MAKE YOUR MOVE

Custom 3D-Printed Orthotics

materialise
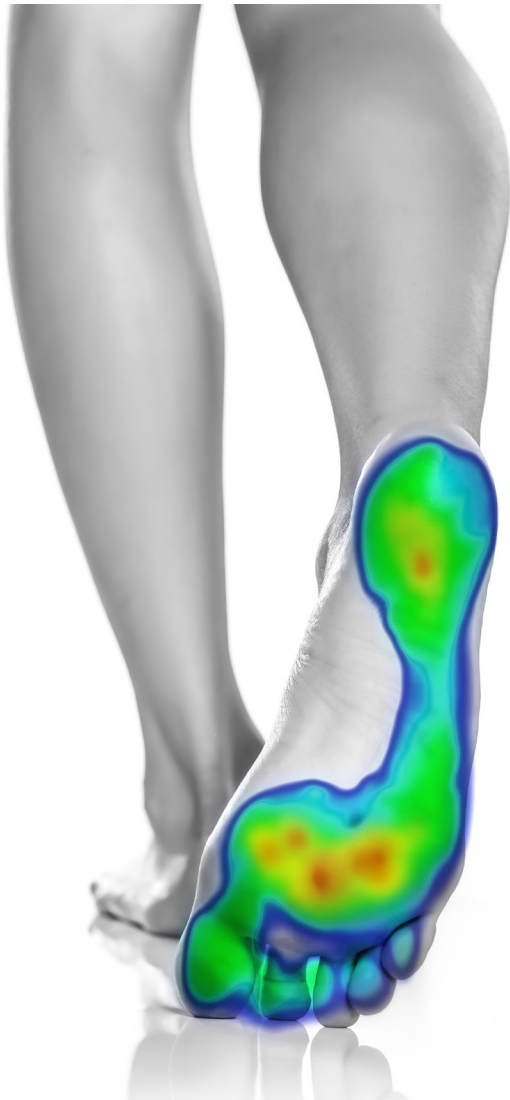phits suite

EXPERT GUIDE

GMT

Official Service & Distribution partner
for the UK and Ireland

MADE TO
MEASURE

Materialise Phits Suite scanners

iQUBE MINI

A fast, accurate, and lightweight 3D scanner with a single camera. Created specifically for portable use.

iQUBE E500

A fast and accurate mobile 3D scanner for orthotics manufacturing. Includes step for portable use.

TIGER

A high-quality 3D scanner designed for orthotists, footwear manufacturers, and designers. Ideal for scanning last, feet, foam boxes, insoles, and shoes.

Already have your own scanner?

You can now import your STL and OBJ files with the new features found in V9 of our footscan software.

www.materialisemotion.com

YOUR AUTOMATED
END-TO-END SOLUTION

phits PRODUCT PORTFOLIO

FEATURED

DESIGN PARAMETERS

Type	EVERYDAY USE (NARROW / COMFORT / WIDE)	RUNNING / SOCCER/FOOTBALL	SPORTS – GOLF	SPORTS – CYCLING	SPORTS – ALPINE SKI / NORDIC SKI	WORKWEAR – SAFETY
Type	phits+	phits+	phits+	phits	phits	phits+
Dynamic footscan analysis protocol	walking	walking + running	walking	walking + running + one legged forefoot squat	walking+ running one legged forefoot squat or double poling simulation	walking
Top cover thickness	3 (default) or 6 mm	3 or 6 (default) mm	3 (default) or 6 mm	1 or 2 mm	1 or 2 mm	3 (default) or 6 mm
Top cover hardness	shore 20, 30, 35, 40	shore 20, 30, 35, 40	shore 20, 30, 35, 40	shore 25	Shore 25	shore 40
Top cover synthetic leather	yes	yes	default	yes	yes	yes
Local stiffness differentiation	yes	yes	yes	yes	yes	yes
Additional heel cushioning	plantar fasciitis, heel spur, fat pad	plantar fasciitis, heel spur, fat pad	plantar fasciitis, heel spur, fat pad	no	no	plantar fasciitis, heel spur, fat pad
Heel cup	5 options (no – high)	5 options (no – high)	5 options (no – high)	2 options (Low - Standard)	2 options (Low - Standard)	5 options (no – high)
Heel wedge	range from -15° up to 15°	range from -15° up to 15°	range from -15° up to 15°	range from -5° up to 7°	range from -5° up to 7°	range from -15° up to 15°
Heel skive	2-8 mm	2-8 mm	2-8 mm	-	-	2-8 mm
Heel offset	1-12 mm	1-12 mm	1-12 mm	1-6 mm	1-6 mm	1-12 mm
Lateral edge	no – high	no – high	yes	yes	yes	yes
Medial edge	standard – high	standard – high	standard – high	-	-	standard – high
Metatarsal bar	1-6 mm	1-6 mm	1-6 mm	-	1-3 mm	1-6 mm
Metatarsal pad	teardrop/T-form 1-6 mm	teardrop/T-form 1-6 mm	teardrop/T-form 1-6 mm	teardrop/T-form 1-5 mm	teardrop/T-form 1-5 mm	teardrop/T-form 1-6 mm
Metatarsal cut-out	1st meta, 1st ray, 5th meta, 5th ray	1st meta, 1st ray, 5th meta, 5th ray	1st meta, 1st ray, 5th meta, 5th ray	-	-	1st meta, 1st ray, 5th meta, 5th ray
Forefoot correction	meta 1, meta 1-2, meta 2-4, meta 2-5, meta 5 / height 2-5 mm / flexible/rigid	meta 1, meta 1-2, meta 2-4, meta 2-5, meta 5 / height 2-5 mm / flexible/rigid	meta 1, meta 1-2, meta 2-4, meta 2-5, meta 5 / height 2-4 mm / flexible/rigid	medial/lateral / height 1-4 mm / rigid	medial/lateral / height 1-4 mm / flexible	meta 1, meta 1-2, meta 2-4, meta 2-5, meta 5 / height 2-5 mm / flexible/rigid
Patient name & serial number	yes	yes	yes	yes	yes	yes

materialise
innovators you can count on

TABLE OF CONTENTS

YOUR MATERIALISE PHITS SUITE INFORMATION

- Gait and Motion Technology
- info@gaitandmotion.co.uk - 01223 603984
- Training date ....
- Follow up training date ....
- User name (e-mail) ....
    - Password
- Materialise Phits scanner serial number(s) ....

FOR ANY TECHNICAL QUESTIONS, CONTACT SUPPORT.MOTION@MATERIALISE.BE

GETTING STARTED

WHY MATERIALISE PHITS SUITE?

Proven and effective expert empowerment with a research-backed end-to-end solution	Expert empowerment	State-of-the-art technology
As part of Materialise, we understand how important it is for you to stay informed with the latest research and clinical studies. Below you'll find interesting cases and facts to help with your new system, with more information on these studies in the appendix of this manual.	Our experts are leading the industry and want to provide tools and support to help you create the very best treatment plan for each patient.	phits are premium orthotics created with state-of-the-art 3D printing techniques that can add extra value to your practice.
	Analyzing tools: The footscan software is a great tool, with several features to analyze your patient's feet and assess their gait. Instead of basing your orthotic on a single measurement, the system calculates an average of all the scans. In addition, the valuable objective dynamic data of the patient is useful for adding dynamic corrections to the orthotics.	The 3D printing technique we have pioneered is powder-based and used in the highest-quality products throughout the medical field. This manufacturing technique creates durable orthotics, strong enough to resist high forces from multiple angles.

Proven and effective expert empowerment with a research-backed end-to-end solution	Expert empowerment	State-of-the-art technology

HAVE YOU BEEN SATISFIED WITH THE QUALITY OF ALL YOUR PHITS?

99% YES **1% NO**
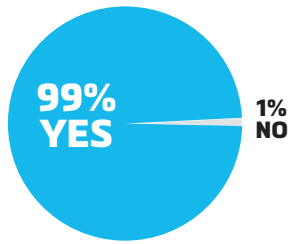
General satisfaction scores
In 2020 GMT ran a survey and 105 clinics gave their feedback. All respondents said that phits was a valuable addition to their clinic, the footscan software is user-friendly, that footscan has improved patient feedback and experience, and that they've been able to get quick and efficient support if required. In addition 99.1% said that GMT has been able to help with their marketing and that they are satisfied with the quality of all phits orthotics. 100% said they would recommend GMT to another professional.

Design tools: As described in the panel on the left, Materialise Phits Suite uses scientifically proven algorithms to help you design your orthotics. The algorithm will use the calculated average of multiple scans to transfer the objective dynamic data into unique dynamic correction suggestions. Next to these suggestions, you can select the proper orthotic type to make sure it fits the patient's needs (and shoes).

Finally, we never stop developing. We are continuously updating our software to include new orthotic types, extra corrections, and an improved user experience.

The design wizard in the footscan software is a guideline to help you design the orthotic in the most efficient way. Remember, you are in control and can always overrule the software suggestions.

Should your patient desire a second pair of orthotics, our 3D printing technique and its 0.1 mm accuracy can produce an identical replica of the original phits. The order ID gives you all the necessary information about the previous design. Another advantage of the order ID is that we can trace every orthotic back to the production site and even the powder level, ensuring' consistent, best-in-class quality.

Material durability: Materialise phits orthotics are printed using Polyamide 12 (PA 12), commonly known as nylon powder. This is a very light material. Rotation tests show that it does not wear out when stressed below 20 Mpa or 2000 N/cm^2, which is exceptionally high for a human footstep. Under normal circumstances, the PA 12 printed base of Materialise phits orthotics is both durable and lightweight at the same time.

Continuous training: In the 'Support' section of this manual, we've listed specific situations that you may encounter in your practice. However, don't let that stop you from contacting our support team — we have clinical technicians standing by. They can provide initial Materialise Phits Suite training and are here to help.

Introduced by the two panels on the left, this is the biggest advantage of phits. The ability to change the intrinsic parameters and characteristics is an important aspect for any orthotic designer. Only phits has these parameters directly linked to the objectively measured dynamic data. Once you have measured your patient, the algorithm calculates the flexibility of the different zones of your printed base. As a designer, you can follow these objective suggestions or overwrite the parameters should you wish to guide the foot in another direction. Either way, you are in control of your final orthotic design.

MATERIALISE PHITS SUITE

A VIEW INTO THE 3D-PRINTED CUSTOM ORTHOTICS AND THE MAKING OF MATERIALISE MOTION

Established in 2014, RS Print was launched as a joint venture between two Belgian companies, both front-runners in their field:

- **RSscan INTERNATIONAL**, as experts in gait analysis with their established footscan pressure plate and gait analysis software; and

- **MATERIALISE**, as a pioneer and industry leader in 3D-printed applications and software.

Through RS Print, our shared goal was to produce the best possible orthotic based on dynamic gait scanning. RSscan International developed a new generation of orthotics that featured a modular system made from EVA components. However, this method was labor-intensive, required a long process to produce replicas, and delivered bulky and delicate/short-lived orthotics.

While the RSscan team was looking for the most suitable solution to tackle the above issues, they discovered the great possibilities offered by 3D printing. The only thing missing was a partner with the right technology to meet their high durability, accuracy, scalability, and automation standards.

Here is where Materialise provided the technology and expertise to help create phits, the next generation of orthotics. Both companies collaborated to create a new, better version based on the tested philosophy and shape algorithms but with a twist — 3D printing technology.

Following the successful collaboration, and the acquisition of RSscan and RS Print, Materialise launched Materialise Motion in October 2020. With Motion, the shared skills, experience, and knowledge come together in one clear mission: helping foot healthcare professionals to provide excellent patient care.

This exciting partnership between Materialise, RSscan, and RS Print resulted in building a superior solution, the Materialise Phits Suite, a seamless end-to-end solution that supports the entire expert workflow, from measuring and analyzing to designing and manufacturing.

Thanks to high-quality measuring and scanning devices, advanced software with design recommendations, and manufacturing automation, Materialise Phits Suite is the most comprehensive toolkit for creating personalized and durable orthotics.

materialise
innovators you can count on

WORKFLOW

FROM PATIENT TO ORTHOTIC IN SIX STEPS

STEP 1: SIZING PROTOCOL

STEP 2: RECORDING THE SESSION

STEP 3: DATA CHECK

STEP 4: FOOTSCAN SOFTWARE ANALYSIS

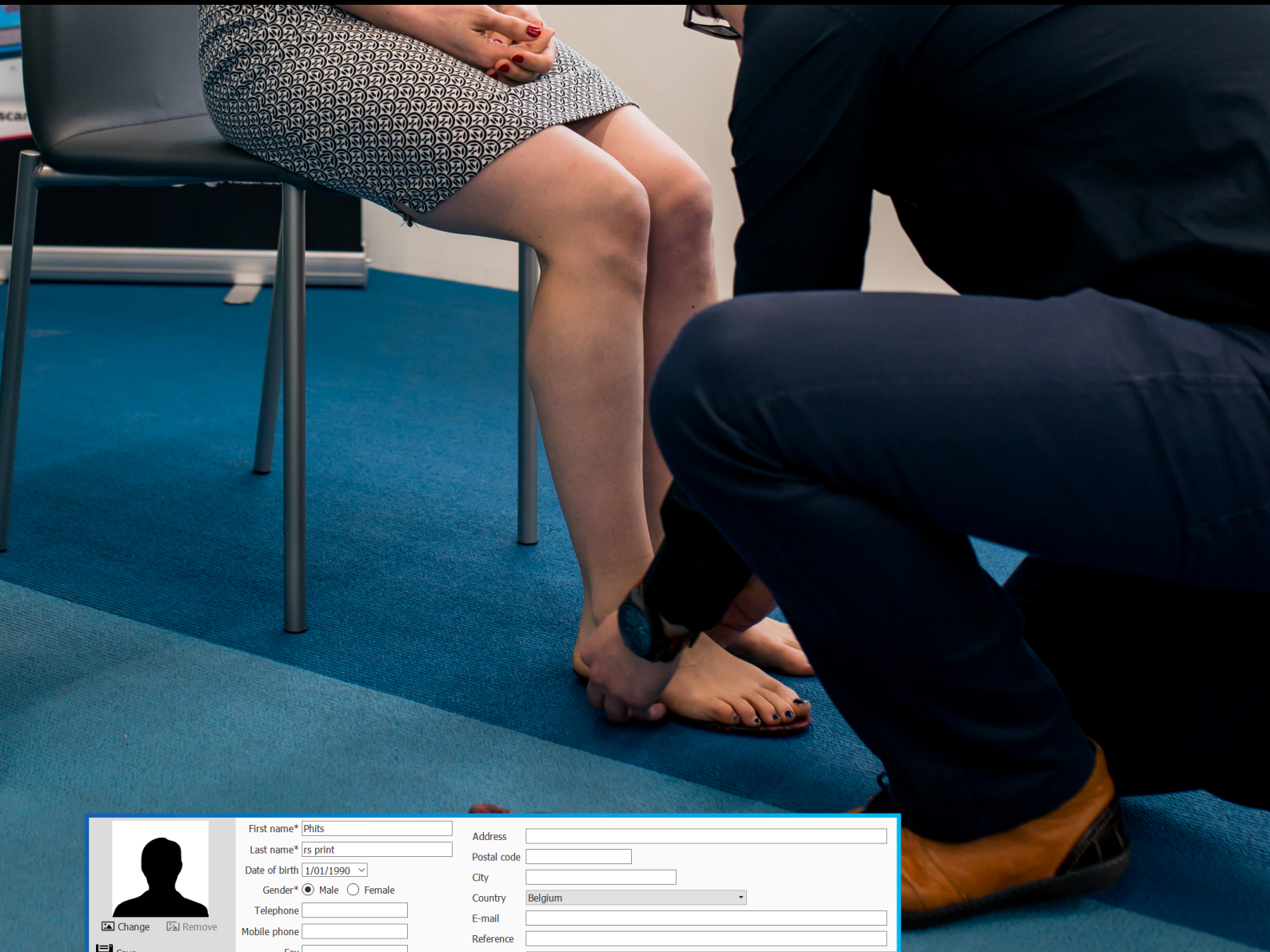STEP 5: DESIGN WIZARD

STEP 6: ORDERING PROCESS AND FOLLOW UP

STEP 1 – SIZING PROTOCOL

CHOOSE THE CORRECT SIZE FOR YOUR MATERIALISE PHITS ORTHOTIC

First name* Phits
Last name* rs print
Date of birth 1/01/1990
Gender* ● Male ○ Female
Telephone
Mobile phone
Fax

Address
Postal code
City
Country Belgium
E-mail
Reference
Remarks Shoe size UK8
Foot size left 7UK
Foot size right 6.5 UK

Change   Remove
Save
Cancel

IMPORTANT!

