

Avior Physiotherapist's Handbook



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Avior

Confidence with every step



1) Introduction

Avior is a microprocessor knee that has been designed specifically with the K2 transfemoral (or knee disarticulation) wearer in mind, whilst also considering the needs of the K1 and low K3 populations. It provides the wearer with a light weight, stable yet responsive knee to support them as they progress from walking indoors, outdoors and into the community. The Base Configurations available allow a continuum of rehabilitation options to be offered whilst still using the same device. It can be a first limb provided at the beginning of a prosthetic wearer's rehabilitative journey. It can also be easily adjusted between levels to accommodate for any periods of deterioration.

2) The Integrated Process

The prosthetist specialises in fitting a device to a person and the physiotherapist specialises in treating the person wearing a device. Working as a multi disciplinary team (MDT) will always benefit the potential wearer. There are key points along the delivery and rehabilitation journey where joint working and/or open communication between clinicians can make a significant difference: at assessment, prioritising pre-delivery rehabilitation, delivery and at points of progression during post-delivery rehabilitation.



The time between assessment and delivery provides an ideal opportunity for physio to offer pre-delivery rehabilitation but the therapist needs to bear in mind that any significant changes made to range or alignment may impact final fitting. Liaising with the prosthetist about notable changes could really help at delivery.

Prescription Activity Level Guide	
K1	Has the ability or potential to use a prosthesis for transfers or ambulation on level surfaces at fixed cadence. Typical of the limited and unlimited household ambulator
K2	Has the ability or potential for ambulation with the ability to traverse low-level environmental barriers such as curbs, stairs, or uneven surfaces. Typical of the limited community ambulator
K3	Has the ability or potential for ambulation with variable cadence. Typical of the community ambulator who has the ability to traverse most environmental barriers and may have vocational, therapeutic, or exercise activity that demands prosthetic utilisation beyond simple locomotion
K4	Has the ability or potential for prosthetic ambulation that exceeds the basic ambulation skills, exhibiting high impact, stress, or energy levels, typical of the prosthetic demands of the child, active adult, or athlete

Product specific training is available via your local Blatchford representative and in-depth information about Avior and the Blatchford app can be found in the Clinician's Manual.

This handbook has been written specifically for physiotherapists, providing key points of reference about the device, the physio app, and a suggested rehabilitative journey.

3) Understanding the Device

Any physiotherapist working with the Avior is responsible for first understanding the purpose of the device, safety aspects and how the device and app function.

Modes

In order to meet the requirements of a K1 or K2 wearer group Avior offers three Base Configurations (Clinician-selectable modes), four Clinician-enabled modes and two wearer modes:

Clinician-Selectable Configurations

The Base Configurations:

LOCK-LOCK Mode

This walking mode provides the wearer with a locked limb when upright and walking. When the wearer needs to sit down it offers a high yield (supported resistance) to give maximum support and control for the descent.

LOCK-FREE Mode

This walking mode still offers the wearer a locked knee in stance and high yield to sit. During gait it progresses them into a short and closely controlled swing phase before transitioning quickly and smoothly back into locked mode as soon as the heel strikes.

YIELD-FREE Mode

This is the most advanced walking mode introducing yield (knee flexion resistance) during stance. This allows a more normal gait pattern with reciprocal (step over step) descent on kerbs, stairs and slopes.

Clinician-Enabled Modes

Standing Support Mode

When enabled, Standing Support Mode intuitively recognises when the device is trying to stand still. The leg can be used in Standing Support Mode when fully extended or flexed up to 30°. The restriction to flexion whilst still allowing a degree of adjustability enables the wearer to perch sit, stand still on slopes and uneven terrain or subtly adjust their alignment in standing.

Donning the limb mode

When enabled, Donning The Limb mode is initiated automatically after powering on. It allows the knee to flex when the wearer holds the extended device horizontally for 2 seconds, making it feel lighter and the process easier from a seated position.

Wheelchair Mode

When enabled, Wheelchair Mode allows the wearer to lock the knee in any flexed position between a pre-selected starting angle and horizontal. This offers them more options in terms of comfort and practicality when wearing the device seated in a wheelchair.

Extension Control

Extension Control can be set as either fast or normal. Fast extension finishes swing phase more quickly, providing greater reassurance and proprioceptive feedback that the leg has reached full extension. Normal extension still ensures that the Avior extends fully but will do so more smoothly, producing a more normal gait pattern.

Wearer Modes

Manual Lock Mode

Manual locking means that the knee can move into full extension but will then remain there, flexion is no longer possible.

Silent Mode

All auditory indicators can be switched off except for high and medium priority alarms.

Other Key Features

Weight Limit

The Avior is suitable for wearers ranging from 44kg (97lb) to 125kg (275lb) in weight.

Stumble Detection

It offers a Stumble Control feature that detects and responds to potential missteps, triggering a high-yield reaction to prevent a stumble turning into a fall and help wearers regain their balance.

Default Mode

The default mode of operation when not locked is a high yielding resistance to ensure the wearer always feels well supported in standing.

Ratchet Function

In all modes the Avior offers a ratchet function between 45° - 0° knee flexion to allow the wearer to finish the stand in stages where needed i.e. moving hands from the chair to the bars or a walking aid. The half stand can be aborted by rocking back on the limb which lowers the wearer back to sitting using high yield resistance.

Comfort In Sitting

2 seconds after sitting the Avior automatically releases the knee to allow the wearer to adjust their foot position for greater comfort.

Stance Flexion

LOCK-LOCK and LOCK-FREE base configurations offer the option of stance flexion which provides a softer more forgiving knee on heel strike. Several ranges can be selected: 0° (off), 5° and 10°. This allows the wearer's trust in this feature to be built up gradually. Once the wearer has progressed to YIELD-FREE there is unlimited stance flexion but if required the knee angle can be limited by mechanical flexion stops (130°, 125°, 120° (default), 115° and 110°).

Dynamic Slope And Stairs Descent Mode

In YIELD-FREE the dynamic slope and stairs descent mode can be fine tuned by an authorised clinician. This adjusts the level of stance flexion and stance extension control experienced by the wearer when descending slopes (up to 5°) and stairs.

Foot Type

The Avior is suitable for use with a wide range of prosthetic feet from multi axial feet such as the Navigator and Epirus, the energy storing foot, Esprit, and the hydraulic self-aligning AvalonK2. Foot type must be considered when choosing the right level of stance flexion as both will affect the amount of movement experienced by the wearer when moving into stance phase.

