

BIOSTRAIN



00

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Icon key



Things you
need to know



Warnings and
precautions



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01

INTRODUCTION

Benefits

Biostrain aids the monitoring and management of synergist muscles that contribute to hamstring strength. Physiotherapists can monitor performance and plan training routines for sportsmen and women. Individuals generate force in the Double Float Transition Zone (DFTZ). Data can be analysed to track performance over time.

Intended use

Biostrain is an integrated system intended for professional athlete use aided by qualified physiotherapists.

It aims to improve sprint related performance, reducing the risk of hamstring injury.

This device is intended to be used as an 'custom built evaluation kit', solely for the purposes of research and development by professionals to evaluate the performance of the system with non-injured users.

Legal manufacturer

If you require help or have any suggestions, please contact our customer service team.

help@biostrain.co.uk

Biostrain
Lucid Group Ltd
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Manchester Science Park
M15 6JJ
UK



The Biostrain difference...

Until now, people have used isolated hamstring exercises in non-specific joint positions, like the Nordic Hamstring Exercise techniques. (NHE)

The NHE technique isolates the hamstring without activating other synergist muscle groups. This concentrates activation towards the middle and distal portions of the hamstring.

Biostrain is different.

It focuses on knee flexor and hip

extensor torque, which not only increases overall activation levels of the proximal portion of the hamstring.

Enabling users to achieve greater force generation compared to isolated exercises due to the presence of reaction forces.

Why we changed the game...

Biostrain helps athletes to increase force generation in extended leg positions. Helping athletes become stronger and more flexible - increasing force generation when sprinting. In short training the body to run faster.

How is Biostrain different to anything in the market?

The Biostrain system enables people to monitor, strengthen and measure forces generated by the legs, abdominals and arms for the purposes of athletic performance.

This reflects muscle activation during sprinting, in a natural upright posture in the Double Float Transition Zone.

During DFTZ the Biostrain System can...

1) Measure Strength

Baseline Testing - Peak Force

2) Assess Force Generation

Peak Force @ timed intervals - Rate of Force Development

3) Analyse Performance

Left/Right side asymmetry - Force generation & fatigue - Assess trends over a season

4) Improve Performance

Structured Warm Up & Strength training Routines - Increasing Range of Motion & Force Generation

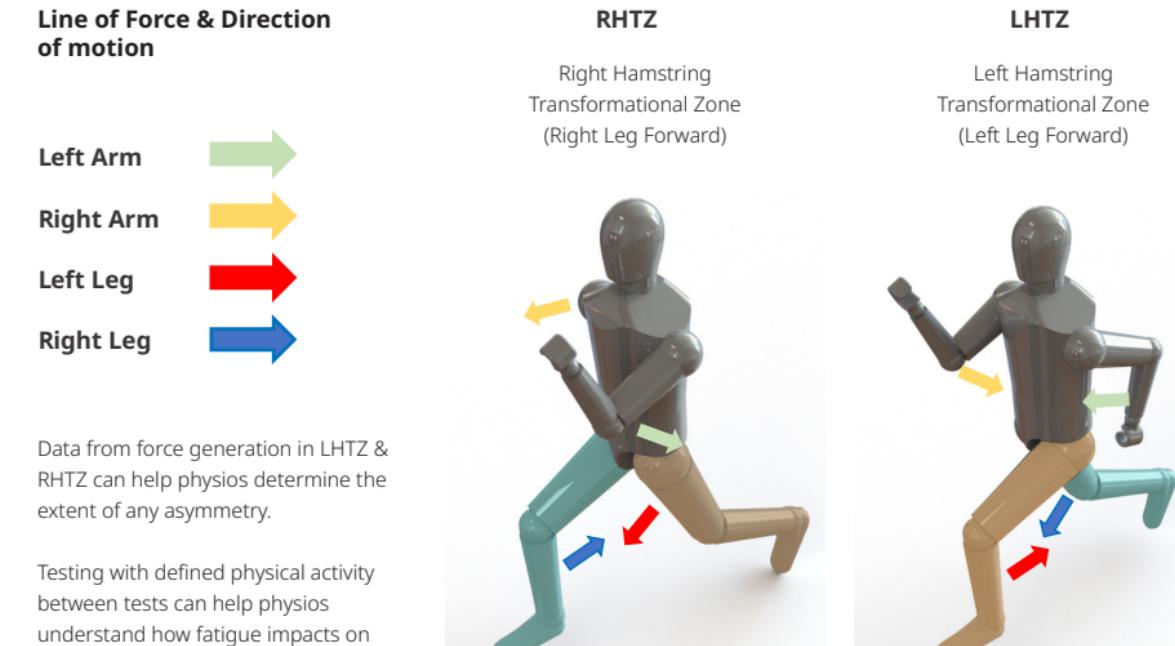
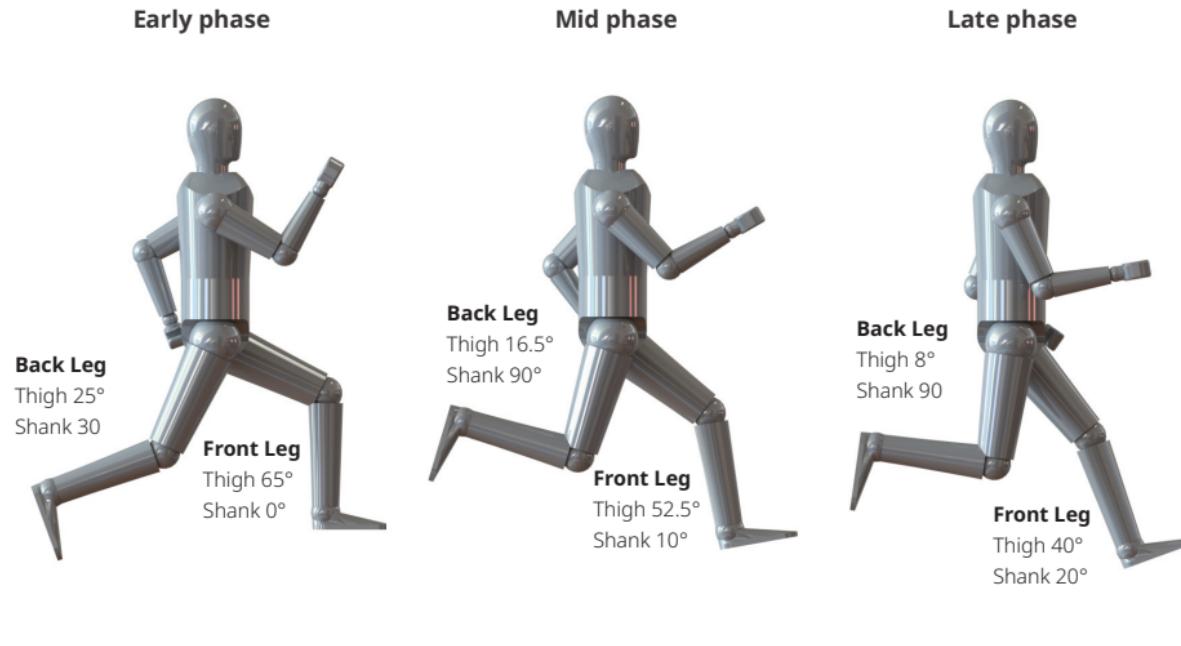
Double float transition zone

What is DFTZ?

The hamstring muscles are most active through the late swing phase of the running cycle. This is the airborne phase, known as DFTZ.

Double Float Transformational Zone occurs when the proximal limb joint motions (hips and shoulders) are changing direction. Hip flexors, abdominals, gluteus maximus all have a big impact on hamstring strength and force production in DFTZ. Lengthening the hamstring whilst generating force beyond its tolerance threshold generates strains.







WHY IS PERFORMANCE TESTING IMPORTANT?

Benefits of performance testing

Biostrain removes the guesswork in testing. Conventional training methods can be effective, the data generated by Biostrain can help determine more targeted training to improve performance.

Tailored training protocols can target weaknesses by building and maintaining strength by setting performance targets.

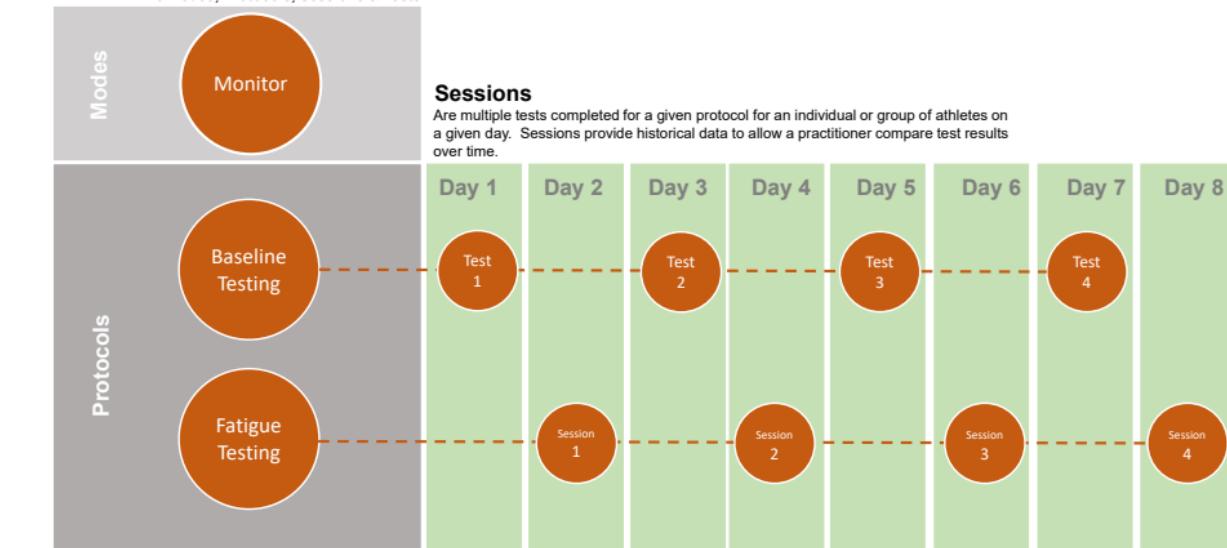
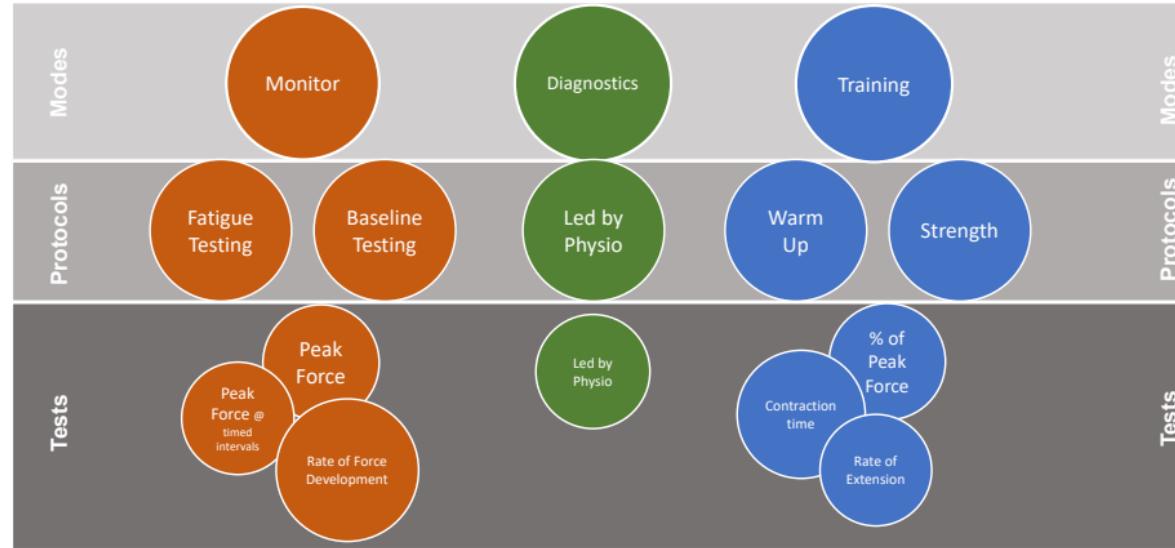
Analysing the data

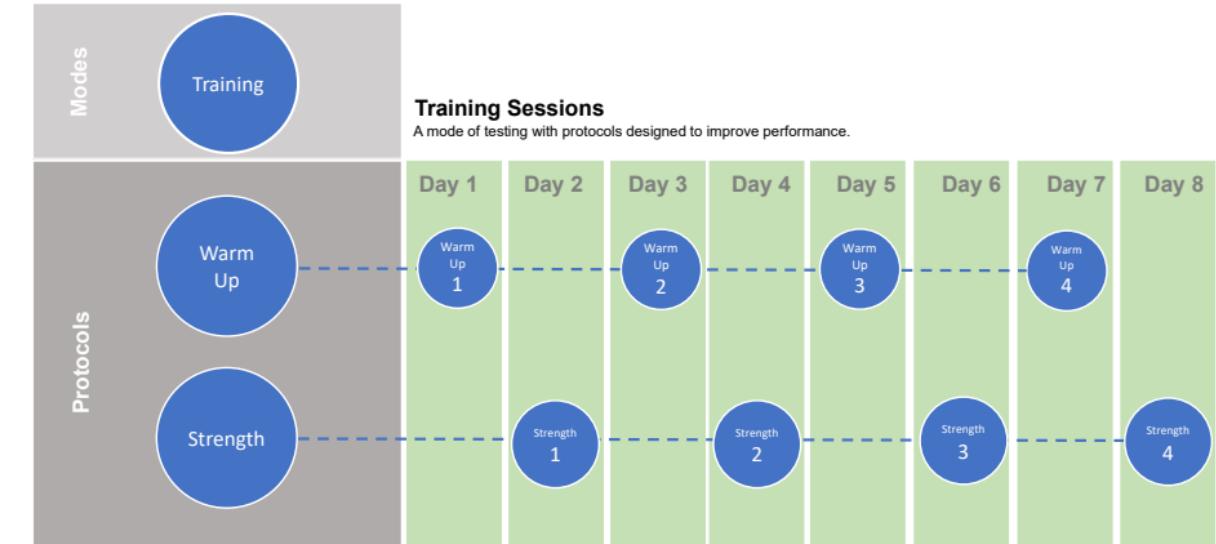
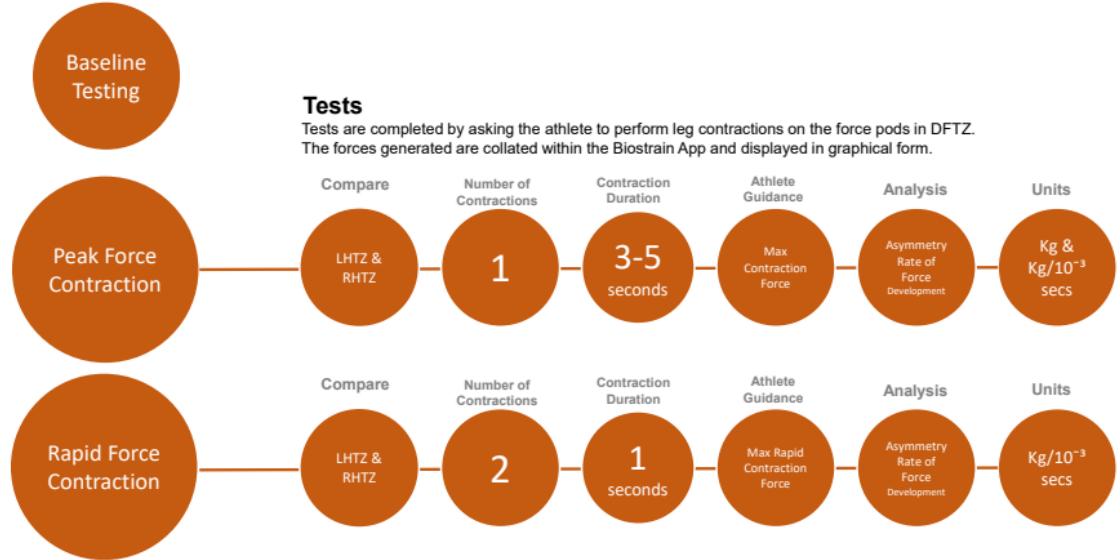
Gathering data from testing help determine the effectiveness of training protocols.

Historical data can be analysed to determine an athletes performance over time. Which can help physiotherapists, sport scientists and coaches to make critical decisions on athlete readiness to perform.

Risk of injury

Data analysis from testing allows sports professionals to see the dips in form earlier. This may help to understand when an athlete needs to rest to prevent potential injury





02

SAFETY INFORMATION



Before use:

- ⚠ Ensure Force pods are positioned correctly to avoid potential hip joint injuries.
- ⚠ Use under guidance of qualified physio/sports coach.
- ⚠ Discuss with clinician/physio for treatment options.

Do not use:

- ⚠ If you are under the age of 16.
- ⚠ If you are pregnant.
- ⚠ If you have a congenital hip joint disorder.
- ⚠ In heavy rain or harsh weather conditions.

Cleaning the device

- ⚠ Always clean hands before and after using the device and tablet
- ⚠ Clean the device with a damp cloth and disinfectant wipes
- ⚠ DO NOT hose down or spray with water
- ⚠ Wipe down bodily fluids (sweat/blood etc.) prior to next user

Electrical care

- ⚠ The device is for indoor use only
- ⚠ Keep Fluids away from the tablet & controller hub

Transport care

- ⚠ The device weighs approx. 75kg – take care when positioning
- ⚠ The device has wheels and lifting points. Tip the device onto its front wheels to reposition. Make sure that the wheels are fitted correctly before using
- ⚠ Ensure that the force pods are not subjected to forces in transit.

Battery considerations

- ⚠ Before commencing testing please ensure that the controller hub has not been powered up for extended periods. Please ensure that the tablet has sufficient charge.



Floor considerations

- ⚠ Ensure the device is stable and, on a level, non slippery surface.
- ⚠ Ensure the device is level prior to use. Caution must be taken on uneven surfaces. If the device is positioned on inclines greater than 10° there will be an increased risk of users of the device tipping over.
- ⚠ Ensure that the levelling feet have been adjusted and that the floor frame is stable prior to use.

Space considerations

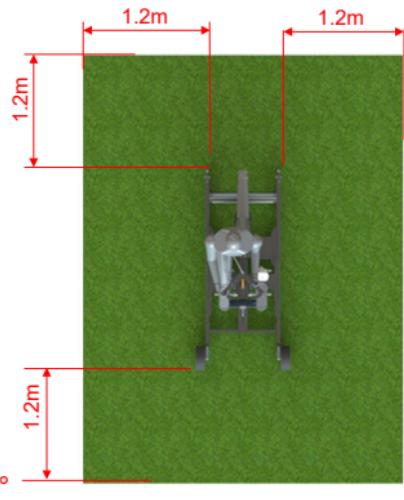
- ⚠ It is important to leave at least 1.2 metres of space around the Device at all times while in use.
- ⚠ The main frame of the device is a potential trip hazard. Please walk with caution when walking around the Device, and when getting on and off the device for a test.

Weight considerations

- ⚠ Whilst in use, it is important to leave a minimum of 1.2 metre clear space around the device at all times.

Calibration

- ⚠ You must calibrate the device once a week. Please refer to the "Device calibration" on page 46 for details.





Biostrain system includes:

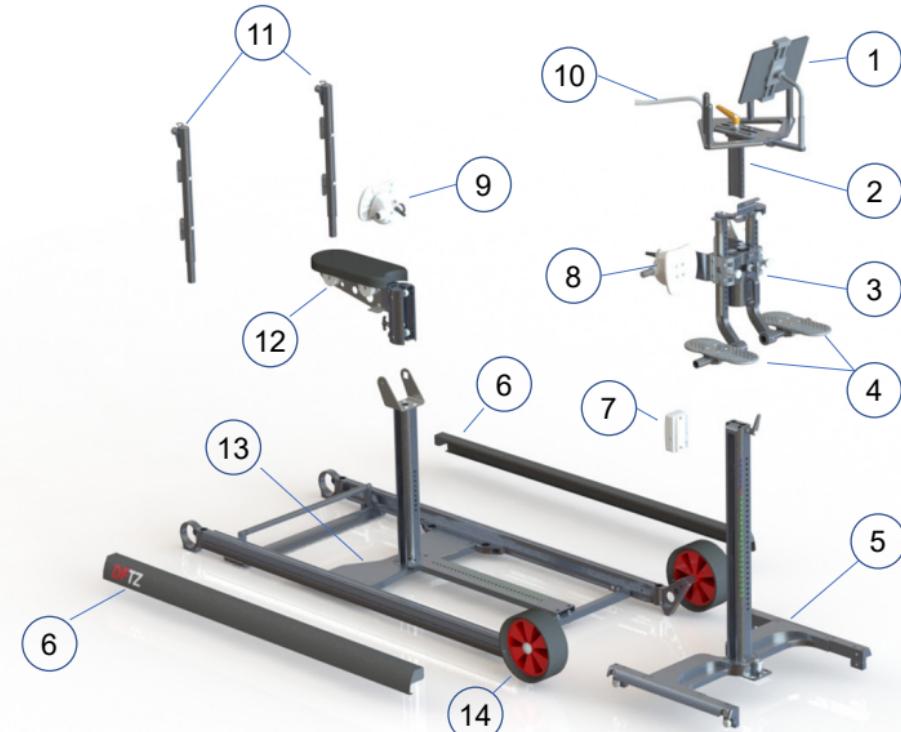
- 1 x User Tablet
- 1 x User Tablet power supply unit
- 1 x Biostrain App (Windows)
- 1 x Biostrain Positioning Frame

Positioning frame includes:

- Tablet (1 off)
- Adjustable Handles (1 off)
- Front Leg Force Pod Vertical adjustment (1 off)
- Foot rests (2 off)
- Front leg Force Pod Horizontal adjustment (1 off)
- Weather Cover (2 off)
- Control Hub (1 off)
- Front Leg Force Pod (2 off)
- Rear Leg Force Pod (1 off)
- Hip placement guide (1 off)
- Rope Posts (2 off)
- Knee Pad vertical adjustment (1 off)
- Floor Frame (1 off)
- Front Wheels (2 off)

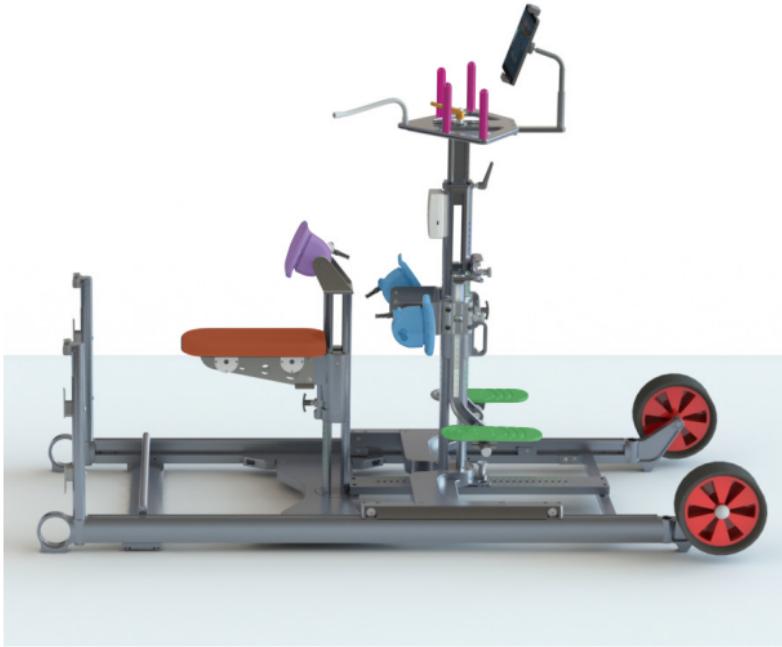
Calibration

You must calibrate the device once a week. "Device calibration" on page 46





- █ Rear Force Pod
- █ Knee Pad
- █ Foot Plate x2
- █ Front Force Pods x2
- █ Handles x4

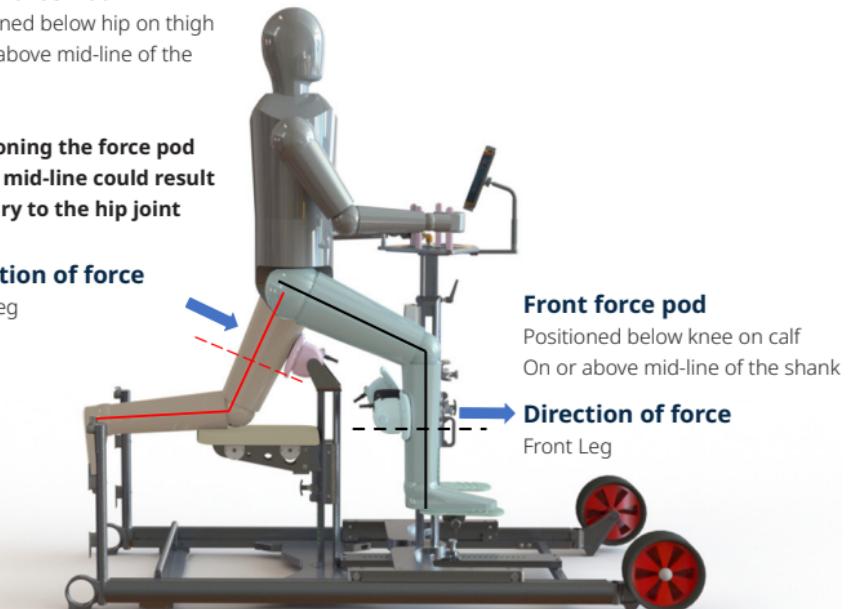
**Rear Force Pod**

Positioned below hip on thigh
On or above mid-line of the thigh.

