MODULE: STAMPING

BRIEF DESCRIPTION:

Fast alternating leg movements are essential to the locomotion in agile sports such as fast acceleration, quick stops, turns or direction changes. Maximal or near maximal locomotion speeds pose a challenge or the central nervous system, to preserve proper limb coordination in accordance with the task demands. Control over the rapid alternating muscle relaxations and contractions turns out to be an important limiting factor affecting frequency, smoothness and effectiveness of locomotion. Fatigue resistance presents another important aspect of alternating high speed leg movement. Accumulation of metabolites formed during intense muscle contraction can affect nerve signal transmission as well as central movement processing. Athletes that are able to cope with the fatigue better have an advantage in sports where prolonged high speed and power activities are needed.

In order to measure the speed and coordination of alternating leg movements, ground stamping test is performed. The subject is asked to adopt a sport specific position like for example a defensive stance in basketball. Before the start of the measurement, both feet are positioned on the force plate. The subject starts to stamp as fast as possible, not stepping outside the force plate. By performing the test for a longer period of time, specific endurance can be assessed. Additionally, other test modalities can be used according to the specific needs (for example hands stamping, etc.).

When the Stamping module opens, the existing measurements of the selected subject inside the current Visit are displayed and the user can review them (see section Analysis for details). If no measurements have yet been done for this subject, than only the option to start a new measurement is enabled. In order to begin a new measurement, click New Measurement button and select the Input Parameters to exactly define the measurement task.

When the New Measurement button is selected for the first time after entering the Stamping measurement module, the force plate is initialized. After the automatic initialization process has been finished, the zero offset must be done (follow the instructions on the pop-up message). The plate must be unloaded during the entire initialization and zero offset procedure. This procedure is performed every time you enter the Stamping measurement module. Zero offset can be repeated any time manually by pressing the Offset button, otherwise the automatic zero offset is done every 30 minutes.

BASIC FUNCTIONS:
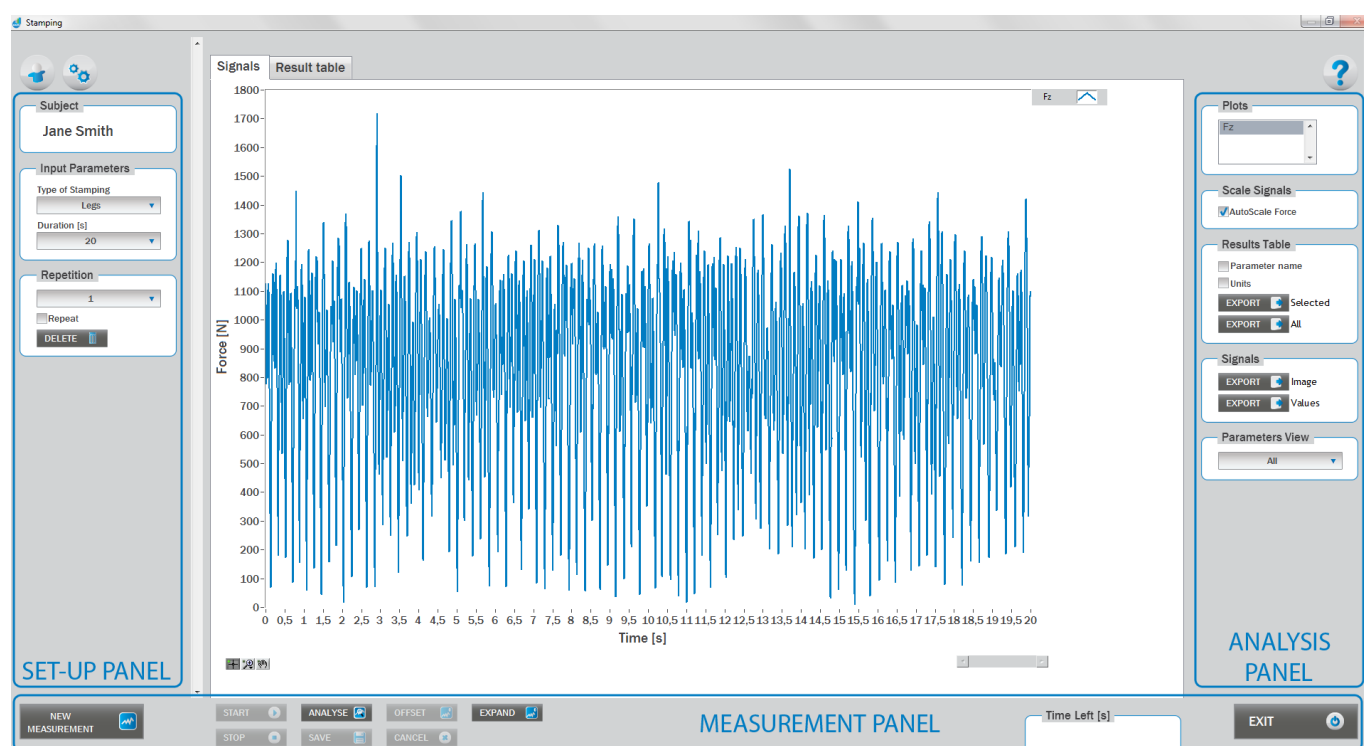
SET-UP PANEL:

