

TECTUS®

Physiotherapy and Tectus Delivery



Blatchford

Tectus



Walk



Sit | Stairs



Lock



Free

Blatchford

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1) An Integrated Approach

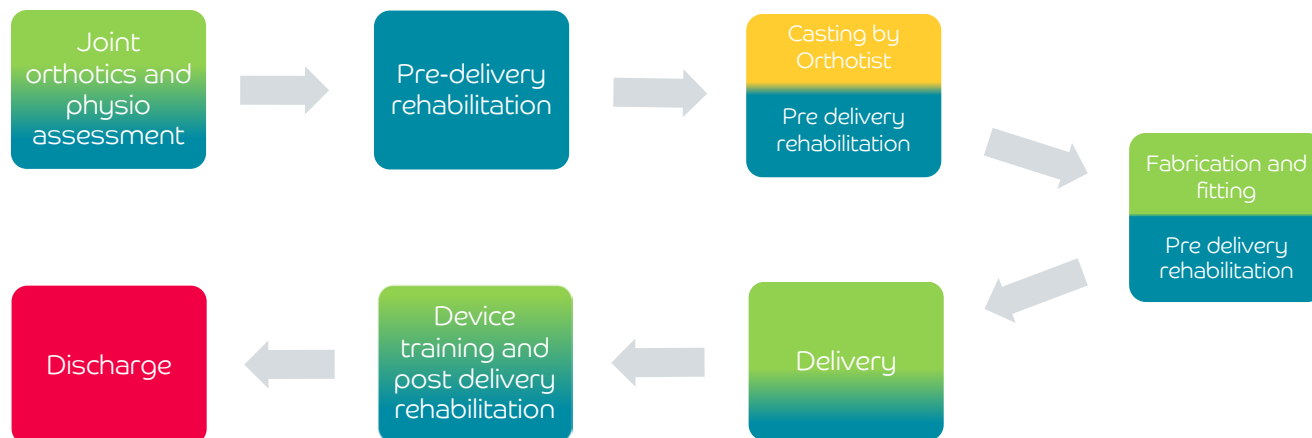
Tectus delivery needs an integrated approach.

Orthotists and physiotherapists bring different skill sets to the process, making joint working or close communication invaluable for the user.

The orthotist can focus on the device the user is wearing and the physiotherapist can prioritise the user wearing the device.

Users with complex presentations will benefit most from an integrated approach.

Key: Green – orthotist Blue – physiotherapist



2) Understanding The Device

Any physiotherapist working with the Tectus is responsible for first understanding the purpose of the device, the safety aspects and how it functions. In depth information can be found in the Clinician's Manual but key points of reference will be discussed here.

Unless a physiotherapist has completed the relevant training they will not have access to the programming of the device but all physiotherapists need to be competent at using the controls on the Tectus module as well as the fob. They need to understand the purpose of the different modes and how to move between them and will be responsible for ensuring that the user becomes just as proficient in time.

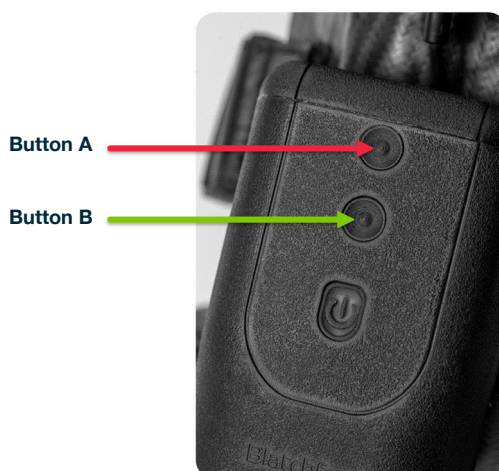
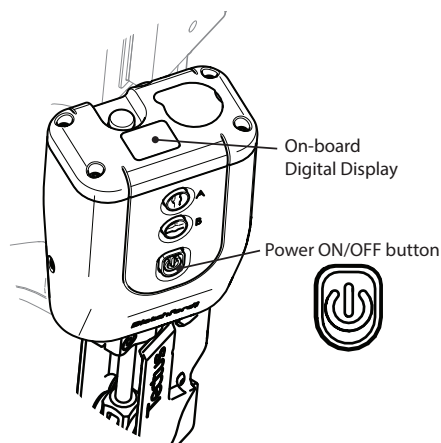
The controls on the Tectus module

These provide ready access to the different modes and the display allows visual confirmation of mode selection.

ON/OFF press and hold the on/off button until two short beeps with one or two short vibrations occur for on or off respectively.

Button A Short press selects Walk mode and a long press selects Lock

Button B Short press selects Stairs mode and a long press selects Sit mode. A press of more than 4 seconds connects the device to Bluetooth.



The Modes

The device has the following modes available:

Walk - Walk mode provides support during standing or stance phase through controlled flexion resistance of the knee and resistance release for swing. The Tectus module itself cannot provide knee extension but there is a degree of hydraulic assistance provided during swing. Within Walk mode there is Backstep, whereby the Tectus goes into a locked state after it detects a backward step (this is not the same as lock mode). The user needs to return to standing for at least 2 seconds for this to release.