Positioning the force pod below mid-line could result in injury to the hip joint

Direction of force

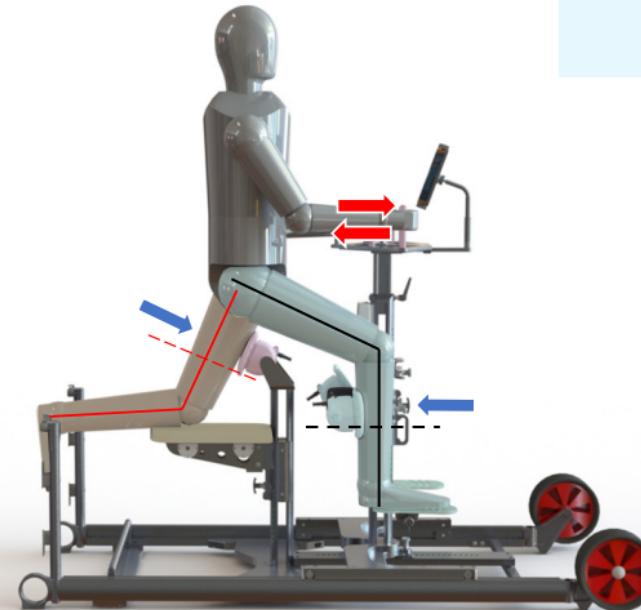
Rear Leg



Positioning player



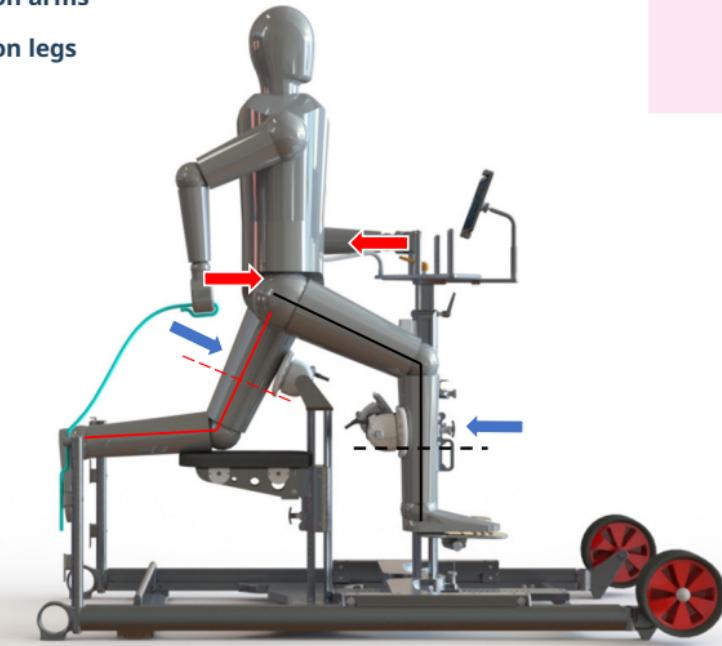
- Force direction arms
- Force direction legs



Handles helps player to apply forces with arms

Without ropes
(Figure shown in RHTZ)

- Force direction arms
- Force direction legs



Rope helps player to replicate running posture with arms

With ropes
(Figure shown in RHTZ)

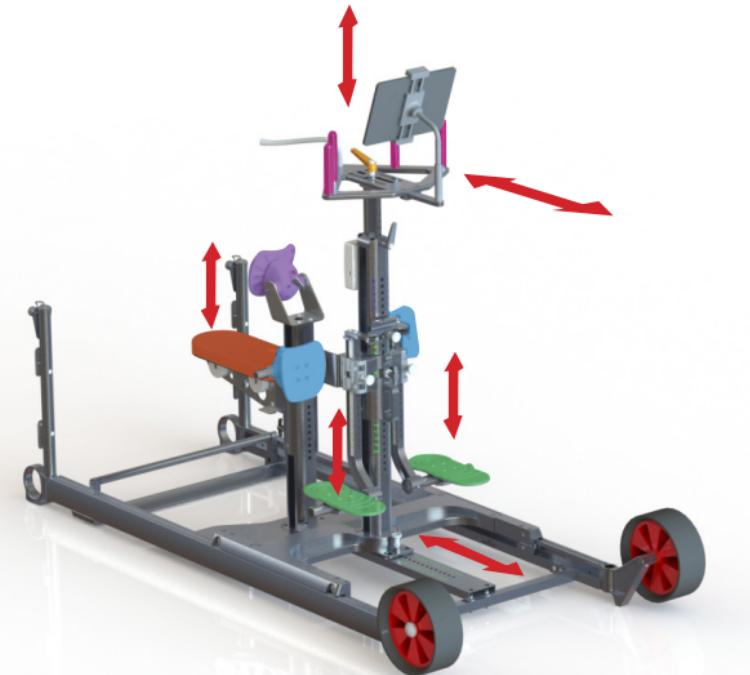


- █ Rear Force Pod
- █ Knee Pad
- █ Foot Plate x2
- █ Front Force Pods x2
- █ Handles x4

Change device setup

To make a custom set up adjust positions for force pods, and foot plates to suit the athlete.

Please ensure you enter new values in the Biostrain App



Caution when releasing the index pins the slide can drop

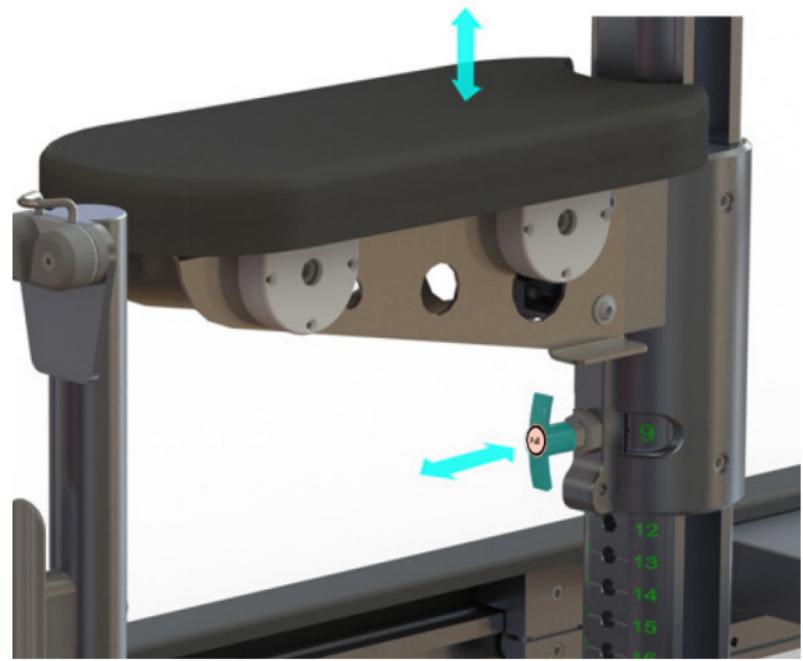


Ensure that the pins are fully engaged in holes before positioning athlete on the device

Knee Pad vertical adjustment

Release sprung index pin and slide vertically

Find your new position and release index pin to secure into hole

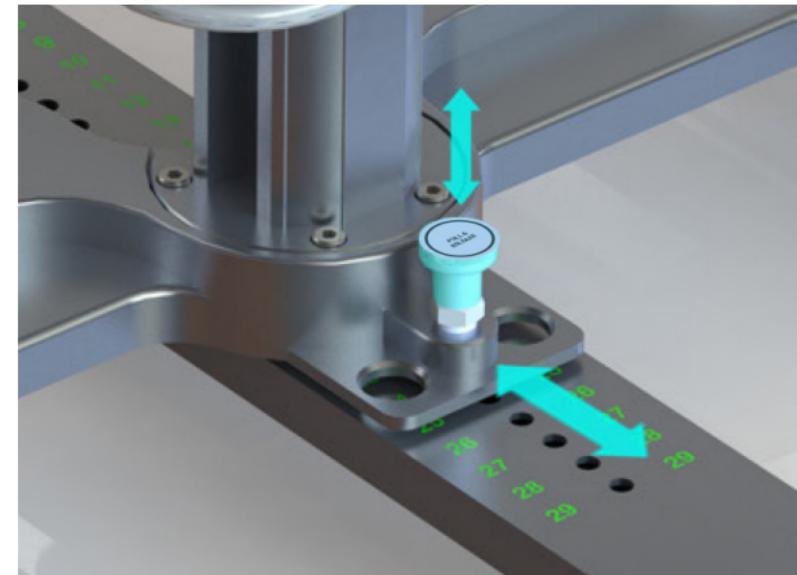


Ensure that the pin is fully engaged in hole before positioning athlete on the device

Front Force Pod (X) horizontal adjustment

Release sprung index pin and slide horizontally

Find your new position and release index pin to secure into hole



Caution when releasing the index pins the slide can drop

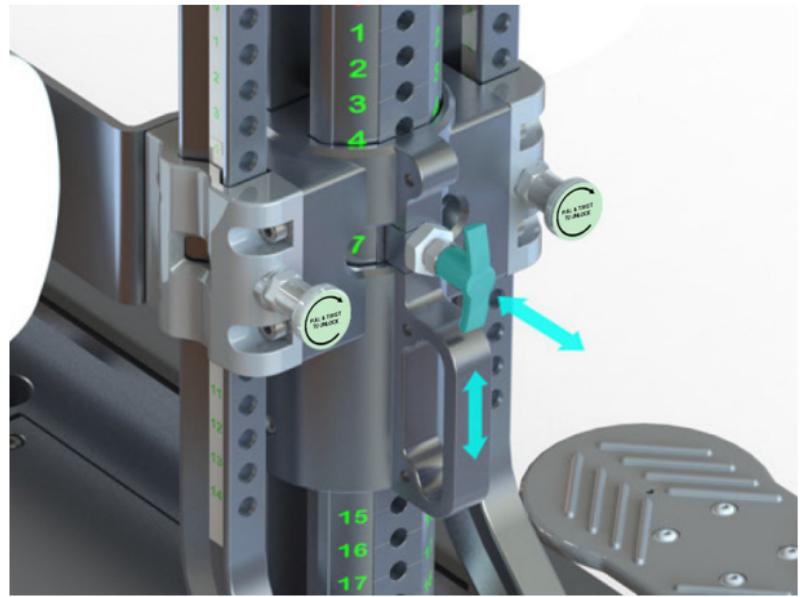


Ensure that the pins are fully engaged in holes before positioning athlete on the device

Front Force Pod (Y) vertical adjustment

Release sprung index pin and slide vertically

Find your new position and release index pin to secure into hole



Caution when releasing the index pins the slide can drop

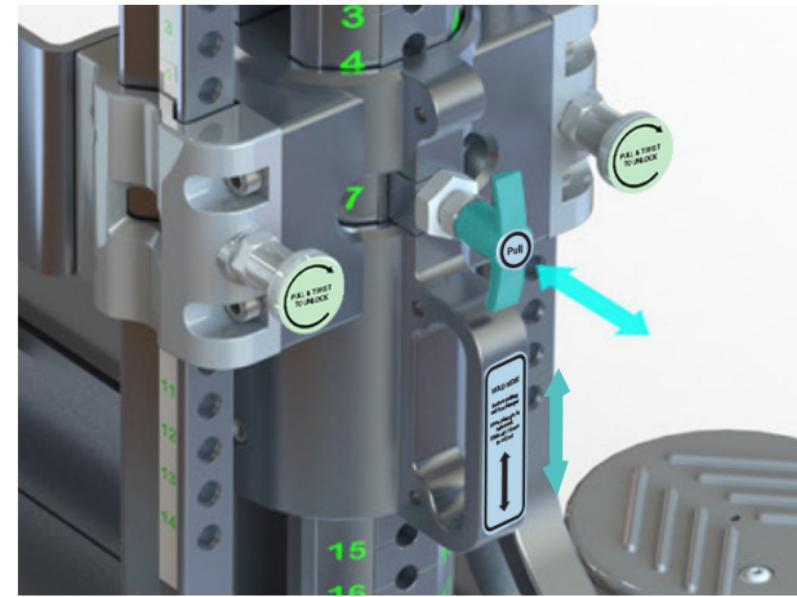


Ensure that the pins are fully engaged in holes before positioning athlete on the device

Foot Plate adjustment

Release 3 sprung index pins and slide the foot plates vertically.

Find your new position and release index pins to secure into holes





Caution when releasing the index pin the handles can drop suddenly

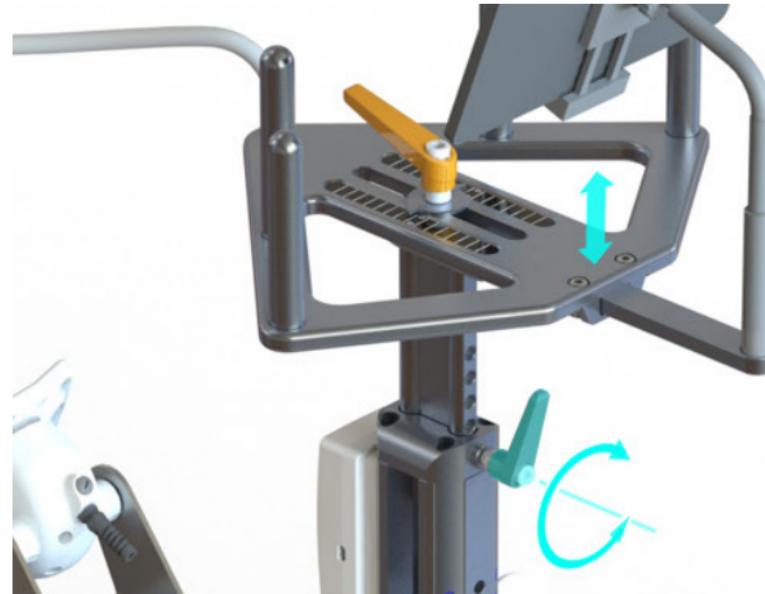


Ensure that the pin is fully engaged and secure in the hole before positioning athlete on the device.

Handles vertical adjustment

Turn the handle to loosen and slide then handles vertically.

Position the handles in your chosen position and secure by tightening the handle



Turn the handle to loosen and slide then handles horizontally.



Position the handles in your chosen position and secure by tightening the handle.

Handles horizontal adjustment

Turn the handle to loosen and slide then handles horizontally.

Position the handles in your chosen position and secure by tightening the handle.



03

GETTING STARTED



Charging user tablet

There are two ways to charge the user tablet.

Plug the small end of the USB C cable into the charging port and plug the large end of the USB C cable into either:

1. The USB C port on your computer
2. The supplied USB C wall adapter, then plug the adapter into a wall socket. Turn on the user tablet to confirm the user tablet is charging.

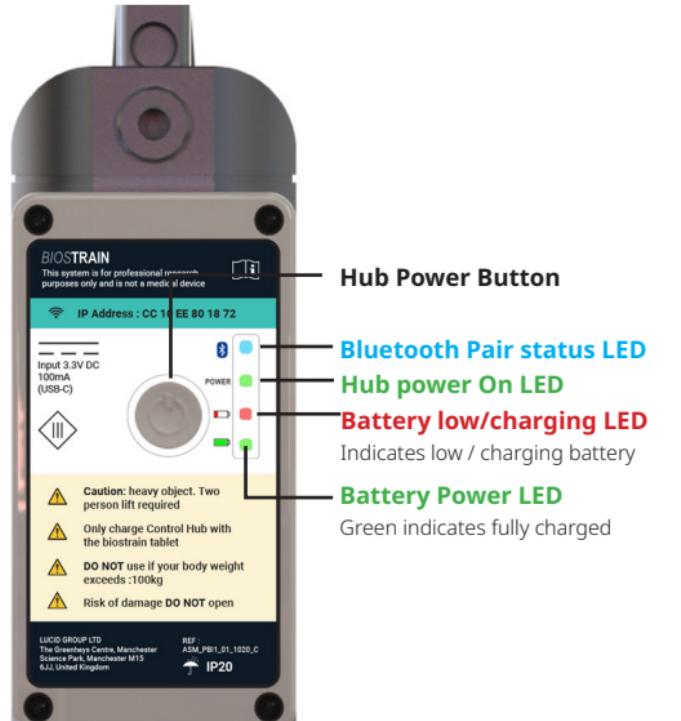


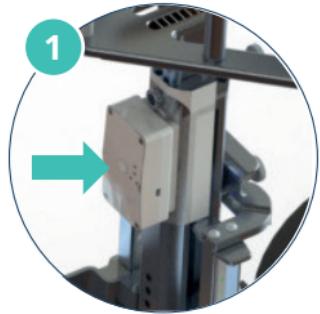


Charging the control hub

The tablet charges the control hub.
You must ensure the tablet has sufficient power available otherwise you may find the hub will not charge.

Please use the USB C provided to charge the control hub.

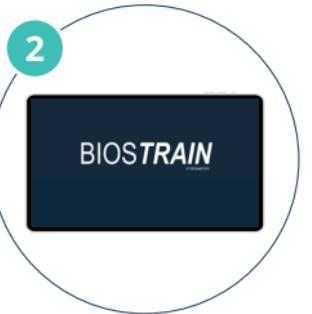




Power Up Control Hub

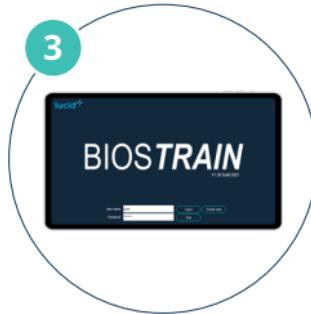
Press button and wait for the green LED to illuminate.

If the red LED illuminates you may need to wait until the control hub battery has charged sufficiently.



Open Biostrain application

This will be accessible on the main screen as you power on the tablet



Add your user login

You will be prompted to create an account. Enter an account name and password. Your user-name can also be your email address.

Password retrieval –
Email: ideas@lucidinnovation.com

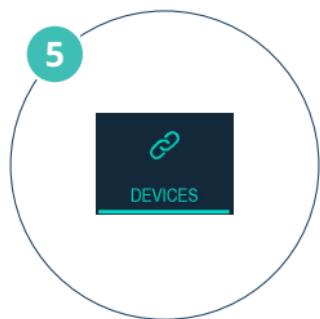


Pair devices



Welcome!

You're in ! Welcome to your new dashboard. The dash board may look a little empty right now, but don't worry. Things will start appearing as you make progress.



Select 'DEVICES' tab

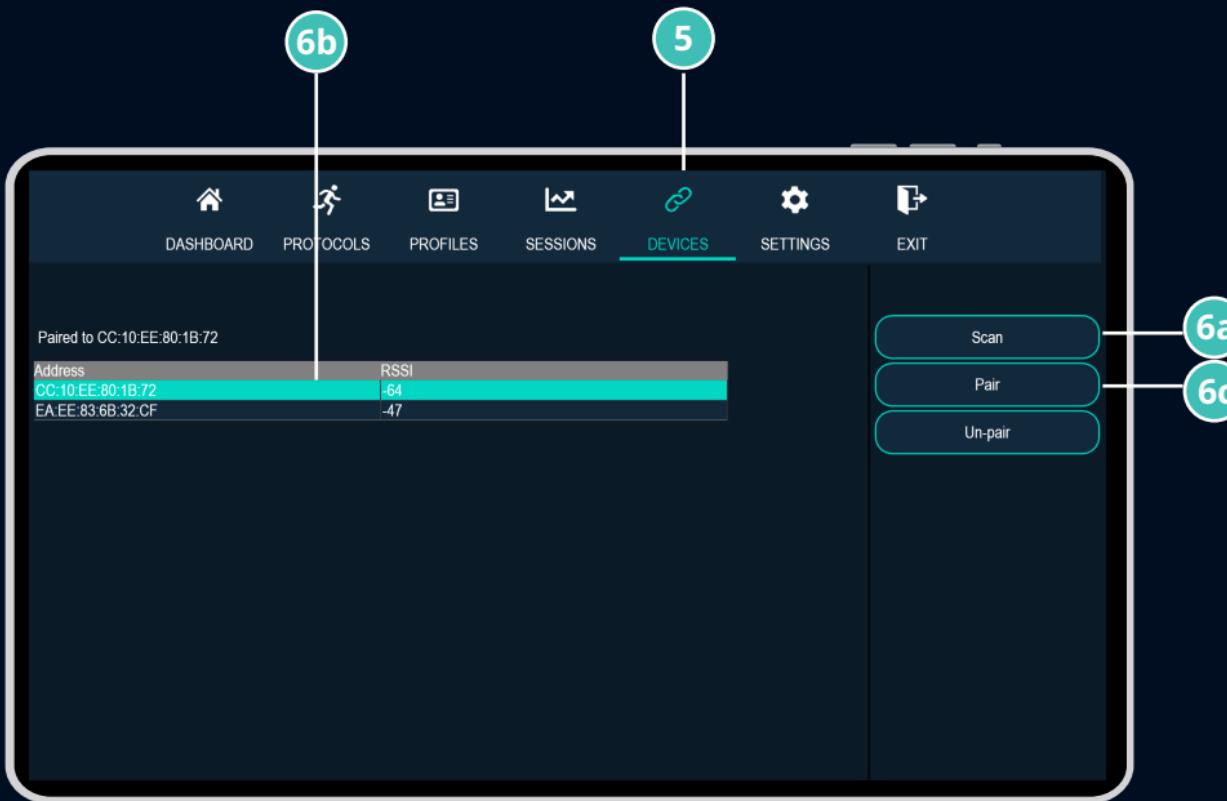
Ensure Bluetooth connection is enabled by accessing the Bluetooth settings on the 'devices' tab on the menu bar located on the top of the screen.



Scan & pair Bluetooth

Select 'scan' (6a) to search for the device, tap on the device - this will highlight blue once selected (6b) and select 'pair' (6c).

