

Lab #1 - Computer Skills and Force in Stand to Squat

Purpose:

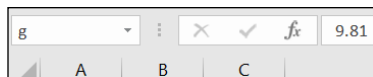
1. Reference System (Coordinate System)
2. Free body diagrams (vectors)
3. $\Sigma F=ma$

Using Excel is an integral part of HBIO 408 Lab. If used properly, Excel will minimize the time you spend generating data, performing calculations, and working on your project. Thus, it is to your benefit to master as many Excel skills and shortcuts as possible. The purpose of this assignment is to reinforce knowledge of the ground reaction forces during a squat task as you develop a subset of Excel skills that will help you to be successful this semester.

Note: Most operations in Excel can be performed in a number ways. The following procedures outline a few methods. If you prefer a different way of performing the same task, that is fine, as long as the results are the same. Please also know that on Blackboard, there is a link to "Lynda" that has modules on learning Excel.

Procedure:

1. Open force data in Excel (provided on the 408 website).
Convert from frames of data to time
2. In cell A1 (column A, row 1), type "frame #".
3. In cell B1, type "time [s]".
4. Fill column A (starting with A2) with frame numbers starting with "1"
5. Fill column B (starting with B2) with the calculated time in seconds, knowing that the frame rate of force data collection is 120frames/second (which is also known as 120Hz).
"Renaming" cells for easier computing
6. In D2, type "gravity [m/s²]". Rename the cell E2 "g" and input 9.81.
 - a. Rename: click in name box at top left of operating screen and type "g" in place of E2, then press enter.



7. In D3, type "avg force during standing [N]"
Plotting Force data
8. Plot Rv[N] vs time on a new worksheet, and remember to include units on the axes labels and a graph title. Make a note to yourself about what time interval the subject is standing still on the forceplate. Make another note to indicate the time interval of the "stand to squat". Make a final note to indicate the time interval of the "squat to stand".
Calculating acceleration
9. Rename the cell E3 "BW" and input a formula to find the average force during the part of the trial that the subject is standing still on the forceplate (using the time intervals you made note of).
10. In D4, type "mass [kg]". Rename the cell E4 "m" and input a formula to calculate the mass of the subject.
11. In cell J1, type "a [m/s²]" and under this cell, starting with J2, calculate the acceleration using the "BW" cell and "m" cell in the formula. Plot this data vs time on a new worksheet, including units in the axes labels and a graph title. (Hint: Use your free body diagram and the formula that relates force to acceleration.)
Plotting calculated acceleration
12. Plot acceleration vs time and Rv on the same graph, see below for an explanation
Plotting your data points using two vertical axes:
 - a. Follow the directions outlined on this site: <http://www.yuvalararat.com/2008/09/creating-multiple-y-axis-graph-in-excel-2007/>

- b. Change the X-axis to fit the range of data: Double click on one of the numbers on the X-axis to bring up the 'Format Axis' dialogue box. On the 'Scale' tab, you can set the maximum and minimum values that will be displayed on the X-axis as well as the increments of what will be displayed.
13. Displaying your formulas
 - a. Under the 'Formulas' tab, click "show formulas"
 - b. Reformat the column sizes to show all of the columns without scrolling to the left or right.

Analysis & Questions: Please consult with the lab report guidelines

1. In a word document, display a print screen/screenshot the first page of data including all of the formulas and display all three graphs. Also create a table in word including the time intervals (ie. from t1 to t2 in seconds) for each task phase:
Phase1: when the subject was standing still
Phase 2: when the subject performed "stand to squat"
Phase 3: when the subject tried to hold still at the bottom of the squat,
Phase 4: when the subject returned from "squat to standing".
Also include the subject's mass and body weight in this table. This information is your results section.
2. In a discussion section, please describe how you were able to determine the time intervals of the subject's task from the force time graph of Rv. Finally, describe how you found the body weight, mass, and acceleration from this vertical force data.
3. Please also include a title page, purpose statement, and conclusion.