Visual, Auditory, And Haptic Indicators

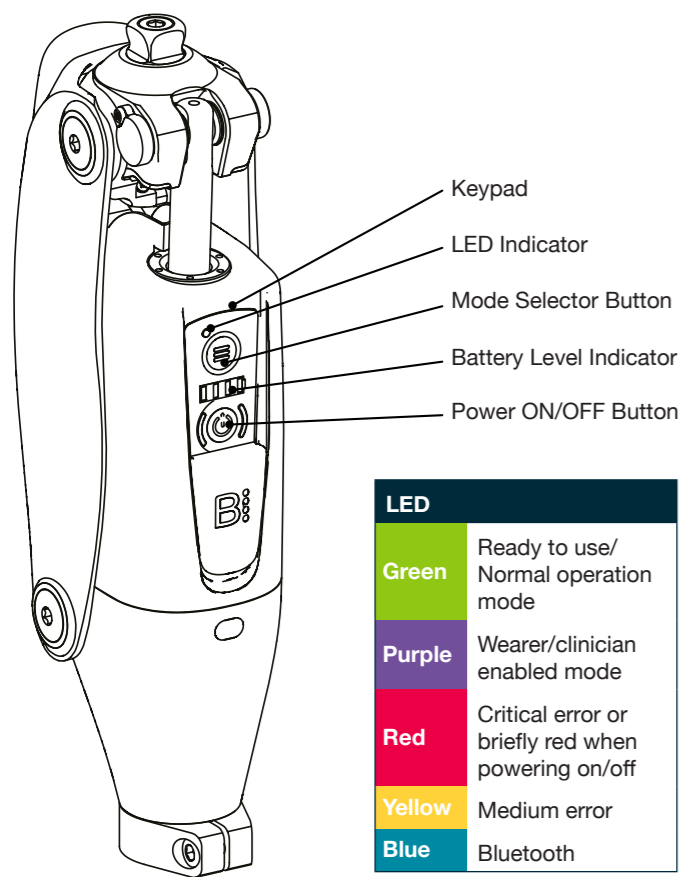
There are visual, auditory and haptic indicators to inform the wearer about the status of their device.

Software Updates

Volume, frequency and the intensity of haptic vibrations can all be fine tuned. This information is transmitted via the device but adjusted by an authorised clinician via the app.

Dust And Water Resistance

The device is dust and splash proof to IP65. This means it can be worn in a fresh water shower but not in a bath. Soap needs to be avoided and the device must be dried as soon as possible afterwards. Environments that include sand, salt or chemically treated water should also be avoided. If exposure occurs the device should be carefully rinsed in fresh water and dried as soon as possible, taking care not to exceed the water resistance limits. (see clinician's manual and user guide for further details). The battery charger is not splash proof and should only be used in a dry environment.



Controls on the Device

Power On - Short press on power button to power on. The LED turns red briefly before flashing green twice and always goes green after power on). A flashing red LED indicates an unsuccessful attempt or an error state. A steady red indicates that the device has not been programmed.

Power Off - Long press on power button to power off. This will turn the LED red and after three beeps decreasing in pitch and a long vibration the device shuts down and the LED goes off completely. Powering off should only be completed in sitting.

Power Off Via Hardware – if usual power off method fails or if the device needs to be stored or transported. Very long press (>8 seconds) on power button).

Donning The Limb Mode is a clinician-enabled user mode. Enabled by default, Donning the Limb mode is initiated automatically after powering ON if the device is held horizontal for two seconds. This will engage Donning the Limb mode allowing the knee to flex or extend to aid donning. When the device is donned and it detects the user starting to move from sitting to standing, it automatically exits Donning the Limb mode and enters Sit-to-Stand mode. If Donning the Limb mode is not enabled for the user, when the device is powered on it enters normal operation directly.

Checking Battery Status - Short press on power button whilst the device is powered on. Display will show battery level for 10 seconds.

Bluetooth® Connection - With the device powered on, short press the power and mode buttons simultaneously. LED flashes blue until the device has paired with a programming device, when it turns steady blue. Short press the power and mode buttons simultaneously to switch Bluetooth off. The LED will return to green unless there is an error, when it will flash red.

Manual Lock Mode - Once enabled, this mode can be selected by a short press on the mode button 3 times with the device turned on. There will be a short beep and vibration after each press and 3 short beeps and vibrations to confirm the selection. A purple LED light will flash with each press and then remain steady once in manual lock mode. A long press on the mode button will exit Manual Lock Mode and the LED will flash green twice then extinguish.

To enter Manual Lock Mode the knee must be in less than 45° flexion. It can be activated sat down and then the lock engages as the wearer stands up.

Wheelchair Mode - Once enabled this mode is selected via device positioning rather than buttons. With the device turned on and the wearer sitting, thigh near horizontal, the foot is manually lifted to place the knee between 45° to 10° of flexion (easiest if lifted by the opposite foot) and briefly held in this position. There will be 5 short beeps and vibrations as the knee locks at the chosen height. The LED light will flash purple 5 times before turning a steady purple.

Wheelchair Mode can be exited either by raising and lowering the shin manually or with the opposite foot or by knocking the foot against something such as a wall. The knee will then slowly flex back to 90°. The LED will flash green twice before turning a steady green to indicate that it is back in Walking Mode.

Silent Mode - Two short presses on the mode button with the device powered on. There will be a short beep and vibration after each press and 2 short vibrations to confirm the selection. The LED will flash purple twice when silent mode switches on. Two short presses on the mode button will exit this mode, confirmed by vibration after each press and two short vibrations once exited. The LED will flash purple twice before turning a steady green to indicate that it is back in walk mode. Medium and high priority alarms will still sound in silent mode.

Alarms And Safety Mode

A flashing red LED light and 14 long beeps with both low and high tones at maximum volume indicates a high priority error state.

A flashing yellow LED light and 3x3 long beeps indicates a medium priority error state.

If either of these critical warnings arise the device will automatically go into safety mode. Free flexion during swing is no longer available for walking but if the wearer moves to sit, the Avior will still provide a high resistance yield. The Avior will always be free to move into full extension so they can stand and walk with a 'locked knee' to a safe place.

Turning the device on and off may allow it to reset but this will not override a critical issue. If the device remains in safety mode it will need to be returned to the prosthetist who can then contact their service centre.

If the device reaches below 5% battery or has got too hot (>60°C/113°F) or too cold (-10°C/32°F) the medium priority error alarm will sound, 3x3 short beeps and vibrations, and the LED turns flashing yellow. Charging the device to more than 5% or changing the environment/activity should resolve this issue.

A low priority alarm will sound when the device needs servicing. 1 short beep and vibration every 20 secs up to 12 times in total whenever the device is powered up or the charger is removed. The LED will remain yellow until service reset or the alarm is paused by a short press on the mode button.