This software uses the UK sizing table. When you add information at the start of your scanner session, it will automatically be converted to the corresponding UK size upon opening the design software. Be sure to add the measured shoe and base size to the remarks section of your patient's information and click 'Save'. This sizing information will be included in the patient's information so it can be consulted when requesting feedback from your colleagues or your local support team.

materialise
innovators you can count on

Materialise phits orthotics consist of two components:

1. **3D-printed base:** This component contains the corrections that will help dynamically guide your patient.

2. **Top cover:** This layer is attached to the printed base for cushioning and comfort. Depending on the selected material and size, the top cover will be pre-formed or made from sheet material.

You will see each of these components defined in the software. In most cases, you will want the top cover to be one UK size larger than the 3D-printed base. The software will default to this configuration, meaning it will prefill the 3D-printed base size based on the size you select for the top cover. When following the sizing protocol outlined below, you will notice that adjustments of this default value are necessary to fit the patient better in some cases. For this protocol, use the sizing templates included in your phits Expert Starter Pack. Please read the information below carefully since this is the basis for your Materialise phits orthotic.

TOP SIZING

This should be based on the patient's current shoe size. The top size refers to the top layer of the orthotics. The size corresponds with the templates you received in your starter package. Compare these templates with the shoe's sock liner or test the template in the shoe itself to find the top cover that best matches the shoe.

Shoe brand sizing can be very inconsistent. Always measure the correct size of the shoe by using the sizing templates — it is the only way to be sure the orthotic will fit the shoe properly.

BASE SIZING

The base size should be based on the patient's foot size. Often, this is one UK size smaller than their shoe size. The foot size must be measured by testing different templates under the foot of the patient. The template that matches the length of the foot is the correct foot size and thus the base size.

- Your patient's left foot will not always be the same length as their right. Both feet must be measured with the templates.

- For this portion, only the length matters when measuring the foot size; disregard the width for now. Direct your patient to stand on the templates with their socks off.

- Not sure whether you've chosen the correct template? Try one shorter or one longer to help you decide. Still not sure? Consider choosing the half size.

STEP 2 – RECORDING THE SESSION

TIPS AND TRICKS WHEN MEASURING YOUR PATIENT
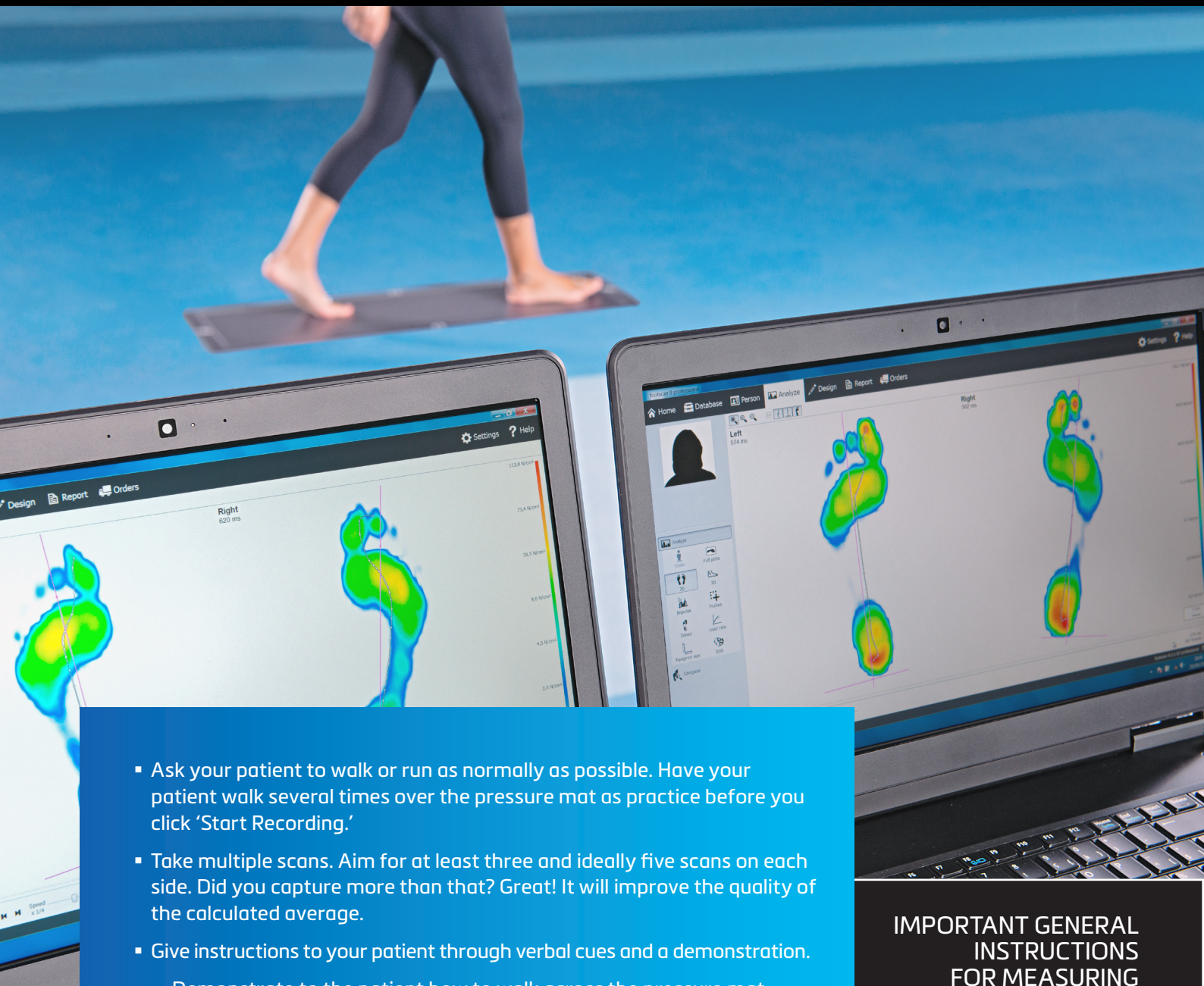
- Ask your patient to walk or run as normally as possible. Have your patient walk several times over the pressure mat as practice before you click 'Start Recording.'

- Take multiple scans. Aim for at least three and ideally five scans on each side. Did you capture more than that? Great! It will improve the quality of the calculated average.

- Give instructions to your patient through verbal cues and a demonstration.

  - Demonstrate to the patient how to walk across the pressure mat.

  - Walk – stop – turn – walk. You want your patient to walk straight and stable as they make contact with the scanner pressure plate.

  - Some suggested verbal cues you can give: "Look straight ahead"; "Walk or run as normal as possible, at your normal speed"; "Continue until I tell you to stop".

IMPORTANT GENERAL INSTRUCTIONS FOR MEASURING YOUR PATIENT'S DYNAMIC GAIT

materialise
innovators you can count on

One of the biggest advantages of phits is that you can design the orthotics based on their intended use. The orthotic type and the measuring protocol are specific to the needs of each patient.

STATIC

When taking a static measurement, you capture a snapshot of the plantar pressure of the patient's feet when standing still. The result of this scan will show you the weight distribution of left-right, front-rear, and within the four quadrants.

- Verbal cues you can give your patient while taking the static measurement: "Empty your pockets"; "Stand still on the plate, in a comfortable position"; "Look straight ahead"; "Arms next to your body".

- To help your patient relax on the scanner, ask them to take a couple of steps on the plate – statically – so they loosen up a little bit instead of focusing on the position of their feet.

- The static measurement captures a specific moment in time. Before making conclusions, it is advised to take multiple static scans or measure over an extended period using the balance measurement.

- Note: the static measurement will not influence the calculated orthotic corrections.

WALKING

The walking scan is beneficial to see the roll-off and pressure points on the patient's feet. You will need bare-foot measurements to make orthotics. While your patients can keep their socks on, we recommend barefoot to avoid slipping. When you want to know how a shoe is affecting your patient's roll-off pattern, you can do measurements over the pressure plates with your patient wearing shoes. When making orthotics these measurements will not add useful information. Avoid high heels, pointy toes, or any other shoes with sharp edges. This will damage the scanner cover and possibly even the sensors.

The walking scan should be the basis of each of your assessments. Even if the patient only wears the orthotics for running, you should always take a walking scan. This is always a good starting point for assessing your patient — the walking measurement will become your patient's baseline session and act as a reference should pain or problems occur during the running measurement. The algorithm behind the footscan software will automatically discard all incomplete foot measurements. If your patient is a forefoot striker, be sure to disable the 'auto-garbage' functionality to prevent it from removing all the forefoot strikes of your patient.

RUNNING

When sports is the intended use for the orthotics, whether intensively or occasionally, we advise you to also measure the patient running. This will allow you to assess the gait of your patient when he or she is active. Even if they never run straight in their chosen sport, the running assessment can teach you a lot about your patient's feet.

SINGLE-LEG SQUAT

The single-leg squat measurement is used for full-length orthotics. It will not be used as the main measurement to start orthotic design but can be used to confirm or challenge findings of the running assessment and inform modifications to the orthotic for cycling or skiing.

For cycling insoles, you should consider the orthotic design as a supplement to proper bike positioning. In this measurement, the goal is to simulate the force on the bicycle's pedals to determine the need for a forefoot wedge in the orthotics.

When designing ski orthotics for both cross-country and downhill use, keep in mind that the midfoot support is more important than the forefoot correction. However, you will need the forefoot correction to support the midfoot correction.

The single-leg squat measurement is divided into six steps. Follow these instructions strictly within the same time interval:

STARTING POSITION: NEXT TO THE MATERIALISE FOOTSCAN PRESSURE PLATE

1. Sidestep onto the footscan pressure plate with Foot A.

2. Bend the knee of Foot B and raise the leg to make sure it is not influencing the measurement.
   Important: Make sure this does not disturb your patient's balance.

3. Bend Knee A to start the squat.
   Important: Do not go too low. It is not a workout.

4. Extend Knee A to end the squat.

5. Place Foot B next to the footscan pressure plate.

6. Position Foot A next to Foot B. The patient returns to the starting position.

STEP 3 – DATA CHECK

BECAUSE IT'S ALWAYS GOOD TO DOUBLE-CHECK

One of the strengths of Materialise Phits Suite is that it is based on the objective data of multiple scans of your patient's feet. These multiple scans are combined into an average which is then used to calculate the specific orthotic corrections. This means that the data used to calculate this average must be accurate and correct.

To ensure the software is calculating the correct average, all irrelevant data should be discarded. This can be done either manually or automatically. To automatically discard flawed measurements, make sure that the auto-garbage option is enabled. Check that the remaining scans are complete and, if necessary, manually discard any additional data.

This data check is done in two steps, each using a different Materialise Phits Suite scanner feature:

1. 2D

In the 2D feature, you can see the peak pressure areas. Make sure the entire foot has been captured during these measurements as this gives you the best idea of the foot's shape.

During this check, look for:

1. Missing toes;
2. A missing medial or lateral forefoot, or;
3. An incomplete calcaneus

See examples in the images below.

2. ZONES

In the zones feature, the foot is divided into ten anatomical zones which are used by the software's algorithm for the orthotic corrections. The graphs on the right in the software show the force on each zone over time. The forces, values, and timing must be accurate for correct calculations. Pay attention to:

1. A correct heel distribution (the medial and lateral heel zones should have about the same surface), and;

2. The direction of the metatarsal zones (For example: Do these zones follow the direction of the foot axis?)

You can find some examples in the image below.
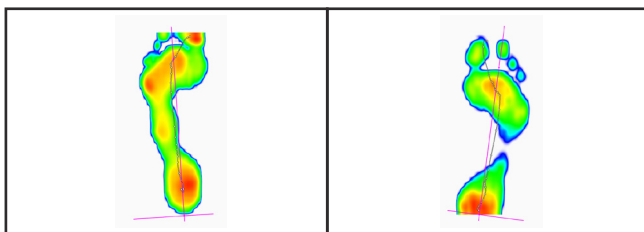
Example of an incomplete capture

Example of the anatomical zones in the footscan software'

The scan outlined by the blue box is the one you see on the screen. Make sure you click on the desired scan to enlarge it on your screen, even if it looked like there was nothing wrong.

If you want to discard one of the scans, just click on the scan, hold, and drag it to the trash bin.

STEP 4 – MATERIALISE FOOTSCAN SOFTWARE ANALYSIS

HOW TO USE THE AVAILABLE TOOLS EFFICIENTLY

The footscan software has many different analysis tools that can be useful during a patient assessment. However, we designed footscan with efficiency in mind to ensure you get the information you need in the least amount of time. This section will explain which tools to focus on when designing phits orthotics.