A lit blue LED on the controller hub indicates pairing has been successful.





Prior to use

Ensure the knee pad, handles and tablet have been cleaned and wiped with a disinfectant wipe.

Ensure device is on a stable, level floor.

Ensure there are no obstructions in the 1.2m clear zone around the device.

Ensure all slide mechanisms are free from obstructions.





Select 'SETTINGS' tab

Then select 'calibration'.



Grab kettle bell

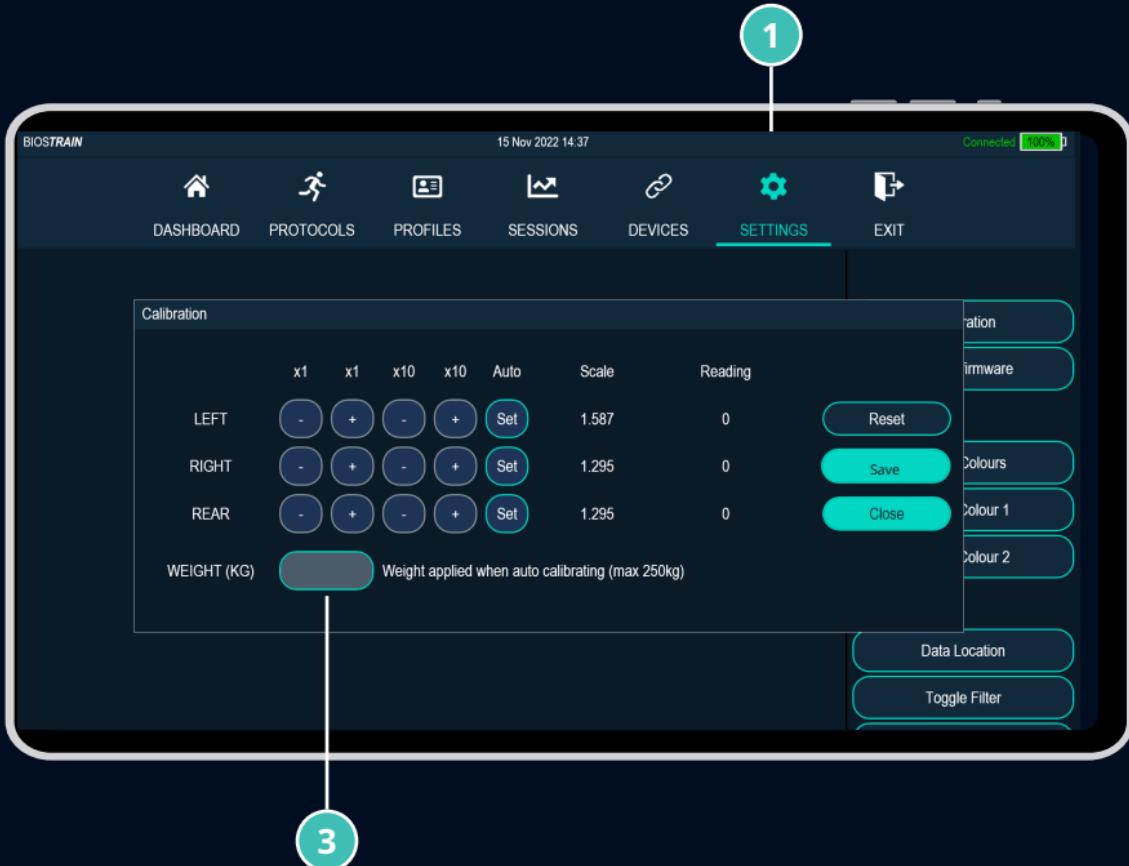
Use the 15.3kg kettle bell.

Rotate each force pod to face upwards
(see next page for more details).



Enter weight

Enter the kettle bell weight in the
check-box.





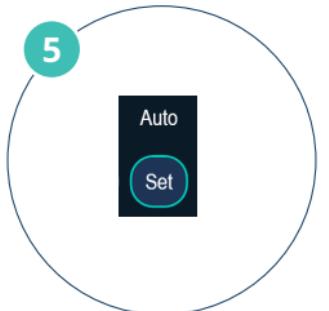
Calibrating using kettle bell

1. Rotate each force pod to face upwards – as near vertical as possible
2. Place the cup on the upper face of the force pod.
3. Then place the kettle bell on top of the cup – positioning it carefully allowing it to seat in its recess.
4. Hold the force pod firmly. Do not allow this to rotate as the kettle bell may fall off causing a risk of injury or damage to the device.



**Ensure weight is correctly placed on force pod**

Please refer to previous page for more details..

**Observe sensor readings**

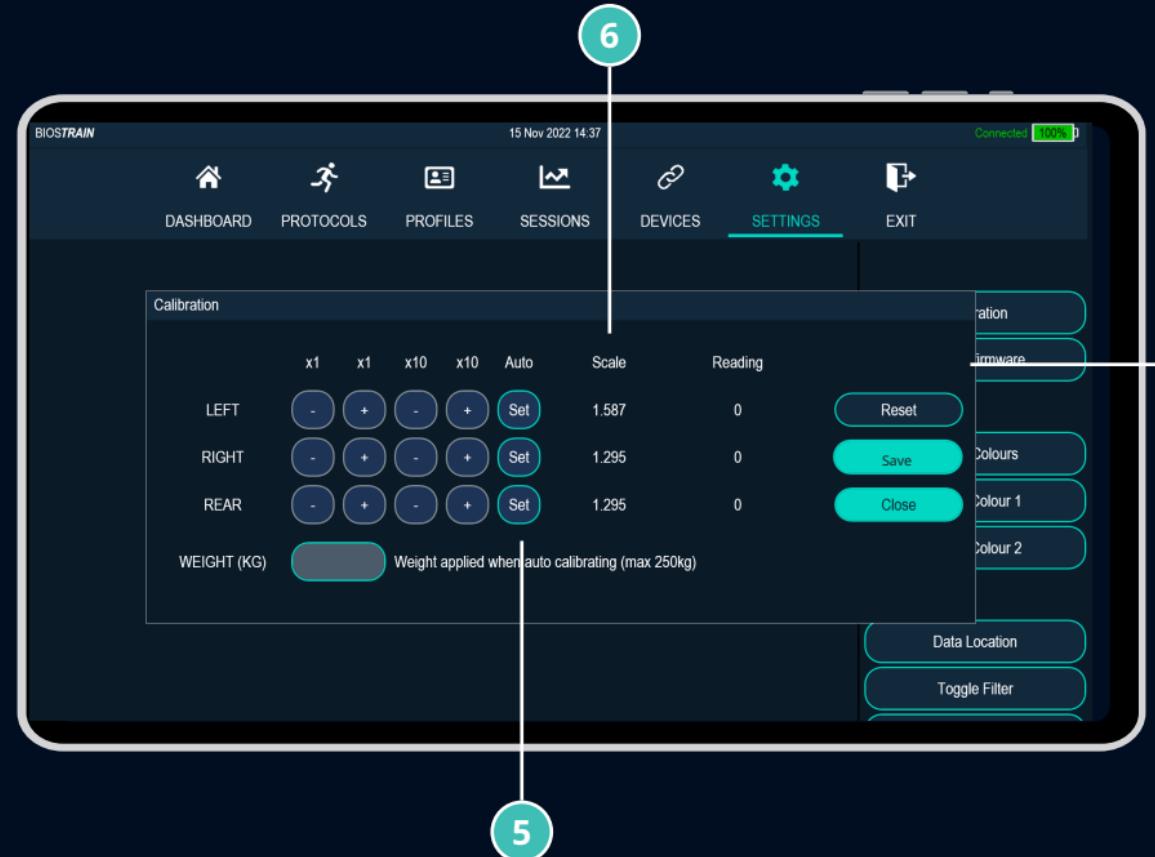
Adjustments can be made automatically using the 'Set' button.

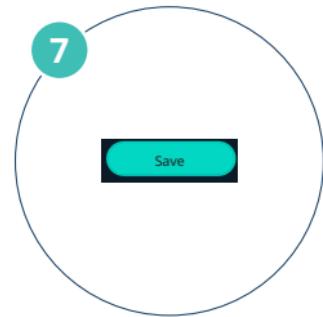
Alternatively, scale factors can be manually adjusted using the plus and minus symbols next to each sensor.

**Adjust values**

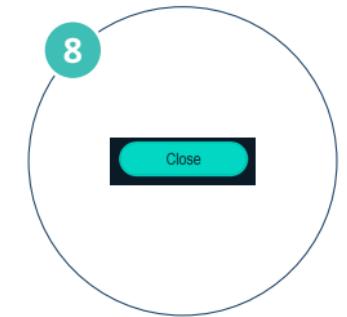
If the sensor reading is different to the applied weight, adjust the sensor using a scaling factor.

Repeat this process for each force pod.

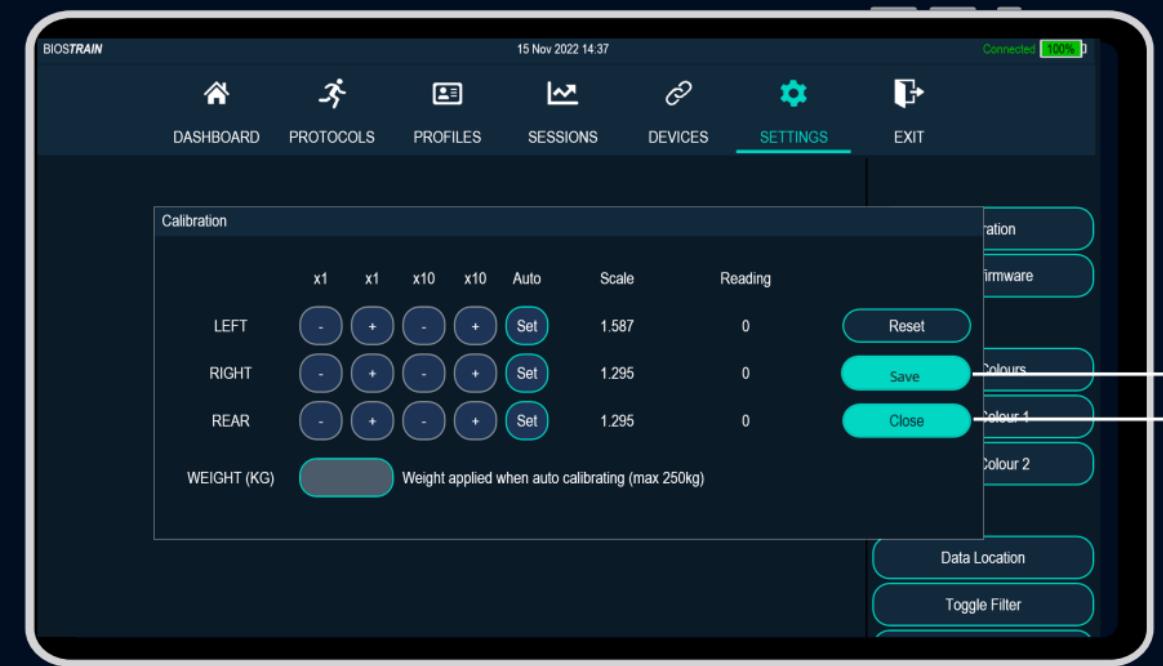


**Save**

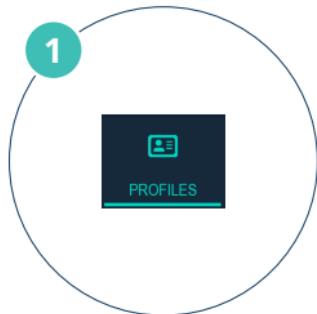
If you have made any changes.

**Close window**

Until you need to calibrate next time.

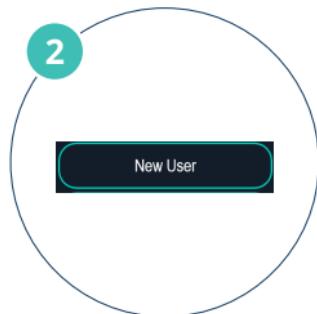


Add player profiles



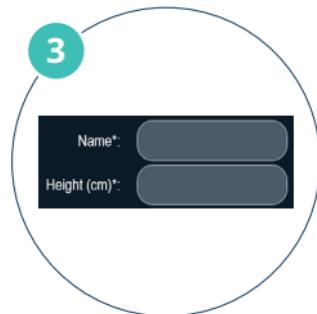
Select 'PROFILES' tab

The profiles tab is located on the top of the screen on the main menu.



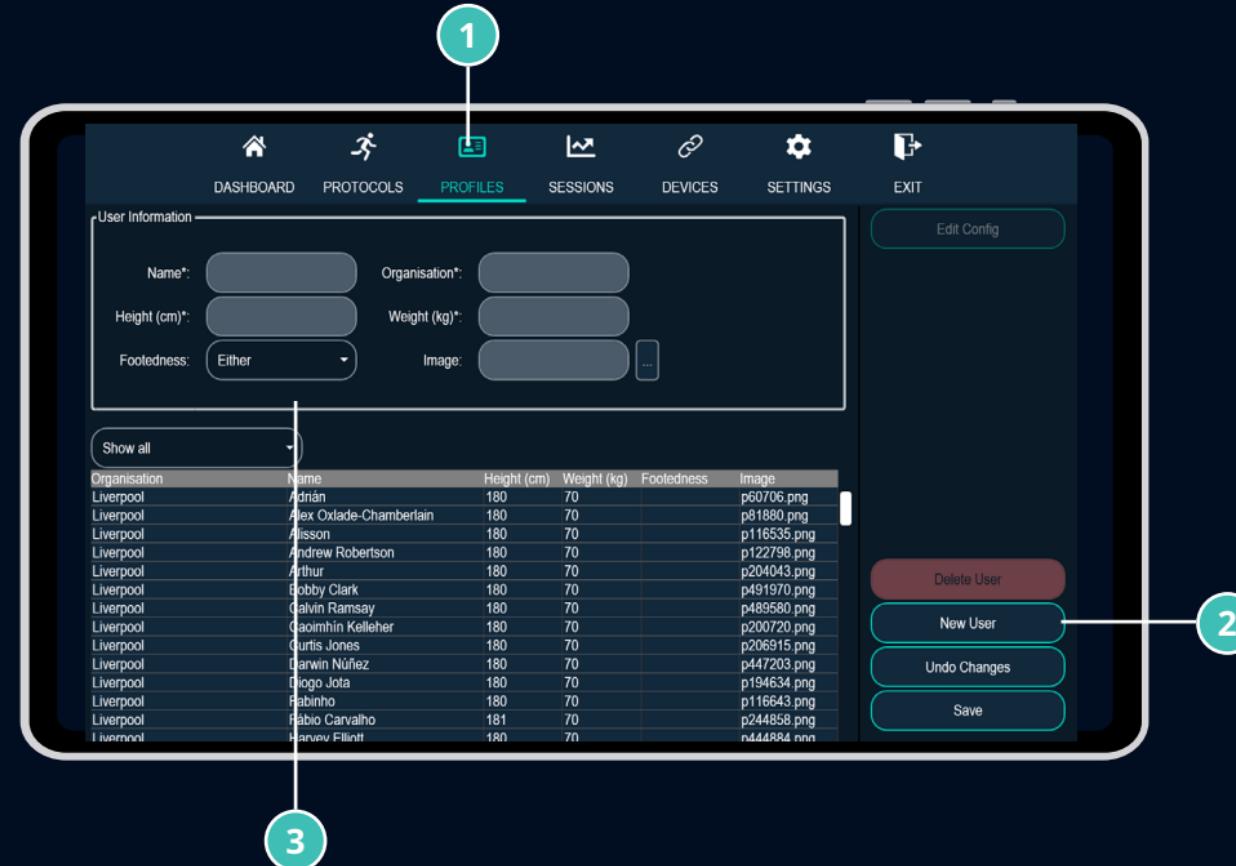
Select 'New user'

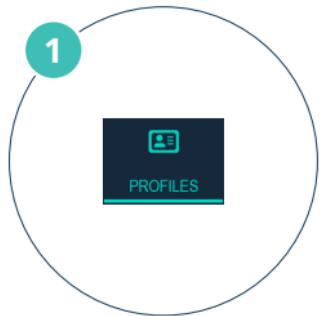
Enter player profile details including height, weight, handedness, organisation & image (optional).



Enter user information

Once complete, the profile needs to be saved to the Biostrain database





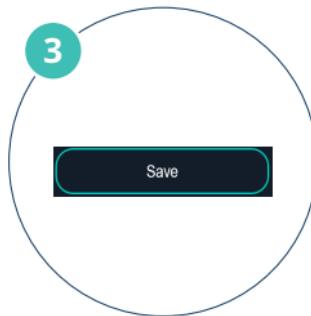
Select 'PROFILES' tab

The profiles tab is located on the top of the screen on the main menu.



Select a profile

Select the chosen profile. The player information is now editable.



Make changes

Make changes to manage the athletes profile then select save. To change player config, please refer to next page.

The profile needs to be saved to the Biostrain database

User Information

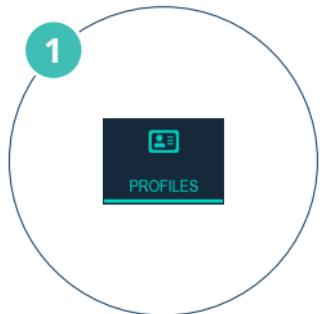
Name*	Organisation*	Height (cm)*	Weight (kg)*	Footedness	Image
Adrián	Liverpool	180	70	Right	p60706.png

Show all

Organisation	Name	Height (cm)	Weight (kg)	Footedness	Image
Liverpool	Adrián	180	70	Right	p60706.png
Liverpool	Alex Oxlade-Chamberlain	180	70	Left	p81880.png
Liverpool	Alisson	180	70	Left	p116535.png
Liverpool	Andrew Robertson	180	70	Left	p122798.png
Liverpool	Arthur	180	70	Left	p204043.png
Liverpool	Bobby Clark	180	70	Left	p491970.png
Liverpool	Calvin Ramsay	180	70	Left	p489580.png
Liverpool	Caoimhin Kelleher	180	70	Left	p200720.png
Liverpool	Curtis Jones	180	70	Left	p206915.png
Liverpool	Darwin Núñez	180	70	Left	p447203.png
Liverpool	Diogo Jota	180	70	Left	p194634.png
Liverpool	Fabinho	180	70	Left	p116643.png
Liverpool	Fábio Carvalho	181	70	Left	p244858.png
Liverpool	Georginio Wijnaldum	180	70	Left	p441004.png

Dashboard Protocols Profiles Sessions Devices Settings Exit Edit Config

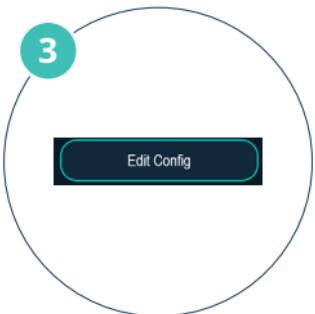
Delete User
New User
Undo Changes
Save

**Select 'PROFILES' tab**

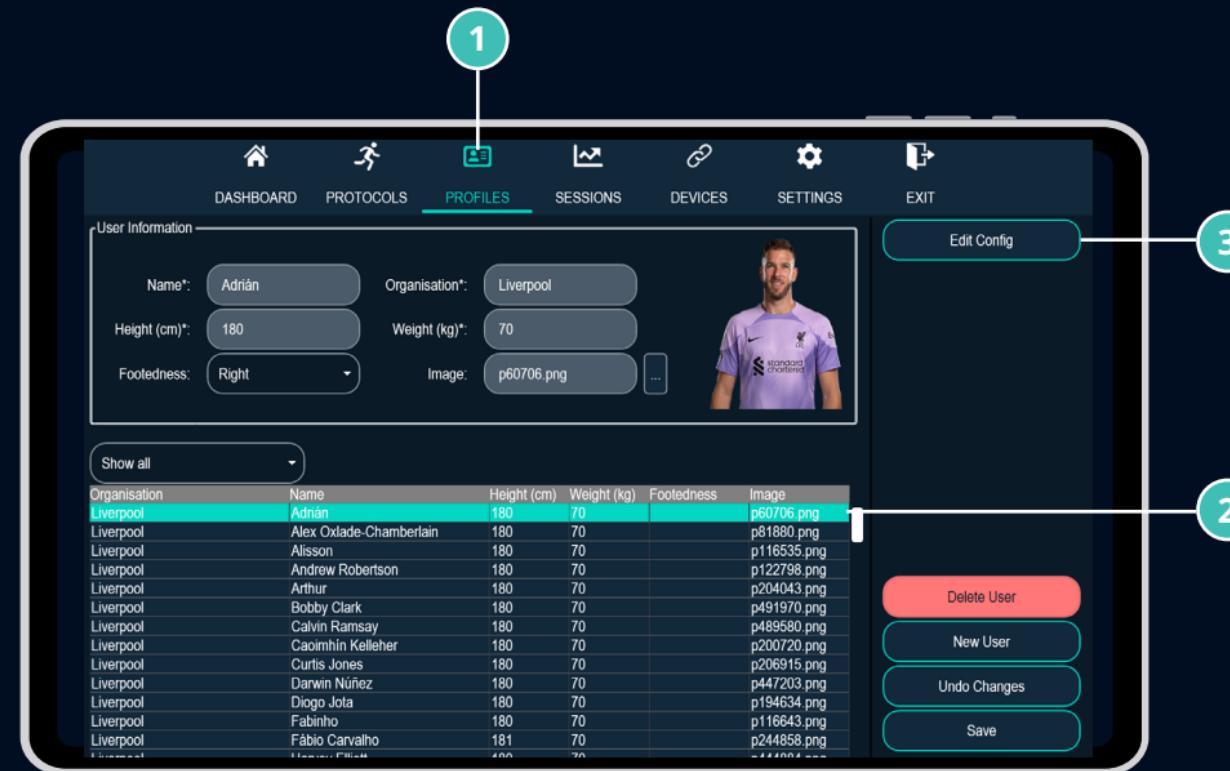
The profiles tab is located on the top of the screen on the main menu.

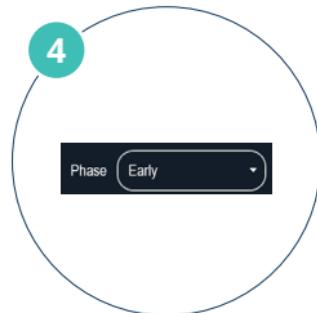
**Select a profile from the list**

Select the chosen profile. The player information is now editable.

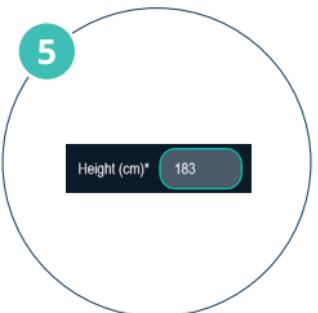
**Select 'edit config'**

Pressing edit config button enables a unique device set up assigned to the profile of the athlete.