Safety mode will be initiated once an alarm has been triggered and the wearer stays still for 4 seconds. The wearer can then walk themselves with a 'Locked knee' (it's a high yield) to a safe place.

Any critical issues should be clearly signalled by the device but a timely review by the prosthetist is also advised if the wearer reports any unexpected changes in performance such as:

- Increase or decrease in knee stiffness
- Instability
- Reduced knee support (free movement)
- Any unusual noise (other than the slight air noise from the cylinder during the first few steps that should dissipate quickly)

Device Identification Number

The device PIN number, needed for Bluetooth® connection, can be found on the the product label at the base of the cylinder cover.

The Blatchford App

The Blatchford app allows the prosthetist to configure the device, programme it specifically for the wearer and then fine-tune the settings as they progress. It also provides a means for sending Activity Sessions and feedback forms to wearers that have a Blatchford app account.

The physiotherapist's interface to the Blatchford app provides a subset of controls and features applicable to physiotherapists. A physiotherapist will be granted access by the prosthetist once they have completed the relevant training.

Via the Blatchford app physiotherapists will be able to connect to a specific device, move between base configurations and initiate walking calibration within their sessions. However, they will not be able to save their changes. Once Bluetooth® connection is lost or the device is switched off it will revert to the settings last programmed by the prosthetist. If the device is still in use when the connection is lost then the settings will revert to the prosthetist settings during the next period of wearer inactivity. They will not revert while the wearer is still walking.

The physiotherapist will not be able to adjust parameters such as yield resistance level, stance flexion or swing extension. This level of adjustment can only be made by the referring prosthetist.

Timely recalibration and fine tuning of the settings is essential if the wearer is to reach their full potential however. Achieving this will require regular communication between prosthetist and physiotherapist.

Via the wearer interface within the Blatchford app the wearer will be able to keep track of their activity levels and undertake specific tasks requested by an authorised practitioner, such as the completion of an on-line questionnaire or an Activity Session for a specific exercise.

When the wearer responds to Activity Sessions and adds videos of their progress to the Blatchford app the videos will be uploaded directly into cloud storage alongside the sensor and actuator data that was collected by the device at the same time. This creates a data rich video that can be viewed and discussed remotely between authorised practitioners with wearer permission. Over time a visual

history of progression will also be created in this way. For data protection reasons no videos will be stored locally on the phone or tablet.

With wearer permission authorised clinicians can also take, upload and review videos during sessions using the Gait Visualiser option within the Blatchford app. Joint access to securely stored videos alongside data captured by the device at the same time will enhance remote communication between authorised clinicians about issues identified or progressions made.

A physiotherapist may also want to take videos during sessions to review directly with the wearer within the same session. Video feedback along with the Blatchford app's activity monitoring can help incentivise the wearer as well as provide a useful overview of progress.

The following activities are monitored by the Blatchford app:

Activity	Parameter Monitored	Units
Usage	Average use per day over selected period	Hrs/day
	Total steps	Steps
Walking (Level Surface)	Average Steps	Steps/day
	Number of times standing state entered	Number
Standing	Total duration standing	Hours
	Number of times sitting state entered	Number
Sitting	Total duration sitting	Hours

Charging

The device has a Lithium-ion battery that can last for up to two days of normal use when fully charged. A full charge from empty will take up to 6 hours. Daily charging is advised using only the charger that has been supplied with the device. Alternative regional plug adaptors are available.

A short press on the power button will bring up a 10 second display of the battery status.

A single green bar indicates that the limb is at 25% charge. During use when the charge level drops to 25% the device will emit 3 short beeps to alert the wearer.

Correct charging is indicated by a single green bar illuminating in turn along the length of the battery display, this dims after 1 minute of charging. 4 steady green bars indicate that the device is fully charged.

A single red bar whilst the limb is charging means that it is charging incorrectly. It will emit 2 short beeps and vibrations 6 times and repeat this every 20 seconds until resolved.

A single red flashing bar when not on charge indicates that the battery level is critically low, 5-12.5%. The device will emit 2 sets of 3 short beeps and vibrations when it reaches this point. A final critical warning of 3 sets of 3 short beeps and vibrations is given if the battery levels drop below 5%. At this point the LED will start flashing yellow before the device then goes into safety mode.

Alterations Post Delivery

Initial wearer settings will be determined by the prosthetist on delivery. As the wearer learns to trust the Avior more their alignment as well as their readiness to load the device should improve. Such changes require the referring prosthetist to review the set up and recalibrate, to support further progress.

If the volume of the residual limb reduces significantly or there are significant changes to the wearer's weight then the fitting of the socket may need reviewing. The Avior will need recalibrating if a new socket is required.

The limb will be delivered with the foot deemed most appropriate by the prosthetist at the time of assessment. As the wearer progresses either clinician may start to feel that a change in foot could help their performance. A discussion between clinicians is needed.

If the wearer is trying to take longer strides than a more stable foot naturally allows, or the stiffness of their foot appears to be limiting their potential dynamic stability, it needs to be determined whether they have sufficient proximal control to progress onto a more dynamic but less stable foot.

Alternatively, it may seem that the amount of movement available with their hydraulic foot is undermining the wearer's trust in the Avior and reducing their confidence to fully load. Improving proximal control or moving to a more stable foot needs to be considered. Choosing the right foot for the right person/phase of rehabilitation can noticeably affect their speed of progression.

Flexion stops are available at 130°, 125°, 115° and 110° to prevent contact between the Avior unit and the socket. There should be at least 5mm clearance between the socket and the cylinder to accommodate for different clothing choices for example. If a wearer puts on weight and requires a larger socket or if a degree of flexion contracture increases that has already been accommodated for then the flexion stops may need to be adjusted. This can only be done by the prosthetist but the physiotherapist might be the first to notice and is therefore responsible for alerting the prosthetist and communicating it back.

4) Indications and Contraindications

Indications

- User bodyweight up to and including 125kg.
- Users who require a prosthetic knee as part of their limb system.
 - This includes users with amputations at the following levels; through knee, above knee or hip disarticulation as well as dysmelia patients with residual limb characteristics corresponding to the previously mentioned amputation sites.
- Unilateral or bilateral requirement.

Contraindications

- Body weight over 125kg.

Precautions

- Open wounds or areas of vulnerability on the residual limb - seek medical advice.

- Medical conditions that could be exacerbated by exertion - seek medical advice.
- A lack of or altered sensation in the residual limb - monitor regularly during sessions.
- Reduced cognition/insight - seek reliable feedback or support from a familiar carer or family member for safe management during rehabilitation.

5) Assessment

Natural observation can offer a wealth of information. Try to observe the potential wearer exiting from the car, entering the assessment room and watch how they negotiate any obstacles.