When designing the orthotic, three of the tools are essential: 2D, Zones, and Risk Analysis. These will be explained in detail in this manual. Explanation of the others will be explained as far as it is relevant for designing the best phits orthotic.

2D

In the 2D analysis, you can see the roll-off of the current foot selection. The dotted line represents the center-of-pressure (COP) during the roll-off. The pink line shows the foot axis connecting the middle of the medial and lateral heel with the middle of metatarsal heads two and three. The 2D feature tells you more about the foot's peak pressure and the amount of contact during gait. Because you can play and pause the roll-off feature, this is an interesting visual to show your patient when providing feedback on their gait.

Look at the dotted COP line to assess the stability of your patient during their gait. The roll-off is divided into time intervals, each represented by a dot. The number of dots per region can teach you something about the speed at that moment in the roll-off.

A red zone is not necessarily bad for your patient. The software will always recalculate the N/cm^2 to divide the pressure values on the scale. This means that the pressure values will be different for every session and every patient. What is too much pressure? Once the pressure values are above 70 $N/cm2^2$, it is advised to double-check the red areas on the physical foot, especially for higher-risk patients.
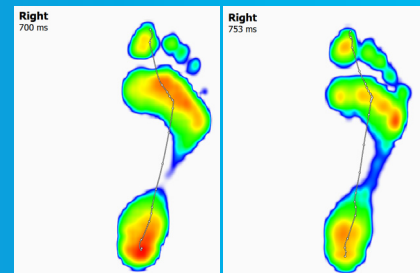
ZONES

Ten anatomical zones on each foot are automatically recognized by the software when measuring the patient dynamically. On the left side of the screen, you will see the result of these zones for the selected left and right foot. On the right side, you can see the graphs plotting the force per zone during the roll-off. Each zone has its own color, as shown in the legend at the bottom of the screen. In the top right of the screen, you can choose to plot the total force. Next, you can also adjust the graph by selecting the force for the selected feet only, for the average feet, or a combination of the two. Like the 2D feature, the roll-off can be played for your patient to help illustrate their gait.

The forces on the different zones are crucial for the orthotics. The average values will be passed on to the algorithm and will be used for calculating the corrections. When you plot the force for the average feet, you see the exact values that the algorithm will use. It can help you to analyze your patient, predict and understand the recommended corrections, and even overrule them if necessary. The roll-off is divided into three stance phases. For each of them, the force values are analyzed.

- Initial heel contact: 0-15% of gait
- Midstance phase: 20-40% of gait
- Propulsion phase: 50-80% of gait
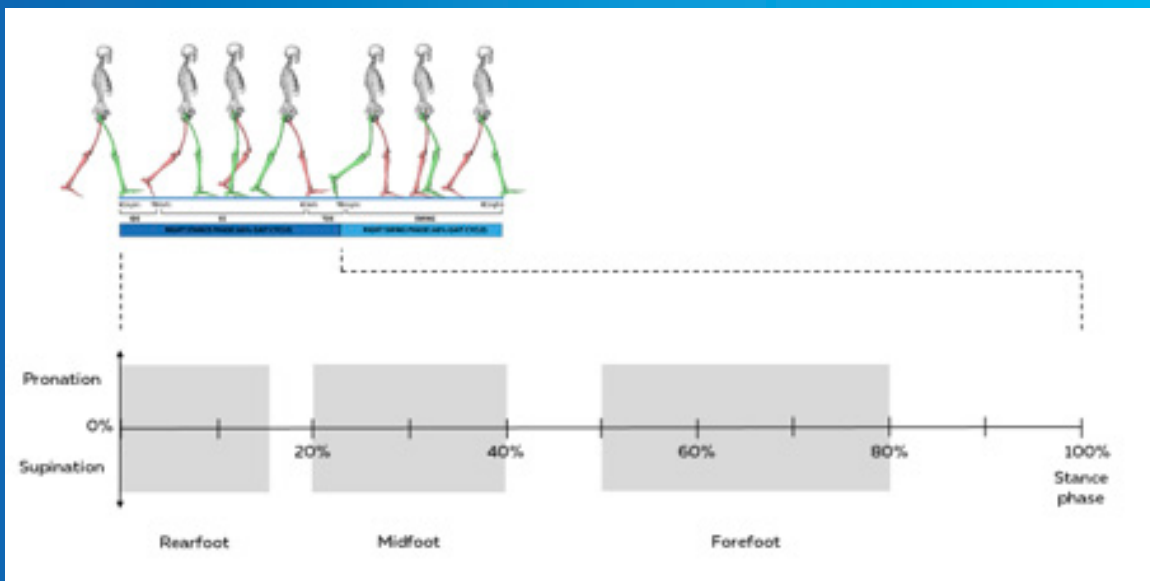
RISK ANALYSIS

The risk analysis in the software gives you an indication of the patient's injury risk. The software will divide the roll-off into the three stance phases, as mentioned above. The algorithm will then evaluate and compare the medial and the lateral forces working during each phase. If an excessive imbalance is measured, the heel zone – medial or lateral, the midfoot zone – medial, or the forefoot zone – medial or lateral, will be highlighted.

- The percentage displayed next to the zones can be explained as
  - **< 90%:** No risk
  - **90-100%**: Low local risk
  - **100-110%:** Medium local risk
  - **>110%:** High local risk.
- Global risk meaning
  - **Low global risk:** No medium or high local risk was measured — No need for corrective orthotics unless the patient has reported foot pain.
  - **Medium global ris**k: Only one medium or high local risk zone was measured — A pair of correcting orthotics can be useful.
  - **High global risk:** At least two medium or high local risk zones were measured — Orthotics based on the patient's dynamic measurements are recommended.

> This risk analysis can answer the question, "How will this patient benefit from using corrective orthotics?" The analysis will show where (in which phase) the problem or the imbalance for this patient is occurring and how it can be remedied.

> Risk analysis is used frequently as a preventative measure to assess the risk of injury for your patient.

The risk analysis and the algorithm behind it has been scientifically tested in the following studies:

Contents lists available at ScienceDirect

The Foot

journal homepage: www.elsevier.com/locate/foot

Can RSScan footscan® D3D^{TM} software predict injury in a military population following plantar pressure assessment? A prospective cohort study

Andrew Franklyn-Miller [a,b,c,*], James Bilzon [b], Cassie Wilson [b], Paul McCrory [c]

[a] Sports Medicine Department, Sports Surgery Clinic, Santry Demesne, Dublin 9, Ireland
[b] School of Health, Claverton Road, University of Bath, United Kingdom
[c] Centre for Health, Exercise and Sports Medicine, University of Melbourne, Australia

Risk category	Number of participants $n = 200$	% of total	Number of injuries sustained $n = 57$
High	42	21	27
Medium	56	28	14
Low	102	51	16

Fishers test – high risk vs. Medium $p < 0.0002$, high vs. low $p < 0.0001$, combined vs. low $p < 0.0001$.

> The above study indicates that we can use the footscan pressure plates and software to test our patient's risk of a lower-limb injury based on their dynamic measurement. Of course, not every high-risk patient will experience an injury. The same goes for low-risk patients, as they also have the potential of developing a lower limb injury. However, the prediction from this system can be a great tool to provide valuable feedback.

Foot Orthoses in the Prevention of Injury in Initial Military Training

A Randomized Controlled Trial

Andrew Franklyn-Miller,[*†‡§] MBBS, Cassie Wilson,[‡] PhD,
James Bilzon,[‡] PhD, and Paul McCrory,[†] PhD
Investigation performed at Britannia Royal Naval College, Dartmouth, Devon, United Kingdom

TABLE 4
Results Comparing Injury Rate and Injuries Between Groups[a]

Group	Risk	Patients, n	Injuries, n	Injury Rate:Hours Training
Control	High/medium	200	61	1:1600
Orthotic	High/medium	200	21	1:4666
Absolute risk reduction		CER − EER (0.74 − 0.25) = 0.49		
Number needed to treat		1 / 0.49 = 2		

[a]Chi-square, $P < .0001$. CER, control event rate (74%); EER, experimental event rate (25%).
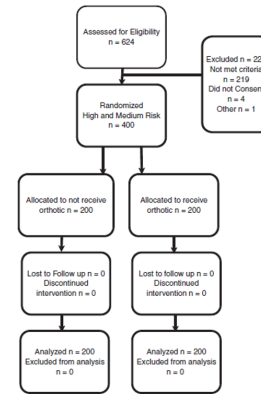
Figure 1. CONSORT diagram of the flow of participants through study.

Do orthotics work? This important study can help answer that question. From the first study of Franklyn-Miller et al mentioned above, we know that we can test our patient's risk of getting an injury. In the second study of Franklyn-Miller, we tested the reduction of the injury rate by providing the 'medium' and 'high' risk patients with orthotics based on the same algorithm. Although this study didn't use phits orthotics, they are based on the same algorithm. The D3D orthotics used in this study, are in fact, an ancestor of our phits!

TIPS & TRICKS

Did you know that the footscan software's risk analysis is used in many universities throughout the US? University athletic departments use the software to assess the injury risk of their athletes. In case of 'medium' or 'high' risk results, phits orthotics are given to these athletes to help prevent injury. Other users apply the same principle in their businesses, e.g., testing employees and providing phits orthotics to reduce the injury rate.

OTHER

3D SCAN

3D scans can also be added to your footscan software and used as input for the orthotics design. You can either measure your patient directly with a 3D scanner from Materialise — Iqube Mini, Iqube E500, or Tiger — or use your own 3D scanner and import an OBJ or STL file of the patient's feet.

Specific measurements can be done on the feet. You can also use the 3D scan to calculate the navicular height of the patient's feet. You can use this information to design your phits orthotics. The 3D scan and the accompanying static navicular height calculation are optional and not a necessity.

STATIC

The static measurement displays the static pressure distribution. The percentages show the left-right and the front-rear weight distribution. These percentages combined form the distribution in the four quadrants.

BALANCE

The balance measurement evaluates the pressure distribution and the displacement of the center of pressure (COP) of a balance measurement. Next to the specific balance usage of this feature, you can also use it to measure the patient statically. The disadvantage of the static recording session is that the snapshot is taken at a specific moment in time. The balance measurement allows you to measure for a longer period. Note that there is no link with the design software.

DYNAMIC

3D
The 3D screen is a 3D visualization of the 2D peak pressures. It is an excellent visual tool that you can show your patients. Click and drag the image to change the view on the measurement.

Impulse
The impulse displays the areas where there was a higher pressure during an extended period. This is a useful feature to detect the risk areas in patients with diabetes or peripheral neuropathy.

Probes
Comparable to the zones, the probes feature plots the force in the graph. However, instead of plotting the forces for the zones of the foot in general, this graph will only show the force for one sensor. You can select more sensors by clicking on the arrows.

Load rate
The load rate evaluates the rate at which the force applied to each anatomical zone changes. A positive graph means that the force is increasing. Once the graph is at the zero axis, the highest force is reached. The force on the specific zone is decreasing when the graph is negative.

Footprint size
The footprint size will automatically measure the width and the length of the selected foot. It is NOT recommended to measure the exact foot size with this tool because it is based on a dynamic pressure measurement.

Compare
The compare function in the software allows you to compare different scans from the same patient, trials from different sessions, and even trials from other customers in the 2D, impulse, and areas option.

Do you want extra information on the different features? Take a look at the manual by clicking 'Help' in the software.
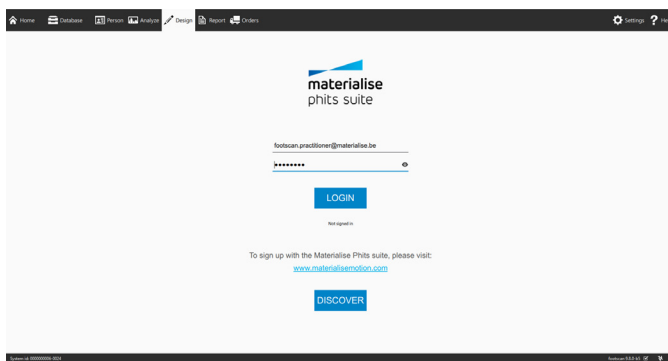
STEP 5 – DESIGN WIZARD

NOW, LET'S HELP YOUR PATIENT

When using the design software for the first time, you will see the screen below.
Fill in your account credentials to log in with your phits account.
Having issues logging in? Contact support.motion@materalise be, and the team will be happy to help you proceed.

Be aware that to create the best possible orthotics, we advise you to begin with at least three left and three right scans of the patient. Make sure the data is verified before you analyze your patient's data and design the orthotics, as it is directly linked to some of our suggested orthotic corrections. For more information about verifying the data, see the section titled: 'Step 3 — Data check'.

In the design software, you will notice that some corrections are already filled in. These suggested corrections are calculated based on the dynamic measurement. In the original phits design wizard, they can be recognized by a blue italic title. The color of the title will change to black once you adjust the proposed value. However, in the new phits+ design wizard, you can identify a proposed correction by the lack of a reset button in the menu box. This button will appear as soon as you change a suggested value.

Do you have more than three left and right scans? Even better! As both our algorithm and our visualizations use an average of the measurements you provide, the more scans you have, the more reliable your average will be.

Don't hesitate to contact us on support.motion@materialise.be.
For more information, see the 'Troubleshooting' section.

DESIGN SELECTION
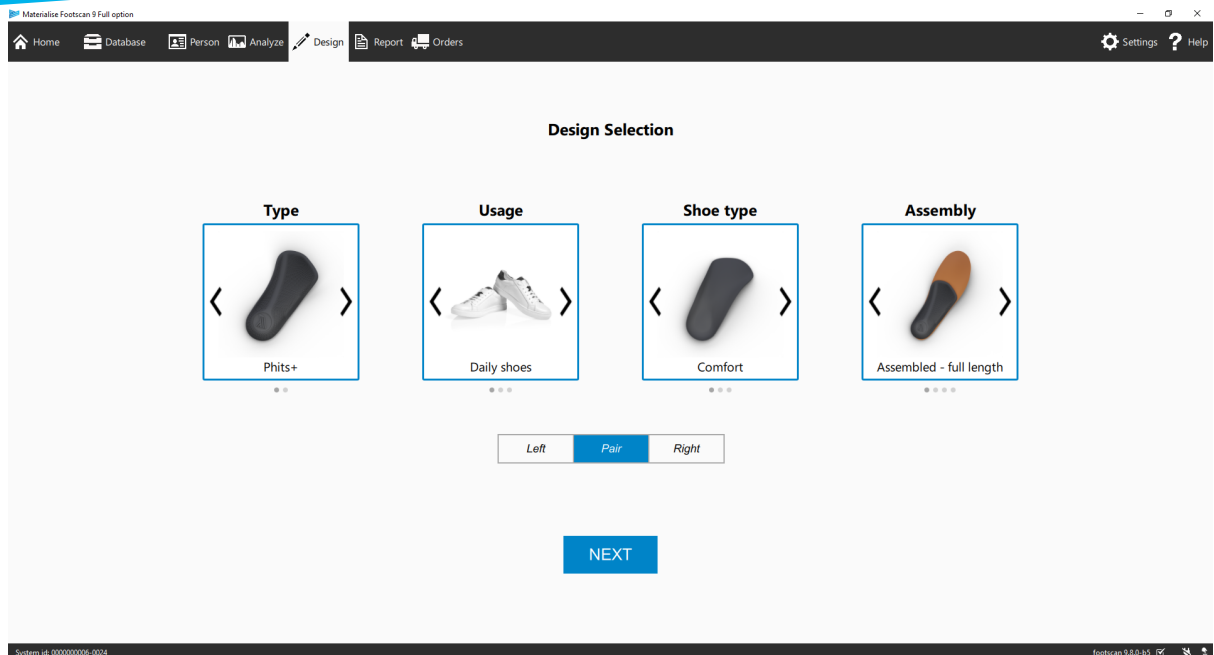
TYPE

Two types of phits orthotics are available in the software: the phits+ and the phits. The phits is the legacy orthotic, has the well-known design software panel on the right side of the screen, and is supported by the typical lattice structure.