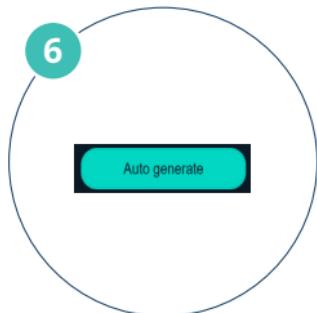


**Select a DFTZ phase**

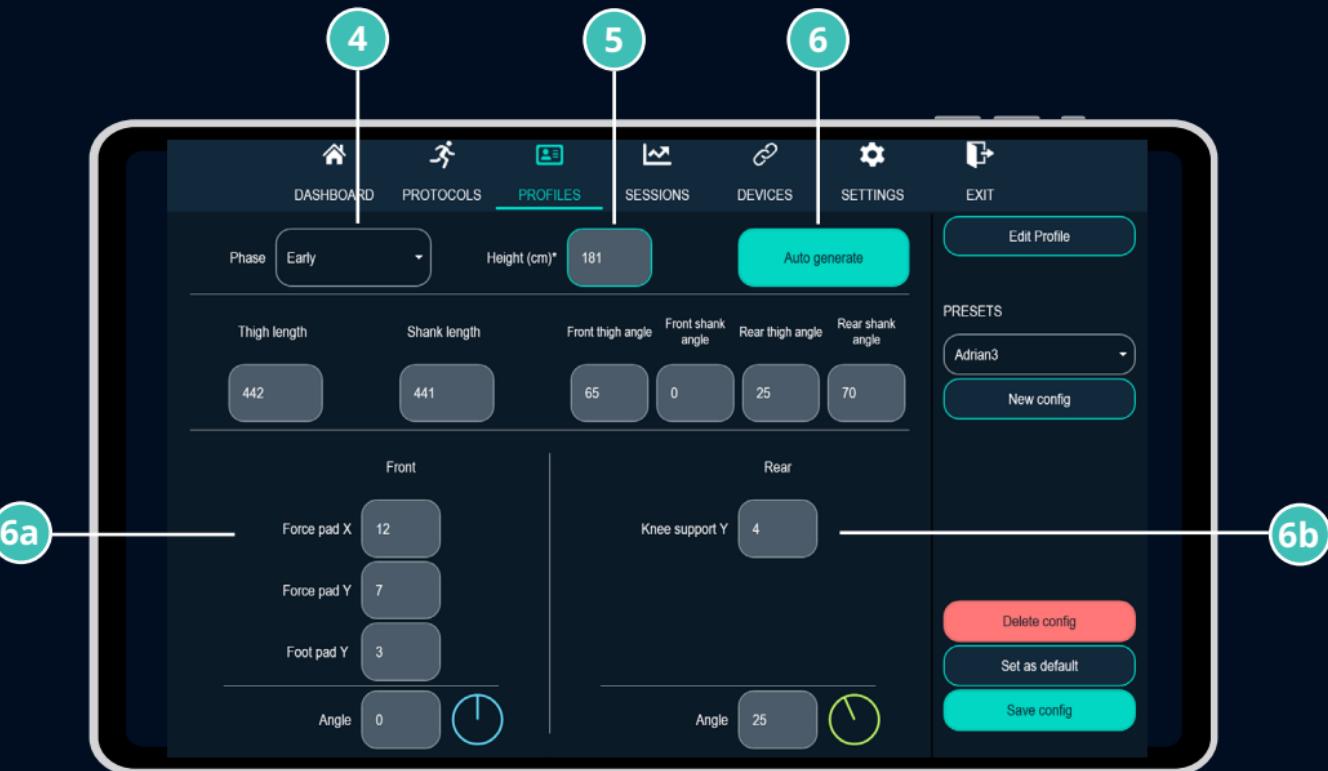
Select from early, mid or late. To learn more about "DFTZ phases, see "Double float transition zone explained" on page 6.

**Enter players height**

This helps the Biostrain App guide you when positioning the force pods, foot and Knee pads.

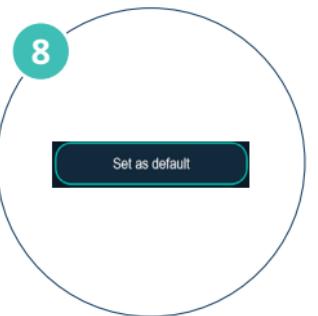
**Define settings**

Selecting 'auto generate' gives exact positions of pods and pads to enable you to set up the device. 6a defines front force pod positions. 6b defines knee pad position.

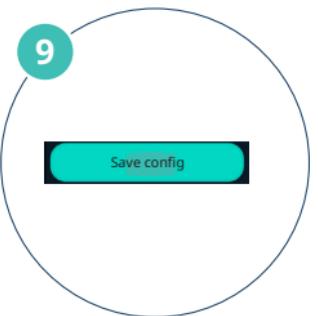


**Create a new pre-set**

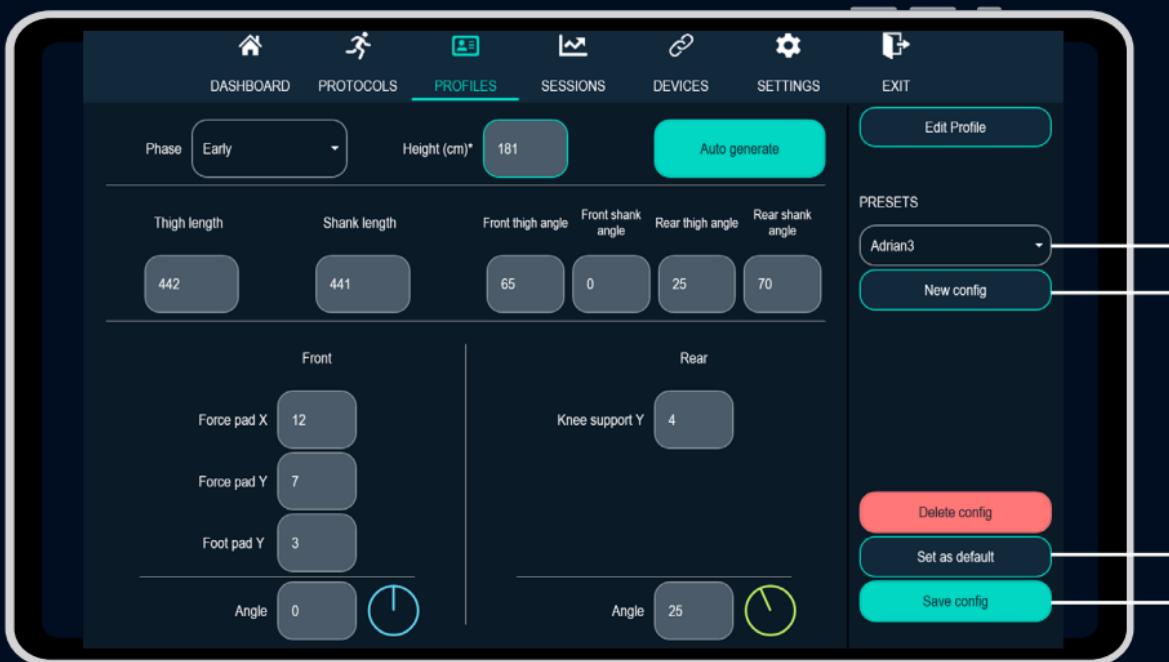
Select "new config" to create a new pre-set.
Type in the name of this pre-set and select "OK" to confirm. If you have a few pre-sets for one player, you will be able to select them via the drop down menu (7a).

**Set as default (optional)**

Select 'set as default' if you would like this configuration to be automatically loaded when conducting a new test.

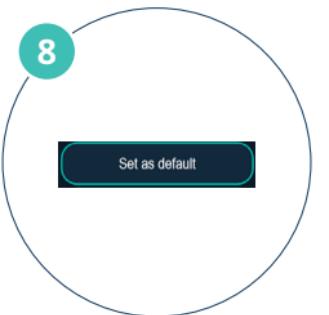
**Select 'SAVE CONFIG'**

Ensure you save config to update any changes.

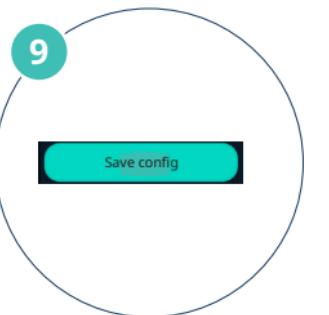


**Create a new pre-set**

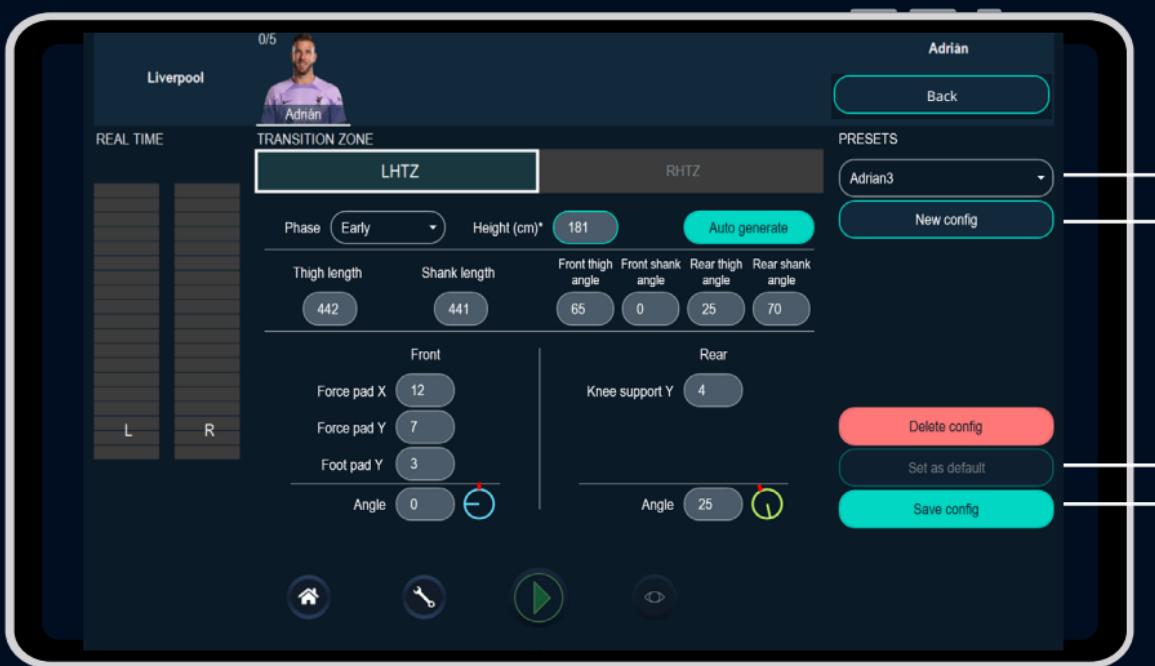
Select "new config" to create a new pre-set. Type in the name of this pre-set and select "OK" to confirm. If you have a few pre-sets for one player, you will be able to select them via the drop down menu (7a).

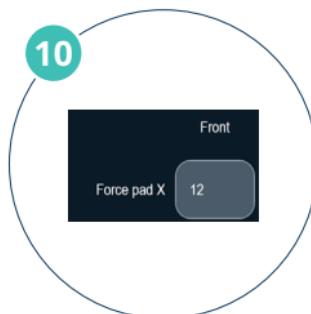
**Set as default (optional)**

Select 'set as default' if you would like this configuration to be automatically loaded when conducting a new test.

**Select 'SAVE CONFIG'**

Ensure you save config to update any changes.

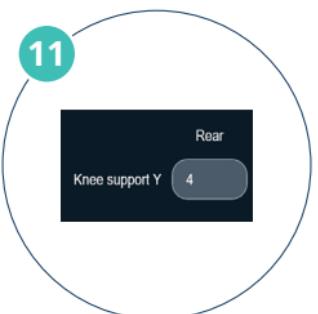




Change front force pod settings manually

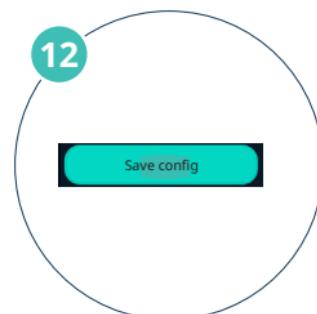
To make a custom set up change the settings for force pods, and foot plates to suit the athlete by entering a value in the boxes.

See page 24 and 26 to see player positioning set-up.



Change rear force pod settings manually

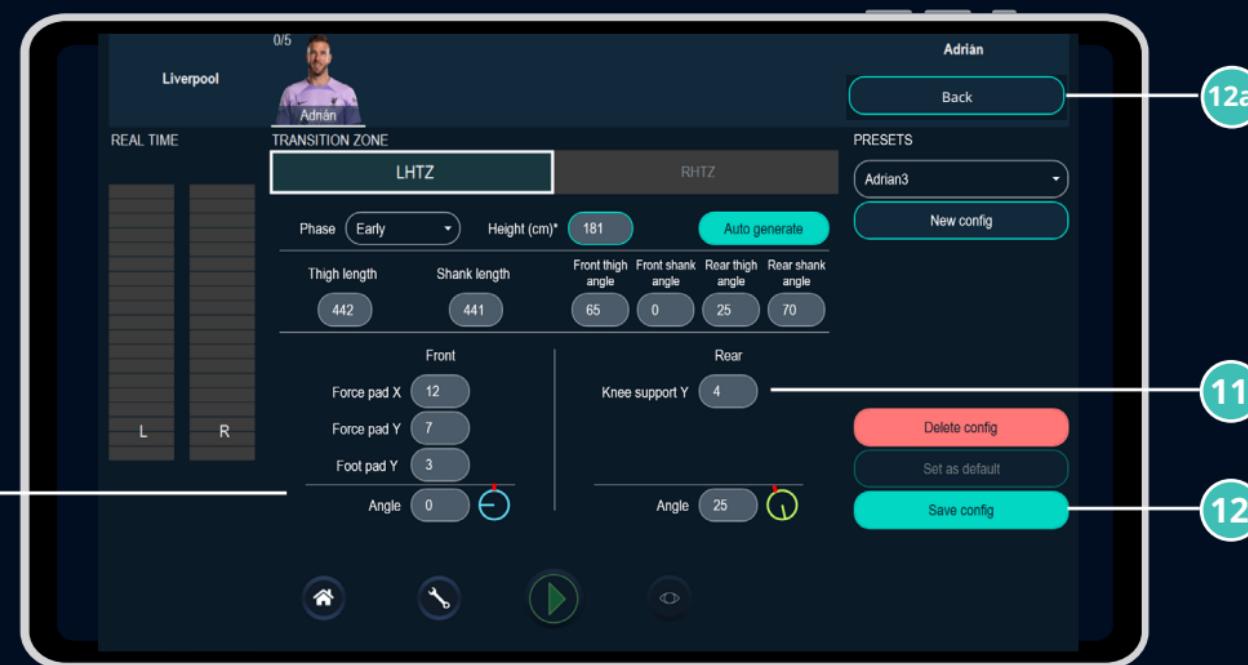
Repeat the process for knee pad positioning.

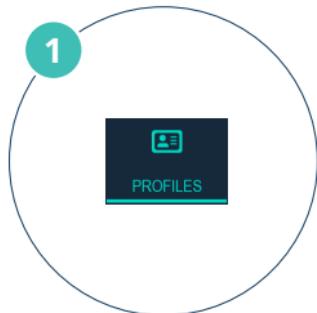


Select 'SAVE CONFIG'

Ensure you save config to update any changes.

Select 'back' to go back into the session screen (12a).





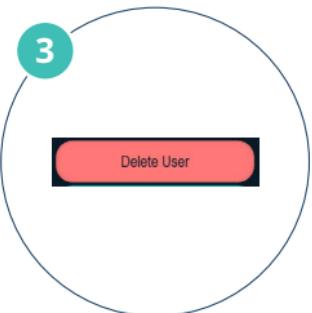
Select 'PROFILES' tab

The profiles tab is located on the top of the screen on the main menu bar.



Select a profile

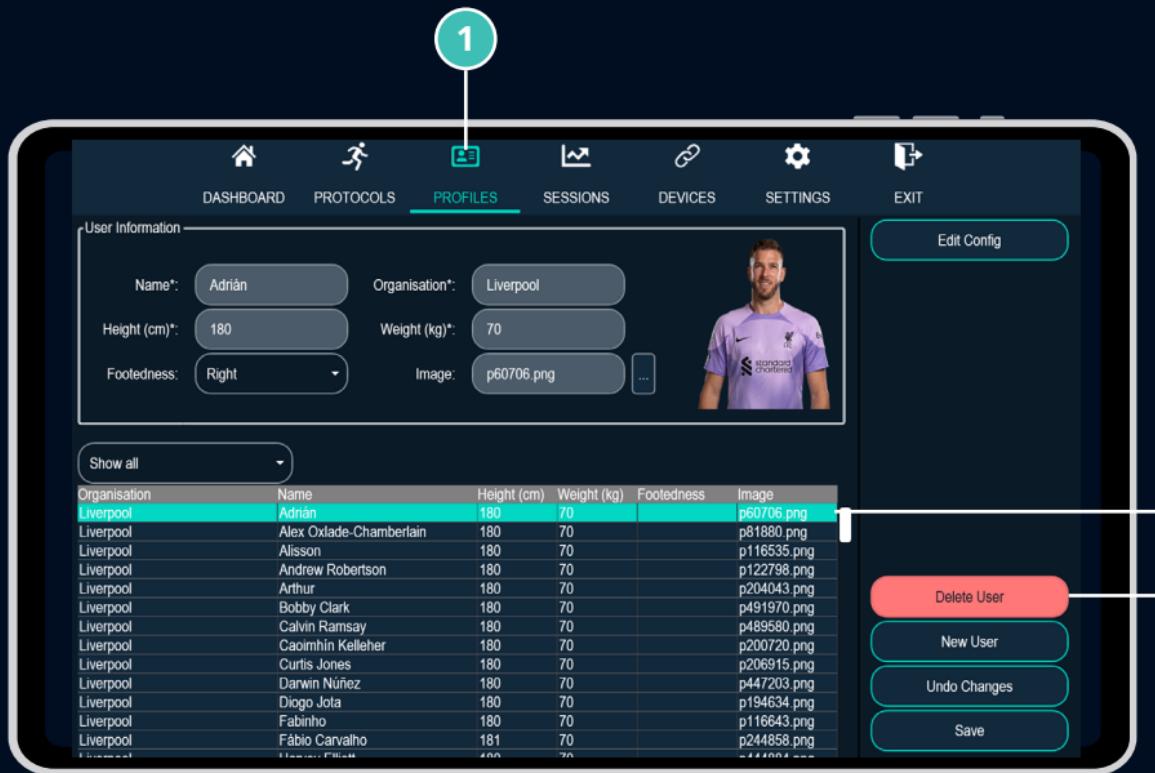
Select the chosen profile. The player information is now editable.



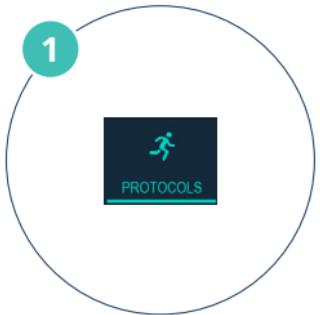
Select 'delete user'

Once selected, the profile will be permanently removed from the Biostrain database.

Save settings once complete.

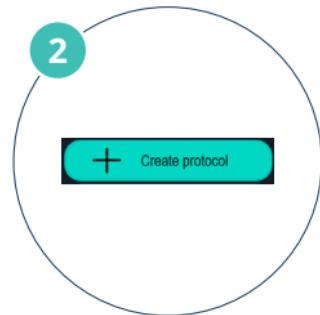


Create a new protocol



Select 'protocol' tab

The profiles tab is located on the top of the screen on the main menu..



Select 'create protocol'

Protocols will appear here once they have been created. Once you have created a protocol, you will have the option to edit and delete when selected.

What is a protocol?

A Protocol is a structured test with specific targets in a pre-defined set up.

Protocols allow practitioners to produce comparable data by ensuring test conditions are repeatable

The screenshot shows a software interface with a dark theme. At the top, there is a navigation bar with icons for Home, Protocols (highlighted in teal), Profiles, Sessions, Devices, Settings, and Exit. Below the navigation bar is a search bar labeled "SEARCH PROTOCOLS:" followed by a table of protocols. The table has columns for Name, Mode, Tag, Sides, Test, Rest, Reps, Steps, Intensity, and Hold. The "PROTOCOLS" tab is highlighted in teal. On the right side of the screen, there is a vertical sidebar with buttons for "Create protocol" (with a plus sign), "Delete protocol" (with a trash bin icon), and "Edit protocol" (with a pencil icon).

Name	Mode	Tag	Sides	Test	Rest	Reps	Steps	Intensity	Hold
50m sprint test (LHTZ)	Monitor		Both	1 mins	5 secs	5	-	-	-
Baseline JL	Monitor		Both	1 mins	5 secs	2	-	-	-
Baseline N+1	Monitor	N+1	Both	1 mins	30 secs	1	-	-	-
Baseline N+2	Monitor	N+2	Both	1 mins	30 secs	1	-	-	-
Baseline N+3	Monitor	N+3	Both	1 mins	30 secs	1	-	-	-
Baseline N-1	Monitor	N-1	Both	1 mins	30 secs	1	-	-	-
Baseline N-2	Monitor	N-2	Both	1 mins	30 secs	1	-	-	-
Baseline N-3	Monitor	N-3	Both	1 mins	30 secs	1	-	-	-
baseline pbx	Monitor		Both	1 mins	5 secs	1	-	-	-
baseline sa	Monitor		Both	1 mins	30 secs	2	-	-	-
Baseline test	Monitor		Both	1 mins	5 secs	2	-	-	-
Baseline th	Monitor		Both	1 mins	5 secs	1	-	-	-
Baseline_1	Monitor		Both	1 mins	5 secs	2	-	-	-
config1	Monitor		Both	1 mins	5 secs	1	-	-	-
easy early	Monitor		Both	1 mins	5 secs	7	-	-	-
easy late	Monitor		Both	1 mins	5 secs	3	-	-	-
easy mid	Monitor		Both	1 mins	5 secs	3	-	-	-
easy	Monitor		Both	1 mins	5 secs	3	-	-	-
easy1	Monitor		Both	1 mins	5 secs	3	-	-	-
easy2	Monitor		Both	1 mins	5 secs	3	-	-	-
gggg	Monitor		Both	1 mins	5 secs	1	-	-	-
my monitor protocol	Monitor		Both	1 mins	5 secs	10	-	-	-
My protocol (monitor)	Monitor		Both	1 mins	5 secs	2	-	-	-
new	Monitor		Both	1 mins	5 secs	1	-	-	-
sprint fatigue 8-9-22	Monitor		Both	1 mins	30 secs	8	-	-	-



What is a baseline test?

The Baseline Test should be repeated monthly or after periods of high activity, such as a busy fixture period. The athlete should be 'fresh' when prior to undertaking this test: i.e., no fatigue inducing activity done immediately before testing.

Protocol and Device parameters can be adjusted at practitioners discretion.

Protocol parameters

Repetitions	x2	Allows for outlying results to be mitigated. Best score from 2 reps taken as baseline. 1 rep consists of x1 RHTZ x1 LHTZ
Test Time	1 minute max	Helps to maintain recovery periods between tests.
Rest Time	1 minute max	Time between reps to prevent results being affected by fatigue.

Device parameters

DFTZ Phase	Early	Comfortable position to enable maximum force generation
Set up	Athlete stature	Use Auto Generate on Protocol set up on Biostrain App Multiple athletes of similar heights can be grouped to accelerate duration of tests.

Test instructions

1. Ask athlete to get into position on device following set up. Ask the athlete to match the pod angles, specified in the protocol parameters.
2. When ready press 'START' button to begin recording data.
3. Athlete performs 3 contractions per DFTZ – First contraction 3-5 seconds, next 2 contractions to be rapid lasting 1-2 seconds.
4. When 3 contractions are complete press 'STOP' button and check output graphs. If data is acceptable
5. Ask athlete to swap sides and repeat steps 1-4.
6. After both sides have been completed (1 rep) Ask athlete to align the device and rest for 1 minute.
7. Following rest repeat steps 1-4.
- 8.



Protocol parameters

Repetitions	x5	Allows for outlying results to be mitigated. Best score from 2 reps taken as baseline.
Test Time	1 minute max	Test must be recorded within 1 minute after start of 50m sprint
Rest Time	1 minute max	Short rest time to prevent users recovering. Rest time can be imposed whilst the athlete returns to start point of sprint.