What is their natural alignment? Do they already have a prosthetic limb? If so, are they wearing it, carrying it or it is being carried for them? If the wearer arrives using a wheelchair are they propelling themselves or being pushed? Do they have a stump board in situ? How active are they within their chair?

Subjective Assessment

Alongside understanding the potential wearer's present condition, information such as the history of their condition, social history, medical and medication history should also be gathered. These findings will inform the physiotherapist about the potential wearer's medical fitness and their suitability for an Avior.

Is this the potential wearer's first prosthetic limb? Does any prior medical clearance need to be obtained before active rehabilitation can be started?

Are they still under the care of a medical team, community healthcare professional or another prosthetic provider? Should communication be established?

What is the wearer's motivation for wanting to trial the Avior and how realistic are their goals? If cognitive deficits have been reported a more detailed exploration of their aspirations might help expose any loss of insight.

Record any previous prosthetic history. It could be useful to understand the background to any positive or negative experiences.

Does the potential wearer report any issues with their skin on the residual limb or elsewhere i.e. peripheries/areas of altered sensation? Has there been a history of blisters or skin breakdown?

Pain, whether phantom or present, should be explored with the potential wearer. When present they may find it easier to describe this via a body chart. Be aware that asking them to think about their pain is likely to exacerbate it. Do they understand this concept? How much pain education have they received? What are their aggravators, easers and what level of analgesics are they currently using and when? Have they been reviewed recently? Have any alternative methods of phantom pain management been explored i.e. mirror box, visualisation, residual limb desensitisation etc?

How does the wearer describe the sensation of their residual limb? Offering another body chart to help record this may be useful. Are there areas of hypersensitivity, reduced or absent sensation?

Is there a falls risk? If so, where, when and how did recent falls occur? Does this need to be taken into consideration with regards to the rehabilitation environment?

Any upper limb pain or restriction that may impact safe use of the parallel bars or walking aids and therefore needs to be explored.

Asking about functional independence during day to day tasks can provide further insight for goal setting and may highlight where the Avior can make a specific difference.

Objective Assessment

Careful assessment of muscle lengths in the residual limb is of paramount importance along with a thorough examination of muscle strength.

Maintaining full range of movement in the residual limb is vital for good prosthetic use and the wearer should have been made aware of this from the outset. They should therefore have been provided with a basic exercise programme to help them maintain range and strength since amputation. Ask them to demonstrate the exercises that they were taught. How familiar are they with these exercises? Pain, swelling and delays to prosthetic provision can all challenge motivation to continue with exercises so when this looks to have occurred explore the cause.

Can the wearer demonstrate any techniques they were shown to help reduce swelling or desensitise their residual limb? Do they appear confident when handling their own limb or are they averse to touching it? Are they avoiding areas of hypersensitivity or pain?

Are there any reported or visible areas of redness/skin breakdown on the residual limb? Unless there is a risk of further damage or there are no spare dressings available ask the wearer to remove their liner and ideally lift any dressings so that you can get a clear view. With their consent, it is advisable that a photo is taken of any marks/wounds before rehabilitation starts with something to indicate size within the photo as well.

Consider a quick assessment of the other lower limb, upper limbs and the trunk as shortening, pain or weakness elsewhere may have its own impact on rehabilitation.

Try to take note of how easily the potential wearer moves between different postures or positions for you and any visible asymmetries. If anything can't be explained by your findings so far, explore it in more depth.

Early observation of gait in whatever form the potential wearer can demonstrate is invaluable. If they are not wearing an alternative prosthetic limb it may still be informative to watch them hop a short distance with two crutches or a frame. Valuable information such as confidence levels, alignment, dynamic standing balance and stamina can all be obtained by just observing sit to stand in the parallel bars.

If consent for photography has been given, then take videos at assessment stage for later comparison.

Managing Expectations

Enough time must be prioritised to explain the assessment findings with the potential wearer. This discussion will help manage expectations and through it mutually agreed goals for pre and post delivery rehabilitation can be established.

If contraindications are identified or concerns raised regarding the potential wearer's suitability for the Avior a clear explanation must be provided. Referring to the wearer's BLARt score, if previously recorded, may also help discussions around suitability.

A period of targeted pre delivery rehabilitation could be offered if limiting factors such as muscle length, joint range, skin condition, physical fitness or weight appear changeable. A timely review date must also be agreed.

If contraindicating factors are identified that cannot be resolved it is unsafe to continue. Contraindications will impede the safe functioning of the device and put the wearer at risk. Please refer to the Clinician's Manual for further detail on this.

The assessment process is complete once the physiotherapist, prosthetist and wearer are all in agreement about the findings, proposed goals and the plan forwards.

6) Pre-delivery Rehabilitation

Effective use of the time between assessment and delivery can make all the difference to outcomes. Pre-delivery rehabilitation can help prepare the wearer both physically and mentally for the transition to the Avior. Working to improve core stability and range, addressing alignment issues, improving muscle lengths and strengths or working on desensitisation will all be beneficial. Working on balance, flexibility and general fitness can better prepare the wearer for the demands of post-delivery rehabilitation. Gains made pre-delivery will speed up post-delivery rehabilitation.

Pre-delivery is a good time to refer on to other clinicians such as for optimisation of pain management, wound care and psychology or to address any co-morbidities that may impact the overall prosthetic outcome. Educational support on areas such as lifestyle changes, diet or residual limb management can also be offered.

i) Outcome Measures

If not taken at the time of assessment then baseline measurements can be collected during predelivery rehabilitation. A combination of videos, photos and outcome measures can best demonstrate current functional level.

Outcome measures to consider:

ABC Scale: https://www.physio-pedia.com/Activities-Specific_Balance_Confidence_Scale

Amputee Mobility Predictor Assessment Tool (AmpPro): [https://www.physio-pedia.com/Amputee_Mobility_Predictor_\(with_prosthesis\)](https://www.physio-pedia.com/Amputee_Mobility_Predictor_(with_prosthesis))

AmpNoPro: [https://www.physio-pedia.com/images/f/fa/AmpNoPro.pdf_\(with_no_prosthetic_on\)](https://www.physio-pedia.com/images/f/fa/AmpNoPro.pdf_(with_no_prosthetic_on))

Timed up and Go (TUAG): [https://www.physio-pedia.com/Timed_Up_and_Go_Test_\(TUG\)](https://www.physio-pedia.com/Timed_Up_and_Go_Test_(TUG))

Use Tinetti Balance Test (Tinetti Performance Orientated Mobility Assessment POMA): [https://www.physio-pedia.com/Tinetti_Test_\(falls_risk\)](https://www.physio-pedia.com/Tinetti_Test_(falls_risk))

Verbal Rating Scale or Visual Analogue Scale (VRS or VAS) for Pain#

10 metre walk test (10MWT): https://www.physio-pedia.com/10_Metre_Walk_Test

6 minute walk test (6MWT): https://www.physio-pedia.com/Six_Minute_Walk_Test_/6_Minute_Walk_Test

ii) Early Exercises Without A Prosthetic Limb

Prior to delivery regaining full range of movement through both limbs is top priority. Any noticeable loss of range will affect alignment and consequently performance.