The phits+ is the updated version of the phits. It has a thinner texture, takes less space in the shoe, and has all the corrections you need to help your patient. Furthermore, it has its own full-screen design software, showing real-time changes to the printed base when you adjust something. The phits+ is the new standard in the world of 3D-printed orthotics.

> Your chosen type will influence the design software you see after clicking 'next.'

USAGE

When selecting the intended usage of the orthotics, you must choose between daily use, sport, and safety. This choice will affect the recommended top cover, the orthotic types, and the available corrections.

SHOE TYPE

In the design selection screen, the user must make choices about the shoe. It is particularly important that you know what shoes your patient wears AND the intended use of the orthotics. Will the patient use them for daily activities? Is the patient a runner? A soccer player? How many times a week do they practice? When do they experience issues or pain? Which activity can benefit from the support of the orthotics?

> You can find some additional information on the shoe types on the next page.

ASSEMBLY

You can choose between

- **ASSEMBLED – FULL LENGTH (DEFAULT)**
- **ASSEMBLED – 3/4 LENGTH**
- **NOT ASSEMBLED – FULL LENGTH**
- **NO TOP LAYER**

SIDE SELECTION

Configure your order by selecting only the left orthotic, right orthotic, or full pair.

SHOE TYPE INFORMATION

There are many different types of orthotics available. Decide which type is best for your patient based on their intended use and footwear. Don't focus too much on the name of the shoe type — instead, understand the goal of the orthotics and choose the best solution to achieve it.

DAILY USE

For everyday use and activities, from cooking to gardening, choose Daily Use orthotics. This standard orthotic can be customized with all the possible corrections and is compatible with every top cover type. The top covers have a standard thickness of 3 mm, but if the shoes allow it, 6 mm is also possible. The Daily Use orthotic is the go-to orthotic for most end-users and is available in three different shoe types.

Comfort

This standard width will fit most shoe types.

- 👣 **footscan protocol: walking**

Narrow

Narrow

We designed a narrower orthotic to fit narrow shoe types, like lace-up shoes or women's loafers. Users can still wear those shoes while experiencing orthotic support.

- 👣 **footscan protocol: walking**

Wide

The wider orthotic type, ideal for wider or full feet. This type should be used in wider or (semi-) orthopaedic shoes.

- 👣 **footscan protocol: walking**

SPORTS

There are six different orthotic types specifically designed for individual sports. Some of their characteristics can be applied to other sports as well. Please find all the information below.

Running

Running has a major impact on your body, from your feet to your hips, knees, and back. Therefore, we designed the running orthotic to have a standard top cover of 6 mm thickness. The suggested top cover will be EVA 30, 35, or 40 shore, depending on the patient's weight, but you can also choose the more resilient PU Soft material (shore 20).

- **footscan protocol: walking + running**

Soccer

Like running orthotics, soccer orthotics have a standard top cover of 6 mm. The main difference is in the base; it can be compared to the Narrow type orthotic as soccer cleats can be very narrow. The soccer-type orthotic can also be used for track and field spikes, rugby boots, and many others.

- **footscan protocol: walking + running**

Golf

The Golf orthotic is almost identical to the Comfort type. The only difference is they always have a synthetic leather finish, giving them a nicer look. No wonder they're loved by many golfers.

- **footscan protocol: walking**
- Top cover: Always with synthetic leather finishing

Cycling

For optimal performance, cycling shoes are very stiff for efficient power transmission from foot to pedal. That is why we designed our Cycling type orthotic to be full length and rigid under the forefoot. Here you can play with a complete forefoot wedge from 1 to 4 mm thick.

- **footscan protocol: walking + running + one legged forefoot squat**
- Top cover: available in 1 and 2 mm thickness
- No metatarsal bar available
- Only to be used in rigid shoes
- Currently only available in phits type — phits+ compatibility coming soon

Alpine ski

Similar to the Cycling type, the Alpine ski orthotic has a full-length printed base. The only difference here, the 3D-printed base is flexible under the forefoot. The base and 1 or 2 mm top cover combined result in a thin orthotic that fits all ski boots without compromising the available space in the toe box. It is suitable for ski boots, hockey skates, or any other 'rigid' shoe where you want to use forefoot wedges to correct the foot.

- **footscan protocol: walking + running + one legged forefoot squat**
- Top cover: available in 1 and 2 mm thickness
- Currently only available in phits type — phits+ compatibility coming soon

Nordic ski

The Nordic ski orthotic has the same characteristics as our Alpine ski orthotic. The only difference is the smaller width, which is needed for a slimmer last.

- **footscan protocol: walking + running + one legged forefoot squat**
- Top cover: available in 1 and 2 mm thickness
- Currently only available in phits type — phits+ compatibility coming soon

SAFETY

For many people, safety shoes are mandatory at work and often the shoe they wear most. Unfortunately, these shoes have very standard and non-supportive sock liners, which may cause discomfort or injuries at work. That is why we designed a safety orthotic where the top cover is anti-static. Again, you can use all the different corrections to customize the orthotic to your patient's foot type. This type can be designed in the Comfort, Wide, and Narrow shoe type versions.

- 👣 **footscan protocol: walking**
- Top cover: Always anti-static EVA material
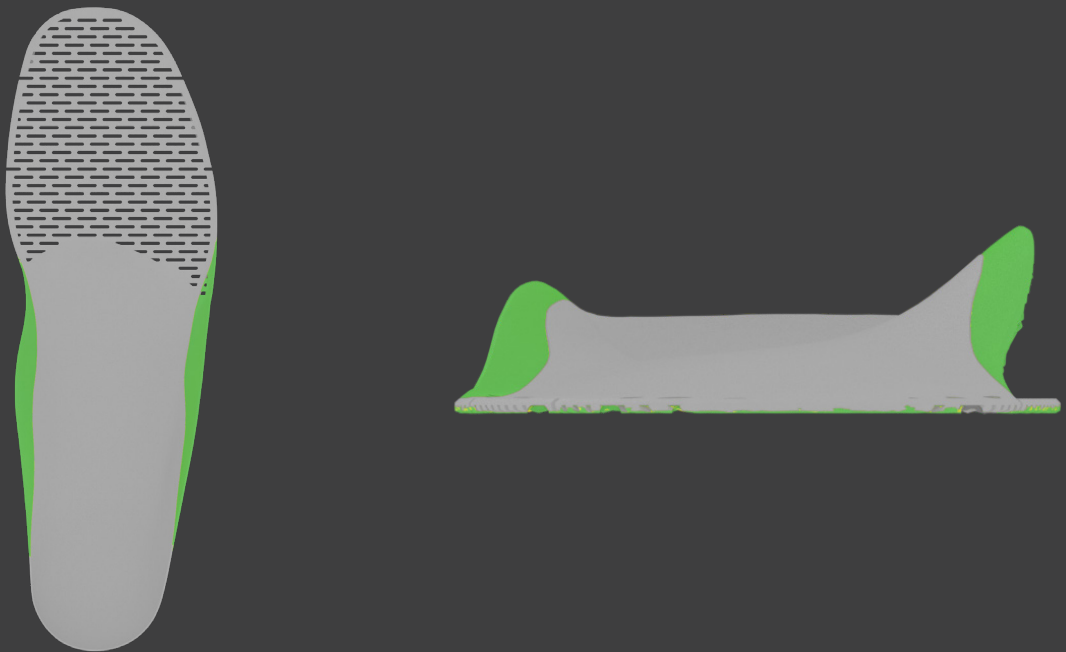
Alpine versus Nordic ski orthotic: height and width for size UK 8 and navicular support 'normal'

phits+ DESIGN

The phits+ design wizard is a full-screen design software that shows you the designed orthotics in the middle of the screen. Changes to the design are shown in real time, allowing the user to see the influence of their decisions immediately. At the bottom of the screen, you can find the different components of the sole. Different corrections are possible for each component. A blue contour and a checkmark make it easy for the user to see which corrections they have already applied to the orthotic design.

Wedge ✓	Cup height	Heel raise	Heel skive

Wedge ↻

The reset button allows the user to go back to the proposed correction setting easily.

Left
✓✓ ▾

Wedge 🗑
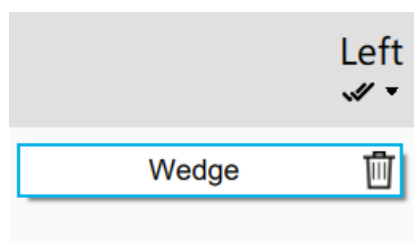
The stack menu, shown when clicking on 'left' or 'right', gives the user a quick overview of all added corrections. This allows the user to quickly remove the correction or adjust the correction by clicking on the title.

On the right side of the screen, we provided different viewing, analyzing, and design options, which can help you evaluate your clinical decisions

L/R   **Left-right view** lets users view only the left, right, or both insoles in the wizard.

3D   **3D view mode** lets users visualize the insoles in all directions. In this mode, users can freely rotate and zoom

Default plane view lets users quickly select a default plane to view the insoles: top, bottom, medial, lateral, or heel plane views are available. Note: this feature is only enabled if the 3D view mode is active.

2D   **2D analysis** lets users overlay the **average** plantar pressure measurement on top of the insole to make informed decisions using the 2D analysis functionality. This can be an extremely useful tool when deciding the length of the printed base or when positioning the metatarsal supports, for example. Note that this is still a dynamic measurement, so it's likely that the foot looks a bit longer than when standing.

COMING SOON: 3D scan analysis lets users visualize the 3D scan (if present in the measurement session) on top of the insole. Note: This feature is only available with the following corrections: Heel wedge, Heel cup height, Heel raise, Heel skive, Navicular support, Lateral edge, and Midfoot edge. This feature is further also available when 3D view mode is active.

The **patient remarks** feature lets users quickly show the patient remarks noted in the Person module.

Design **prescription overview** enables users to quickly generate an overview of the insole design, describing all applied corrections and comparing actual and proposed values.

Overall reset enables users to reset the entire design quickly. When clicking, a pop-up will first appear to ensure the user wishes to perform an overall reset.
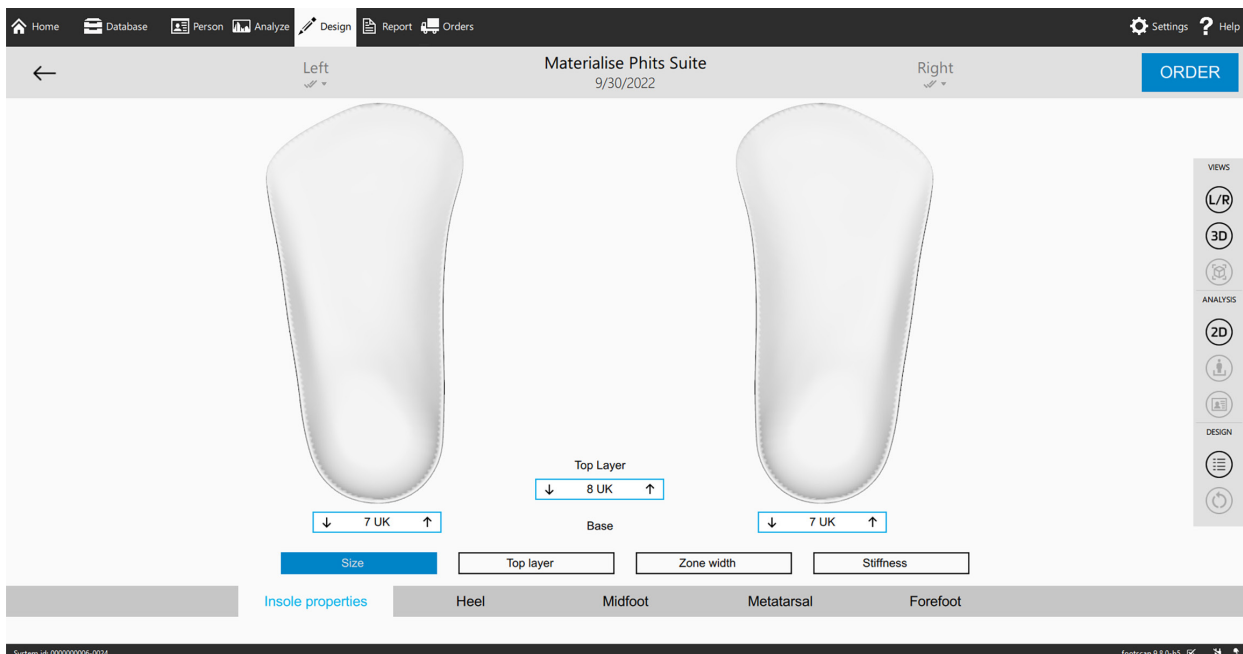
INSOLE PROPERTIES

SIZE

TOP LAYER

The top layer size will correspond with the value entered when recording the session. Because the design software uses the UK sizing table, the entered size will automatically be converted to the UK sizes. Make sure to read 'Step 1 — Sizing protocol' before designing your first Materialise phits orthotic.

BASE

Similar to the shoe size determination, you should follow the guideline described in 'Step 1 — Sizing protocol'. The 2D visual can be useful when evaluating the selected base size, as it shows you the average 2D pressure image of your patient's feet. However, remember that it is a dynamic measurement and that due to various factors such as, for example, a collapsing arch, the size is not 100% representative of the foot size.

> In contrast to the top cover sizes, it is possible to print the bases in UK half sizes. It is also possible to design different sizes for the left and right foot. This can be useful in case of a difference in length between the patient's feet, for instance.