Sit - Sit mode uses flexion resistance to control the knee during standing to sitting. Once the user has remained seated for more than 2 seconds the device will revert to an active form of free mode. If the user starts to load the limb again it will automatically switch back to Walk mode in order to stabilise the limb once again. Once back in Walk mode the knee needs to move through full extension before Sit mode can be selected once again.

Stairs - This mode is used to assist in the descent of stairs using a reciprocal pattern. Until the user is confident using the flexion resistance provided by the Tectus to control a fully loaded limb, is not recommended and the lock mode should be selected for a step to pattern instead.

Lock - This needs to be set and released manually. It is most useful for stairs, when standing for a long period of time or for storage. If the user does not have sufficient Quadriceps power to ascend stairs the Tectus will need to be put into Lock mode and a step to pattern be used.

Free - Free mode is useful for storage, donning and doffing. It does not provide sufficient support for walking.

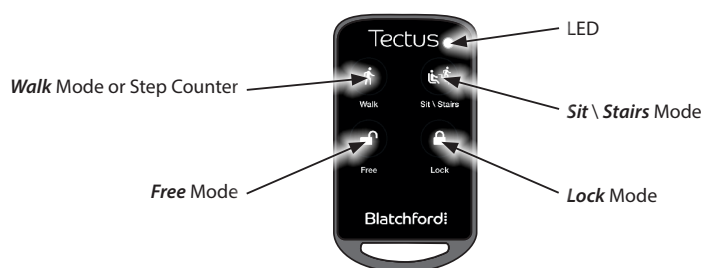
The device will not allow Free mode to be selected when the device is loaded. This is for safety reasons.

Also from a safety perspective the device will not allow the user to move to or from Stairs mode directly from Sit mode. It cannot move from free mode into Stairs mode nor can it move directly from Lock mode to Free mode. For all of these mode switches, the user will have to pass through Walk mode first.

Training Mode

Training mode provides useful auditory and vibratory cues for a new user whenever new modes have been selected. It can only be activated by the orthotist or a physiotherapist with programming training. In time proficient users might prefer the silent mode, which can be selected via a very long press of button A on the Tectus module.

The Controls on the Fob



The fob makes moving between modes easier for the user. Leaning down to see the buttons or digital display on the

Tectus module will alter the user's alignment and prevent them from moving into the desired mode. Users with longer arms who are familiar with the device may be able to operate it from the buttons on the module whilst still maintaining an upright posture.

The fob does not provide visual feedback. If the training mode is not switched on to provide auditory cues then the physiotherapist may need to confirm with the user which mode they have selected. In time the user is less likely to need either visual or auditory cues.

Walk mode or Step Counter button - Short press selects Walk mode and a long press selects Step Counter

Free Mode button - Short press selects Free mode

Sit/Stairs Mode button - Short press selects Sit mode and a long press selects Stairs mode

Lock Mode button - Short press selects Lock Mode and a long press selects Connection Code

If the training mode is switched on, the user can rely on auditory cues provided by both the fob and the device for confirmation of mode selection. The fob will emit a single beep and vibration following a short press of a button or a single beep and vibration followed by two quick beeps and vibrations for a long press of a button.

The device will then confirm which mode has been selected by the following auditory cues:

Walk mode - Two short low tone beeps

Free mode - One long medium tone beep

Sit mode - One short medium tone beep

Stairs mode - Two short medium tone beeps

Lock mode - Two short medium tone beeps

The two additional fob functions of Step count and Connection code are not confirmed with an auditory signal. The relevant information will be shown on the digital display.

Charging

The Tectus module uses a magnetic charger which is easy to connect. The device should never be worn whilst it is charging.

It is recommended that the device is charged every night when used on a daily basis. A fully charged battery can last up to 18 hours, depending on level of use and ambient temperature.

To check the level of charge press and hold buttons A and B together. Charge levels will be displayed in bars, each bar symbolising 20% of charge.

When plugged in to charge a yellow light turns to orange. A green light indicates that it is fully charged. No lights mean that the battery is fully discharged. Charging from a fully discharged state takes 2 hours to be fully charged and at least 1 hour to enable use.

Two short high-tone beeps signify that the battery level is below 20% charge. A warning symbol will be displayed alongside a single bar. The auditory cue will change to a long high-tone beep and the warning symbol will start to flash once a critical level has been reached. The device will go into safe mode at this point.

Safe Storage of the Tectus

The safest way to store the Tectus device is laying it down on its side, in 5 degrees of knee flexion. If the orthotic is placed Tectus module down or in full extension it is unstable and will try to self-correct. This risks direct damage to the module and the device could end up rolling off a raised surface.