What is a fatigue test?

The Fatigue protocol is designed to assess levels of fitness and conditioning. Testing takes place immediately after a fatigue inducing activity such as a 50m sprint.

Tests must be recorded within 1 minute window following the sprint.

Use this protocol during intense training sessions to see how fatigue impacts on force generation and asymmetry.

Protocol and Device parameters can be adjusted at practitioners discretion.

Device parameters

DFTZ Phase	Early	Comfortable position to enable maximum force generation
Set up	Athlete stature	Use Auto Generate on Protocol set up on Biostrain App Multiple athletes of similar heights can be grouped to accelerate duration of tests.

Test instructions

1. Ask athlete to get into position on device following set up. Ask the athlete to match the pod angles, specified in the protocol parameters.
2. Lay out a 50m sprint course on a flat surface. Ensure the finishing point is near the device.
3. Position athlete at start of the sprint course.
4. Ask athlete to start sprint.
5. When sprint has finished, Instruct athlete to get positioned on device.
6. When ready press 'START' button to begin recording data.
7. Athlete performs 3 contractions per DFTZ – First contraction 3-5 seconds, next 2 contractions to be rapid lasting 1-2 seconds.
8. When 3 contractions are complete press 'STOP' button and check output graphs. If data is acceptable press 'EXPORT' button to save data.
9. After left side has been tested ask athlete to alight device and return to start point of sprint
10. Ask athlete to and repeat steps 1-9.



What is warm up?

Multiple low- intensity force contractions of increasing intensity. Warm up is designed get athlete's ready for intense training or testing.

Protocol and Device parameters can be adjusted at practitioners discretion.

Protocol parameters

Repetitions	x2 1 rep consists of x1 RHTZ x1 LHTZ	Force intensity remains constant between reps.
Test Time	1 minute max	Test time indicator to maintain recovery periods between tests
Rest Time	1 minute max	Recovery time
Force Intensity	70% of Peak Force	Intensity relates to a percentage of best Peak Force data recorded in last 10 Baseline Tests
Hold Time (Contraction)	3 seconds	Athlete to hold contraction at specified intensity.
Number of Sets	3	User to complete 3 sets of 2 repetitions on left and right sides to complete the protocol

Device parameters

DFTZ Phase	Early	Comfortable position to enable maximum force generation
Set up	Athlete stature	Use Auto Generate on Protocol set up on Biostrain App Multiple athletes of similar heights can be grouped to accelerate duration of tests.

Test instructions

1. Ask athlete to get into position on device following set up. Ask the athlete to match the pod angles, specified in the protocol parameters.
2. Athlete to perform a contraction, ramping up slowly until the applied force is within the 'green zone'.
3. Once the athlete is exerting the correct intensity of force a timer will countdown the hold duration. The athlete should maintain the force for the duration of the contraction.
4. When the contraction has been held, the athlete, should swap sides and repeat the contraction on the other side. The App will notify the athlete which side is correct.
5. After contractions have been completed on both sides, the athlete should alight the device and rest for 1 minute.
6. Repeat steps 1-5 for 5 repetitions.
7. No data is saved after performing this protocol.



What is strength training?

Multiple force contractions of increasing intensity. Strength training is designed to improve athlete peak force output on the device. This can contribute to increasing sprinting speed.

This protocol could be used as a part of a strength and conditioning training regime

Protocol and Device parameters can be adjusted at practitioners discretion.

Protocol parameters

Repetitions	x5 1 rep consists of x1 RHTZ x1 LHTZ	Force intensity increases between reps.
Test Time	5 minute max	Test time indicator to maintain recovery periods between tests
Rest Time	2 minute max	Athletes should be aiming to achieve maximal forces
Force Intensity	50 – 100% of Peak Force	Intensity relates to a percentage of best Peak Force data recorded in last 10 Baseline Tests
Hold Time (Contraction)	3 seconds	Athlete to hold contraction at specified intensity.
Number of Sets	3	User to complete 3 sets of 5 repetitions on left and right sides to complete the protocol

Device parameters

DFTZ Phase	Early	Comfortable position to enable maximum force generation
Set up	Athlete stature	Use Auto Generate on Protocol set up on Biostrain App Multiple athletes of similar heights can be grouped to accelerate duration of tests.

Test instructions

1. Ask athlete to get into position on device following set up. Ask the athlete to match the pod angles, specified in the protocol parameters.
2. Athlete to perform a contraction, ramping up slowly until the applied force is within the 'green zone'.
3. Once the athlete is exerting the correct intensity of force a timer will countdown the hold duration. The athlete should maintain the force for the duration of the contraction.
4. When the contraction has been held, the athlete, should swap sides and repeat the contraction on the other side. The App will notify the athlete which side is correct.
5. After contractions have been completed on both sides, the athlete should alight the device and rest for 2 minutes.
6. The force intensity will now increase by 10% for the next repetition.
7. Repeat steps 1-5 for 5 repetitions.
8. No data is saved after performing this protocol.

**Position athlete**

A Protocol is a structured test with specific targets in a pre-defined set up. Protocols allow practitioners to produce comparable data by ensuring test conditions are repeatable.

Once all elements have been positioned and securely fixed, ask the athlete to try the settings for size. Try to position legs at the prescribed angles.

Ask the athlete how the position of their bodies feel. The positions can feel uncomfortable – but ask if they feel any pain and take note.

If you can see that the set up requires adjustment – take note.

Adjusting Device

Adjust the device according to the settings recommended by the Biostrain App.

Move the horizontal and vertical slide mechanisms to position the front force pods and foot plates into position. Repeat with the knee pad.

Tweaking the device set up

If adjustments are required – re-position force pods, knee pads and foot plates accordingly.

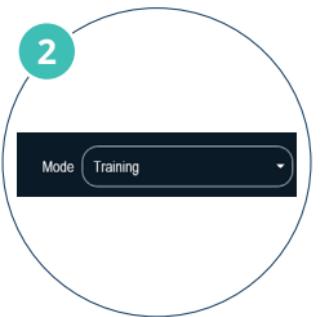
Ask the athlete to return to the device and try the new set up before commencing testing.





Enter protocol name

Make the protocol name unique and something relevant to your testing requirements



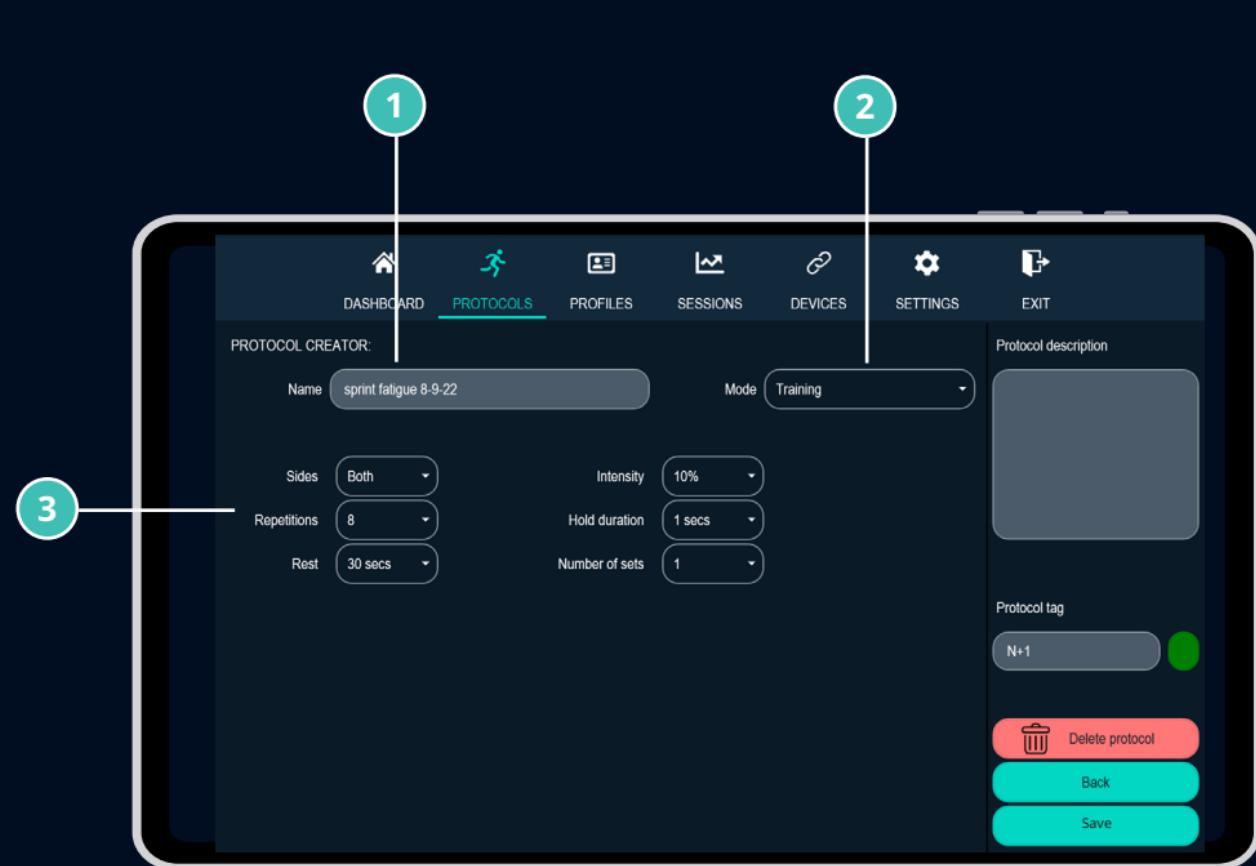
Select a mode

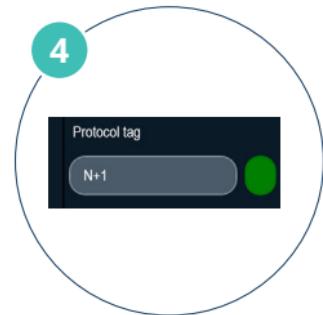
Select from Monitor, Training or Diagnostics. To find out which mode is relevant see "Modes, protocols, sessions & tests explained" on page 10.



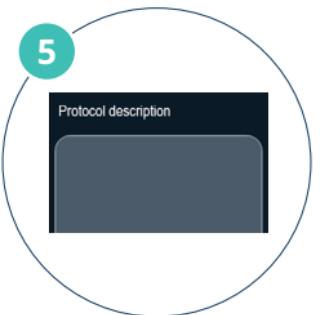
Define parameters

Tweak the parameters to suit your testing requirements. You can modify the transformational zones, repetitions, rest time and test time.

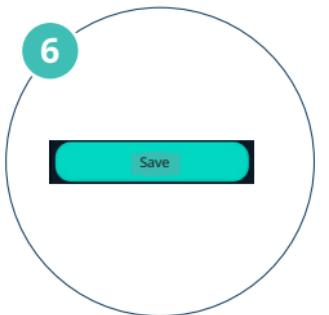


**Add protocol tag (optional)**

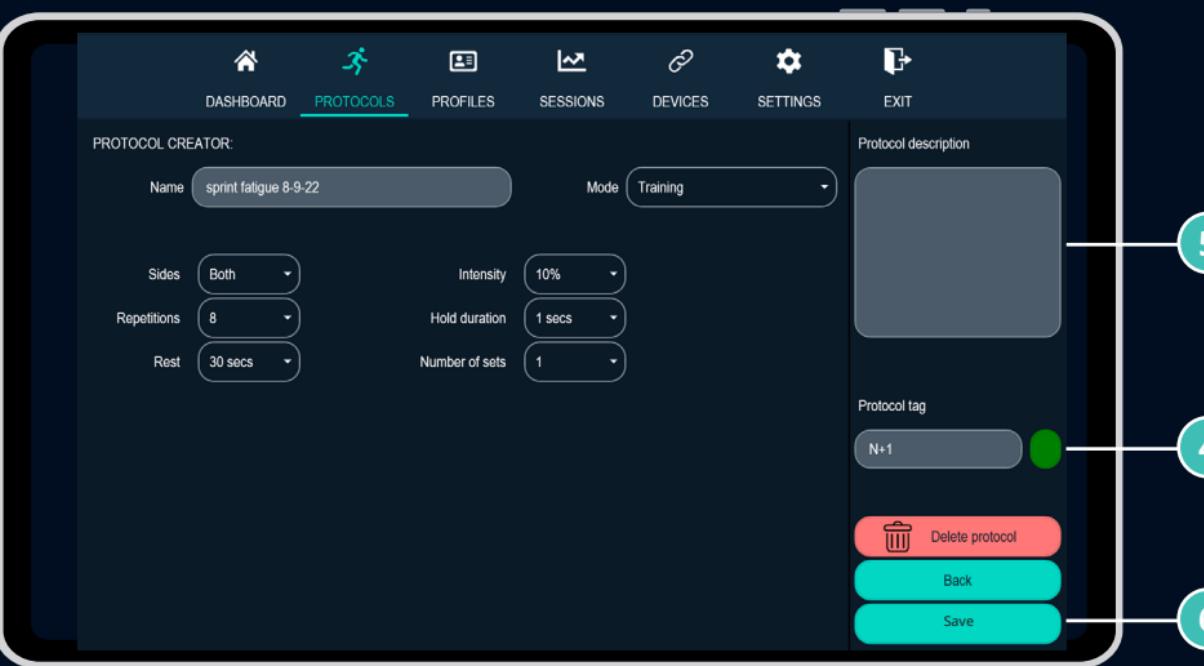
A protocol can be given a unique Tag. An ID & a colour can denote the tag in session graphs. For example: N = Match day test. N+1 = A test done the day following a match. Etc. To find out more about session graphs, see next page.

**Enter protocol description (optional)**

Select on the text box and describe the protocol you have created.

**Select 'save'**

Ensure you select 'save' to update any changes.





Why use protocol tags?

Coloured bands on graph Indicate a tag made in the Protocol. This feature enables a physio to compare tests done on specific day after/before a match



Example: N+1
(This test was done following a match)

04

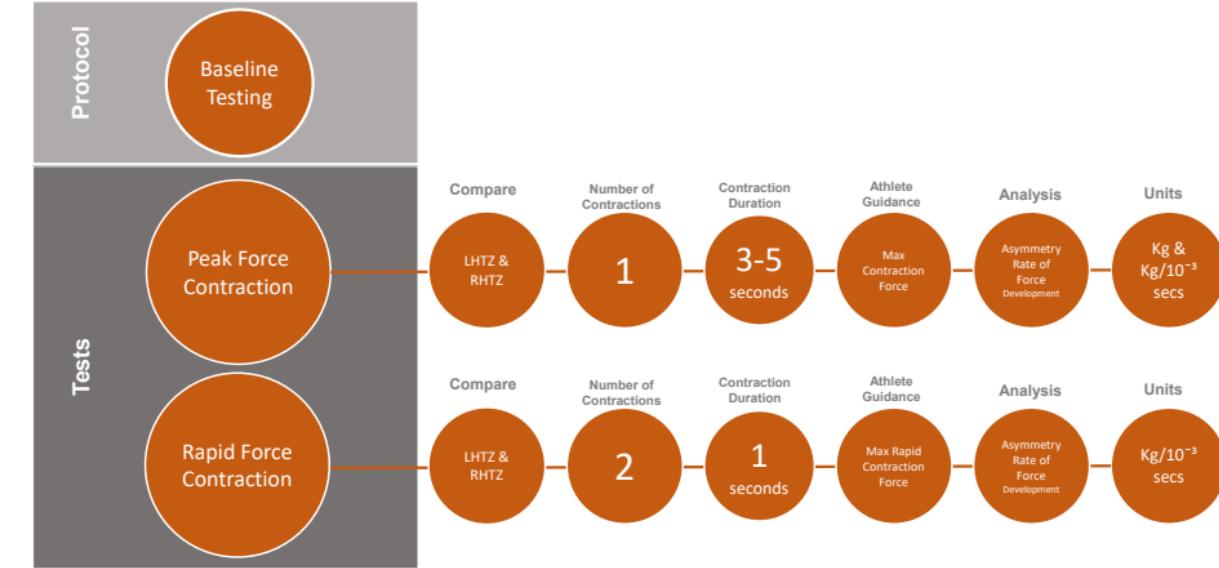
TESTS

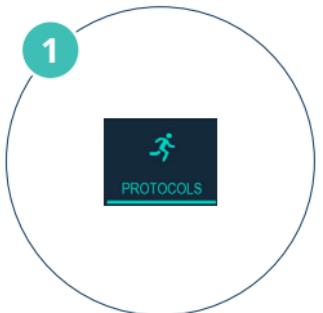


Understanding contractions

Tests are completed by asking the athlete to perform leg contractions on the force pods in DFTZ.

The forces generated are collated within the Biostrain App and displayed in graphical form.





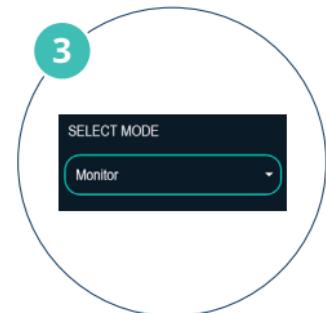
Create a protocol for baseline test

Before you begin, please ensure you have created a protocol. Please refer to page 70 for information on how to create a new protocol. Please name this new protocol "baseline test"



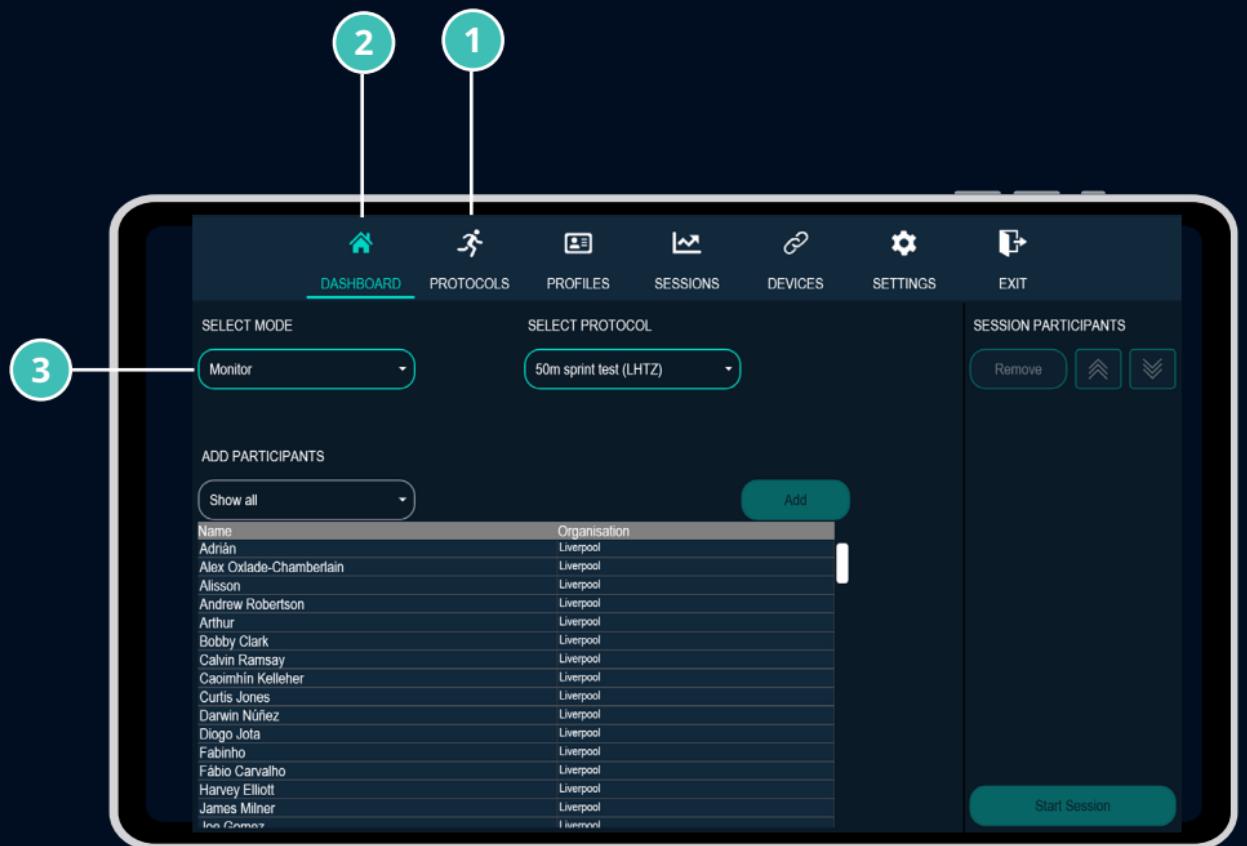
Select 'DASHBOARD' tab

To begin.



Select 'monitor' mode

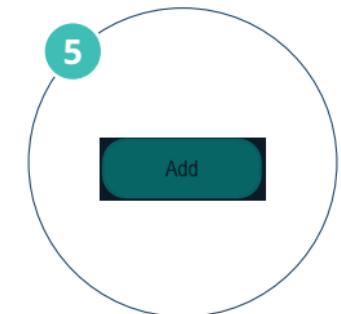
This helps select the protocol of interest





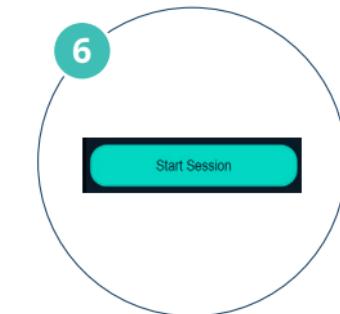
Select a protocol

In this case Baseline Test, you may have named this differently, so select your protocol of choice.



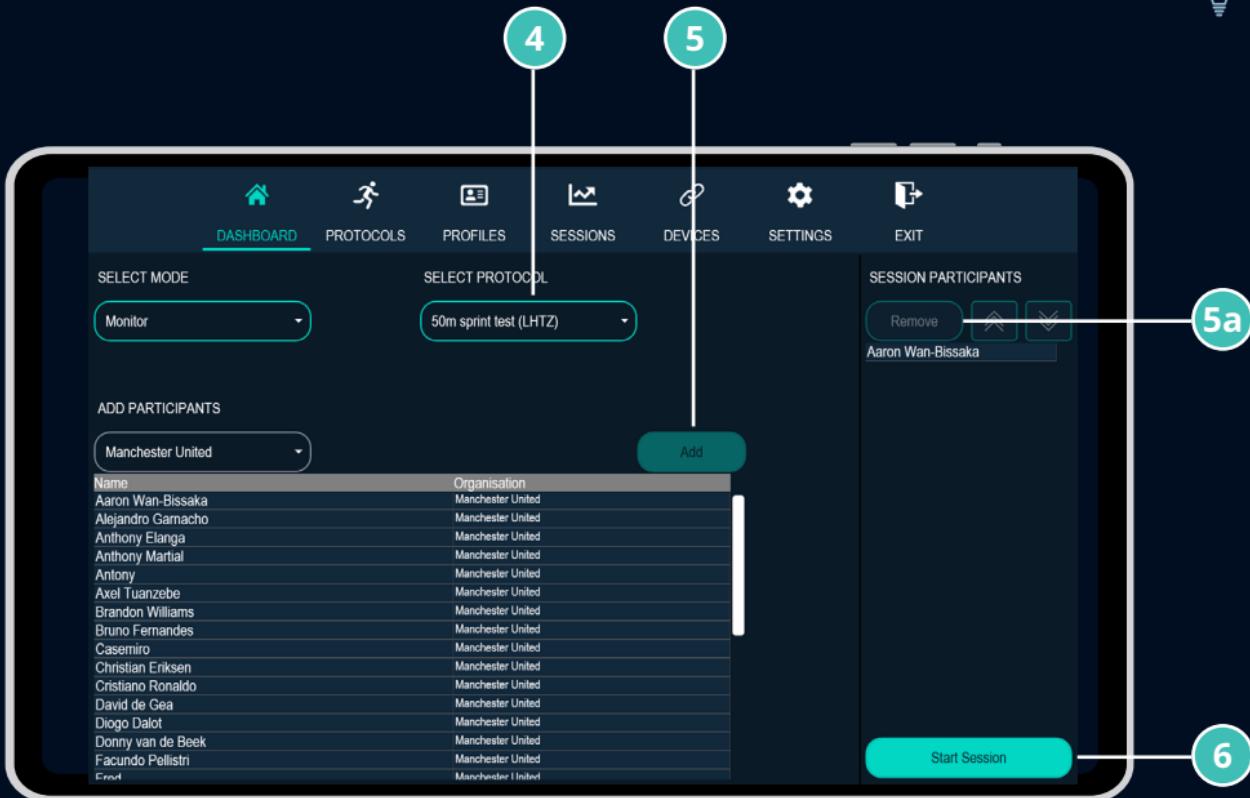
Add participants

Select athletes from the drop down list. You can also remove participants by selecting on the participant and selecting 'remove' (5a).