TOP LAYER

THICKNESS — SUGGESTED VALUE

1, 2, 3, or 6 mm thickness of the top cover.

Depending on the usage chosen in the first design panel, you will receive a recommendation for the top cover thickness. However, you can adjust this depending on the available space in the shoe or the amount of cushioning you would like to add to the orthotic.

HARDNESS — SUGGESTED VALUE

Based on the patient's weight, the system will propose the firmness of the top cover. Please note that this recommendation will only apply on the shore 30, 35, and 40 EVA top covers. The shore 20 is a PU top cover, which you must always select manually.

- Shore 30 (EVA material) — Patient's weight is below 70 KG or 154 lbs
- Shore 35 (EVA material) — Patient's weight is between 70 KG/154 lbs and 80 KG/176 lbs
- Shore 40 (EVA material) — Patient's weight is above 80 KG/176 lbs
- Shore 20 (PU material) — No proposal, always clinician's decision

> Does your patient need more cushioning, but there is not enough space in the shoe for a 6 mm top cover? Are they used to softer orthotics? Do you think the recommended hardness will be too much for your patient? Then the shore 20 — PU soft material might be an appropriate solution. If you want to decrease the firmness of the top cover for your patient, it is advised to start with shore 20 instead of a softer EVA cover. Since the PU soft material is made of memory foam, it will hold its thickness and will not be affected easily by the patient's weight. On the other hand, EVA will compress and wear out easier if you go for a lower than recommended density.

MATERIAL

Depending on the shore value you selected, the top cover material will be EVA (shore 30, 35, and 40) or PU (shore 20). A synthetic leather top cover can be added to both the EVA and the PU top cover.

> The synthetic leather option is added by default when selecting a golf orthotic for its more luxurious look. Other reasons to add the synthetic leather option are aesthetics, friction in the heel, heavy usage, or high activity. Remember that the orthotic will be a little thicker with an additional synthetic leather layer.

HEEL PADDING

Not available for Cycling, Ski, and Safety orthotics with a 6 mm thick top layer

If necessary, you can add specific cushioning to the top cover of the orthotics. Because the cushioning is made from soft PU material, this option is only available if an EVA top cover is selected. Also, the top cover will be thicker than average due to the production method, meaning both the 3 mm and the 6 mm top cover will be slightly thicker than without heel pad correction. Make sure to consider the top cover thickness of your orthotic when designing an orthotic with a heel pad modification. By default, the orthotics will be covered with a 2 mm EVA layer, but you can also select the synthetic leather top cover. Although this synthetic leather cover will reduce the cushioning effect slightly, this cover will be stronger and more durable.

ZONE WIDTH
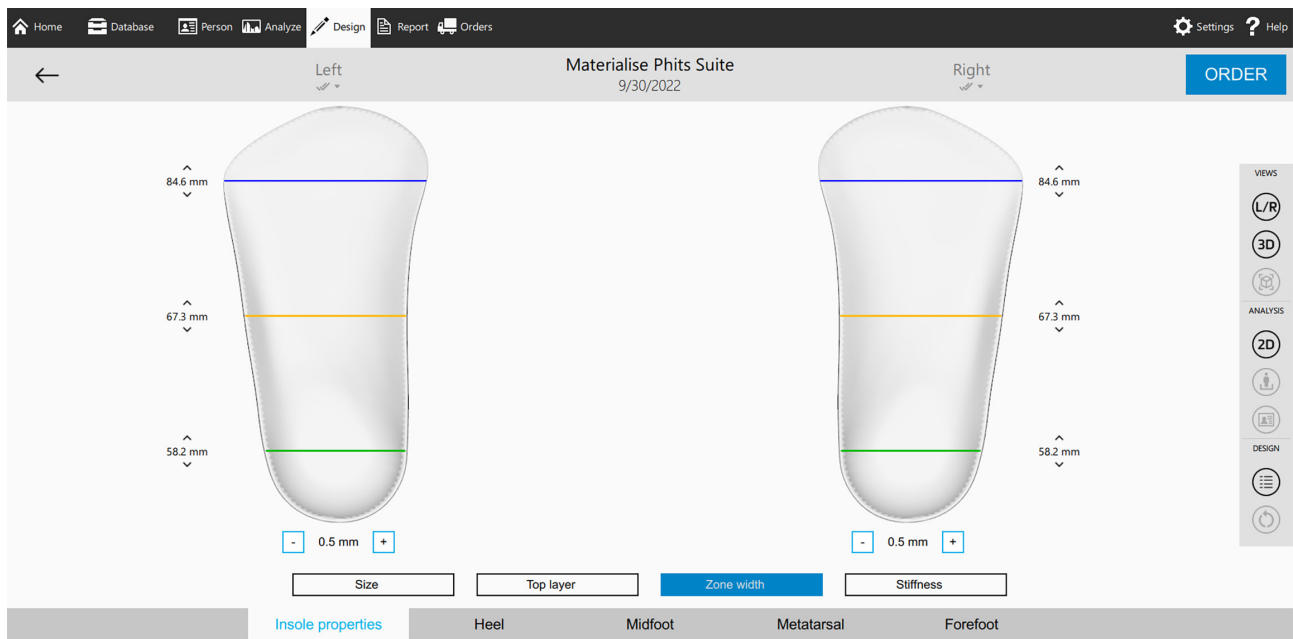
Change the overall width of the base part by using the general modifier underneath the insole shown on the screen, or change the width of the three predefined regions of the base; the meta region (blue line), the midfoot region (yellow line), and the heel region (green line).

STIFFNESS — SUGGESTED VALUE
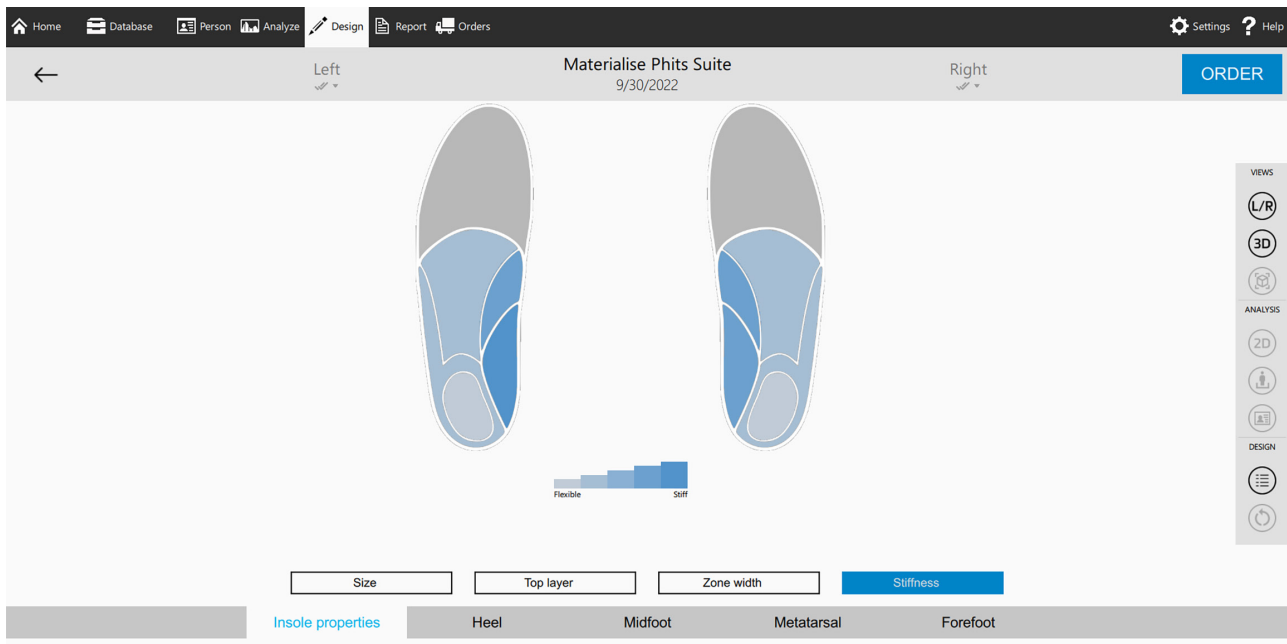
By changing the local stiffness, you can modify the flexibility of the printed base in five predefined zones. The stiffness ranges from 1, being more flexible (light blue), to 5, being stiffer (dark blue). Hovering over a zone activates the local stiffness controller, allowing you to set each zone's local stiffness. The calculations are based on the roll-off, the amount of internal or external rotation, and the patient's weight. Use the reset button to go back to the suggested values.

The benefit of this tool is that it allows you to fully customize orthotics to your patient. For example, if you want to add extra support to the orthotic, you can increase the lateral stiffness zone. If you wish to block pronation, you can change the stiffness in the medial zones. The general idea of this feature is to steer and correct the foot by adjusting the intrinsic properties of the base.

WEDGE — SUGGESTED VALUE
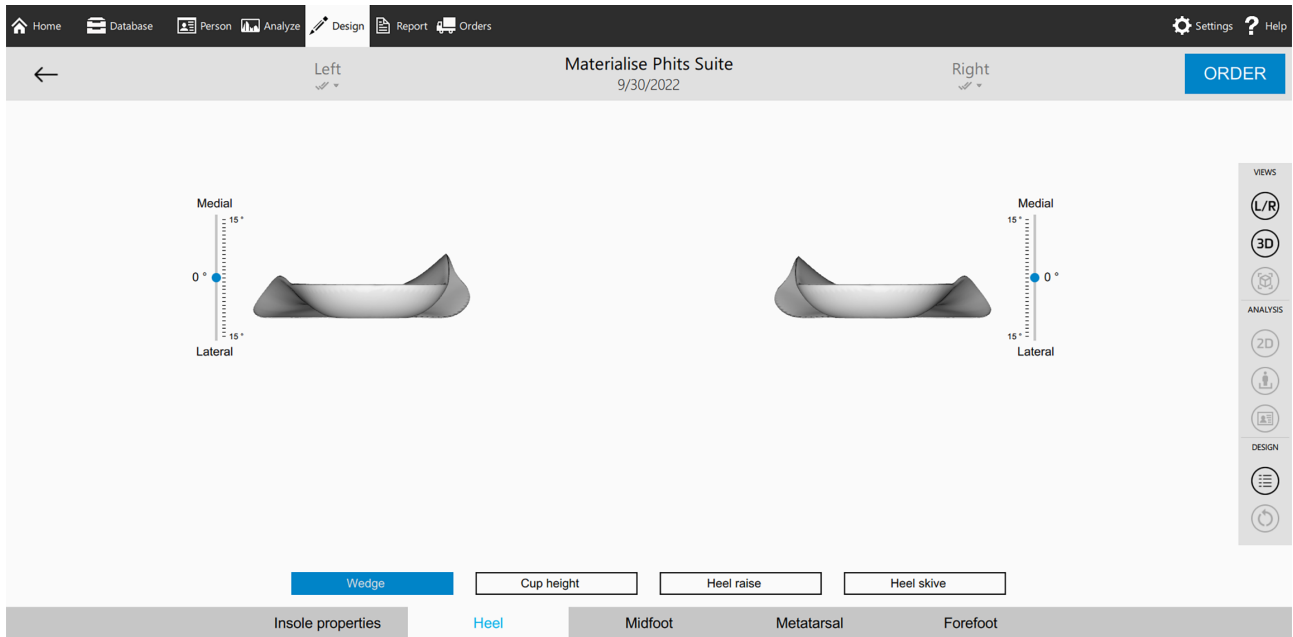
The phits algorithm will calculate a medial or lateral heel wedge. For these calculations, the system evaluates the heel loading during the first 15% of the roll-off. Depending on the difference between the force applied to the medial heel zone and the lateral heel zone, it will propose a corresponding wedge angle (in degrees).

This correction is the perfect example of the possibilities you have as a Materialise Phits Suite expert. Although the heel wedge is calculated, we strongly advise double-checking the result. If you think your patient could benefit from a heel wedge, but the software suggested 0°, you can easily overrule the prefilled value. On the other hand, if a heel wedge is recommended but doesn't make sense based on your expertise, you can easily remove it. Our goal: You are the clinician and are free to design the orthotics the way you want them.

CUP HEIGHT
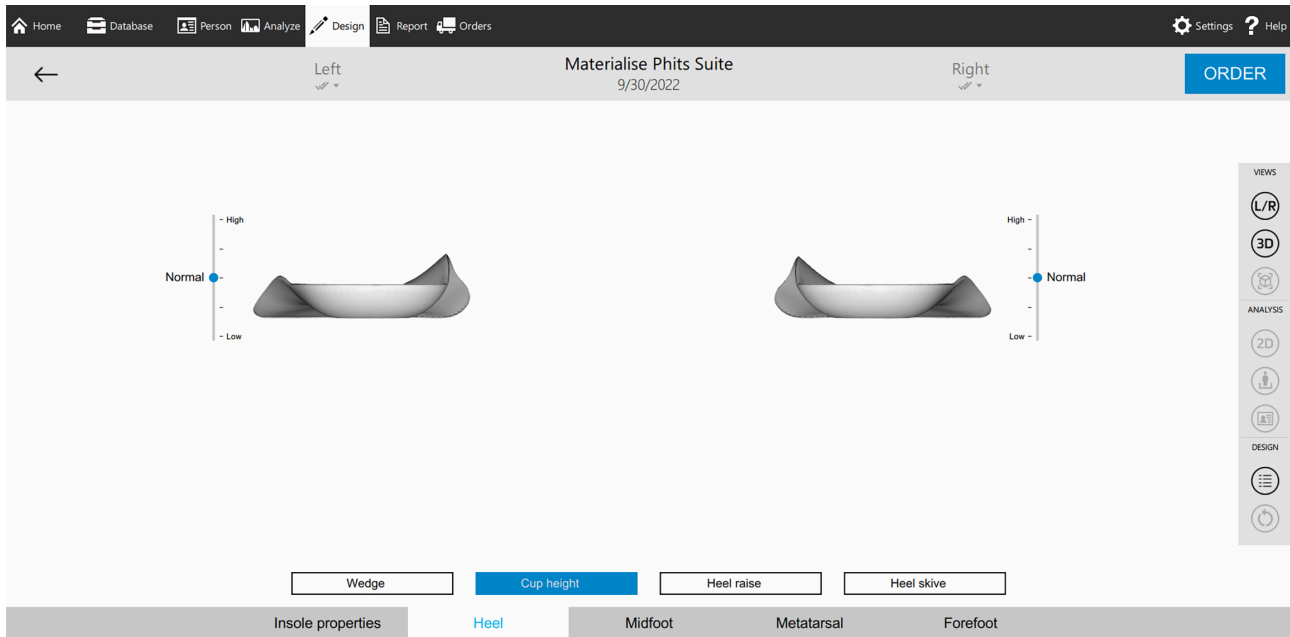
You can select the height of the heel cup of the printed base by moving the slider in the design software. Changing the height of the heel cup is an easy way to give more or less support to the calcaneum and has a significant impact on the foot roll-off.