Shortening through the hip flexors on the side of the residual limb and disuse atrophy of the extensors, abductors and adductors on the same side are highly likely if the potential wearer has not been using a prosthetic limb or there has been a period of reduced mobility.

Remember that effective strengthening of the hip extensors and hip adductors can help lengthen hip flexors and abductors through the process of reciprocal inhibition.

Encourage better adherence to a regular programme if motivation levels have waned, the expectation of a new limb should help to re-incentivise. Do not confuse matters by starting a new programme if the potential wearer is already following one. Ask them to demonstrate their exercises and progress any that are too easy.

Here are some basic exercises that can be conducted without a prosthetic limb. The potential wearer will hopefully be familiar with many of them but others might be progressions. Adapt them to best suit the individual's needs in preparation for post-delivery rehabilitation.

An effective position for working with the residual limb has been demonstrated but this can be adjusted for the opposite limb so that each exercise can be performed bilaterally.

i) The Basics

Modified Thomas Test as a hip flexor stretch.



Bridging on a rolled towel or foam roll. Check alignment and for glut rather than back extensor activity.



Hip abduction, keeping the top limb in line with the rest of the body.



Hip extension – isolate the hip extensors by keeping the back flat. Minimise hip abduction.



Hip adduction squeezing a rolled towel.



ii) Progressions - Adding Resistance Whilst Maintaining Control and Alignment

Single leg bridging to strengthen hip extensors (knee to chest on opposite side will prevent excess lordosis).



Progression - opposite leg into table top making sure the lumbar spine is still in neutral.



Side bridging with residual limb on a stool to strengthen hip adductors.



Progression - lift an extended sound limb at the same time keeping it in alignment with the rest of the body.



Side bridging with the residual limb on a rolled towel or foam roll to strengthen hip abductors.



Progression – lift an extended sound limb at the same time, keeping it in alignment with the rest of the body.



Prone bridging with the residual limb to strengthen hip flexors within the required range. Keeping the hip and lumbar spine in neutral.

Progression - Lift an extended sound limb at the same time.



Core strengthening whilst sitting in midline. If there is a significant difference in muscle bulk you may need to build up under the affected ischium for a level ASIS/PSIS.



Progression - maintaining midline on a BOSU on a plinth whilst doing core strengthening exercises.



Tip: if there is a significant difference in muscle bulk in the glutes, this may affect balance.

iii) Addressing Any Outstanding Scar And Sensory Issues

tapping, rubbing all over the residual limb with different textures/items and increased general handling of the residual limb during ADLs.



Modifying phantom limb pain where possible.

Mirror box therapy is one option. Other non pharmacological options available include: Guided imagery, relaxation techniques, hypnosis, TENS and acupuncture.



Deep scar massage and the use of silicone dressings to soften tethered or raised keloid scarring.

Adhesions are most likely to respond to treatment within the first few years.



7) Post Delivery Rehabilitation

i) Pre Gait

a) Donning And Doffing

This process will have been demonstrated by the prosthetist at delivery but may need further practice.

When enabled, donning mode turns on automatically at power on. Donning mode allows the knee to flex, making the limb easier to put on when seated. It lasts for a clinician determined number of seconds before switching to walk mode automatically. Liaise with the prosthetist if the length of time it is on needs adjusting.



Tips: Watch fingers as it reaches full flexion!

Donning should be performed in sitting unless the wearer can confidently stand unsupported on the opposite limb. If so, donning then becomes easier in standing. Set the extended limb slightly to the side and lean it in towards the residual limb, which the wearer then pushes into the socket.

The knee will flex slowly if the extended limb is held horizontally for 2 seconds at any time.

b) Wearing A Prosthetic Limb

Ask the wearer to squeeze their muscles within the socket, pushing and pulling into the socket walls to feel how this changes the pressure, sensation and space within it.



Tap the prosthetic foot with a reflex hammer to recreate the sensation of foot contact.

Wearer is in standing and looking ahead/eyes closed whilst trying to identify from the location of the vibration where the contact was made on the foot (front/back/side)



Maintaining midline whilst sitting on a BOSU on a plinth or a gym ball between parallel bars. Both feet are on the floor and knee at 90°.

Introduce reaching for a target so the wearer starts pushing with the residual limb in the socket to stabilise.

Tip: Transfer from a plinth that is level with the ball and make sure the ball is firmly pumped up.

If the wearer tries to stand to do the transfer and goes beyond 45° knee flexion i.e. halfway up, the Avior will go into ratchet mode. See notes below on how to release this (under LOCK-LOCK mode, section v) sitting to standing).



c) Wheelchair Mode

When enabled the wearer needs to practice extending the shin of the Avior manually (by hand or opposite foot) within the clinician determined ranges and holding it there for 2 seconds. The Avior will then lock at that position.

To release it the user needs to manually extend the knee (by hand or opposite foot) or tap the foot against a solid surface.



ii) Progressing Through The Base Configurations

Exercises will now be suggested according to the relative progressions that might be expected and the Avior specific features made available at each base configuration.

Someone who has progressed onto LOCK-FREE or even YIELD-FREE may still benefit from reviewing earlier exercises. For example to keep working on their weight transfer or to help determine the cause for any gait deviations that arise.

PLEASE NOTE: Walking aid progression has been included as an exercise or activity that needs to be practiced and progressed alongside base configuration progression. A wearer's readiness to progress onto different walking aids should ALWAYS be determined by their therapist however, on a case by case basis.

a) LOCK-LOCK Configuration

The limb is locked when upright and in walking but provides high flexion resistance (yield) for sitting. Stance flexion of 5° or 10° can be introduced.

Things to practice:

- Finding midline in parallel standing
- Working outside of the base of support
- Stepping with the opposite leg (full weight transfer onto the Avior)
- Standing to sitting
- Sitting to standing using the ratchet function and aborting a stand
- Gait training - stance flexion
- Progression out of the parallel bars
- On/off the floor with a locked leg
- Ascending and descending with a locked knee

i) Finding Midline

It could be sometime since a wearer last stood in midline. Finding it proprioceptively may take time and trust but it is vital if the wearer is to regain a normal gait pattern.