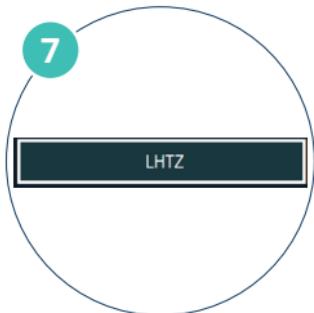


Start session

This helps select the protocol of interest

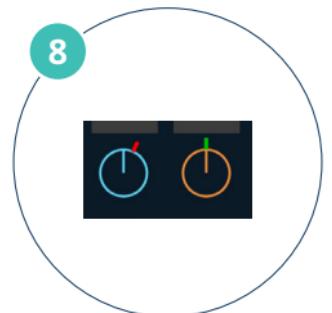


Start a baseline test



Select the Transformational Zone

To begin your test. Ensure the athlete is on the device in the correct DFTZ. In this case the LHTZ



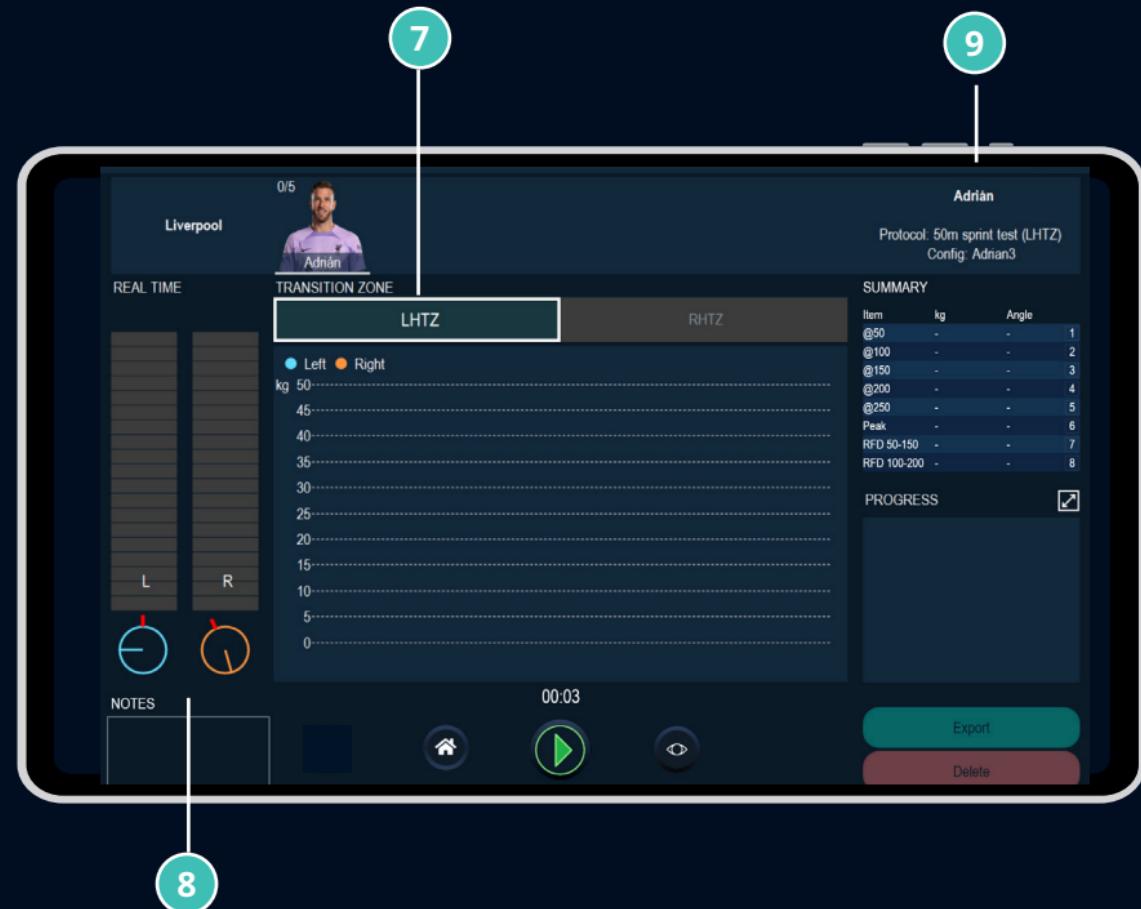
Check Leg & Pod angles

Ensure the legs are engaged with the front and rear pods and that the angles align to the red guides.



Modify Protocol (optional)

Should you wish to make modifications to the protocol you can still do so by clicking on the protocol description in the top right hand corner.



Start a baseline test



Breakdown of forces

Refer to this area when testing is complete



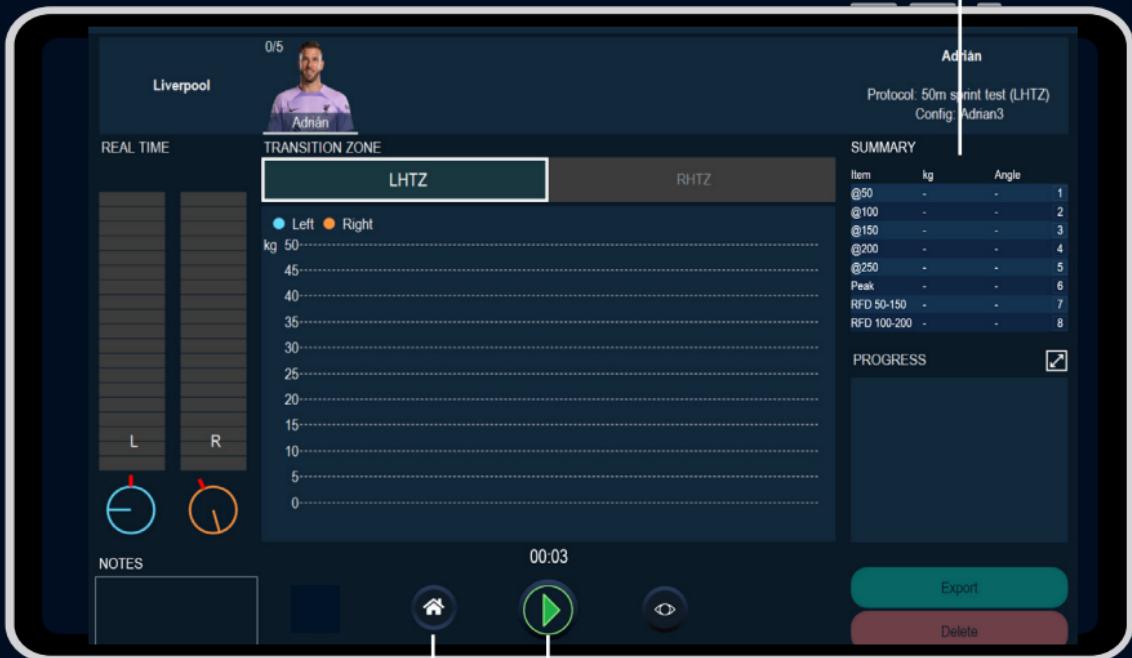
Start test

Press green button to commence testing and recording data



Quit test

Press HOME button to end the test





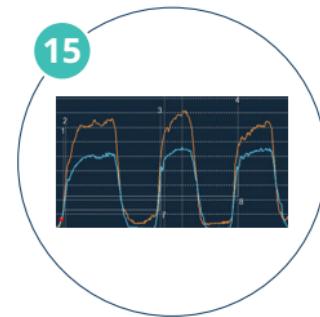
Select a player

Ensure you select the correct athlete as the test data will be linked to their profile.



Real Time Forces & Angles

You can see data in real time assessing left & right leg force generation simultaneously.



Graphs

Illustrate 3 contractions and forces generated by left & Right legs.





Breakdown of forces

Check Peak Force, Forces at time intervals and Rate of force development.



Scroll through Results

Identify each value on the graph by clicking the arrows



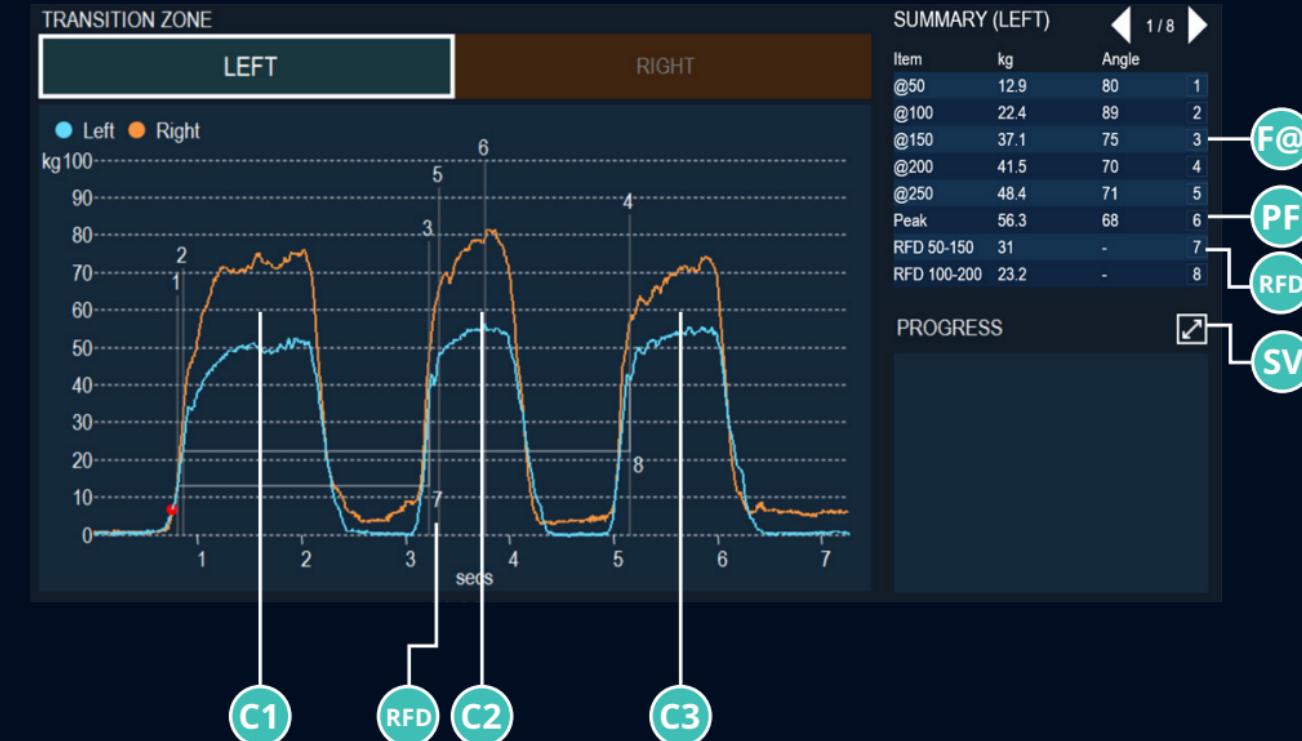
Export data

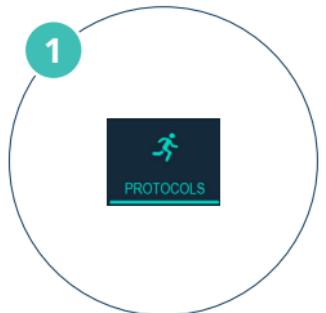
When you are happy with the results. You can always re-test if you want to





- | | | | |
|-----|--|----|---|
| C1 | Peak Force Contraction
3 second contraction – max force generation | F@ | Force @ 200 milliseconds (Left Leg)
41.5 kg – in LHTZ this would be the front leg |
| C2 | Rapid Force Contraction 1
3 second contraction – max force generation | SV | Switch views |
| C3 | Rapid Force Contraction 2
1-2 second contraction – max force generation | | |
| PF | Peak Force (Left Leg)
56.3 kg – in LHTZ this would be the front leg | | |
| RFD | Rate of Force Development (Left Leg)
Measured between 50 -150 milliseconds | | |





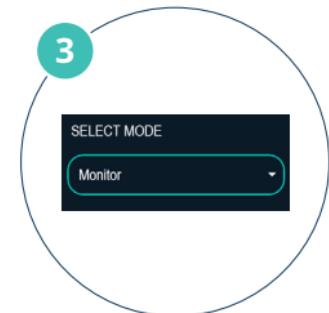
Create a protocol for baseline test

Before you begin, please ensure you have created a protocol. Please refer to page 70 for information on how to create a new protocol. Please name this new protocol "baseline test"



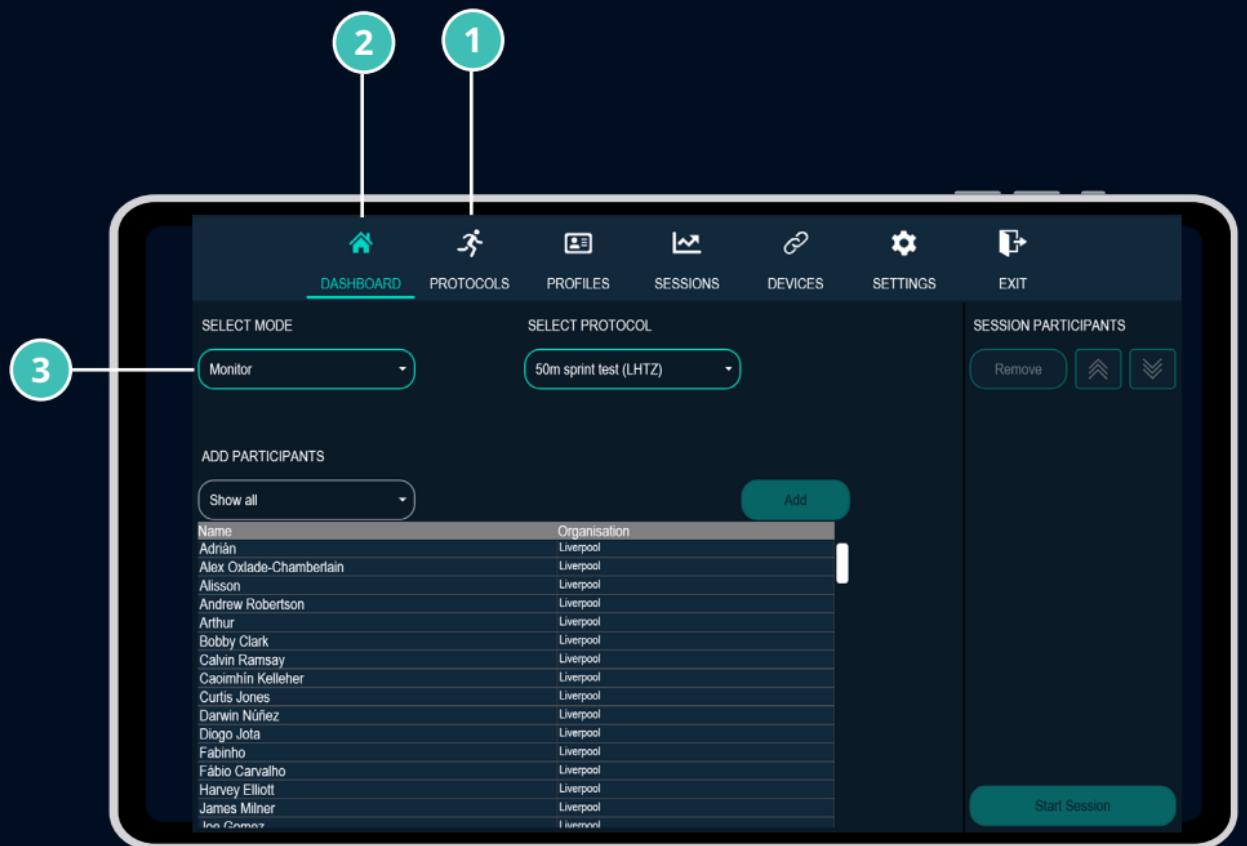
Select 'DASHBOARD' tab

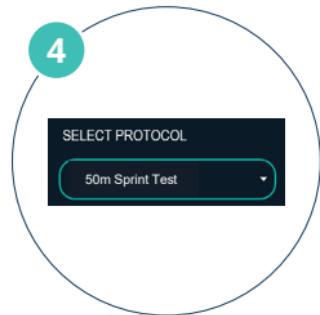
To begin.



Select 'monitor' mode

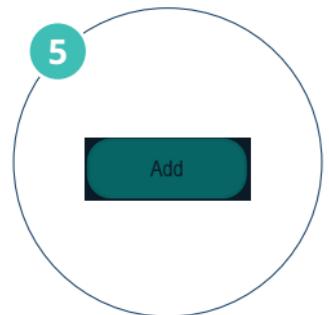
This helps select the protocol of interest





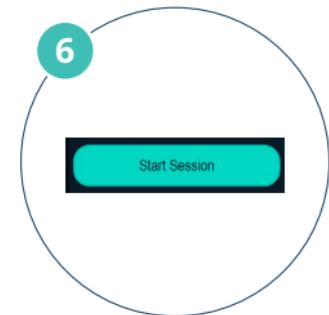
Select a protocol

In this case 50m Sprint Test, you may have named this differently, so select your protocol of your choice.



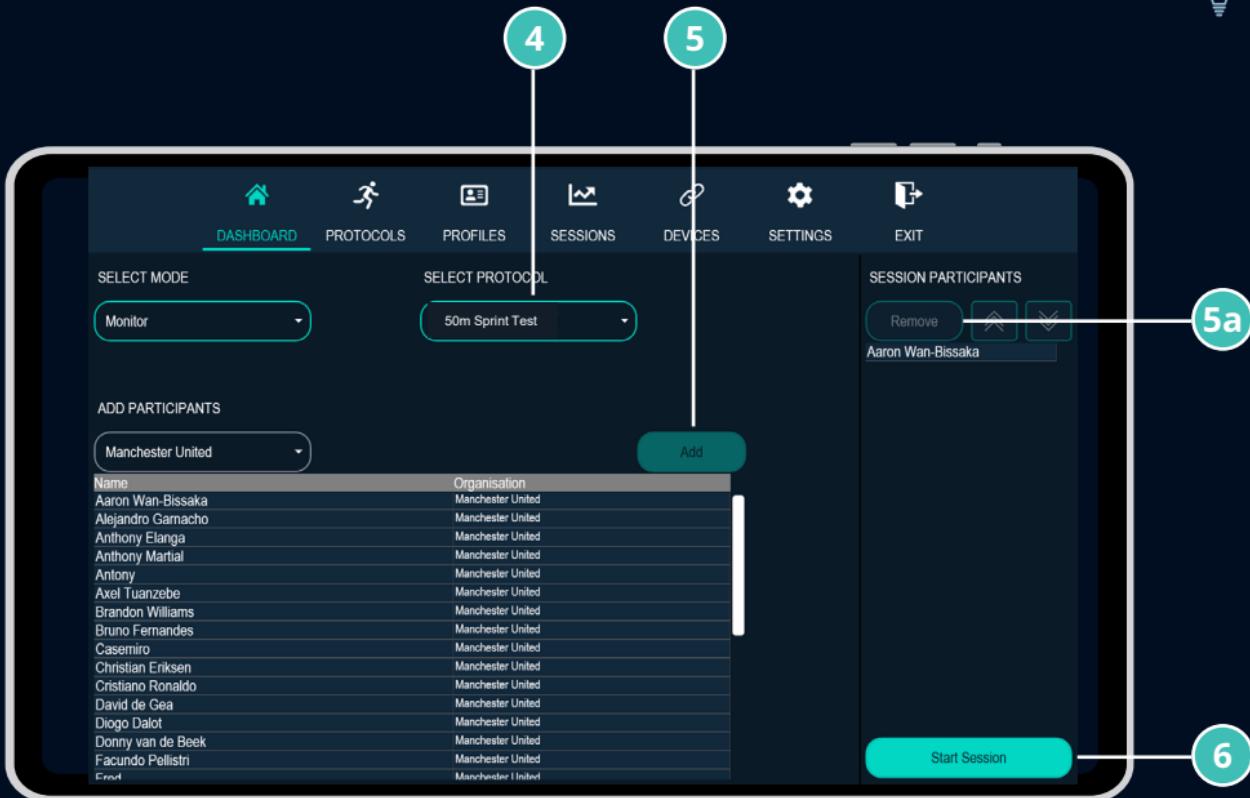
Add participants

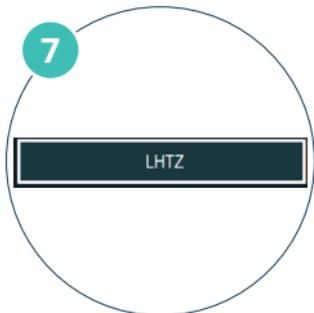
Select athletes from the drop down list. You can also remove participants by selecting on the participant and selecting 'remove' (5a).



Start session

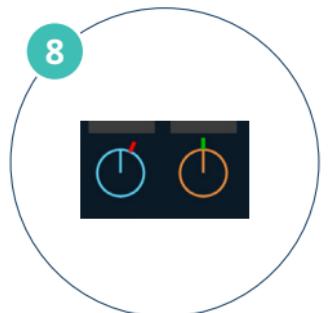
This helps select the protocol of interest





Select the Transformational Zone

To begin your test. Ensure the athlete is on the device in the correct DFTZ. In this case the LHTZ



Check Leg & Pod angles

Ensure the legs are engaged with the front and rear pods and that the angles align to the red guides.



Modify Protocol

Should you wish to make modifications to the protocol you can still do so by clicking on the protocol description in the top right hand corner.