Note that the addition of a heel skive correction and your choice of top layer composition will affect the available heel cup options. More precisely, adding a medial or lateral heel skive of more than 4 mm must be accompanied by a heel cup with at least a "normal-high" height. If you apply a heel skive of more than 4 mm and reset the heel cup height to normal, the software will automatically remove the heel skive.

RAISE
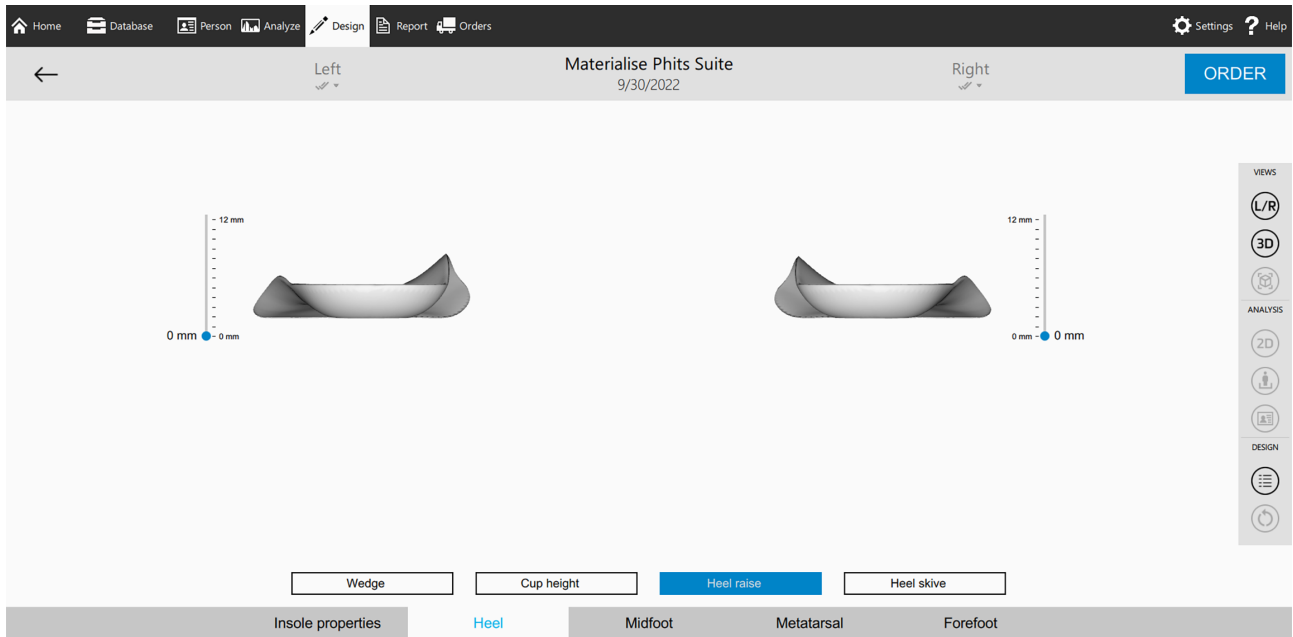
You have the option to lift the patient's heel by up to 12 mm. You will likely use this option specifically to compensate for a leg length discrepancy. Be sure to consider the amount of available space in the shoes.

SKIVE

You can select a medial heel skive of up to 8 mm and a lateral heel skive of up to 6 mm. These corrections can be used to increase the pronation and supination moment of the orthotic by adding a plane surface at a 15-degree angle on the inside of the heel section. Note that adding a heel skive may result in an increased heel cup height, as this may be required to add the correction.

MIDFOOT

NAVICULAR SUPPORT — SUGGESTED VALUE
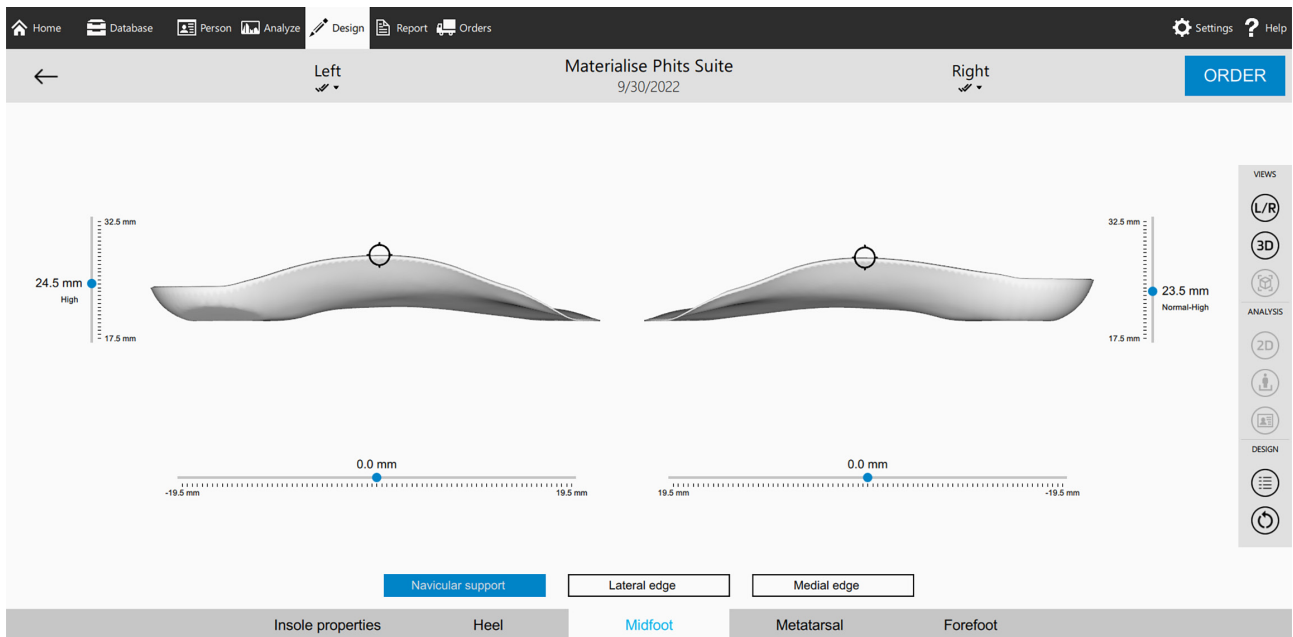
In the navicular support correction, you influence the medial arch support of the orthotics. The software will identify the patient's foot type and suggest the best matching navicular support height based on the dynamic measurement. The highest point of the medial arch is marked on the insole. Next to the orthotic, you can see the height of the highest point of the medial arch in millimeters. You can easily adjust the height by using the slider. Underneath the orthotic, you see the anterior-posterior shift of the highest point, which can also be moved by using the slider. You can also click and drag the marker on the orthotic itself, according to the patient's needs. Looking at the orthotic in 3D by using the 3D view button allows you to see your choice from different angles.

Because this feature will have a large impact on the result of the orthotics, it is imperative that you double-check the proposal for navicular support. If you have more patient information (joint flexibility, orthotic history, usage, etc.), make sure to take this into account when deciding the navicular support. Remember that in most cases, less is more.

STATIC 3D SCAN NAVICULAR HEIGHT — COMPUTED *ONLY ACTIVE IF THE 3D SCAN IS AVAILABLE*

If you have a 3D scan of the patient's feet, alone or in combination with a footscan pressure plate, you will see a static navicular height value. You can use this extra information to design the phits orthotics.

Important: The recommendation of the navicular height in the software is dependent on the 3D scan. If there is no dynamic measurement present, the system will recommend the normal navicular support by default.

LATERAL AND MEDIAL EDGE

You can increase the height of the medial and lateral edges of the printed base. On the lateral side of the printed base, you can also remove the edge entirely.

Increasing the edge height is an easy way to give the foot additional support. Always keep the tolerance of the patient's feet in mind for this correction. On the other hand, reducing the lateral edge can be used for a wide (fore)foot or a prominent base of the 5th metatarsal or cuboid. The goal is to avoid irritating the printed base due to the patient's foot properties.

METATARSAL

The general rule for the metatarsal supports, both the metatarsal bar and the metatarsal pads, is don't go too high. The meta supports will be integrated into the 3D-printed shell and thus be quite prominent in the orthotics. In most cases, 1 or 2 mm will suffice. A 3 mm metatarsal support will be an exception for patients with specific and serious foot problems.

METATARSAL BAR AND PAD

You can add a metatarsal bar and a teardrop or a T-form metatarsal pad to the orthotics. The height can vary from 1 to 6 mm. Be careful with the height of the metatarsal pad. As this is a very local correction, 1 to 3 mm should give sufficient support to your patient's feet.

CUT-OUTS
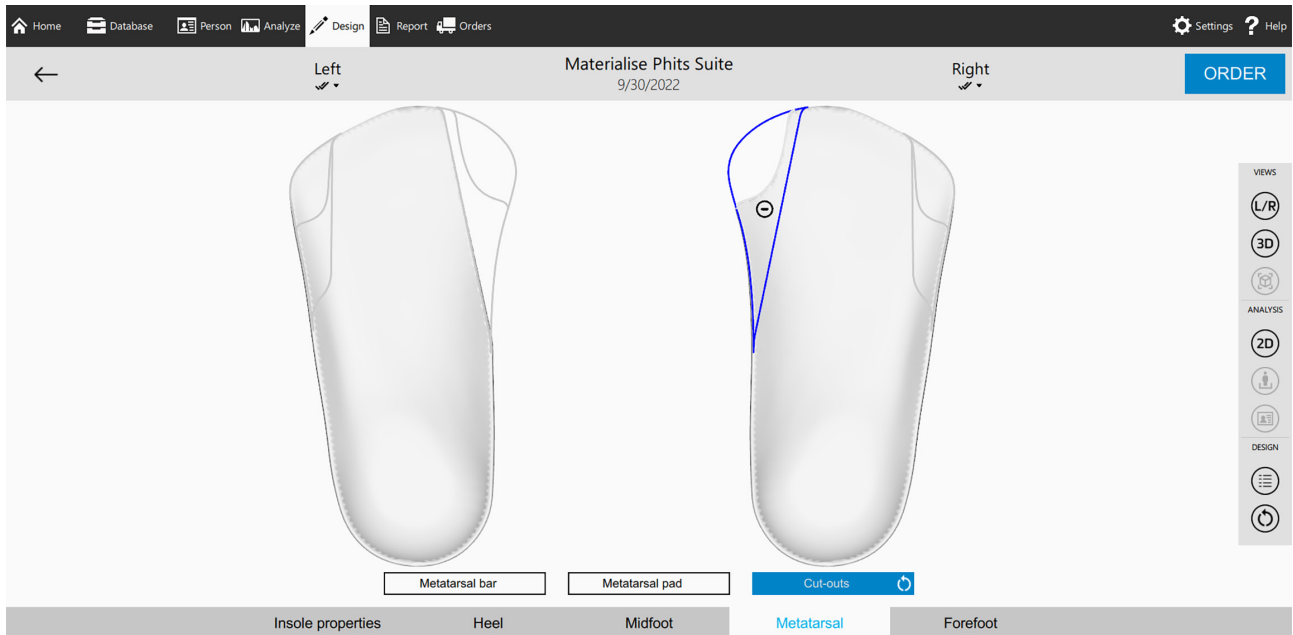
Four types of metatarsal cut-outs are available in the phits+ orthotics. The design software shows you the different shapes; On the medial side, you can go for a 1st meta or 1st ray cut-out for a bigger area. The 5th meta and 5th ray cut-out are your options on the lateral side. Keep in mind that the cut-out you select will influence the available forefoot corrections.

FOREFOOT

FOREFOOT CORRECTIONS
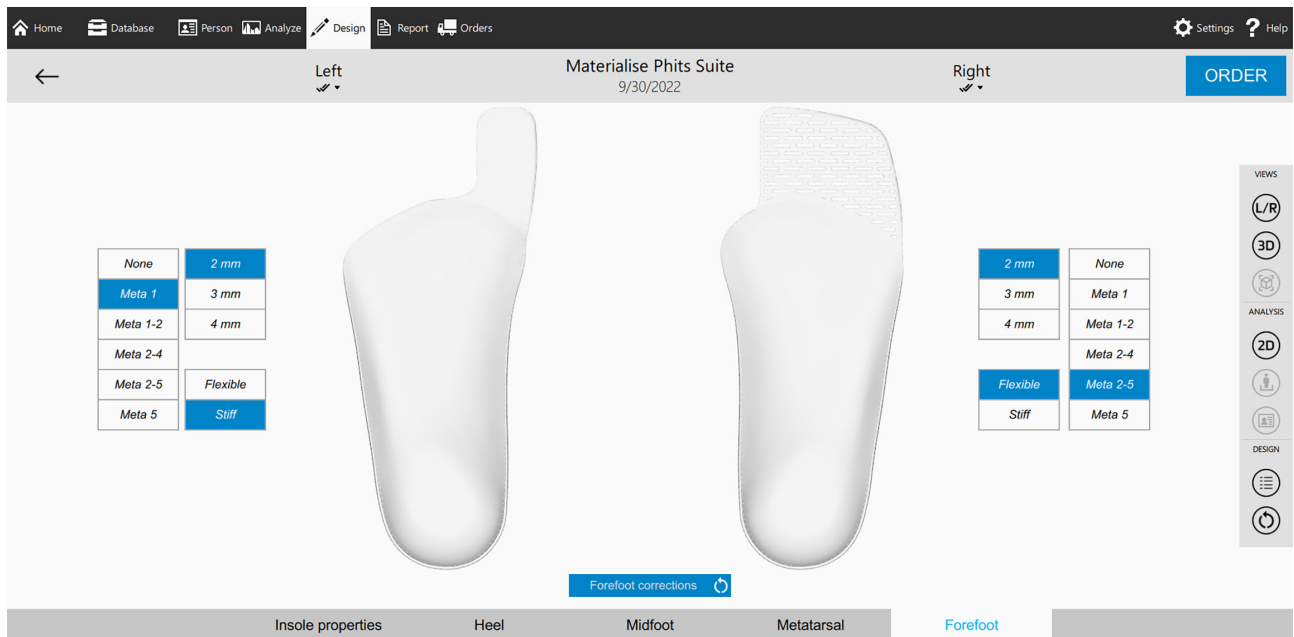
Correction
- Meta 1
- Meta 1-2
- Meta 2-4
- Meta 2-5
- Meta 5

Height
- 2-4 mm

Stiffness
- Flexible or Rigid

The zones and the risk analysis feature of the software can indicate the need for a forefoot correction. When it measures high loading on the medial or lateral metatarsals or when the risk analysis shows a local risk in the forefoot, there is an imbalance during the propulsion phase. A forefoot correction can, in that case, help to stabilize the forefoot and to improve the roll-off. The flexible forefoot correction will mostly be used in high loading, whereas the stiff forefoot correction is used in more specific cases, e.g., a hallux rigidus.