Alterations Post delivery

The brace itself is custom made and should not be delivered until everyone is happy with the fit but there are a couple of elements that can be modified post-delivery if deemed necessary:

- If marking occurs then some but not all edges can be trimmed back
- If the user loses weight then padding can be added
- The type of buckle used for the straps

As the user becomes more competent and their alignment improves it may be that the programming of the Tectus needs reviewing. The settings that can be adjusted by the orthotist post-delivery are:

- Standing calibration posture and positioning-level of flexion resistance at the knee during stance phase
- The angle at which knee release is triggered during swing phase
- Spring assistance into knee extension during swing phase
- Degree of dorsi flexion/plantar flexion at the ankle joint

3) Contraindications

- Hip or knee flexion contracture of more than 10° combined
- Genu varus/valgus of more than 10° that cannot be corrected
- Leg length discrepancy > 15cm
- Body mass > 100kg (including any additional weight carried by the user i.e. when carrying a bag)
- Hypertonicity of 3 or above using the Modified Ashworth Scale (MAS)
- Severe spasticity as measured by the Penn Spasm Frequency Scale (PSFS)
- Less than 3/5 hip flexion using the Oxford Grading Scale
- (unless swing phase can be initiated using a compensatory strategy)
- Insufficient trunk stability to maintain unsupported sitting on the edge of a plinth or firm bed
- Insufficient cognitive or sensory ability to follow commands, safely operate the device and respond to its cues
- Insufficient dexterity to accurately select the desired device or fob buttons

4) Assessment

Ideally a joint assessment between orthotist and physiotherapist can be offered. If this is not possible then close liaison is essential.

Natural observation can offer a wealth of information. Try to observe the potential user exiting from the car, walking to the assessment room and how they negotiate any obstacles. What is their natural alignment, can they turn to look around and hold conversations whilst in motion? Could wearing the Tectus provide any obvious functional benefit?

Subjective Assessment

Alongside understanding the potential user's present condition, information such as the history of their condition, social history, medical and medication history should also be gathered. These findings will start to inform the physiotherapist with regards to the potential user's suitability for a Tectus and for goal setting. Pain should also be explored, the aggravators, the easers and the degree of analgesic use.

Should any prior medical clearance have been obtained?

Record previous orthotic and walking aid use to understand prior experience and tolerance of external devices.

Upper limb pain or restriction may impact safe use of parallel bars and walking aid use.

Asking about functional independence during day to day tasks can provide further information for goal setting. Are there any tasks that they are currently unable to perform but hope to be able to achieve when using the Tectus?

If reduced dexterity limits independence with dressing are there any useful techniques or modifications that they have adopted that could be reflected in the design of the Tectus? Easy release straps can be fitted to the device for example, to make independent donning and doffing more achievable

Is there a falls risk? If so, where and how did recent falls occur? Can the cause be addressed during pre-delivery rehabilitation? e.g. through the correction of an altered sense of midline, strengthening, stretching and realigning or the modification of a habitual compensatory strategy. Once delivered, the Tectus will help stabilise the relevant limb but in the meantime do additional precautions need to be taken such as working within parallel bars, temporary regression of walking aids or having a second pair of hands available in order that the potential user can be safely challenged in an upright position during predelivery physiotherapy?

Objective Assessment

Joint range of movement in the lower limb is of particular importance as the Tectus can only work effectively and safely within certain parameters (refer to contraindications in section 3 of this document or page 6 of the Clinicians Manual).

Careful assessment of lower limb muscle lengths is therefore paramount. Where indicated muscle lengths in other areas should also be assessed as shortening through the trunk or upper limbs may also impact the potential outcome.

A leg length discrepancy that cannot be safely eliminated by a shoe raise is contraindicated (i.e. > than 15cm). An apparent leg length discrepancy needs careful exploration. If changeable it could be addressed through pre-delivery rehabilitation.

A thorough examination of muscle strengths particularly in the lower limb is required. Quadriceps weakness being the most obvious indicator that the user might benefit from the Tectus. Reduced strength in the trunk and upper limbs will impact Tectus outcome so should also be assessed. Hip flexor weakness of 2/5 or below using the Oxford Grading Scale can only be accommodated by the Tectus if the potential user can demonstrate an effective compensatory pattern to initiate swing e.g. using trunk and/or pelvic muscles to hitch or propel the limb forwards alongside whatever degree of active hip flexion they have available.

Minimal hip and/or trunk extensor strength will have an impact on posture and cannot be supported by the Tectus itself. Light use of walking aids to maintain an upright posture in standing can be accommodated but heavy reliance on aids might restrict the operation of the Tectus.

Observation of the current gait pattern, with and without walking aids where possible is of paramount importance. This observation combined with a detailed assessment of muscle lengths, strengths and any tonal changes should explain the cause for any gait deviations identified and determine the focus of pre-delivery rehabilitation.

Functional observation can provide further information and help support or refute initial theories such as getting in and out of a car, opening and going through a door, kerbs, stairs, getting on and off the floor or retrieving objects from the floor/a high shelf.

Neurological Considerations

Are there any specific aspects of a neurological presentation that need careful management in order to prevent them from limiting the user's experience in the Tectus and enable a successful outcome?

Autonomic Dysreflexia - Is there a risk of Autonomic Dysreflexia (only relevant for spinal cord injury above the level of T6)? How will this be managed during treatment if necessary?

Cognition - Have there been any changes to cognition? The user must be able to follow commands and safety measures when learning to use the Tectus.

Continence - Are there any bladder or bowel management concerns? Can any therapeutic considerations or device modifications help reduce this?

Hypertonicity - Is the potential user aware of any increased tone/stiffness? Do they have spasms? If so, can they identify key triggers or aggravators?

Could **increased tone** be modified by stretching or standing in good alignment prior to use of the Tectus? Has the potential user managed any aggravators prior to attending the session i.e. bladder or bowel, skin issues, nail care etc Is there a stress element involved?

