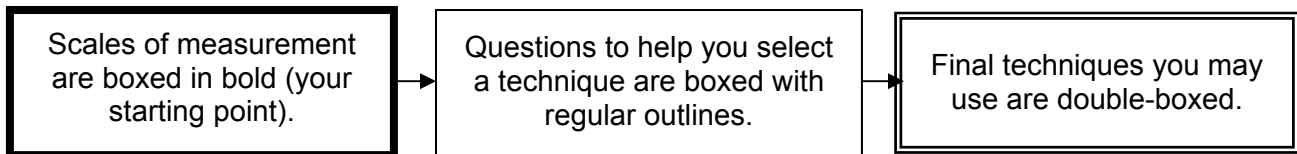# Statistics Decision Aids

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Description and Use

I used Microsoft Visio™ to display my ideas as PDF reference tools for students learning statistics. The first is a matrix that allows students to determine how scales of measurement determine what descriptive techniques are appropriate. The second is a set of tree diagrams that allows students to determine how scales of measurement and, where applicable, relevant design features determine what inferential techniques are appropriate. To make navigating through the inferential trees easier, I coded the different levels of information with different box outlines:

Scales of measurement are boxed in bold (your starting point).	Questions to help you select a technique are boxed with regular outlines.	Final techniques you may use are double-boxed.

I print the two charts (double-sided) on one sheet of colored paper (to make it harder to misplace), then get them laminated and three-hole punched for the students. I tell the students that this handout summarizes the entire semester's techniques and strongly encourage them to keep the sheet for reference when they are in the Research Methods class (for which Statistics is a prerequisite) and future use.

Students receive these on the first day of class along with the syllabus. This allows me to share with them about the importance of scales of measurement (which we do not cover on the first day, yet cover very early in the semester) and how they will need to know that material for the entire course.

As we move through topics in the semester, I point out to students where we are on the charts and encourage them to refer to the charts as a study aid. Use during tests is not allowed, however.

My tool has become so popular that colleagues teaching Research Methods and Advanced Research Methods have asked for copies to give to students who either misplaced their copy or never got one because they did not take my Statistics course.

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Descriptive Statistics

Selection

Type of Description	Scale of Measurement		
	Nominal	Ordinal	Interval/Ratio
central tendency	**mode**	**mode, median**	**mode, median, mean**
variability	not applicable	**range, semi-interquartile range**	**range, semi-interquartile range, standard deviation, variance**
relationship	**Cramer's V** (for two dichotomous variables*) or **tetrachoric correlation** (if variables are not truly dichotomous**)	**Spearman rank order correlation**	**Pearson product-moment correlation**

relationship between nominal (categorical/ dichotomous) and interval/ ratio variables	**point-biserial correlation** or (if variables are not truly dichotomus**) **biserial correlation**

*dichotomous variable: only two categories exist (e.g., male-female, yes-no, pet owner-not owner)
**not truly dichotomous: actually on a continuum, but combined into only two categories (e.g., anxiety: high-low)

Display

Scale of Measurement	Type of Display			
	Table	Graph		
		Shape	Outcome	Relationship
Nominal or Ordinal	simple freq. distribution cumulative freq. distribution grouped freq. distribution (simple or cumulative)	pie chart frequency bar graph	bar graph	scatterplot
Interval or Ratio	simple freq. distribution percentage (aka relative) freq. dist. cumulative freq. distribution grouped freq. distribution (simple or cumulative) 5-number summary stem and leaf plot (hybrid table/graph)	pie chart box & whiskers (aka boxplot) freq. bar graph (discrete data) freq. histogram (continuous data) freq. polygon (all varieties) (continuous data)	bar graph (with variability/error information) mean dot (with variability/error information)	scatterplot

Decision Tree: Inferential Statistics

Note: These trees cover univariate techniques; multiple DVs require special techniques (e.g., MANOVA).

nominal techniques (nonparametric)

1 variable observed vs. expected?

relationship between 2 variables?

Chi square goodness of fit

Chi square test of independence

interval/ratio techniques (parametric)

independent variables?

σ known? — no

yes / no

z-test

Student's t-test (aka single sample)

yes → number of independent variables?

1 → levels?

2 or more

2 → between subjects?

3 or more

yes / no

independent samples t-test *or* **1-way between subjects ANOVA**

dependent/related samples t-test *or* **1-way within subjects ANOVA** (aka repeated measures)

1-way ANOVA between or within Ss

how are independent variables manipulated?

ordinal techniques (nonparametric)

between subjects design?

yes / no

groups?

groups?

2 → n per cell < 20?

3 or more

2

3 or more

yes / no

Mann-Whitney U

rank-sum

Kruskal-Wallis

Wilcoxon *or* (quick but not very accurate) **sign test**

Friedman

all are between subjects

all are within subjects

at least 1 is between Ss and at least 1 is within Ss

2-way (or higher) **between Ss ANOVA**

2-way (or higher) **within Ss ANOVA**

2-way (or higher) **mixed ANOVA**