Working in midline will also enable the Avior to perform at its best.

Within the parallel bars, support the wearer with verbal and manual guidance to identify their midline.



Visual feedback via a mirror or balance plate.

Remove/turn the mirror and see if the wearer can lose and then re find their midline – confirm with the mirror.



Even weight shifting from left to right.



Moving weight backwards and forwards.

Tip: Only move in one direction at a time and then pause. If a rapid forward backward motion is detected the device could prepare for sitting. A faint click may be heard as the knee moves into high yield resistance. If no sitting motion/ knee flexion is then detected however it will revert back to locked within 1-2 seconds.

It could be reassuring for the wearer to practice putting the limb into and out of sitting mode (without actually trying to sit). Have them standing between the parallel bars, plinth/chair behind them and therapist in front of the knee. Familiarising themselves with the timing of the trigger movement can help them avoid it during weight transfer exercises.



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

Tip: If the wearer is avoiding the lateral weight transfer and moves forwards and backwards quickly the device may prepare for sitting – see tip above.



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



Tip: Movement should be slower and more deliberate here but if rapid movement forwards backwards does occur the device may prepare for sitting – see tip above.

Who wins the card?

Slide a piece of card under the metatarsal heads of both feet. Can the wearer maintain equal weight bearing and retain both cards whilst turning their head, reaching, marching their arms or turning to look over their shoulder?

Cue: Stand up tall and look ahead.



ii) Working Outside Of The Base Of Support

Both feet remain in contact with the floor but the wearer is starting to be more dynamic, exploring what happens when they start to reach outside of the base of support.

Reach to a target.



Marching arms with poles.

This 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 wearer are holding a gym ball between them.

Made more challenging if the physiotherapist determines where the ball is going and the wearer has to mirror the movements they make.



Within the safety of the parallel bars, throw and catch a ball.

This can be made as simple or as challenging as is appropriate.

Overhead work will be most 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.



iii) Stepping With The Opposite Leg

Pain, altered sensation &/or proprioception, anxiety and previous experience may all contribute to a wearer's reluctance to fully load the prosthetic side.

Use a mirror, photos or videos to provide visual feedback on how much weight has been transferred versus what is still needed.

These exercises all encourage full weight transfer onto the prosthetic side.

Stepping onto a block.

Introducing arm swing will challenge stability further.



As above but whilst pinning a soft ball, bean bag or rolled towel against the parallel bar with the hip on the prosthetic side. The ball/bean bag falling to the floor indicates a loss of weight transfer.

Progressions: turning head, reaching for a target or throwing/catching.

Tip: Use a soft item so it squashes and stays put. The therapist's fist instead of the ball can also work well.



Sliding a wheeled board with the opposite foot.

Tip: The opposite foot needs to be on a similar height step for this to work.



Kicking a stabilised gym ball with the opposite leg. It is stabilised by the physio kneeling one leg on it.

Progression: kick a free rolling ball between therapist and wearer.



Roll or squash a ball under the opposite foot.

Progression: spell name/draw shapes with the ball and see if the physiotherapist can identify them.



iv) Standing To Sitting

Once the wearer is moving within their base and accepting weight through both sides it can be put to the test with descent to sitting.

Stand to sit, aiming for a smooth controlled descent with even weightbearing.

Tip: From a starting position of standing with equal weightbearing the wearer slightly loads the toe by pushing the hips forward before moving the weight backwards again, reaching for the armrests and flexing forward to sit into the chair at the same time.

Cue: Roll forward onto your toes and then back onto your heels whilst putting your 'nose over toes'.

Tip: The wearer may hear/feel a slight click when the device moves into sitting mode.

The wearer may need to be directed to push their residual limb forwards inside the socket to facilitate knee flexion.



Placing a table in front may help the wearer find the correct movement pattern to trigger the release of the knee.

i.e. their weight rolls forwards onto the toe as they reach for the table, before rocking back onto the heel as they then reach for an armrest.



'Who wins the card?' exercise for stand to sit helps encourage equal loading left to right as well as across the length of the foot whilst descending.



Assessing alignment during stand to sit practice can help identify whether the correct level of flexion resistance has been set for this task.

Correct stand to sit.

Flexion resistance level is set appropriately.



Flexion resistance level is set too high.

Excessive forward lean and the heel may rise or too much resistance from the knee pushes the wearer backwards and the foot may kick out in front as they land heavily.



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

v) Sitting To Standing, Using The Ratchet System And Aborting A Stand

Move forwards to the edge of the seat. Feet level. Encourage equal loading and then nose over toes for a symmetrical stand.



Flexion resistance level is set too low.

The wearer descends too quickly into the chair. Toes may lift as the knee collapses.



Using the ratchet function.

From 45° knee flexion (i.e. when half stood) through to full extension the device offers a ratchet function. This allows the wearer to continue to stand in stages or transfer their hands to a walking aid, if needed.



Practice aborting a stand.

From 90° up to 45° knee flexion the device will be in sit to stand mode. If the wearer starts sitting again the device will provide the same level of yield resistance as when in stand to sit.

If the wearer wants to abort the stand once using the ratchet function they need to rock their weight backwards, reach for the chair and prepare to sit. There may be a pause before the device starts to yield. Just reaching for the armrests may not be enough, the thigh needs to move backwards by at least 5°.

2 seconds after sitting the knee will become free and standing practice can resume.



vi) Gait Training – Stance Flexion

It is accepted that when walking with a locked knee gait deviations such as circumduction, hip hitching and/or vaulting are necessary to clear the foot during swing.

Someone who has not previously experienced stance flexion may feel quite disconcerted about any degree of movement being introduced at the knee, however small.

The wearer must always step with the opposite limb when starting to walk. This ensures weight transfer onto the Avior and prepares the device for walking.



Walking with a locked knee (0° stance flexion) forwards, backwards and sideways within the parallel bars.



Exploring stance flexion at either 5° or 10° forwards, backwards and sideways within the parallel bars.

Tip: The effect of stance flexion is most noticeable on slopes. It provides a softer less abrupt knee that can help relieve back pain, contralateral knee pain or off load vulnerable skin at end of a residual limb.

Stance flexion is adjusted by the prosthetist.

If the wearer has a hydraulic foot plus 10° of stance flexion they may find it harder to release the knee for sitting. A more exaggerated forward backward movement is needed.



vii) Progression Out Of The Parallel Bars

PLEASE NOTE: It is up to the treating therapist to determine walking aid progression and the point at which a wearer is safe and ready to progress 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.



viii) On/Off The Floor With A Locked Knee

On/off the floor in lock-lock.

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

Progression: managing this transfer without any aid in the middle of the gym, in case they need to get on/off the floor when in an open space.