Make sure that 5/5 power in an affected muscle group is a genuine assessment of muscle strength not a measurement of increased tone or spasm created by the testing process.

Sensation/skin management - Identify any areas of altered sensation on a body chart. Insensate areas and areas of altered sensation are at greater risk of skin break down and therefore need to be clearly identified.

Managing expectations

The Tectus device will not be the correct orthotic option for everyone. Understanding what it can offer as well as its limitations is key to managing user expectation from the

outset.

If factors such as muscle length, joint range, user weight or spasticity appear changeable during the assessment a period of targeted rehabilitation with a timely review could be of benefit.

If contraindicating factors cannot be resolved then it is unsafe for the process to continue as they will impede the safe functioning of the device and put the user at risk.

Please refer to the Clinician's Manual for further detail on this.

Once the assessment has been completed, the physiotherapist should summarise their findings for the potential user, with a clear explanation if any contraindications or potential issues in terms of their suitability have been identified.

Summarising the findings helps manage expectations and through it mutually agreed goals for post-delivery rehabilitation can be established.

Open discussion between the orthotist and physiotherapist is essential at this stage and should cover any relevant concerns or contraindications, potential limitations to device use and any ideal modifications.

The assessment process is not complete until the physiotherapist, orthotist and user are all in agreement of the findings, proposed goals and outcome.

5) Pre-delivery Rehabilitation

The aim of pre-delivery rehabilitation is to maximise the user's potential to benefit from the Tectus.

Any areas of restriction or limitation that were deemed changeable during assessment need to be addressed and managed at this stage.

Lost range can be recovered, muscle balance improved and tone potentially modified. It is also the ideal time to start reversing long term compensatory patterns, addressing an altered sense of midline, improving alignment within the base of support and correcting habitual gait deviations. Without the Tectus, working in standing may not be an option but the compensation or deviation can be broken down into its component parts and addressed through other more stable positions e.g. unsupported sitting, perch sitting, high kneeling, four point kneeling, prone or prone standing.

If standing work can be safely undertaken at this stage however then the early post-delivery rehabilitation exercises recommended in this document could also be used during pre-delivery rehabilitation.

Any improvements made to posture and alignment will enable the Tectus device to operate more smoothly. Changes made prior to casting could enable a better fit. Significant changes made after this time however may impact the fitting of the final device or its function and so a direct communication pathway between therapist and orthotist is highly recommended.

If during assessment latent muscle activity is detected (i.e. activity that the user may not have been aware of or has been unable to access on their own) then pre-delivery rehabilitation provides the ideal opportunity to explore these further.

Pre-delivery rehabilitation also provides the therapist with the time to better understand any sensory and tonal changes. In doing so they can monitor for any secondary issues with device use, understand how to best address or modify them within therapy and refer their management on to other healthcare professionals where relevant.

If there are any concerns with regards to expectation management then education and goal adjustment can take place at this time, in order to improve compliance and overall success during the rest of the process.

If the user is unable to attend pre-delivery rehabilitation with the Tectus trained physiotherapist it is recommended that this period of time is not wasted. Referrals can be made to local physiotherapists with clear goals for pre-delivery rehabilitation provided and explained. An outline of the process ahead may also be informative.

Referring the user to a local fitness instructor to work on general strength and conditioning alongside the pre-delivery rehabilitation will also improve outcomes.

It is vital that pre-delivery outcome measures are recorded during this time and a record is kept of the user's baseline gait patterns in order to show change over time.

Baseline measures

Video provides an invaluable record of change. It can also provide motivation and visual feedback for the user. Remember to take video, with the user's consent, during assessment and then at regular intervals during the delivery process so that progress can be demonstrated.

Reasons for wanting to use a Tectus will vary, as will the user's medical presentations. Try to choose outcome measures that best reflect the user's own goals and will best demonstrate change that is relevant to them.

Possible outcome measures available to achieve this are:

Physical

- a) HiMat ([https://www.physio-pedia.com/High_Level_Mobility_and_Assessment_Tool_\(HiMAT\)](https://www.physio-pedia.com/High_Level_Mobility_and_Assessment_Tool_(HiMAT))), [https://www.physio-pedia.com/High_Level_Mobility_and_Assessment_Tool_\(HiMAT\)](https://www.physio-pedia.com/High_Level_Mobility_and_Assessment_Tool_(HiMAT))
- b) WISCI <https://www.sralab.org/rehabilitation-measures/walking-index-spinal-cord-injury>
- c) SCI FAI https://scireproject.com/wp-content/uploads/2022/05/worksheet_sci-fai.pdf, <https://scireproject.com/outcome/spinal-cord-injury-functional-ambulation-inventory-sci-fai/>
- d) TUG https://scireproject.com/wp-content/uploads/2022/05/worksheet_tug-1.pdf, <https://scireproject.com/outcome/tug/>
- e) 10MWT <https://scireproject.com/outcome/10-meter-walking-test/>
- f) 6MWT <https://scireproject.com/outcome/6-minute-walk-test/>
- g) Berg Balance Test <https://scireproject.com/wp-content/uploads/2022/07/berg.pdf>, <https://scireproject.com/outcome/berg-balance-scale-bbs/>
- h) Star excursion balance test (SEBT) https://www.physio-pedia.com/Star_Excursion_Balance_Test
- i) Penn spasm frequency scale (PSFS) <https://scireproject.com/outcome/penn-spasm-frequency-scale/>
- j) Modified Ashworth Scale (MAS) <https://scireproject.com/outcome/ashworth-and-modified-ashworth-scale-mas/>

