Instructor Notes

Title: Comparison of Standing Vertical Jump Performance Using a Counter-Movement Jump (CMJ) versus an Isometric Preload Jump (IPJ)

Discipline/Courses: This project was specifically designed for use with kinesiology students early in their degree program to promote interest in the use of statistics in describing athletic performance. It would also be appropriate for any of the career paths commonly associated with kinesiology such as exercise science, athletic training, sport and fitness management, physical therapy, and occupational therapy. This project assumes the students have not had formal coursework in measurement or statistics and the instructor is probably not a specialist in these areas. A great place to insert this project is in a freshmen foundations course in kinesiology. This module could be extended to include additional concepts in research methods, measurement principles and statistical analysis depending upon the specific class and knowledge/interest of the instructor.

Degree of Difficulty: This project has an "easy" or "elementary" degree of difficulty, often indicated as "I" for these types of projects. This level of difficulty facilitates the promotion of interest in quantitative analysis using statistics as the primary goal. Even so, one can appreciate the complexity that might "creep in" to the project if not carefully controlled.

Resources/Background Needed by the Instructor: The resources needed for the instructor in this project are minimal by design. The essential background information in the student information document is sufficient for the project without additional time spent accessing references, looking through theory or studying statistical software packages. Excel, and, the data analysis add-in, is easily available and will provide the student with a method for analyzing data in the future even though many will eventually learn a more sophisticated software package. The biomechanical and physiological principles used as background for this project will be familiar to most kinesiology instructors and is kept simple and straightforward by design. Once again, the background explanation should be sufficient for students to understand the project. This project could easily be extended into a discussion of measurement issues, biomechnical laws, and extended statistical analysis concepts depending upon the expertise of the instructor and the intended purposes of the course in which the project is embedded.

Individual and Group Possibilities: This project could be used in an individual or group format. The actual data collection and analysis is so basic that the author feels students should do individual work on the final report. Certainly, the explanation of the research hypothesis and use of data to address the question should be left up to the individual student to struggle with if maximum learning is to occur. Still, dividing the project up into work groups is entirely possible.

Duration of the Project: This project is designed to be embedded within a course and not consume a large amount of time. It can be even shorter than the 2-3 class periods by supplying the students with data instead of measuring it in class. While I feel not actually measuring the performances takes much of the fun and measurement learning out of the project, it is a possibility if, for example, an instructor desired to cover for another instructor or a "breather"

was necessary in the term. The content could easily be extended an additional two or three classes by spending additional time on the measurement of performance in athletes, calculation of standard scores, data distribution issues, estimates of error, histogram generation, graphing, etc.

Open-ended questions: The opportunity to include questions without easy answers are numerous when the content touched by the project are extended. As mentioned above, there are numerous research, measurement, statistical analysis, biomechanics, and physiology issues involved in even a simple project such as this one if an instructor cared to address them. Due to the purposes of this project, open-ended questions were not identified for the sake of clarity. It is hoped that this initial look at statistical analysis will motivate ambitious students to ask these more involved questions. Some examples of possible open-ended questions might include:

(1) "order effects of testing" as a threat to the validity of the experiment,
(2) subject motivation with maximal exertion challenges in measurement,
(3) warm-ups effects on testing,
(4) best ways to measure "power" in athletes without a skill component (the vertical jump has a skill component)
(5) how to look at the distribution of scores (histogram)
(6) adequacy of Excel's numerical estimations of kurtosis and skewness
(7) difference between analyzing data that is a population and data that is a sample
(8) situations in which the mean is not the best measure of central tendency
(9) what to do with an "outlier"
(10) why standard scores are useful
(11) effect of rounding in Excel

Special Instructions and Assumptions: As stated above, this project has an "easy" or "elementary" degree of difficulty, or "I". This level of difficulty facilitates the promotion of interest in quantitative analysis using statistics as the primary goal. Even so, one can appreciate the complexity that might "creep in" to the project if not carefully controlled.

It is best if the instructor demonstrates the statistical analysis in Excel using the example data sheet at least once before turning the students loose to analyze the data on their own. Even though the student instructions are clear regarding using Excel, some students will struggle if not actually viewing the process at least once. Remember, we want the students to be successful and discover that using statistics can be fun and meaningful.

Revision and Continuation: As stated in greater detail in the resources/background, duration, open-ended questions sections above, this project can easily be repeated with different data, revised, and expanded to a more challenging level of difficulty, and used with a different statistical analysis package. In the interest of brevity, I will refer to the suggestions previously mentioned.

Further Guidelines on Evaluation: The evaluation will be based upon (1) correct measurement values, (2) correct analysis using the results of the descriptive statistics tool in Excel (print-out), and (3) answers to the research question using logical conclusions drawn from the data. Incorrect measurement values would mean that the student has data that are not possible, are full of error, are incorrectly entered, or missing.

The results of the Excel print-out of the *descriptive statistics* summary should look like that given in the example. It is important to encourage the student to further format the report for ease-of-inspection so that it does not look exactly like the printout you would produce. For example, most students will widen columns when necessary, take out a few decimal points, highlight the main statistics they will be using, etc. It is also possible they know how to use the data analysis package already and run descriptive statistics on all variables at once. In this case, the printout will contain a far greater number of variables.

Watch for students who did not follow instructions and use individual Excel formulas instead of the data analysis package. I would take points off for this because it is not the best way to use Excel.

The most important part to be evaluated is the logical conclusions resulting from the data. Be careful in your evaluation because more writing may not be better. Students who understand and can explain their conclusions using correct terminology often need to write less to make their point. The biggest challenge to students is in basing their conclusions on the data analysis. Remember, the data resulting from testing the class may not result in conclusions that are consistent with what research tells us about performance.

Other Information: Students sometimes want examples in class related to the project. My suggestion is to provide examples of projects using different variables. This is such a simple project that creating examples using the same variables (types of vertical jumps) might result in students writing out the same phrases you used without any thought at all. I would use the supplied data spreadsheet but change the variables measured.