Source: Polit, D. F. (1996). *Data analysis & statistics: For nursing research*. Stamford, Connecticut: Appleton & Lange.

#### A. Parametrical statistical tests

Name (Test Statistic)	Purpose	Measurement Level *		Corresponding Index of Strength of Relationship
		IV	DV	
One-sample <i>t</i> -test ( <i>t</i> ) (rarely used)	To test the predicted value of a man for a population	–	I, R	–
<i>t</i> -test for independent groups ( <i>t</i> ), also called independent <i>t</i> -test	To test the difference between the means of 2 independent groups	N	I, R	point-biserial <i>r</i> (rarely used)
<i>t</i> -test for dependent groups ( <i>t</i> ), also called paired <i>t</i> -test	To test the difference between the means of 2 related groups/sets of scores	N	I, R	point-biserial <i>r</i> (rarely used)
Analysis of variance/ANOVA ( <i>F</i> )	To test the difference among the means of 3 or more independent groups (one-way) or groups for 2 or more IVs (multi-way)	N	I, R	eta <sup>2</sup> (rarely used)
Repeated measures ANOVA/RANOVA ( <i>F</i> )	To test the difference among means of 3 or more related groups/sets of scores	N	I, R	eta <sup>2</sup> (rarely used)
Pearson product moment correlation ( <i>r</i> )	To test the existence of a relationship or correlation between two variables	I, R	I, R	<i>r</i> <sup>2</sup>

Note. \* Measurement level of Independent Variable (IV) and Dependent Variable (DV):  
N = Nominal, I = Interval, R = Ratio.

**B. Non-parametrical statistical tests**

Name (Test Statistic)	Purpose	Measurement Level *		Corresponding Index of Strength of Relationship
		IV	DV	
Chi-square goodness-of-fit test ( $\chi^2$ )	To test the predicted value of a proportion for a population	-	N	-
Chi-square test of independence ( $\chi^2$ )	To test the difference in proportion in 2 or more independent groups	N	N	Phi (2 X 2) Cramer's <i>V</i>
Fisher's exact test	To test the difference in proportions (2 X 2 table) when expected frequency for a cell < 5	N	N	phi
McNemar test ( $\chi^2$ )	To test the difference in proportions for 2 related groups (2 X 2 design)	N	N	phi
Cochran's <i>Q</i> test ( <i>Q</i> )	To test the difference in proportions for 3 or more related groups	N	N	-
Mann-Whitney <i>U</i> -test ( <i>U</i> )	To test the difference in the ranks of scores of 2 independent groups	N	O	Glass rank biserial correlation
Kruskal-Wallis test ( <i>H</i> )	To test the difference in the ranks of scores of 3 or more related groups	N	O	Epsilon <sup>2</sup>
Wilcoxon signed ranks test ( <i>T</i> or <i>z</i> )	To test the difference in the ranks of scores of 2 related groups	N	O	Matched pairs ranked biserial correlation
Friedman test ( $\chi^2$ )	To test the difference in the ranks of scores of 3 or more related groups	N	O	Epsilon <sup>2</sup>
Spearman's rank order correlation ( $r_s$ )	To test the existence of a correlation between two variables	O	O	( $r_s$ )
Kendall's tau ( $\tau$ )	To test the existence of a correlation between two variables	O	O	( $\tau$ )

**C. Multivariate statistical analyses**

Name	Purpose	Measurement Level *			Number of--		
		IV	DV	Cov	IVs	DVs	Cov
Multiple correlation/regression	To test the relationship between 2 or more IVs and 1 DV; to predict a DV from 2 or more IVs	N, I, R	I, R	–	2+	1	–
Analysis of covariance (ANCOVA)	To test the difference between the means of 2 or more groups, while controlling for 1 or more covariate	N	I, R	N, I, R	1+	1	1+
Multivariate analysis of variance (MANOVA)	To test the difference between the means of 2 or more groups for 2 or more DVs simultaneously	N	I, R	–	1+	2+	–
Multivariate analysis of covariance (MANCOVA)	To test the difference between the means of 2 or more groups for 2 or more DVs simultaneously, while controlling for 1+ covariate	N	I, R	N, I, R	1+	2+	1+
Canonical analysis	To test the relationship between 2 sets of variables (variables on the right, variables on the left)	N, I, R	N, I, R	–	2+	2+	–
Factor analysis	To determine the dimensionality/structure of a set of variables	–	–	–	–	–	–
Discriminant analysis	To test the relationship between 2 or more IVs and 1 DV. To predict group membership; to classify cases into groups.	N, I, R	N	–	2+	1	–
Logistic regression	To test the relationship between 2 or more IVs and 1 DV. To predict the probability of an event; to estimate relative risk.	N, I, R	N	–	2+	1	–

Note. \* Measurement level of the independent (IV), dependent variable, (DV), and covariates (Cov): N = Nominal, I = Interval, R = Ratio.

## Selected Statistical Symbols

Note. This list contains some commonly used symbols in statistics, in approximate alphabetical order, with English and Greek letters intermixed. Non-letter symbols are placed at the end.

Symbol	Meaning
a	Regression constant, the intercept
$\alpha$	Greek alpha; significance level in hypothesis testing, probability of Type I error
b	Regression coefficient, slope of the line
$\beta$	Greek beta, probability of a Type II error; also, a standardized regression coefficient (beta weights)
$\chi^2$	Greek chi squared, a test statistic for several nonparametric tests
CI	Confidence interval around estimate of a population parameter
df	Degrees of freedom
e	Base of natural logarithms, $e = 2.7183$
$\eta^2$	Greek eta squared, index of variance accounted for in ANOVA context
f	Frequency (count) for a score value
F	Test statistic used in ANOVA, ANCOVA and other tests
$\gamma$	Greek gamma, population effect size
$H_0$	Null hypothesis
$H_1$	Alternative hypothesis; research hypothesis
$\lambda$	Greek lambda, a test statistic used in several multivariate analyses (Wilks' lambda)
$\mu$	Greek mu, the population mean
M	Sample mean (alternative symbol for $\bar{x}$ )
MS	Mean square, variance estimate in ANOVA
n	Number of cases in a subgroup of the sample
N	Total number of cases or sample members
p	Probability that observed data are consistent with null hypothesis
r	Sample Pearson product-moment correlation coefficient
$r_s$	Spearman's rank order correlation coefficient
R	Multiple correlation coefficient
$R^2$	Coefficient of determination. Proportion of variance in Y attributable to Xs
$R_c$	Canonical correlation coefficient
$\rho$	Greek rho, population correlation coefficient
SD	Sample standard deviation
SEM	Standard error of the mean
$\sigma$	Greek sigma (lower case), population standard deviation
$\Sigma$	Greek sigma (upper case), sum of
SS	Sum of squares
t	Student's t, a test statistic
U	Test statistic for the Mann-Whitney U-test
Y	Predicted value of Y, dependent variable in regression analysis