Quality of Life

- a) Utrecht Scale for Evaluation of Rehabilitation-Participation (USER-Participation) <https://www.kcrutrecht.nl/wp-content/uploads/2018/09/USER-Participation-English.pdf>, <https://www.sralab.org/rehabilitation-measures/utrecht-scale-evaluation-rehabilitation-participation>
- b) Quality of life Index – SCI <http://qli.org.uic.edu/questionnaires/pdf/spinalcordinjuryversionIII/spinal%20cord.pdf>, <https://scireproject.com/outcome/quality-of-life-index-qli-sci/>
- c) SF-36?? https://www.rand.org/health-care/surveys_tools/mos/36-item-short-form/survey-instrument.html

Pain

- a) Verbal Rating Scale (VRS) https://www.physio-pedia.com/Visual_Analogue_Scale
- b) A record of analgesic use

Exertion

- a) Borg rating of perceived exertion (RPE) https://www.physio-pedia.com/Borg_Rating_Of_Perceived_Exertion

6) Post Delivery Rehabilitation

Stages	Location
Basic training	Training within the parallel bars
Initial gait training	Progression out of the parallel bars
Device training	Use of fob/device controls during function
Advanced gait training	Open gym, outdoors, community

Basic Training

Donning and Doffing the Device

See clinician's manual for detailed guidance if required, otherwise the Tectus KAFO is donned and doffed using the same technique as for any other KAFO device. The only difference is making sure that the Tectus module itself is in free mode to facilitate the process. If the Tectus was switched off after the user sat then it should have automatically switched into free mode. If it is not in free mode then the device needs to be switched on and set to free mode via the module buttons or the fob.

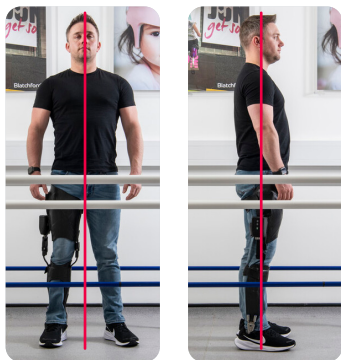
Wherever possible the user needs to be independent with donning and doffing. Independence will improve compliance considerably. The user needs to be able to check their skin regularly when they are first starting to use the device and as they build up the time they are able to wear it. Having to ask for assistance every time will make this much less practical and could thereby encourage unsafe behaviour. Liaise with the orthotist if small modifications to the device could make the difference, such as adding loops or changing the type of buckle etc.

Alignment in Standing

It could be many years since the user last stood in midline. Finding it proprioceptively might take some time but retraining midline is of paramount importance if they are to progress to walking independently with the Tectus.

Support the user with verbal and manual guidance to find midline.

If the user has sufficient sensation to feel two feet on the floor then draw their attention to this, the weight moving across them and whether or not it is evenly distributed.



Adding visual feedback, via a mirror or balance plate, can help consolidate the new sense of midline.



Having realigned the user in standing, review the alignment of the device and review the apparent leg lengths. As well as asking the user for their perspective, use the heights of the anterior superior iliac spine and posterior superior iliac spine to determine whether they are level and correctly set up. Liaise with the orthotist if modification is required.

Moving Within the Base of Support

Standing within the parallel bars, feet level and remaining in contact with the floor, the user starts by exploring the feel of Tectus within their base of support.

Even weight shifting from left to right.



Moving weight forwards and backwards.



Drawing a figure of 8 shape with the pelvis can encourage movement into all four corners.



Rhythmic stabilisation work in standing gently introduces a less predictable element of static balance training.



Working to keep a rocker board level also provides visual feedback on equal loading.

Progression options include:

A) controlled touching down of each side to the floor

B) turning the head whilst keeping the board stable



Trusting the Yield

Building the user's trust in the device and how the flexion resistance will support them is paramount.

The user stands in step stance position within the parallel bars, the physiotherapist is in front. The user transfers weight onto the Tectus limb, gradually increasing the load and degree of knee flexion they have control over.

Remaining in step stance, they need to progress to loading and unloading without the need for upper limb support.

Full range of movement is available at the knee so the physiotherapist needs to provide close supervision until the user is competent.



Standing to Sitting

Once the user is reassured that the Tectus will support them in the step stance position move to standing to sitting practice.

Initially the therapist may need to encourage equal loading of the limbs again, as the user continues to build trust in the Tectus.

The goal is for the user to be able to sit down independently, using the arms of the chair if necessary, in a smooth, equally balanced and controlled manner.



Stand to sit practice provides a useful means of assessing whether the correct level of flexion resistance has been set.

Correct stand to sit.

Flexion resistance level is set appropriately.



Excessive forward lean, user struggles to flex the knee and a heel rise may occur.

Flexion resistance level is set too high.



Toes lift and the user descends too quickly/heavily into the chair.

Flexion resistance level is set too low.