Tip: The wearer may notice slight movement in the knee if stance flexion has been enabled.

Wearer starts the transfer by sitting on the side of the opposite limb, with knee bent and foot tucked under the extended prosthesis lying out to the side. They push up onto the knee of the opposite limb whilst sliding the prosthetic foot away to the side. Once kneeling they dig the inside of the prosthetic foot into the ground and push down on the chair with their hands to bring the foot of the opposite limb through to push up on.

Crawling or bottom shuffling to the chair with a locked knee may pull the socket off. It can therefore be useful to practice donning the device sitting/kneeling on the floor as well.



ix) Ascending And Descending With A Locked Knee

Stairs and slopes will need to be negotiated with a step to pattern.

Lead with the opposite limb when ascending.



Lead with the prosthetic limb when descending.



b) LOCK-FREE Configuration

The wearer will now be introduced to a short and closely controlled swing phase before transitioning quickly and smoothly back into locked mode as soon as the heel strikes.

A prosthetic review is recommended before a wearer progresses from lock-lock to lock-free for the first time. It is strongly advised if there has been a significant change to their presentation e.g. a significant increase or decrease in weight or a noticeable change in alignment. Optimisation of the setup would be recommended anyway however to improve their first experience.

The physiotherapist can then make the switch between lock-lock and lock-free within their sessions using the Blatchford app.

Things to practice:

- Swing phase training
- Mode practice – swing extension control and standing support
- Gait training using swing
- Manual lock in standing
- Foot consideration

ij) Swing Phase Training

The wearer needs to understand how to initiate the release of the knee for swing but also that correct swing phase initiation starts with correct loading in stance. It can take time and practice for a new wearer to perfect both of these elements.

Continue to review and progress the weight transfer exercises described earlier until the wearer can happily transfer their weight onto the prosthetic side during all activities.

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

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

Tip: There might be the temptation for the wearer to look down to check that the knee has released. This will usually have the opposite effect.

Cue: 'stand up tall, roll over the foot all the way to the toe whilst looking ahead. Knee remains straight.



Place a stabilised ball or target in front for the wearer to aim to kick as they transition from stance into swing.

Tip: Use a large target so the wearer can't miss and can keep looking ahead.

Start with the Avior as the front leg almost a full step length away from the ball. Step forwards with the opposite leg so the wearer's weight rolls across the prosthetic foot into toe off to help trigger a release into swing.



The wearer needs to recognise when 'swing' can be initiated unintentionally.

Stepping up a step with the opposite foot a stride length ahead could trigger the knee to release into swing but the wearer can avoid this by pushing the knee back as they roll over the foot.

It is important to practice this within the safety of the parallel bars until the wearer is confident that they can consistently avoid the unintentional release.



ii) Mode Practice

Practice using swing extension control.



Fast swing extension will provide greater reassurance that the Avior is locked and ready for stance but normal swing extension speeds will allow a smoother gait pattern.

Tip: If the foot is kicking up too high at terminal swing then the extension control is too aggressive, request for it to be reduced.

If the wearer is having to wait for the leg to come through then it needs increasing.

If the wearer is naturally a fast walker they may prefer the faster settings.



Practice using Standing Support mode.

Standing Support is available in LOCK-FREE and YIELD-FREE between 0-30° of knee flexion. The sensitivity (how long the leg must be still for) can be adjusted by the prosthetist from normal, low and very low (between 0.8-1.6 seconds).

Instead of always having to fully sit to rest, standing support gives the option to rest in perch sitting on a kitchen stool or lean against a wall for example. It also allows the user to stand still on uneven terrain and slopes (up to 30°).

In the clinic you can introduce standing support mode by perch sitting against a parallel bar or a raised plinth (that has good brakes!).

Tip: This mode is only available up to 30° knee flexion and is not available in LOCK-LOCK.

To come out of Standing Support mode the wearer needs to either stand themselves fully upright again or if they'd like to continue directly into sitting they need to push the knee forwards decisively or flex both knees to a squat position as they move to sit. There may be a pause and the knee flexion does need to be quite a deliberate action. If in doubt, the wearer stands upright again first and then sits from there.

Between 30° – 90° the Avior will offer yield resistance but won't lock. It will remain in sitting mode until 90° knee flexion has been reached. After 2 seconds sitting still it will go free for foot repositioning.

Any movement forward or backward will disengage Standing Support mode but it can be reset immediately if a new position is held. A degree of lateral movement is available without it disengaging.



iii) Gait Training Using Swing

The Avior can now release for swing phase but remains locked in stance. This is not enough to provide a normal gait pattern but work can be done to minimise deviations such as circumduction, vaulting and hip hitching as the wearer becomes more proficient with their swing.

They may also gain sufficient confidence to progress their walking aids for short distances over level ground for example.

PLEASE NOTE: It is up to the treating therapist to determine walking aid progression and the point at which a wearer is safe and ready to progress out of the parallel bars.

It is recommended that the progression from two elbow crutches is to two sticks.



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

Losing alignment will interfere with the function of the Avior.



iv) Manual Lock In Standing

Reaching the mode button at the back of the knee (for 3x short presses) whilst in standing may be too challenging for some wearers but with practice others may manage it.

Tip: If three presses doesn't put it into manual lock try increasing the speed of the presses. There isn't time to remove the finger from the button between presses.

It is a long hold on the same button to come out of lock, there is a pause.



v) Foot Consideration

The Avior is suitable for use with a wide range of prosthetic feet from multi axial feet such as the Navigator and Epirus, the energy storing foot, Esprit, and the hydraulic self-aligning AvalonK2.

Changing a wearer's foot could have a significant impact on their gait pattern, either positively or negatively. Progressing onto a more dynamic foot needs to be done with careful consideration and a good understanding of the impact on the wearer.

Providing greater degrees of freedom of movement at the foot and ankle can allow the wearer to find a more normal gait pattern IF they have sufficient proximal control to achieve this. Moving to a more dynamic foot too soon however can undermine confidence and stall progress. If a wearer is struggling to load their prosthetic side, providing a more stable foot and ankle alongside working on proximal strength and control should help build their trust and improve loading. They can always move onto a more dynamic foot again once they have improved.

Changing feet can occur at any point, so long as due consideration and clinical reasoning has taken place and the wearer feels prepared.



c) YIELD-FREE Configuration

The wearer is introduced to yield during stance. This allows a more normal gait pattern as well as reciprocal descent on kerbs, stairs and slopes.

For all wearers a prosthetic review is required before they are progressed from LOCK-FREE to YIELD-FREE for the first time. This will optimise set up and facilitate a smooth transition. Once correctly set up for yield the physiotherapist can select LOCK-FREE or YIELD-FREE as required during sessions via the Blatchford app.