Start a fatigue test



Breakdown of forces

Refer to this area when testing is complete



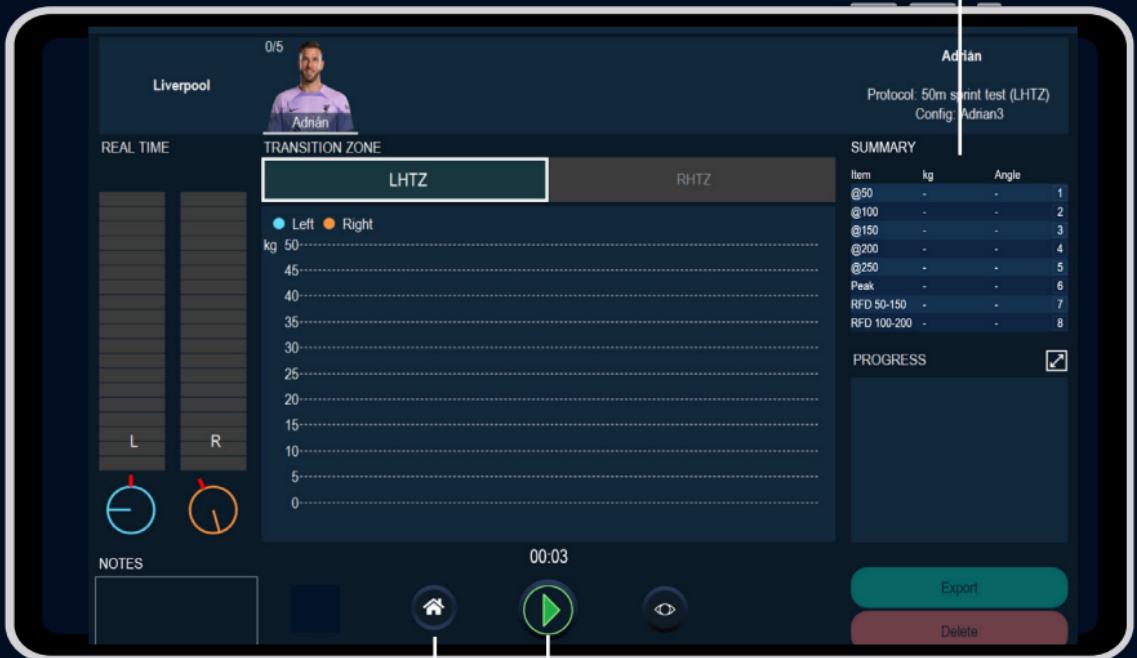
Start test

Press green button to commence testing and recording data



Quit test

Press HOME button to end the test





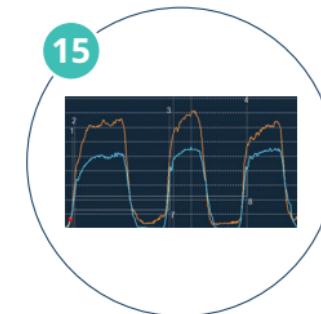
Select a player

Ensure you select the correct athlete as the test data will be linked to their profile.



Real Time Forces & Angles

You can see data in real time assessing left & right leg force generation simultaneously.



Graphs

Illustrate 3 contractions and forces generated by left & Right legs.





C1 Peak Force Contraction
3 second contraction – max force generation

F@ Force @ 200 milliseconds (Left Leg)
41.5 kg – in LHTZ this would be the front leg

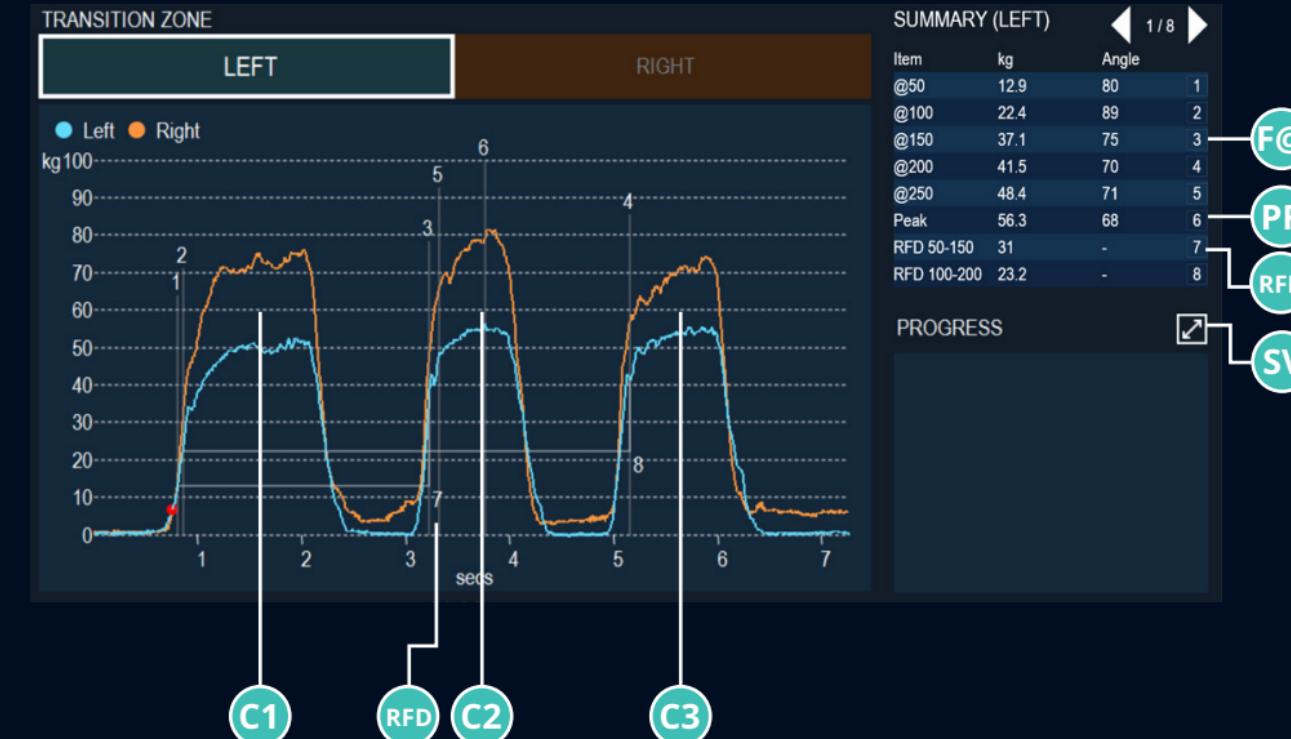
C2 Rapid Force Contraction 1
3 second contraction – max force generation

SV Switch views

C3 Rapid Force Contraction 2
1-2 second contraction – max force generation

PF Peak Force (Left Leg)
56.3 kg – in LHTZ this would be the front leg

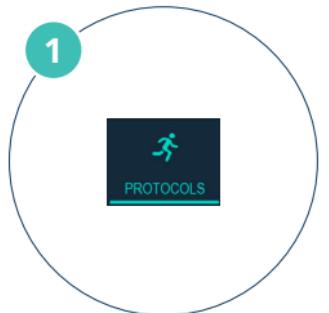
RFD Rate of Force Development (Left Leg)
Measured between 50 -150 milliseconds





- T1** Test 1
Best results based on 3 contractions
- T2** Test 2
Best results based on 3 contractions
- T3** Test 3
Best results based on 3 contractions
- MV** Max value (kg)
of data of all data in the session
- %C** Percentage change
Between Tests
- TG** Test graph
Most recent test





Create a protocol for baseline test

Before you begin, please ensure you have created a protocol. Please refer to page 70 for information on how to create a new protocol. Please name this new protocol "baseline test"



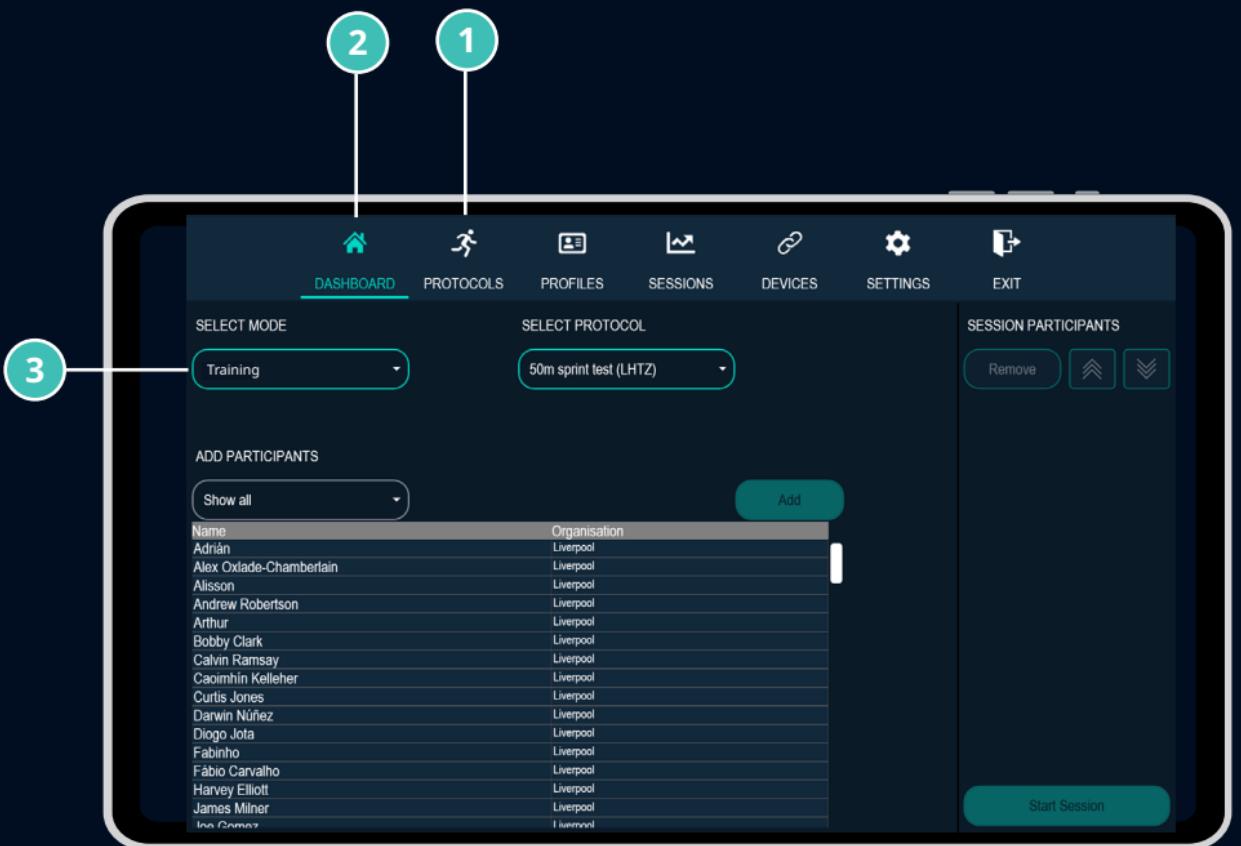
Select 'DASHBOARD' tab

To begin.



Select 'training' mode

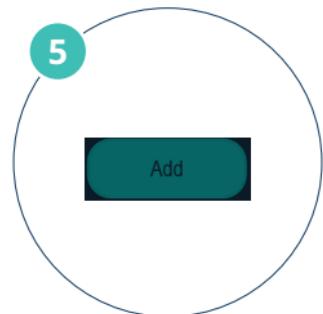
This helps select the protocol of interest





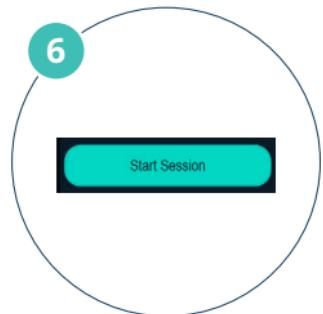
Select a protocol

In this case strength, you may have named this differently, so select your protocol of your choice



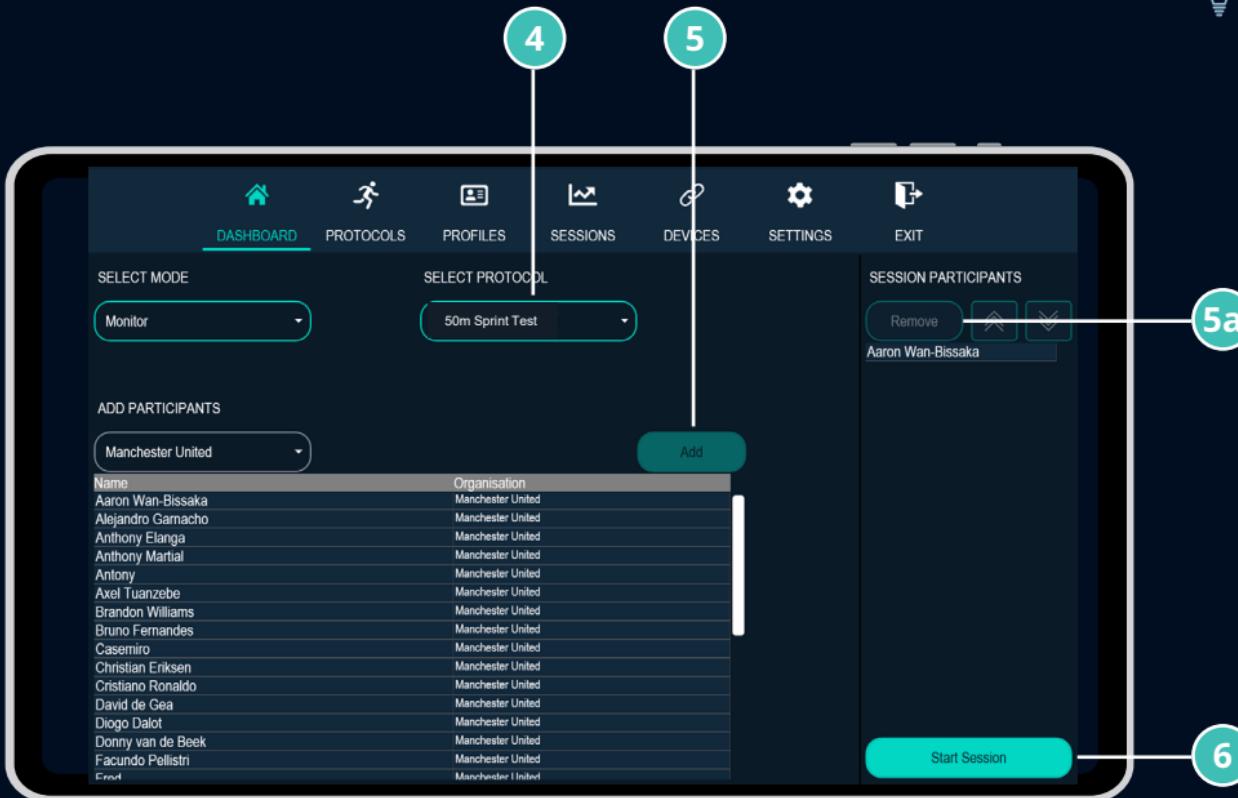
Add participants

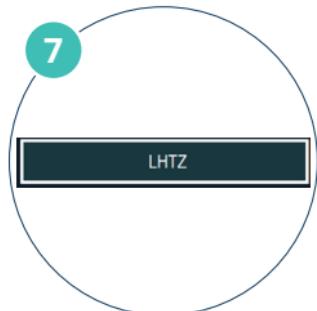
Select athletes from the drop down list. You can also remove participants by selecting on the participant and selecting 'remove' (5a).



Start session

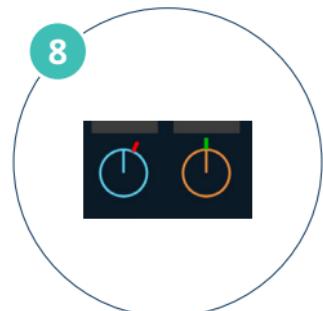
This helps select the protocol of interest





Select the Transformational Zone

To begin your test. Ensure the athlete is on the device in the correct DFTZ. In this case the LHTZ



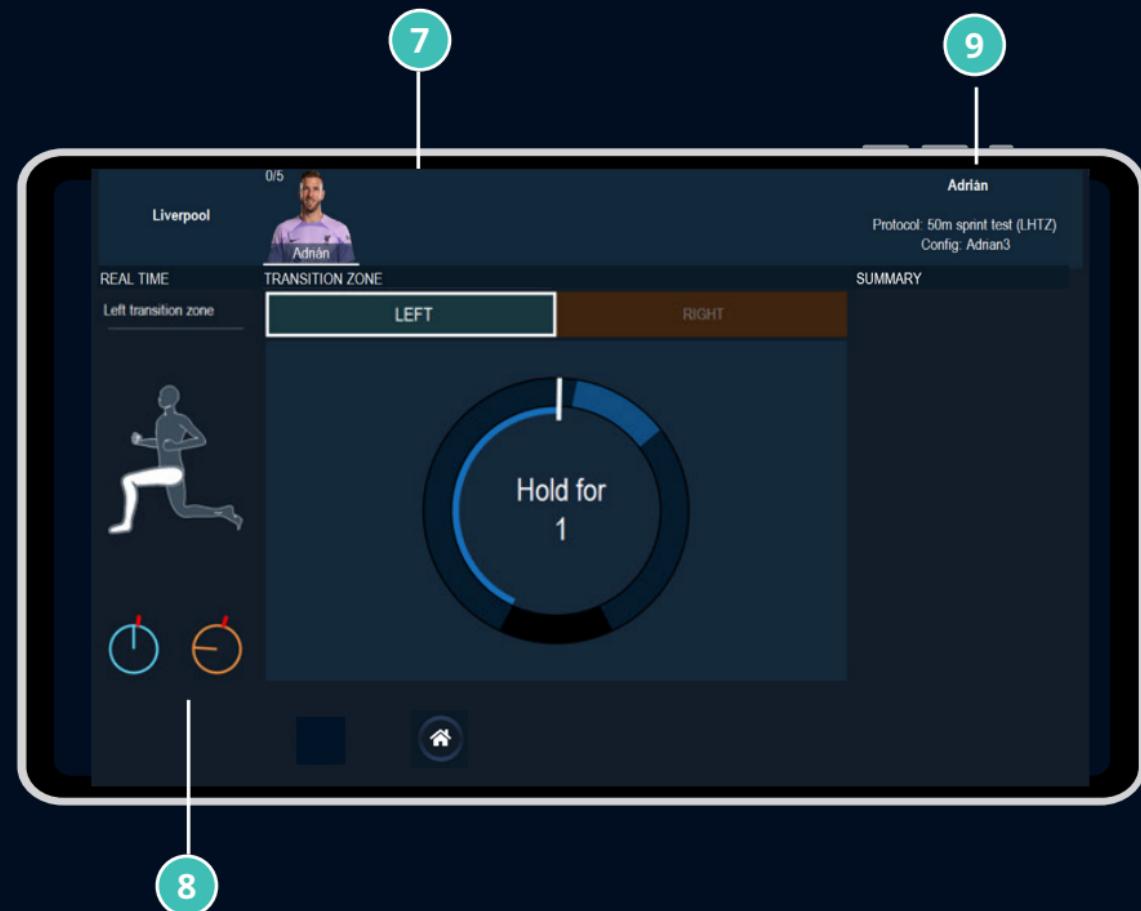
Check Leg & Pod angles

Ensure the legs are engaged with the front and rear pods and that the angles align to the red guides.



Modify Protocol

Should you wish to make modifications to the protocol you can still do so by clicking on the protocol description in the top right hand corner.





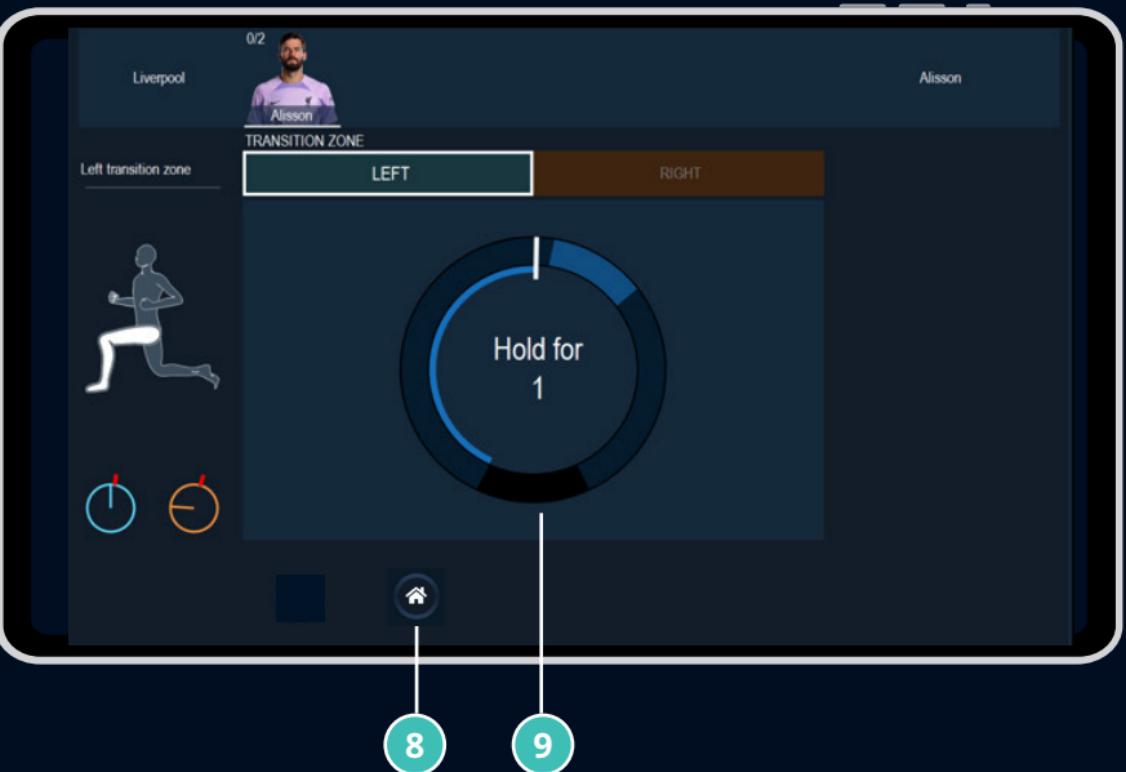
Start a contraction

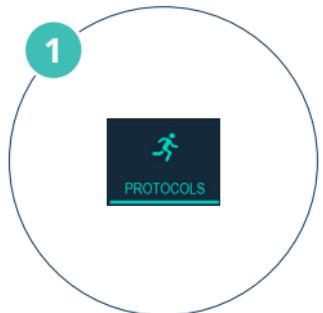
Ensure the line enters the blue field and hold the contraction for the allotted time



Quit warm up

Press HOME button to end the warm up





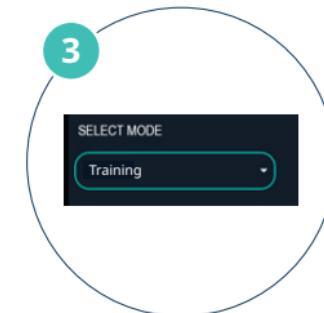
Create a protocol for baseline test

Please refer to page 70 for information on how to create a new protocol. Please name this new protocol "baseline test"



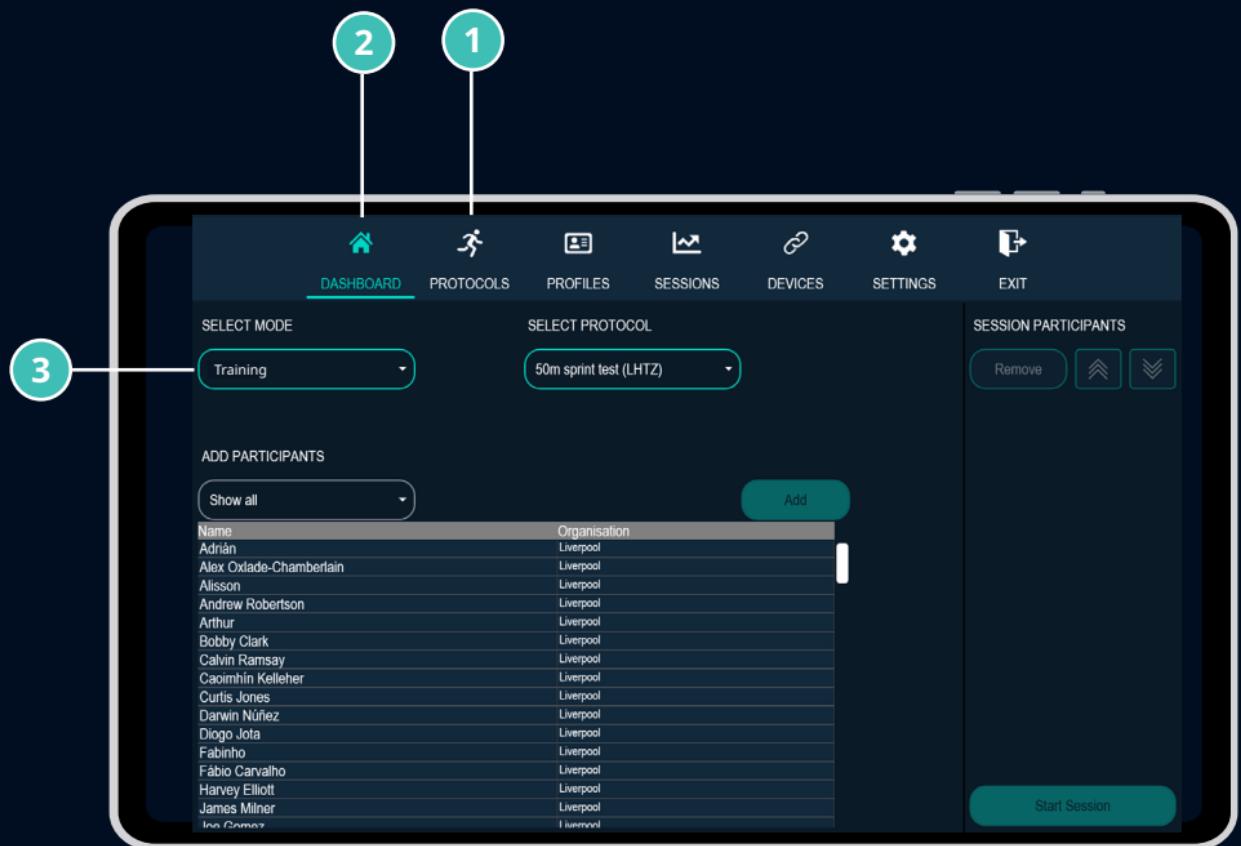
Select 'DASHBOARD' tab

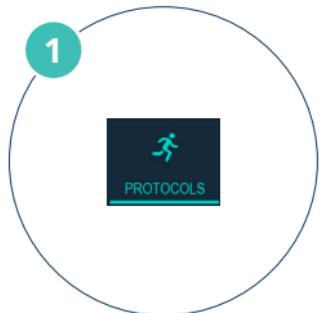
To begin.