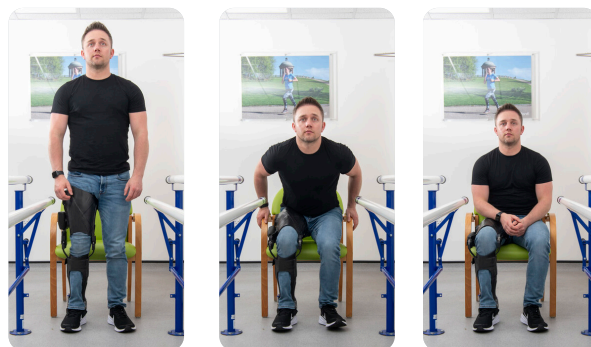


Liaise with the orthotist if you feel the level of flexion resistance needs reviewing.

Sitting to Standing

For standing to sitting the Tectus device will stabilise the limb, allow full range of movement at the knee and provide flexion resistance if the knee tries to flex once a stand has already been initiated. It can not provide active knee extension.

Encourage the loading of the Tectus limb as much as possible. The user may find that with the added support of the Tectus they are able to utilise their muscle activity more effectively through all or part of the range and thereby stand more symmetrically.



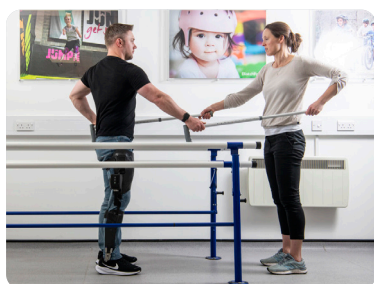
Working Outside of the Base of Support

For standing to sitting the Tectus device will stabilise the limb, allow full range of movement at the knee and provide flexion resistance if the knee tries to flex once a stand has already been initiated. It can not provide active knee extension.

Encourage the loading of the Tectus limb as much as possible. The user may find that with the added support of the Tectus they are able to utilise their muscle activity more effectively through all or part of the range and thereby stand more symmetrically.



Marching arms with poles adds an element of unpredictability if the physiotherapist determines the speed and degree of swing.



Taking a gym ball in a figure of 8 shape in the air.



Mirror work when both therapist and user are holding a gym ball between them. The physiotherapist dictates where the ball is going and the user needs to mirror the movements they make.



Within the safety of the parallel bars, throw and catch can be made as simple or as challenging as is appropriate. Overhead work will obviously be more destabilising.



Standing balance work whilst on a foam balance cushion can provide useful visual feedback on equal weight bearing and weight transfer during more dynamic exercises.

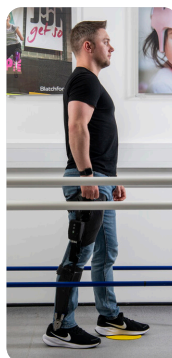
The exercises performed above can be repeated whilst on a balance cushion.



Stance Phase Training

Now that the user knows how to control the yield progress to stance phase training i.e. stepping with the non Tectus limb so that the Tectus limb is fully loaded

Stepping to a target in front, out to the side or over to the side of the Tectus limb.



Stepping forwards whilst reaching above the head and across the body to a target or trying to hit a balloon above head progresses this further.



*Stepping non Tectus limb onto a step directly in front.**

Introducing arm swing will challenge stability further.

**Place the step just in front of the Tectus foot. If it is too far forward this activity could initiate the release of the Tectus knee.*



The star excursion test for the non Tectus limb can provide a measurable target.



Stepping on/over a low door threshold.

Place tape across the midfoot as a guide. Aligning this point with the edge of the step will allow a smooth roll over and start to train the user on correct foot placement for stair descent later.

The tape needs to be removed and the user encouraged to look ahead again once they know the correct position.



Swing Phase Training

The user needs to understand how to initiate the release of the knee in order to transition from stance into swing. Correct swing phase initiation starts with correct loading of the Tectus in stance. It can take some practice for a new user to perfect this.

Once loaded the Tectus needs to detect the thigh moving forward as the user transitions onto their forefoot and the knee extends fully for toe off.

This movement pattern initiates the release of the knee for swing.



There might be the temptation for the user to look down at the knee to check that it has released. This will usually have the opposite effect.

Placing a stabilised ball or target in front can help with the fluidity of the movement and encourage the user to keep looking ahead.



The user needs to recognise when stance release can initiate unintentionally.

Stepping up a step a stride length ahead could trigger knee release. It is important to practice this within the safety of the parallel bars until the user is confident that they can consistently avoid the unintentional release.



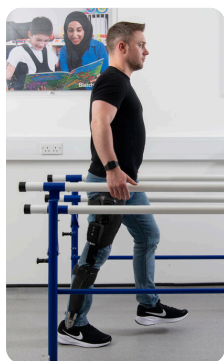
Initial Gait Training

Initially focus on walking forwards, sideways and backward stepping whilst in the parallel bars.

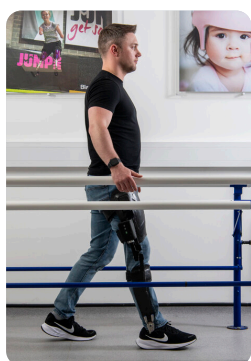
If the user is struggling to consistently load and release the Tectus device stop and analyse their pattern. Gait deviations and loss of alignment can prevent the Tectus module from receiving the correct commands.