SUBJECT

Name
The selected subject.

INPUT PARAMETERS

See Selecting Input Parameters section for details.

REPETITION

Repetition
Number of repetitions for the selected Input parameters.

Repeat
If checked, the selected repetition is replaced when the new measurement is performed.

Delete
Delete the selected repetition.

ANALYSIS PANEL:

PLOTS

Plots
The list of all channels. The selected channels are shown on the graph.

SCALE

AutoScale Force
If checked, the vertical scale of the graph is adapted to the maximum and minimum value of all force signals.

RESULTS TABLE

In the Result Table panel, result parameters from Result table tab can be exported into clipboard, CSV or TXT format. Format of the file can be set in settings window under export section. For details about setting the parameters refer to Settings Section.

Parameter Name
Parameter name will be included.

Units
Units of the parameters will be included.

Export Selected
By clicking on Export Selected button only the parameters that are selected in the table will be included.

Export All
By clicking on Export All button all parameters from the table will be included.

SIGNALS

In the Signals panel, image or values (row data) of acquired signal can be exported. Image and values can be exported with different parameters, which can be set in Settings window under export section.
For details about setting the parameters refer to Settings Section.

Export Image

Export the image of signals (as visible on the graph on the Signals tab)into the clipboard. Image can be paste in any image editor.

Export Values

Export values (raw data) of signals (as visible on the graph on the Signals tab) into CSV or TXT format. Format of the file can be set in settings window under export section. For details about setting the parameters refer to Settings Section.

PARAMETERS VIEW

In the Parameters View panel, calculated parameters which are displayed in the result table can be set. By default, all and basic view are available. Basic view contains preset parameters and cannot be changed. Custom view can be defined, by clicking »Manage...« button.

To create a new view click on add button and enter the name of the view. Parameters included in the view are selected by checking the checkboxes next to them. To confirm the changes click save.

MEASUREMENT PANEL

New Measurement
Starts with a new measurement.

Start
Starts the measurement.

Stop
Stops the measurement.

Save
Saves the measurement.

Cancel
Cancel the last measurement.

Offset
Makes zero offset. Note that the force platform must be unloaded during the process.

Analyse
Performs the analysis.

Collapse
Collapses the graph and the side panels are shown.

Expand
Expands the graph and the side panels are hidden.

Time left [s]
Time left to the end of measurement.

Exit
Closes the measurement module.

SELECTING INPUT PARAMETERS:

Before the measurement can start, the user has to choose some input parameters with which the measured motor task (stamping) is specifically defined. These parameters are important for further analysis, comparisons and reporting. The stamping characteristics are defined by the following parameters:

TYPE OF STAMPING:

Arms
The subject performs the stamping task so that he/she is alternatively tapping one and the other hand against the surface of the force plate, thereby using the highest possible frequency – just like drumming.
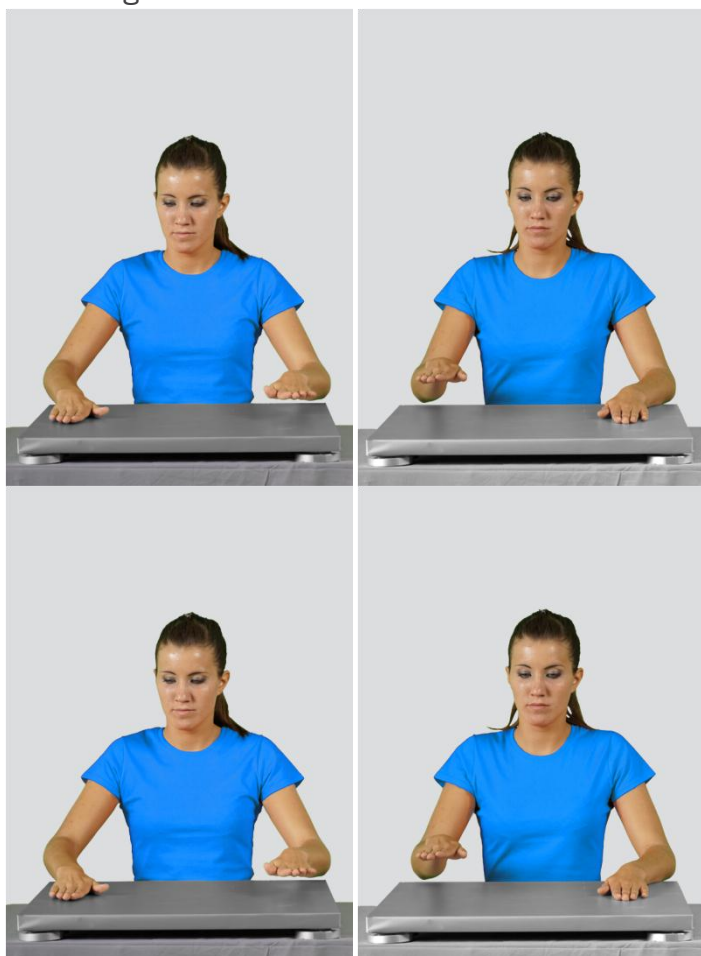
Legs
The subject performs the stamping task so that he/she is alternatively loading one and the other foot with the highest possible frequency. This task should be performed with the "active feet" which means that the heels are lifted and the foot pressure is on the front parts of the feet.

Other user defined

In the Settings panel of the main window of the software the user can define any other type of a stamping-like movement/task (see Settings Section for details). After doing so, the newly defined input parameter will from then on appear as an optional choice under the Type of Stamping in the Stamping measurement module.

DURATION:

10/20/30/40/50/60/70/80/90/100 s

The user selects the duration of the Stamping test – either from the pre-set values or he/she can define other values (see Section Settings for details). After doing so, the newly defined duration of the quiet stance task will from then on appear as an optional choice under the Duration in the Stamping measurement module. The default duration is 30 s.
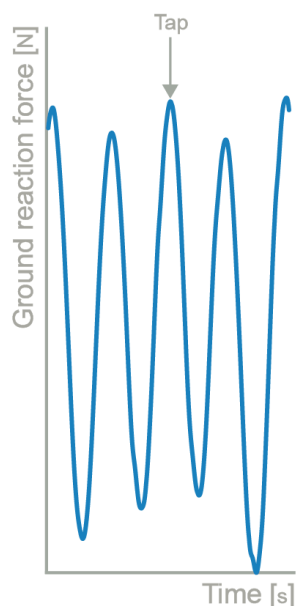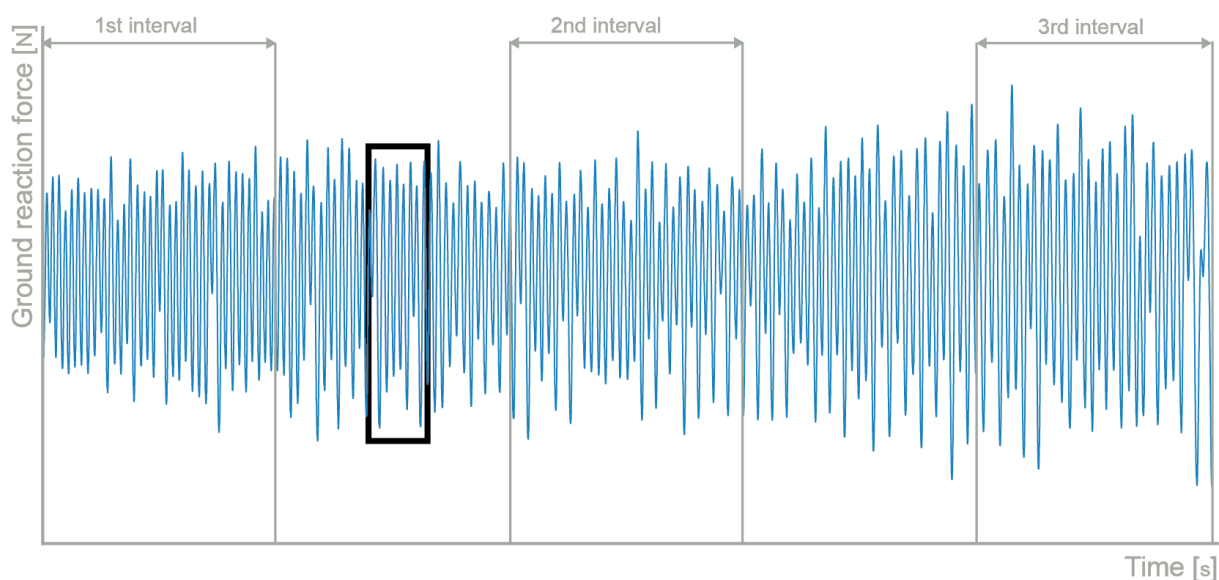
MEASUREMENT:

After selecting the input parameters, the subject acquires the initial position for the test: (1) for the Legs-Stamping he steps on the force plate and acquires the required initial active position or (2) for the Hands-Stamping he places the hands on the force plate while sitting in front of it. After you are satisfied with the initial position, you give the verbal start signal to the subject to begin with the stamping task. Right after the subject begins with the task, click Start. After this, the software begins with the signal acquisition and the time left until the end of the test is displayed in the top-left corner of the screen. For details about this automatic acquisition please see Settings Section.

If you want to start a new measurement, click the New Measurement button and repeat the procedure. Before doing so, you can change the Input Parameters; if not, the Input Parameters of the previous measurements will be used. If you want to repeat a certain measurement, click on the drop down menu, select the repetition you want to replace and check the box Repeat. Then click Start and a pop-up window will ask you if you really want to repeat the measurement. Click OK if you want to repeat.

ANALYSIS:

Analysis enables you to check the signals of the ground reaction force (GRF) and the calculated parameters. Under the Signal tab you can see the signal of the vertical component of the ground reaction force – if chosen also, the other two components (X and Y). Under the Results tab you can see all calculated parameters. If you want to confirm the measurement, click Save. If you would like to export the calculated parameters use Export function in Result Table panel.

CALCULATED PARAMETERS:

GENERAL

Mean FRE from peaks [Hz]
The frequency of stamping calculated as the number of vertical force peaks divided by the measurement time.

Mean FRE from peaks – 1st interval [Hz]
The frequency of stamping calculated as the number of vertical force peaks in the initial time interval (i.e. start + the interval duration) divided by the duration of the initial time interval. The default duration of this interval is 3 s, but it can be changed in the Settings panel.

Mean FRE from peaks – 2nd interval [Hz]
The frequency of stamping calculated as the number of vertical force peaks in the middle time interval (i.e. mid-time ± ½ of the interval duration) divided by the duration of the middle time interval. The default duration of this interval is 3 s, but it can be changed in the Settings panel.

Mean FRE from peaks – 3rd interval [Hz]
The frequency of stamping calculated as the number of vertical force peaks in the final time interval (i.e. end - the interval duration) divided by the duration of the final time interval. The default duration of this interval is 3 s, but it can be changed in the Settings panel.

Endurance index [%]
The mean frequency of stamping in the middle (2nd) time interval divided by the mean frequency of stamping in the initial (1st) time interval. The mean frequencies are calculated as the number of vertical force peaks in the time interval divided by the duration of the time interval.

Fatigue index [%]
The mean frequency of stamping in the final (3rd) time interval divided by the mean frequency of stamping in the initial (1st) time interval. The mean frequencies are calculated as the number of vertical force peaks in the time interval divided by the duration of the time interval.

Minimum FRE from peaks [Hz]
The minimal frequency of stamping calculated as the number of vertical force peaks divided by the duration of the time interval. The running time interval for which the frequency values (and then the minimum among them) are calculated is by default set to 3 s, but can be changed in the Settings panel.

Maximum FRE from peaks [Hz]
The maximal frequency of stamping calculated as the number of vertical force peaks divided by the duration of the time interval. The running time interval for which the frequency values (and then the minimum among them) are calculated is by default set to 3 s, but can be changed in the Settings panel.

Min/Max ratio – FRE from peaks [%]
The ratio between the minimum frequency and maximum frequency of stamping calculated as the number of vertical force peaks divided by the duration of the time interval. The time interval for which the frequency values are calculated is by default set to 3 s, but can be changed in the Settings panel.

Mean F of the peaks – abs [N]
The mean value of the peaks in vertical force during the foot/hand taps. The parameter is expressed in absolute force values.

Mean F of the peaks – rel [%BW]
The mean value of the peaks in vertical force during the foot/hand taps. The parameter is expressed in relative values as the percentage of the body weight.