Select 'training' mode

This helps select the protocol of interest





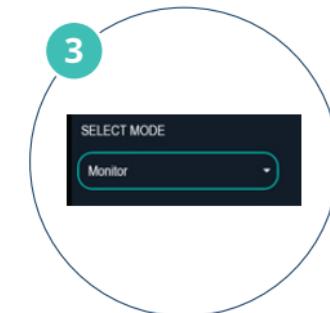
Create a protocol for baseline test

Please refer to page 70 for information on how to create a new protocol. Please name this new protocol "baseline test"



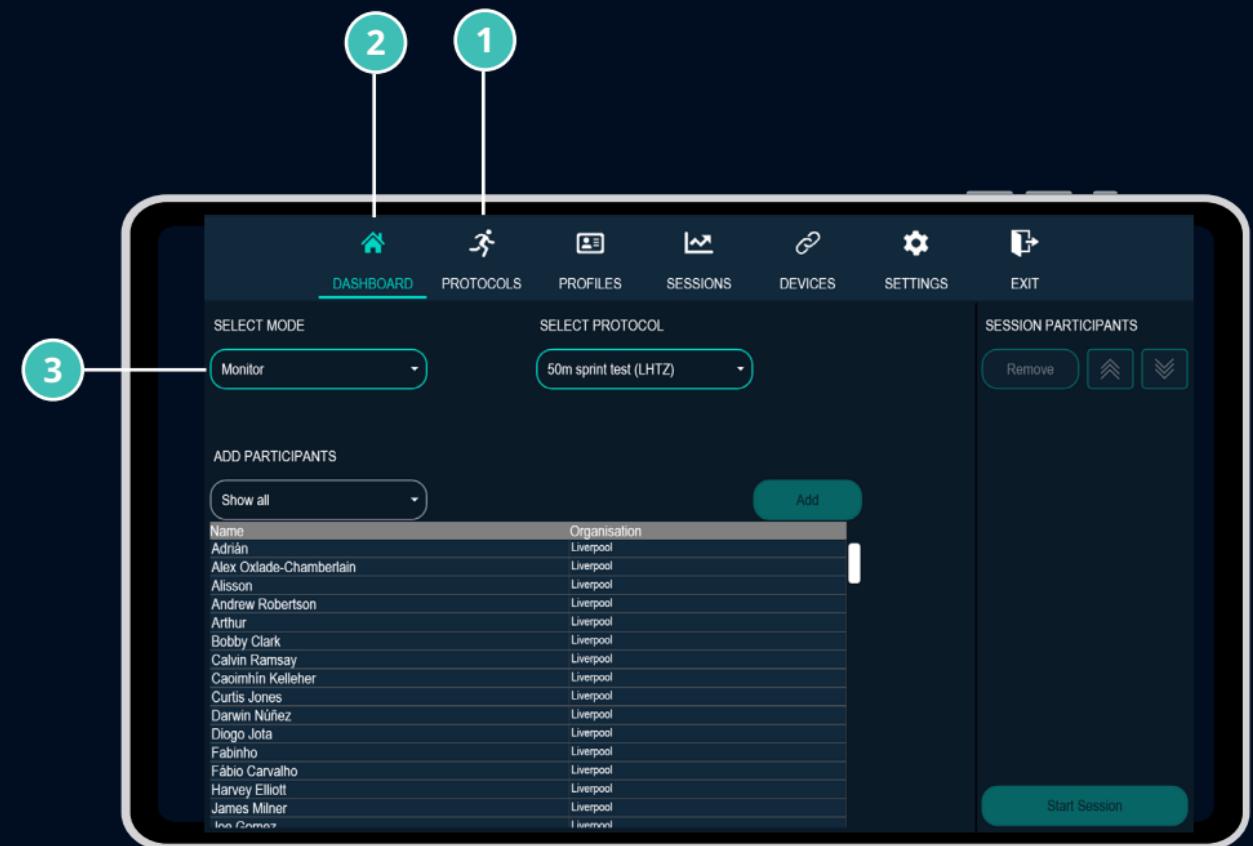
Select 'DASHBOARD' tab

To begin.



Select 'training' mode

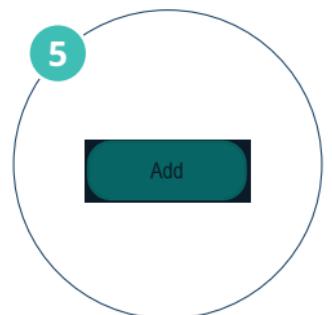
This helps select the protocol of interest





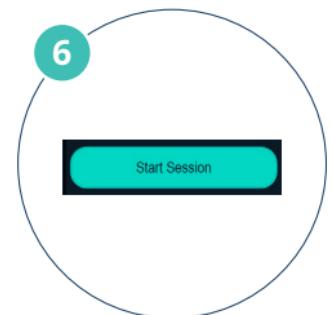
Select a protocol

In this case Warm Up, you may have named this differently, so select your protocol of your choice



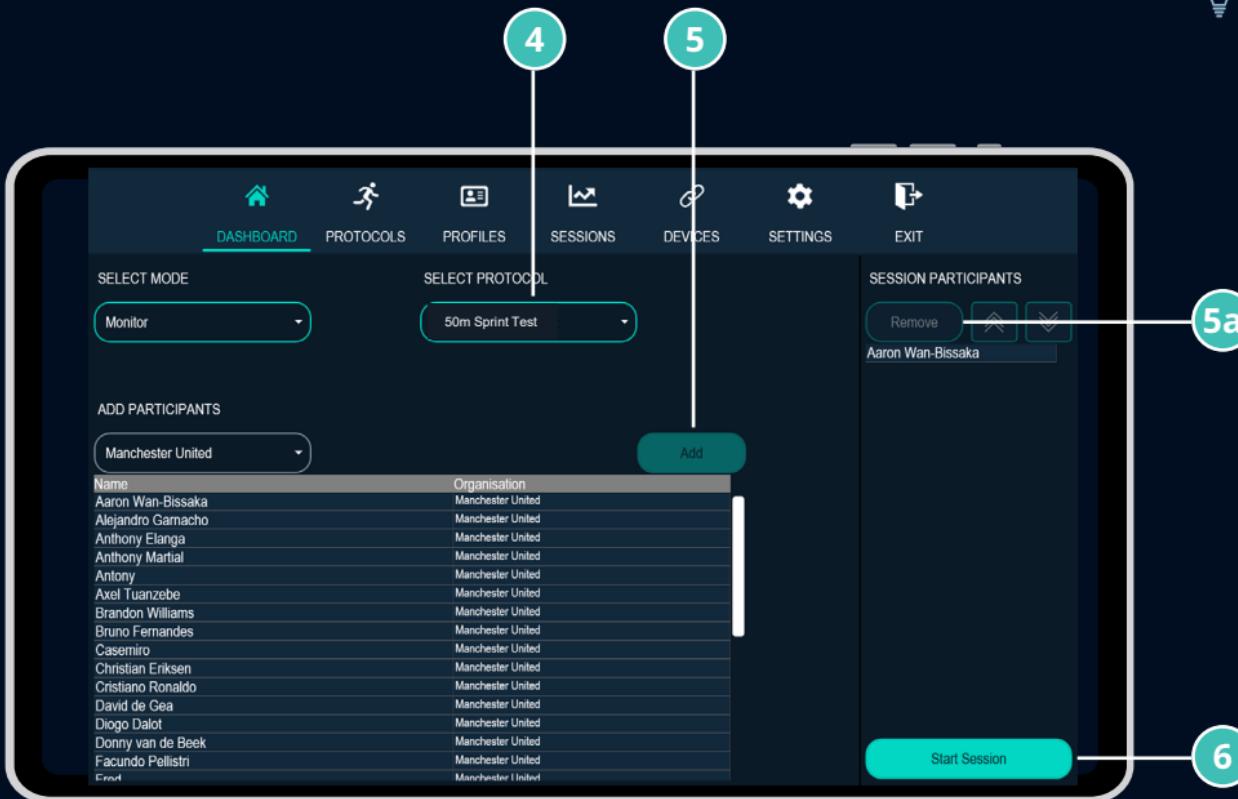
Add participants

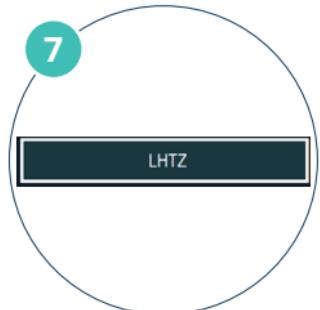
Select athletes from the drop down list. You can also remove participants by selecting on the participant and selecting 'remove' (5a).



Start session

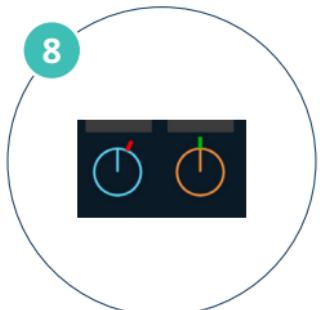
This helps select the protocol of interest





Select the Transformational Zone

To begin your test. Ensure the athlete is on the device in the correct DFTZ. In this case the LHTZ



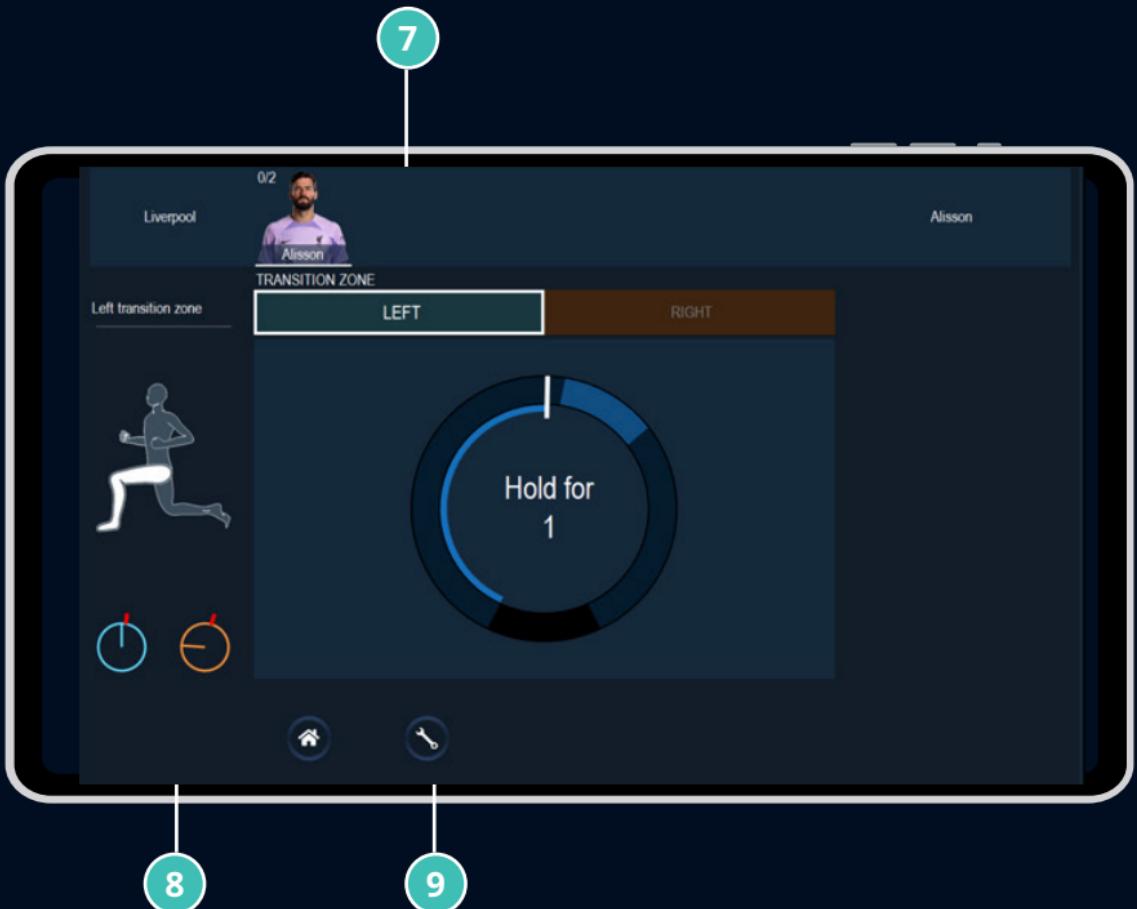
Check Leg & Pod angles

Ensure the legs are engaged with the front and rear pods and that the angles align to the red guides.



Modify device set-up

Only if you need to edit the set up of the device





Power button



Shutting down the tablet

Press and hold power button to power down the tablet



Shutting down the hub

Press and hold the hub power button to power down. Or until LED's are not illuminated.

Power button



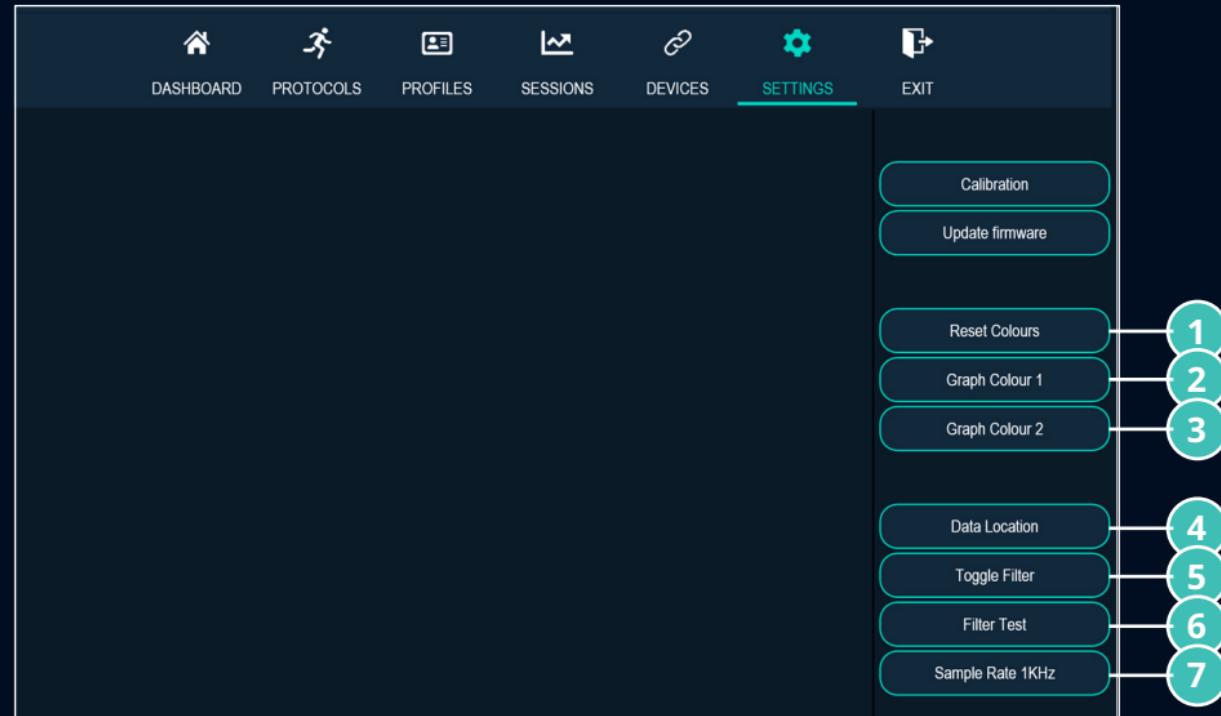
05

DEVICE SETTINGS



- 1 **Reset colours**
Button restores graph colours to default settings
- 2 **Graph colour 1**
Button changes colour of Left load cell curve
- 3 **Graph colour 2**
Button changes colour of Right load cell curve
- 4 **Data location**
Where data is stored on the tablet
- 5 **Toggle filter**
Button toggles between raw and filtered data
- 6 **Filter test**
Button toggles between raw and filtered data
- 7 **Sample rate**
Toggles between sample rates 1kHz & 500Hz. This is useful to analyse more data points (1kHz)

Important to switch off controller hub if you change sample rate and then power up controller hub to ensure correct data is saved



06

GLOSSARY

Glossary of terms



Term	Definition
Peak force contraction	Force contraction in which the user is queued to apply maximum force to the force pods. Typically a slow ramp up of force over a period of 3-5 seconds.
Rapid force contraction	Force contraction in which the user is queued to apply explosive force to the force pods. Contraction should be over a period of around 1 second and should result in a steeper gradient than a peak force contraction.
Asymmetry	Percentage difference in force between a user's left and right sides.
Test	The act of recording a single set of force contractions on the device.
Session	Tests completed for a given protocol for an individual or group on that given day.
Mode	Defines the type of test to be conducted. User has a choice of three modes: Monitor, Diagnostics and Training.
Monitor	Mode of testing where testing protocols are implemented to monitor important performance aspects over time.
Diagnostics	Continuous testing mode designed for investigative sessions with a trained practitioner. Used to identify potential causes of deficiencies in performance.
Training	Mode of testing with protocols designed to improve performance on the device.
Protocol	A structured test with specific targets for the user to achieve in a predefined device setup. Protocols allow users to produce comparable data by ensuring the test conditions are the same in each repeat test.
Device setup	The combination of adjustment settings that determine the position of the user on the device. Device setups can be auto generated based on user height and DFTZ phase.
Profile	Profiles store information relating to individual users (i.e. height, weight) and their saved test data.
Calibration	Procedure of placing a known mass onto the force pods to ensure that sensors are reading forces accurately.
Dashboard	Home screen where user can define the parameters of a session (mode, protocol, users involved).
Protocols tab	Area in the app where user can create or edit protocols.
Profiles tab	Area in the app where user can create or edit profiles.
Session viewer	Area in the app where user can view saved test data.
Devices tab	Area in the app where user can set up or check Bluetooth connection
Settings tab	Area in the app where user can customise graph colours, access data files and perform calibration.

Term	Definition
GUI	Graphical User Interface - the Biostrain app.
DFTZ	Double Float Transformational Zone – the period of running gait during which both feet are off the ground. This is the phase of running gait that Biostrain is designed to simulate.
DFTZ phases	Early - shortly after toe-off. Mid – Midpoint of DFTZ. Late - just before heel-strike.
LHTZ	Left Hamstring Transformational Zone - double float phase with left leg forwards.
RHTZ	Right Hamstring Transformational Zone - double float phase with right leg forwards.
Proximal	In the direction of the point of origin i.e. the hip joint is proximal to the femur.
Distal	Away from the point of origin i.e. the ankle joint is distal to the shank.
Thigh	Portion of the leg between the hip joint (proximal) and the knee joint (distal).
Shank	Portion of the leg between the knee joint (proximal) and the ankle joint (distal).
Force pods	Part of the device that the user applies force to. Force pods contain a load cell to measure applied force and an accelerometer to measure pod angle.
Control Hub	Electronics enclosure located underneath the grab handles on the device. Used to power on/off the device, display battery life and display Bluetooth connection status.
Force contraction	The act of the user applying force to the force pods on the device.
Peak force (PF)	The maximum force (kg) achieved by a user on the device in a test.
Rate of force development (RFD)	The rate at which force is developed between a given set time parameter. i.e. RFD 100-200 would be the rate of change between 100-200ms time window, displayed in kg/s.
Peak Force @ timed interval.	The magnitude of force at a specific time interval after the start point of a force contraction. i.e. Force at 150ms = 25kg.

07

TECHNICAL INFORMATION

Electronic specs

Parameters	Min	Typical	Max	Notes
Battery Voltage	3.3 V	3.7 V	4.2 V	3.7 V Lithium Polymer Battery
Battery Current Capacity	-	1.2 Ah	-	Dependent on battery and session duration
Battery Dimension	-	-	Max 30 mm x 48 mm x 7.5 mm	
Operating voltage	3 V	-	5 V	5V USB to supply electronics circuit
Storage temperature	20 °C	-	30 °C	-
Device operating temperature	20°C	-	30 °C	Max 42°C is required by EU 60601 (actual range is -40C to 85C)
Device current consumption	-	100mA	-	Dependent on battery and session duration
Session duration	6 min	60 min	360 min	60 minutes a session is typical
Wireless comms / processor	-	2.4 GHz	-	Laird BL654 (451-00001) Bluetooth Low Energy 5 IC, integrated antenna
Load Cell capacity	0kg	100kg	500kg	5kN max load required.

Parameters	Min	Typical	Max	Notes
Load Cell accuracy	Non-Linearity 0.29% Hysteresis 0.29% Zero Balance 0.50%	-	-	All are based on percentages of the full rated output of the load cell (5kN)
Load cell overall dimensions	-	-	Maximum 50x32x32mm	-
ADC Sampling rate	0.5kHz (filtered)	1 kHz	-	-
Accelerometer incline measurement range	0°	50°	-	-
Accelerometer incline measurement Accuracy	+/- 1o	-	-	-
Control hub charging hub cable connection	-	-	-	USB C

Mechanical specs

Permissible environmental conditions of use,

Parameters	Min	Typical	Max	Notes
Overall device length	2160mm			
Overall device width	800mm			
Overall device height	1500mm			
Total weight of device	-	-	85kg	2- person lift required when positioning Biostrain device
Force sensor pod length	172 mm	-	-	-
Force sensor pod width	160 mm	-	-	-
Force sensor pod height/depth	110 mm	-	-	-
Ingress rating for electronics/sensors enclosures	IP20	-	-	Protected against solid foreign objects of 12.5 mm diameter and greater.

Parameters	Min	Typical	Max	Notes
Recommend operating and storage environment ambient temperature	20°C	30°C	-	
Recommend operating and storage environment ambient pressure	87 kPa	108.4 kPa	-	
Recommend operating and storage environment ambient relative humidity	15%	93%	-	