Look out for vaulting, circumduction or a loss of midline during motion, a lack of forward progression of the knee or incorrect loading of the forefoot for toe off.

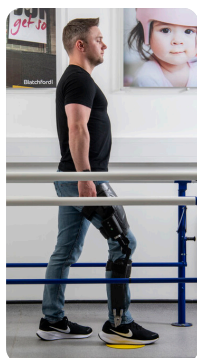
The user must always lead with the non Tectus limb. This ensures weight transfer onto the Tectus limb and prepares the device for walking.



Backstep mode is triggered when the user steps backwards. Backstep mode feels like a locked limb, providing a safe knee for weight transfer. In order to come out of this mode the user needs to return to a parallel standing position for at least 2 seconds. The Tectus will then revert to Walk mode.



Stepping forwards to a marker and back again, this time with the Tectus limb requires careful control of the yield.



Narrowing the base of support during walking. This can be achieved with taped lines or sticks on the floor.

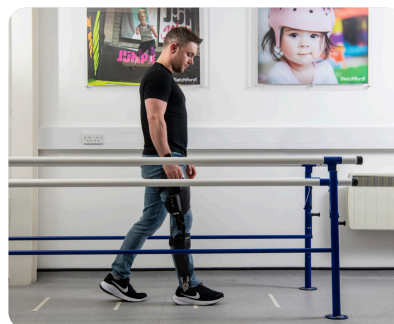


Tandem walking along a single line is even more challenging.



Even markers on the floor can provide a useful visual to work on even stride lengths.

In order to discourage looking down however a consistent auditory cue can also work well i.e. with a metronome.



Progression Out of the Parallel Bars

The first stage of progressing out of the parallel bars is using one bar and one crutch.



Then two elbow crutches.

Prior experience using two elbow crutches will make this transition quicker.

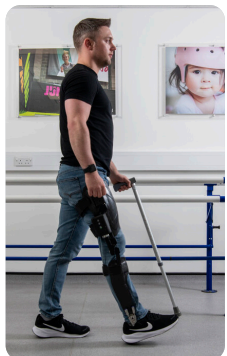


The user can then move onto two walking sticks if appropriate.



Using a single walking aid is only recommended if the user can consistently maintain an upright symmetrical gait pattern.

Losing alignment will interfere with the function of the Tectus.



Palm to palm contact with the physiotherapist whilst walking can provide a nice progression away from walking aids altogether. (therapist walks backwards)



Learning to Use the Controls

The user may have been introduced to the controls on the device and the fob by the orthotist but now that they have a much better idea of how the Tectus works they will need to be taught how to use them independently whilst upright.

Some users may have a preference towards using one or the other but training using both is suggested at this stage. They need to understand what each button does but also practice using both options during relevant functional tasks.

(see clinician's manual for comprehensive guidance or the summary above as a quick reminder).

Quadriceps Activity Review

If on initial assessment quadriceps activity tested as $< 3/5$ on the Oxford Grading Scale a review at this stage could be of benefit. Any elements of disuse due to previous compensatory movement patterns have the potential to be reversed. The Tectus facilitates normal movement at the knee as well as providing stability to the whole limb. Whilst wearing the Tectus the user may find that a more symmetrical gait pattern allows them to utilise muscles they had previously neglected.

More active quadriceps whilst using the Tectus could enable the user to progress from a step to pattern up a low step, a kerb, stairs or up a slope to a reciprocal one.

Advanced Gait Training

Advanced gait training introduces the user to the challenges they are likely to face when out in the community but in a controlled environment.

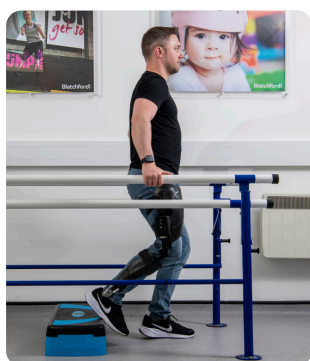
Ascending and Descending

Ascending and descending stairs and ramps requires consistent control of the yield and consistent foot positioning.

Single step/kerb.

The user may prefer to descend steps and stairs using a step to pattern, leading with the Tectus limb.

However, foot positioning for stepping over a low threshold has already been established, as has trust in the yield, so they may feel ready to combine these skills and descend using a reciprocal pattern. Experiencing a single step before attempting stairs is highly recommended as control is required through more range than over a low step.



Ramp training.

This requires consistent and successive use of stance and swing control.



Stair descent using a reciprocal pattern

This requires consistent foot placement for every step alongside consistent control over the yield.



Ascending stairs.

For the majority of users ascending steps or stairs will require a step to pattern, leading with the non Tectus limb.

However, as described at the quadriceps review if the user finds that with the support of the Tectus they can activate sufficient quadriceps to step up they may find they can progress to a reciprocal pattern.

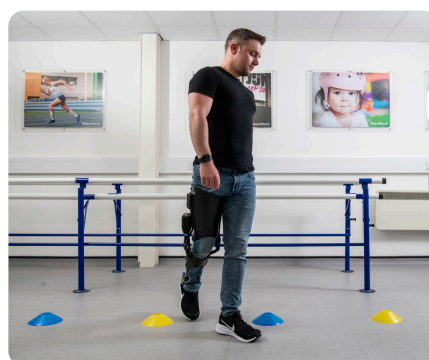


Functional Skills

This section is completed outside of the parallel bars but still indoors. This lets the user know how the Tectus will behave during these activities but without the added distractions and hazards found outdoors.