ORDER

The 'order' button is always visible in the phits+ design software, allowing the user to work as efficiently as possible. Click 'order' to go to the checkout screen.

PERSONAL ID

You can select the engraving you wish to include on the back of the printed base. The first name will be filled in by default. Feel free to personalize this for the patient. The name is limited to eight characters on each side. This feature is not compatible with the low heel cup options.

PHITS DESIGN

Next to the phits+ design wizard, we also have our phits wizard, a panel on the right side of the screen. Designing an insole with the phits design software will always result in a phits insole with a lattice structure. Contrary to the phits+ design software, you won't see any real-time changes to the insole images. The phits design software has fewer options than the phits+ design software. Most of the corrections in the phits design software are also present in the phits+ design software. However, there are some minor differences which are described below.

TYPE

You can choose between a normal and an ortho base type. The ortho base type has a more pronounced correction. It will give more support to the foot and, more precisely, the heel. This base will have more influence on the subtalar joint movement.

MEDIOLATERAL (ML) SUPPORT

ONLY AVAILABLE FOR COMFORT TYPES

The mediolateral support influences both the width of the base and the height of its medial and lateral edges. You can select either normal or high. Note that this correction is only available for the comfort shoe type.

STIFFNESS DIRECTION — SUGGESTED VALUE

The correction range goes from -30° to + 30°, with negative degrees guiding the foot to pronation and positive degrees guiding to supination.
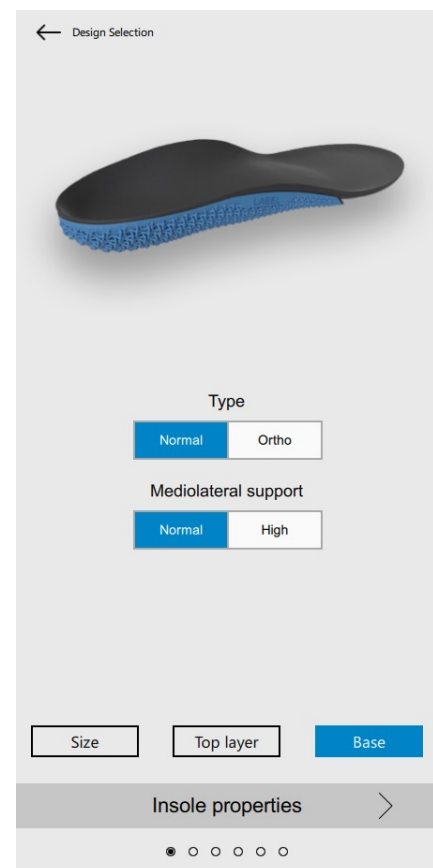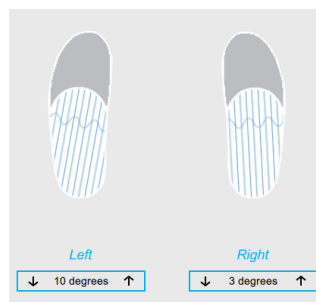
STEP 6 – ORDER

JUST A COUPLE OF CLICKS AWAY FROM ORDERING YOUR PHITS

CHECKOUT SCREEN

The phits design software's checkout screen gives you a complete overview of the corrections that were applied to the orthotics. The final printed base will be rendered. **Please note: you don't have to wait for the final render to confirm the order. You can already proceed with the ordering process.**

Before confirming the order, make sure to:

- Check your internet connection, as this is required to submit orders
- Check your phits account credentials, which can be found in the settings of the footscan software
- Check your patient's name, as it may only contain Latin alphabet characters.

The remarks section shown on the checkout screen is only for you and your administration. If you have a question, you should always contact support.motion@materialise.be directly before submitting the order.

Choose the number of orders you want to submit and add the reference ID per order. This reference ID will be shown on the label of the phits box, providing an easy link between the insoles and the patient. If you have a question or if you are unsure about your order, contact support.motion@materialise.be before submitting the order, as no changes can be made once an order is placed, nor is it possible to cancel the order. Please read the important notice above the confirmation button for more information.

Is the system preventing you from submitting your order? Read the 'Troubleshooting' section or contact our support team at support.motion@materialise.be.

Once an order is submitted, the software will open the order list and provide an order ID number. Each order has a unique order ID number, which can be seen as a confirmation of your order. You will also receive an automatic order confirmation email after submitting the order.
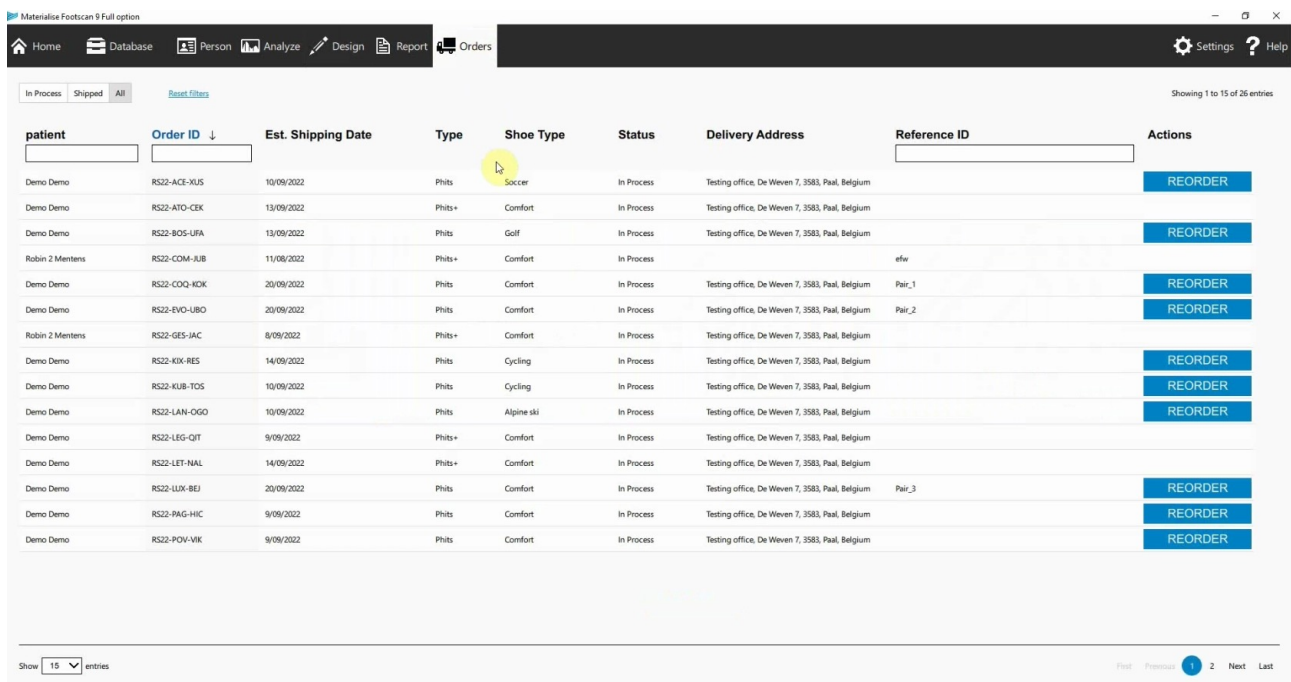
ORDER FOLLOW UP

Orders can be managed in two ways:

1. VIA THE SOFTWARE
When connected to the internet and logged in to your account, you can find the overview of all orders submitted under the order menu at the top of the screen. Different filters can be selected to make it easier to find the desired orthotics. Each phits has its own unique order ID number. The number — written as RSXX (or MMXX)-XXX-XXX — can be found on the label at the bottom of the printed base. Always include this number in your communication when you have a specific question about an orthotic. Based on this number, our team can then retrieve all information about the orthotics.

You can easily reorder an existing order from this list. Please note that this feature is only available for orders placed from 2019 onwards and is not available for slim phits orthotics

2. ONLINE ORDER MANAGEMENT
Using your account credentials, you can log in to the online phits portal — https://portal.rsprint.com. The portal allows you to manage your orders online without needing the footscan software.

SUPPORT

Read the topics below to find the contact information of the specific phits departments. Address your question directly to these e-mail addresses or phone numbers for the fastest response time.

Was the system purchased via a distributor or agent? They may be able to help you even faster since they are in the same time zone.

Have a specific question or problem? Go to the 'Troubleshooting' section on page 40.

Not sure which department to contact? Direct your question to the general support, and they will help you further.

General support
support@gaitandmotion.co.uk

CLINICAL QUESTIONS

CONTACT DETAILS:

UK and Ireland support
support@gaitandmotion.co.uk

Worldwide support
support.motion@materialise.be
+32(0)11 36 01 79 - dial 1
9:00-16:30 (CEST)

TECHNICAL QUESTIONS

CONTACT DETAILS:

UK and Ireland support
support@gaitandmotion.co.uk

Worldwide support
support.motion@materialise.be
+32(0)14 23 20 31
9:00-16:00 (CEST)

MARKETING

CONTACT DETAILS

george@gaitandmotion.co.uk

Do you have a new idea for a marketing tool? Can we help you with content for your website? Do you have a new logo, or would you like to update your brochures? These are just some examples of the things we can help you with. So send us an e-mail or call us on the general number, and we will help you market your Materialise Phits Suite even more!

> Make sure to check our Dropbox for a wide variety of content and ideas. Start exploring right here:
>
> https://goo.gl/mpNmdA

ADMINISTRATION

CONTACT DETAILS:

administration.motion@materialise.be
+32(0)11 36 01 79 - dial 2
9:00-16:30 (CEST)

The admin department will help you in case of questions or changes regarding your ordering account. For example, when you want to update your delivery address or open a new clinic, they can quickly edit this in the back office.

FINANCE

CONTACT DETAILS:

For Ireland:
invoices.motion@materialise.be
+32(0)11 36 01 79 - dial 2
9:00-16:30 (CEST)

For UK:
scott@gaitandmotion.co.uk
+44 (0)12 23 60 39 84
10:00-17:30 (CEST)

The finance team will help you with questions regarding your invoices. Make sure to include the invoice number in your e-mail.

TROUBLESHOOTING

CLINICAL EXAMPLES

SITUATION A: ASSISTANCE OR QUESTIONS ABOUT THE DESIGN OF A PATIENT'S ORTHOTIC

1. Design the orthotics as best as you can

2. Make an export of the patient's data
   - Open your patient's file in the footscan database
   - Select the session you want to export. Hold CTRL to select more than one session
   - Click 'Export data' in the left panel
   - Attach the exported .rsdb file to the e-mail
     - A .rsdb file is an encrypted file that can only be viewed by importing it into a database. Double-clicking on the file will not work.

3. Send the export together with comments and specific questions to support.motion@materialise.be

4. Based on the feedback of the support team, you will be able to order the orthotics

SITUATION B: UNABLE TO ORDER ORTHOTICS

1. Are you connected to the internet?

2. Do you have the most recent footscan software?
   - Click next to the footscan version in the bottom right of the screen to check for updates

3. Are your credentials entered correctly in the settings of the footscan software?

4. Did you use non-Latin characters in the name of the patient?

   - The system will not allow you to order orthotics if a non-Latin character is used in the first or last name of the patient.

5. Still not working? Send us the following information on support.motion@materialise.be:
   - Print screen of the error message
   - Export of patient's data (see situation A for an explanation on export)
   - Exact time of ordering attempt

SOFTWARE-SPECIFIC EXAMPLES

SITUATION A: SOFTWARE STOPS WORKING

1. Take a print screen of the error message, if possible.

2. Go to the following location on your computer:
   - C:\Users\<userprofile>\Footscan\gaitessentials9\

3. Copy the following files to a WeTransfer link
   - footscan.sqlite
   - footscan.log
   - If there is a crash file – file that ends with .dmp – add this to the WeTransfer as well

4. Send the WeTransfer link to support.motion@materialise.be together with the print screen of the error message and describe what you were doing in the footscan software.

Based on this information, the support team will be able to help you with specific instructions. If the problem is still unclear, they might try to schedule a TeamViewer session with you.

SITUATION B: FOOTSCAN SOFTWARE IS NOT WORKING

1. What error message do you see?
   - Make sure the plate and the dongle are connected to the computer.

2. Is your computer connected to the internet?
   - When a new plate is connected to the computer, the computer will have to download this plate's specific calibration files. Click 'yes' to download the newest configuration files of the plate, shown if the computer is connected to the internet.

3. Do you see damage to the cable or USB?
   - Do you see a notification or hear a sign to alert you that a new USB device is connected to the plate?

Contact support.motion@materialise.be and tell them when you would be available for a TeamViewer session. In many cases, the security of the computer or the USB driver is causing the issue, and they can fix it very quickly. However, in some cases, the cable, or the plate itself is damaged and then it will have to come back to HQ to be fixed.

CLINICAL TRAINING EXAMPLES

Although no two patients are ever the same, you may gain some insights by reviewing clinical examples. The described orthotic designs in these cases worked well for the patients, but other designs may have also benefitted them. You can access the cases via this Dropbox link : https://goo.gl/mpNmdA

PRODUCTION

Materialise phits orthotics are 3D-printed with durable materials, but that doesn't mean they will last a lifetime. Depending on the usage, the activity, the material, and how the patient took care of them, the top cover and even the base will wear out eventually. In most cases, and especially in the first years, replacing the top cover will be enough to give your patient a refurbished pair of orthotics. If you see that the printed base is damaged as well, if it is losing its function, or if the patient's gait has changed significantly, it is probably time to order a completely new pair for the patient.

When you think there is something wrong with your patient's orthotics, you can always contact our support team to discuss possible solutions. Please read the topics below to see the correct procedure for reporting specific issues to the printed base or when you would like to replace the top cover.

Did you know our orthotics have a return rate of less than 0.3%?

PRINTED BASE ISSUE

We have a lot of faith in our 3D-printed orthotics. We know that it will normally last longer than traditionally made orthotics and keep corrections and support longer. However, production issues are a reality we must occasionally face. Most of the time these errors are caught in the quality check stage; however, if you see an error in an orthotic that a patient is wearing, please tell the support team.

When you or your patient notice a crack in the printed base in the first year of use, please take the following steps:

1. Take pictures of the base and the damage from multiple angles. Make sure the support team has a clear view of the damage, its position, and the order ID.

