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Handout: Summary of Statistical Tests

<u>Source:</u> 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
		<u>IV</u>	<u>DV</u>	
One-sample *t*-test (*t*) (rarely used)	To test the predicted value of a man for a population	_	I, R	_
t-test for independent groups (*t*), also called independent *t*-test	To test the difference between the means of 2 independent groups	N	I, R	point-biserial *r* (rarely used)
t-test for dependent groups (*t*), also called paired *t*-test	To test the difference between the means of 2 related groups/sets of scores	N	I, R	point-biserial *r* (rarely used)
Analysis of variance/ANOVA (*F*)	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	eta² (rarely used)
Repeated measures ANOVA/RANOVA (*F*)	To test the difference among means of 3 or more related groups/sets of scores	N	I, R	eta² (rarely used)
Pearson product moment correlation (*r*)	To test the existence of a relationship or correlation between two variables	I, R	I, R	r^2

<u>Note.</u> * 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 * IV	DV	Corresponding Index of Strength of Relationship
Chi-square goodness-of-fit test (χ^2)	To test the predicted value of a proportion for a population	-	N	_
Chi-square test of independence (χ^2)	To test the difference in proportion in 2 or more independent groups	N	N	Phi (2 X 2) Cramer's V
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 (χ^2)	To test the difference in proportions for 2 related groups (2 X 2 design)	N	N	phi
Cochran's Q test (Q)	To test the difference in proportions for 3 or more related groups	N	N	_
Mann-Whitney U-test (U)	To test the difference in the ranks of scores of 2 independent groups	N	O	Glass rank biseral correlation
Kruskal-Wallis test (H)	To test the difference in the ranks of scores of 3 or more related groups	N	O	Epsilon²
Wilcoxon signed ranks test (T or z)	To test the difference in the ranks of scores of 2 related groups	N	O	Matched pairs ranked biseral correlation
Friedman test (χ^2)	To test the difference in the ranks of scores of 3 or more related groups	N	O	Epsilon²
Spearman's rank order correlation (r_ς)	To test the existence of a correlation between two variables	O	O	(r_ς)
Kendall's tau (τ)	To test the existence of a correlation between two variables	O	O	(τ)

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 ormore 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
α	Greek alpha; significance level in hypothesis testing, probability of Type 1 error
b	Regression coefficient, slope of the line
β	Greek beta, probability of a Type II error; also, a standardized regression coefficient (beta weights)
x^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
n^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
γ	Greek gamma, population effect size
H_0	Null hypothesis
H_1	Alternative hypothesis; research hypothesis
λ	Greek lambda, a test statistic used in several multivariate analyses (Wilks' lambda)
μ	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
ρ	Greek rho. population correlation coefficient
SD	Sample standard deviation
SEM	Standard error of the mean
σ	Greek sigma (lower case), population standard deviation
Σ	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