

NOTE: Questions to Ponder are in *italics*, while the suggested answers are in **bold face** type.

## Module 2: Statistics Review for Psychological Measurement

### CASE STUDY 2.1: DESCRIPTIVE STATISTICS FOR AN INTRODUCTORY PSYCHOLOGICAL STATISTICS TEST

#### *Questions to Ponder*

1. *What additional descriptive statistics should Rudy have run to try to make sense of the exam data?*

**The key thing at this point would be the histogram to actually observe the data. Examining measures of central tendency (e.g., mean), variability (e.g., standard deviation), and shape (e.g., skewness) would be of little value given the nature of the distribution. He may want to look at the test score and their descriptive statistics (including any graphs such as histograms) separately for the two lab sections to see there is something unique to one or the other lab section.**

2. *How could Rudy have used the additional questionnaire data to help make sense of the test scores?*

**Information such as attitudes towards statistics, GPA, and similar items may be helpful in trying to see why the individuals in the lower end of the distribution didn't do so well. However, since he has them in class, it might be easiest to simply ask the students what they thought the stumbling blocks were to being more successful on the exam.**

3. *What statistics could Rudy calculate to determine if there really were any "significant differences" between the two laboratory sections?*

**An independent groups t-test will identify a "significant difference" in the two groups. However, the sample sizes are relatively small (hence, we have low power), so we may not be able to detect a practically important difference. In addition, comparing the two histograms may be more informative, as we will be able to see where some of the disconnect is occurring (if any) between the two lab sections.**

4. *Professor Ullman has taught the undergraduate statistics class many times. Would it make sense to go back and compare this term's results on the first exam to previous classes' performance on exam 1? Why or why not?*

**Assuming the nature of the class, textbook, her teaching style, as well as the first exam itself, hasn't changed dramatically, it may be informative to go back and see why this particular class may be scoring differently than past classes. It may be that past**

classes have performed similarly on the first exam and Rudy just doesn't know this since he has never been a TA for the class before.

However, if the class has changed in a substantive way, then the comparison of this term's results to past results may not be very informative.

5. *What graphical or visual data displays of the data would be appropriate in this situation?*

Again, a histogram of the exam scores for the class overall, as well as by lab section, would be most useful. Overlapping stem-and-leaf displays may also help in comparing the two lab sections to one another.

6. *Would it be helpful to estimate any population parameters in this situation?*

In this instance we are most interested in describing the results, so estimating population parameters will be of little interest.

7. *Would it make sense to estimate any true scores in this situation?*

Because the exam scores are not being used to make some critical decision (e.g., admissions into a graduate program), then estimating true scores should be of little interest to Rudy or Professor Ullman.

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#### CASE STUDY 2.2: CHOOSING AND INTERPRETING A CLINICAL TEST

##### *Questions to Ponder*

1. *What statistics should Megan calculate to get an estimate of the client's underlying true score on the psychological measures?*

In order to obtain a true score value, Megan would need to compute the standard error of measurement (SEM). In order to calculate the SEM, she would have to have an estimate of reliability of the test and the standard deviation of the test. Once she had these two values, she could plug them into the SEM formula and then build a confidence interval around the client's observed test scores to estimate his true scores. Given that the client fell just below the cutoff score on both tests, his confidence intervals for the true scores would most likely be above the cutoff, thus justifying recommending the client for court ordered anger management treatment.

2. *If you were Megan, what other information would you want to know about the tests in order to make the best decision possible?*

**It would be important to know the psychometric properties of the tests, such as the estimated reliability and validity evidence. Different measures of reliability provide lower and upper bound estimates, thus it would be important to know which measure of reliability was used in the SEM to estimate the individual's true scores. Normative information would also be helpful to see at what relative scores (e.g., percentiles) the client obtained on each of the tests.**

3. *Should the nature of the offense have any impact on how Megan determines if the client is "sufficiently high" on the psychological measures? If yes, how so? If no, why not?*

**Yes, the nature of the offense may impact the determination of "sufficiently high," in that any time we make a decision with a test we could be making a false decision. The question becomes, do we want to minimize false-positives (i.e., saying yes this person needs anger management classes, when in fact he doesn't) or false-negatives (i.e., saying this person does not need anger management classes, when in fact he does). In this case, it would seem we would want to minimize false-negatives, given the potentially violent nature of the charges, and thus we would be more liberal in our interpretation of what we consider "sufficiently high."**

4. *How should (or could) the other information in the client's file be combined with the test data to make a recommendation to the court?*

**In almost all cases, test data should be combined with other relevant information, rather than used alone, in order to make a fully informed decision. Thus, Megan and Dr. Chavez would want to combine the test data with other relevant circumstances and information from the client's file, in order to make a professionally sound judgment as to whether the client should be referred for anger management classes, or possibly some other relevant intervention.**