SOP: Using the Kistler Force Plate

A. What this SOP covers

A force plate is a three dimensional force measuring device that can be used to study how forces are applied to a surface. We have a Kistler Type 9260AA3 force plate in the lab, which is calibrated to detect quite small forces and decompose them into x, y, and z dimensions. The long axis of the plate is x, the short axis is y, and vertical force is the z dimension. The force plate itself detects force using piezoelectric crystals, which respond to an applied force in a standard, known manner that can be quantified. Use of these crystals results in an easy to use force plate that rarely needs any sort of calibration. The signal from the force plate is sent to a Data Acquisition device (DAQ), which then relays a digital signal to the computer, which converts it into useable form.

This SOP covers the steps needed to use the Kistler force plate and associated BioWare software to record force data for an experimental trial. Built-in functions in BioWare allow you to obtain acceleration, power, and center of pressure data in addition to force. This SOP does not cover force plate set-up, or trigger settings. Refer to the SOP on syncing Fastec cameras for instructions on syncing the force plate with a high speed camera.

Cautions: Although the Kistler force plate is easy to use and essentially plug-and-play, it is also a very delicate and expensive piece of equipment. Please get in-person training from Dr. Bergmann or another lab member that knows how to use it before working with it. This SOP is intended to supplement that training. The force plate is also sensitive to static discharge and other forms of electrical surges. Please do not disconnect and reconnect any of the cables without first consulting Dr. Bergmann. Also, please do not move the force plate, the racetrack enclosing the force plate, or the anti-vibration set-up without first consulting Dr. Bergmann. It is important the the race track isn't in contact with the force plate, and the anti-vibration set-up is very heavy.

B. What you need before you start

- Kistler type 9260AA3 force plate
- DAQ connected to the force plate
- Computer with BioWare software, connected to the DAQ
- Animals for use in experimental trials

C. Procedure

1. Starting up the equipment
    a. Turn on the computer and log in.
    b. Remove the black lid that is covering the force plate.
    c. Turn on the DAQ and let it warm up for *at least* 30 minutes.
        - This is a good time to get the animals ready for the trials.

2. Getting the force plate software ready
    a. Start the BioWare software by double clicking on the desktop shortcut.
    b. Press the **Device Set-up** button, confirm that Force Plate 1 (Device 9260AA3) is listed as an active device, and click on the **Okay** button.

i. If it is inactive, press the button in the dialog box to make it active.
ii. If this does not work, see Dr. Bergmann to troubleshoot.

c. Select **Acquire Trial** from the **Data** menu, or press the **Acquire Trial** button underneath the menus.

d. Adjust the length of the trial and the sampling rate as needed for your research.

e. If you need to adjust trigger settings, press the **Setup** button in the **Acquire Trial** dialog.
- You may need to do this if you are syncing the force plate with a camera or if the force plate was synced but that is no longer needed. See Dr. Bergmann for help.

f. You can also weigh the animal in Newtons, which BioWare then be uses to factor out the animal's weight from the force data.
i. Click on the **Weigh** button in the **Acquire Trial** dialog.
ii. While the offsets are being read, **do not** touch the force plate or any buttons.
iii. Once the **Body Weight** dialog pops up, place the animal on the force plate.
iv. Click on the **Okay** button.

3. Collecting force data from a trial

a. In the **Acquire Trial** dialog, click on the **Start** button.

b. **Do not** touch the force plate or any buttons while the offsets are being read.

c. When the **Press enter to begin acquisition** dialog appears, you are ready to start the trial.

d. Press **Enter,** or click on the **Okay** button, or use the pickle switch if a camera is synced with the force plate to start the trial.

e. You can either place the animal on the force plate before step C.3.d. (this should factor out the animal's weight), or place the animal on the force plate as soon as the trail starts.

f. Stimulate the animal to do the desired behavior, but note that touching it during the behavior may affect the force data, making them invalid.

4. Viewing and exporting data from BioWare

a. Once a trial is completed a graph of force in x, y, and z directions against time automatically appears.

b. To change the types of data that are plotted, **right click** on the graph and select the **Configure graph…** option.

c. Select the variables that you wish to plot by clicking on the check boxes and clicking the **Okay** button.

d. You can obtain variable ranges, means, minima, maxima, and other basic statistics by selecting the **Statistics…** option in the **View** menu.

e. To export data from BioWare, select the **Save As** option from the **File** menu.
i. Type in your desired filename.
ii. Change the **Save as type** from **BioWare files (.dat)** to **Text files (.txt)** so that you can open the data in Excel or other software.
iii. Check off all of the variables that you wish to export in the **Export Device Data** dialog box that appears, and click on the **Export Data** button.
iv. This creates a tab-delimited text file that you can open in many different software.