Tight turns i.e. negotiating small spaces.

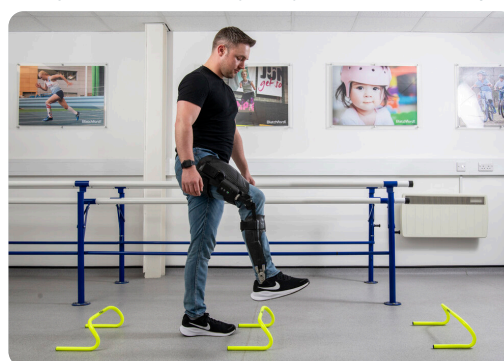
Using cones, map out a path that incorporates weaving cones and turning a figure of 8. Backwards and sideways steps could also be included.



Stepping over a hurdle

i.e. negotiating an obstacle in the users path or a raised door threshold.

Each user will have to explore their own potential to lift the Tectus limb over an obstacle, whether leading with the Tectus limb or not. This may not be possible for some and lifting it over manually may have to be the preferred option.



Stepping backwards and out of the way i.e. to open a door towards you.

This incorporates negotiating tight spaces as well as walking backwards. The user will need to pause for 2 seconds to come out of backstep mode before they can walk forwards again.



Walking over an uneven surface.

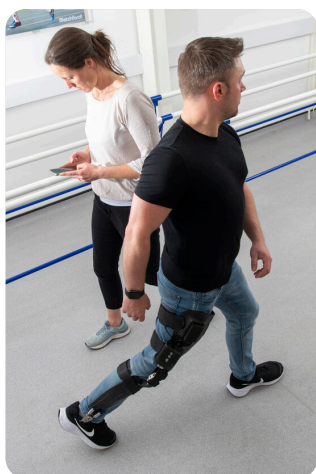
If a suitable training surface is not available then a thick foam mat over small objects such as sticks or 'hedgehogs' can create a similar surface. Use this temporary version within the parallel bars.



*Reaction training or sudden changing of direction
i.e. walking in a crowd*

The therapist can walk in the way of the user as they are walking across a room.

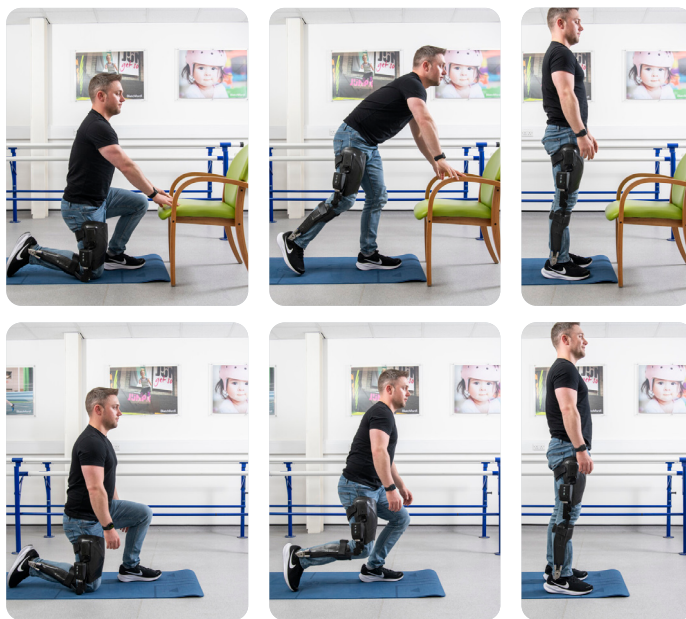
Asking the user to turn their head to identify an object that the therapist is holding whilst standing to the side or slightly behind them as they walk across the room can work well too.



On and off the floor

The user may need to use a chair or something of a similar height to assist them getting on or off the floor.

Ideally they progress to managing it without any aid in the middle of the gym.



Kneeling/crawling.

If the user does require something in front of them to assist them to stand then learning to crawl whilst wearing the Tectus is also required.



Carrying objects 1.

If walking aids are still required, objects can be carried in a bag on the users back but this will change the weight distribution and the user needs to learn to adjust for this.

Once proficient the user may want to practice carrying items down steps, a ramp or whilst stepping backwards.



Carrying objects 2.

Using a single walking aid or ideally no walking aids at all will enable the user to carry objects in their hands.

Initially practice carrying items that still allow the user to see the ground in front of them.



Carrying objects 3.

The most advanced training comes when carrying an item that obscures the users view of the ground in front of them i.e. a tray or a basket of washing.

Holding a large gym ball with both hands whilst completing an activity can simulate this well in the therapy environment.



Community Training

Moving the user outdoors to put all that they have learnt into practice in the 'real' environment means letting them take the device home with them and using it in the community.

They may appreciate working on some of the skills in a real life environment alongside the physiotherapist initially.

Functional activities that incorporate all they have learnt out in the community are:

- Getting in and out of the car
- Walking in crowds
- Opening/closing doors for others
- Manoeuvring a shopping trolley
- Getting on/off the floor in the middle of an open grassy area
- Taking a bus
- Personal hobbies/activities

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