2. Write an e-mail to support.motion@materialise.be and describe in detail how the orthotics were being used when the issue occurred, during which activity, and in what type of shoes, etc. This information will help the support and R&D team to understand how the issue may have occurred. Be sure to always include the order ID in the e-mail.

3. If the patient can still wear the orthotics without pain or issues, give the pair back to them so they can still use their orthotics while you and the support team are working on the solution.

4. The support team will contact you for the next steps.

TOP COVER REPLACEMENT

When you believe the printed base of your patient's orthotics is still working sufficiently, but the orthotics could use a fresh new look and feel, the following topic is for you. The Materialise phits orthotic can be recovered quickly. If you have the equipment and the materials, you can even do the replacement yourself. Read on for instructions for different methods — you can choose the option you prefer.

Replacement done by Gait and Motion Technology Ltd:

1. Please clearly fill out the appropriate Refurbishment form which can be downloaded from the Gait and Motion Technology Ltd Dropbox folder: https://tinyurl.com/gmt-education

2. Please complete all fields clearly and ensure you state the Order-ID number and return address.

3. Please print off the form and send along with your patients phits orthotics to the address at the top of the refurbishment form. We recommend sending any parcel via recorded delivery.

4. Once received, the work will be carried out and shipped back to your return address within 5-7 working days.

5. If you have any questions regarding your refurbishment pre or post completion, please contact support@gaitandmoton.co.uk.

Replacement done by you

- With Materialise top cover material
    1. Please send an e-mail to support@gaitandmotion.co.uk to request your desired material and size*.
    2. Please also include in this email your shipping address.
    3. Your material will be shipped to you within 1-2 working days.

    * Please note that the shore 20 material will be sent in flat sheet form and will require shaping to the desired shape/size.

- With your own top cover material
    - No need to contact us, even better!

Are you going to replace the top cover of the orthotics yourself?
Follow these instructions, using the same procedure practiced in our production facility:

1. Remove the old top cover using acetone
    - To facilitate this, we advise starting at the meta region and continuing towards the heel portion.
    - Don't apply too much force as you don't want to damage the orthotics during the replacement. Sometimes more acetone will do the trick.

2. Align the position of the base on the top cover material using a pen.
    - We use a silver pen as this is very visible on the top cover materials.
    - Make sure there is enough material left for the forefoot. You don't want to end up with a short forefoot...

3. Put glue on the printed base using standard shoemaker adhesive.

4. Put glue on the top cover using standard shoemaker adhesive.

5. If you think the top cover material is rather stiff, it can help to glue the top cover and the base a second time, after the first glue layer is dry.

6. Make sure you double-check the glue on the base and the top cover material. The parts will not bond where there was no glue.

7. When both parts are dry again, assemble them starting at the meta region. Move to the midfoot and heel, and end with the medial and lateral edge. Put pressure on the edge firmly to make sure the edges connect.

APPENDICES

PHITS SIZING TABLE

In the list below, you can see the length of our printed bases from 0.5 to 22 UK.

Base size (UK)	Base length (mm)	Top length (mm)
0.5	137	218
1	139	222
1.5	142	223
2	145	227
2.5	148	231
3	151	235
3.5	154	240
4	156	245
4.5	159	249
5	162	253
5.5	165	258
6	168	262
6.5	171	267
7	174	271
7.5	176	276
8	179	280
8.5	182	284
9	185	289
9.5	188	293
10	191	298
10.5	193	302
11	196	307
11.5	199	311
12	202	316
12.5	205	320
13	208	324
13.5	210	329
14	213	333
14.5	216	338
15	219	342
15.5	222	347
16	225	351
16.5	227	356
17	230	360
17.5	233	367
18	236	369
18.5	239	373
19	242	378

Base size (UK)	Base length (mm)	Top length (mm)
19.5	245	382
20	247	387
20.5	250	391
21	253	396
21.5	256	400
22	259	404

KIDS SIZES

In the list below, you can see the length of our printed bases from 8 to 13.5 kids UK.

Base size (kids UK)	Base length (mm)	Top length (mm)
8	102	164
8.5	105	169
9	108	173
9.5	111	178
10	114	182
10.5	117	187
11	120	191
11.5	122	196
12	125	200
12.5	128	204
13	131	209
13.5	134	213

materialise
innovators you can count on

NAVICULAR SUPPORT

In the graph below, you can find the corresponding height in millimeter for each of the navicular heights, size UK 8. You will see that the height changes based on the shoe and base type that is selected. This has to do with the shape of the different bases.

	Comfort	
	Normal	Ortho
	Height (mm)	Height (mm)
Extremely Flat	18	19
Flat	20	21
Flat Normal	22	23
Normal	24	25
Normal High	26	27
High	28	29
Extremely High	30	31

EXTREMELY HIGH
HIGH
NORMAL HIGH
NORMAL
FLAT NORMAL
FLAT
EXTREMELY FLAT
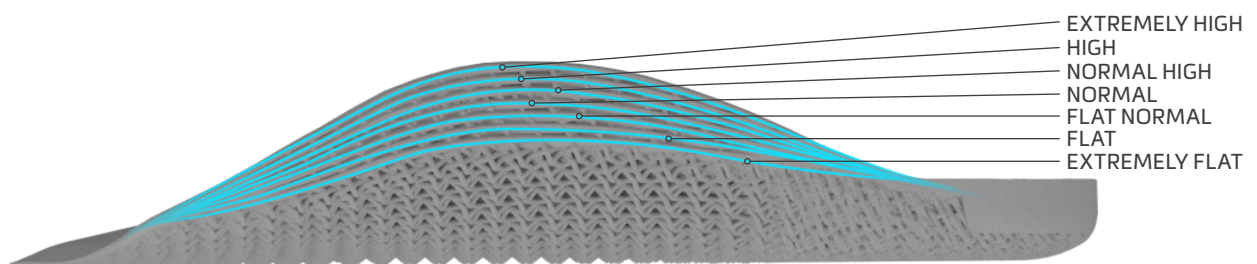
HEEL WEDGE

The following table shows the wedge height in mm, measured on the farthest point, for every degree of the heel wedge. The degrees count for both medial (up to 7°) and lateral (up to -5°).

Base size (UK)	Degree 1	2	3	4	5	6	7
0.5	0.9	1.8	2.8	3.7	4.6	5.6	6.5
1	0.9	1.9	2.8	3.7	4.7	5.6	6.6
1.5	0.9	1.9	2.8	3.8	4.7	5.7	6.6
2	1.0	1.9	2.9	3.8	4.8	5.8	6.7
2.5	1.0	1.9	2.9	3.9	4.8	5.8	6.8
3	1.0	2.0	2.9	3.9	4.9	5.9	6.9
3.5	1.0	2.0	3.0	4.0	5.0	6.0	7.0
4	1.0	2.0	3.0	4.0	5.0	6.0	7.0
4.5	1.0	2.0	3.0	4.1	5.1	6.1	7.1
5	1.0	2.0	3.1	4.1	5.1	6.2	7.2
5.5	1.0	2.1	3.1	4.1	5.2	6.2	7.3
6	1.0	2.1	3.1	4.2	5.2	6.3	7.4
6.5	1.1	2.1	3.2	4.2	5.3	6.4	7.4
7	1.1	2.1	3.2	4.3	5.4	6.4	7.5
7.5	1.1	2.2	3.2	4.3	5.4	6.5	7.6
8	1.1	2.2	3.3	4.4	5.5	6.6	7.7
8.5	1.1	2.2	3.3	4.4	5.5	6.6	7.7
9	1.1	2.2	3.3	4.5	5.6	6.7	7.8
9.5	1.1	2.2	3.4	4.5	5.6	6.8	7.9
10	1.1	2.3	3.4	4.5	5.7	6.8	8.0
10.5	1.1	2.3	3.4	4.6	5.7	6.9	8.1
11	1.2	2.3	3.5	4.6	5.8	7.0	8.1
11.5	1.2	2.3	3.5	4.7	5.9	7.0	8.2
12	1.2	2.4	3.5	4.7	5.9	7.1	8.3
12.5	1.2	2.4	3.6	4.8	6.0	7.2	8.4
13	1.2	2.4	3.6	4.8	6.0	7.2	8.5
13.5	1.2	2.4	3.6	4.9	6.1	7.3	8.5
14	1.2	2.5	3.7	4.9	6.1	7.4	8.6
14.5	1.2	2.5	3.7	5.0	6.2	7.4	8.7
15	1.2	2.5	3.7	5.0	6.3	7.5	8.8
15.5	1.3	2.5	3.8	5.0	6.3	7.6	8.9
16	1.3	2.5	3.8	5.1	6.4	7.6	8.9
16.5	1.3	2.6	3.8	5.1	6.4	7.7	9.0
17	1.3	2.6	3.9	5.2	6.5	7.8	9.1
17.5	1.3	2.6	3.9	5.2	6.5	7.8	9.2
18	1.3	2.6	3.9	5.3	6.6	7.9	9.2
18.5	1.3	2.7	4.0	5.3	6.6	8.0	9.3
19	1.3	2.7	4.0	5.4	6.7	8.0	9.4
19.5	1.3	2.7	4.0	5.4	6.8	8.1	9.5
20	1.4	2.7	4.1	5.4	6.8	8.2	9.6
20.5	1.4	2.7	4.1	5.5	6.9	8.3	9.6
21	1.4	2.8	4.1	5.5	6.9	8.3	9.7
21.5	1.4	2.8	4.2	5.6	7.0	8.4	9.8
22	1.4	2.8	4.2	5.6	7.0	8.5	9.9

SAMPLES

Consult the Dropbox for the characteristics of the standard samples: https://goo.gl/mpNmdA

SCIENTIFIC BACKGROUND

Risk analysis, the gait ratios graphs, and the orthotic algorithm.

REFERENCES:

[1] Franklyn-Miller A, Bilzon J, Wilson C, McCrory P. Can RSScan footscan D3D software predict injury in a military population following plantar pressure assessment? A prospective cohort study. Foot 2013; 24:6–10. doi: 10.1016/j.foot.2013.11.002.

[2] Franklyn-Miller A, Wilson C, Bilzon J, McCrory P. Foot orthoses in the prevention of injury in initial military training: a randomized controlled trial. Am J Sports Med 2011;39:30–7. doi:10.1177/0363546510382852.

DESCRIPTION:

The footscan 9 software includes the risk analysis and gait ratios graphs functionality; these were also present in the footscan 7 software under different names. The 'D3D software' in footscan 7 contained the risk analysis and the construction of insoles. In the footscan 9 software, this is divided. The risk analysis has its own screen while the construction of insoles is found through the phits and D3D design wizards. The footscan v9 gait ratios graphs were named the 'Balance' graphs in footscan v7.

The risk analysis algorithm used by the footscan 9 software is based on a study of Runners' Service in which long-distance runners (100km/week) that were at least three years pain and injury-free (very low injury risk profile) participated as well as knowledge gained from over 25.000 footscan measurements performed by several collaborating universities and internal researchers. As the correlation between static foot posture parameters and dynamics is not confirmed, the aim of this study was to determine relevant parameters to describe the risk of injury as well as the optimal orthotic support for an individual based on dynamic plantar pressure measurements (in contrast to the conventional static techniques used). The relevant parameters derived from this study are balance within a single foot (rearfoot balance during heel strike phase, 0-15% stance phase (SP); midfoot balance during midstance, 25-40% SP; forefoot balance during heel off phase, 50-80% SP).

The footscan risk analysis algorithm was scientifically validated in a prospective cohort study [1] that aimed to identify the ability of footscan to predict the injury risk in 200 male subjects from a military population. Participants were graded using the footscan risk analysis as too high ($\geq$ 2 correction), medium (= 1 correction), and low-risk (= no corrections) of injury and were followed up for injury through their basic training. Results showed that participants categorized in the high-risk group for injury were significantly more likely to sustain an injury than in medium or low groups ($p < 0.001$, OR 5.28 with 95% CI 2.88, 9.70). This proved the predictive value of footscan v9 software in the correct prediction of lower limb injury risk.

The algorithm was furthered to provide advice towards optimal orthoses based on individual dynamic plantar pressure measurements. Both a modular insole (D3D insole) and a 3D-printed insole (phits Insoles) are based on this algorithm. The effectiveness of the modular insoles based on the D3D algorithm is proven within a randomized controlled study [2]. Within this study, 400 male subjects from a military population who presented a medium or high risk of injuries participated. Participants were randomized to either receive or not receive D3D orthoses (produced based on footscan analysis) and followed up for injury during their training. Results demonstrated the effectiveness of the D3D orthoses, an absolute risk reduction of 49% from the use of D3D orthoses.

footscan v9 software allows users to compare the gait ratios graphs of a new subject to those subjects with an exceptionally low-risk injury profile. This low-risk injury profile is made visible in the gait ratios graphs as a solid area in the graphs.

ADDITIONAL ITEMS

RUNWAYS

Although the runways are optional, we do recommend using them during the measurement. The runways are used to level the Materialise phits scanner plate with the floor. By using these, the patient does not have to step up on the plate.
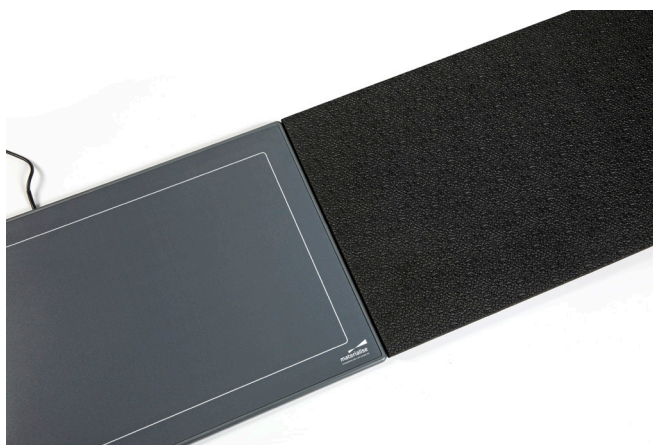
FLIGHT CASE

The flight case is used to safely store the Materialise phits scanner plate during your travels or to take the plate with you for a mobile clinical practice.

DONGLE

Every user has their own footscan pressure plate and dongle. To open the software, either the dongle and/or the plate needs to be connected to your computer.

Materialise Motion

De Weven 7
3583 Paal-Beringen
Belgium
www.materialisemotion.com

Gait and Motion Technology Ltd

4B Boldero Road - Bury St Edmunds
Suffolk IP32 7BS - UK
info@gaitandmotion.co.uk - Tel. 01223 603984
www.gaitandmotion.co.uk

materialise
phits suite

GMT