Things to practice:

- Trusting the yield
- Using the yield
- Advanced gait training
- Standing support mode
- Stairs and slopes
- Progression away from walking aids
- On/off the floor using the yield and crawling

i) Trusting The Yield

The wearer stands in step stance position with the physiotherapist in front. The wearer transfers weight onto the Avior 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 the knee without the need for upper limb support.

Cue: 'Imagine you are trying to sit on your own (prosthetic) heel'.

Tip: there is no limit to stance flexion in YIELD-FREE mode – the knee will yield through range.



ii) Using The Yield

Stepping to reach a target with the opposite limb – in front, to the side, behind or across the body.

Tip: Have the target just ahead of the prosthetic toe.

If the wearer pushes back with knee instead of yielding and pauses the Avior may go into standing support mode.

Lift the foot or move forward/backward to release the knee again.



Stepping forwards to reach above the head to a target or to hit a balloon reduces upper limb reliance and progresses this further.



Stepping the opposite limb onto a high step directly in front.*

*Place the step just in front and be in the parallel bars. If it is too far forward this activity could initiate the release of the knee.



The star excursion test with the opposite limb can challenge stance control further and also provide a measurable target.



Balancing on a rocker board.

This also provides visual feedback on equal loading.

Progression options include:

- A) turning head whilst doing this.
- B) reaching to a target or throw catch a ball.

Tip: To get onto the board the wearer pushes the board to the floor with the prosthetic foot and steps straight on. To dismount they push the board to the floor on the prosthetic side and step off with the opposite limb.



iii) Advanced Gait Training

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

Keep returning to early gait training exercises to help iron out inconsistencies.

A shorter step length with the opposite limb indicates poor loading of the prosthetic limb during stance.

A loss of midline could indicate weakness around the hip or reluctance to load the prosthetic side.

Continue to look out for vaulting, circumduction and hip hitching if the wearer is not utilising the swing function fully.

If the release into swing is inconsistent look for a lack of forward progression of the prosthetic shin or poor loading of the prosthetic forefoot into toe off. This needs to be followed by knee extension, led by extension from the hip.

Work towards equal stride lengths and a base of support that is no wider than the width of the shoulders.

Even stride lengths.

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

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



Narrowing the base of support.

This can be achieved with taped lines or sticks on the floor.

Progression - Tandem walking along a single line

Tip: The wearer must really roll off the toe to initiate swing here. Poor technique will get shown up with a narrower base.



Grapevine walking.

Tip: Always travel with the opposite limb leading i.e. turn and face the opposite bar to walk back along the length of the bars. (leading with the prosthetic limb is possible but very challenging).

The wearer will find that they can move more quickly if they keep the knee locked but foot positioning is harder and they are not learning to control the yield that way. To ensure the knee releases every time roll fully off the toe.



Stepping to reach a target with the prosthetic side and back again.

This requires consistent release into swing as well as yield control as the foot is placed down and then returned.

Tip: The Avior is looking for the wearer's weight to roll across the foot and off the toe to release into swing.



Walking against resistance at the pelvis.

i.e. therapist's hands or theraband to encourage better forward transition, hip extension and prosthetic toe loading.



Speed control.

Varying the cadence on command.



Walking or stepping backwards.



iv) Standing Support Mode - Advanced

Using standing support mode on a steeper slope. This mode is available at any angle between full knee extension and 30° flexion.



v) Stairs And Slopes

Learning foot positioning for stairs.

Place tape at the midfoot of the prosthetic foot to help the wearer align the pivot point with the edge of the step.

This needs to be removed and the wearer encouraged to look up once they have learnt the correct placement.

Use a small door threshold for initial practice.



Stepping down a single full height step/kerb.

Cue: 'Imagine you are trying to sit on your own (prosthetic) heel'.



Descending a ramp.

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 yield control.



For most Avior wearers ascending steps or stairs will require a step to pattern, leading with the opposite limb.

However, it is possible to ascend a low gradient slope (5°) using a reciprocal gait pattern with practice.

vi) Progression Away From Walking Aids

Progressing away from walking aids completely requires good alignment, good core control and the correction of any lingering gait deviations. The regaining of trunk rotation and arm swing can then be worked on, as these are usually the final gait deviations to be corrected.

Walking with palm to palm contact with the physiotherapist (therapist walks backwards).



Timely swinging of walking sticks to regain arm swing and trunk rotation (therapist walks backwards).



Walking palm to palm with the therapist up and down a gentle slope (therapist walks backwards).



Walking with a gym ball between wearer and therapist. This reduces vision of feet but still provides some stability. (therapist walks backwards).



Walking forwards whilst turning to look to left or right on command.

Progression - therapist asks the wearer to identify how many fingers they are holding up.



vii) On/Off The Floor Using Yield

The wearer first gets into a stance kneeling position by taking a big step backwards with the prosthetic limb and yielding down to the floor. They then lower themselves onto the hip of the opposite limb.

Start with a chair in front.

Progression: as above but in the middle of the room without any chair/aid in front - this will be more functional in the community.

Tip: Check the right flexion stops are in place before attempting kneeling - there should be no contact between the socket and the Avior at full knee flexion.

The Avior will use the yield resistance level set for stairs descent for kneeling and getting on/off the floor. If the resistance level is too high it can be adjusted but this will also affect the resistance level set for stairs.



viii) Crawling

If the wearer needs a chair in front to return to standing from the floor then they need to practice crawling to get to it.



Walking well without aids suggests that the wearer has good control over the prosthetic limb, good core strength and good general flexibility.

Progression into the community can then be considered i.e. over uneven terrain and into unpredictable environments.

8) Progressing Towards Community Ambulation

This section is completed outside of the parallel bars but still indoors. This lets the wearer know how the Avior 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 wearer's path or a raised door threshold.



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



Walking over an uneven surface.

If a suitable training surface is not available then a thick foam mat over small, non breakable objects such as wrist weights or 'hedgehogs' can create a similar surface. Use this temporary version within the parallel bars and make sure the mat is not sticking up at either end as a trip hazard.



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

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



Carrying objects 1.

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



Carrying objects 2.

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

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



Carrying objects 3.

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

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



9) Community Training

As the wearer progresses they can start taking the skills they have mastered in therapy out into the community. The Avior is perfectly suited to the community as an introductory limb. Working alongside the physiotherapist during this transition and being able to remain on a familiar limb in a new environment will help boost confidence.

Further progression may warrant a more advanced limb however.

The physiotherapist needs to identify good training grounds near the rehabilitation centre. Areas that include uneven terrain, gravel, slopes on a camber, steps with uneven heights and widths are all useful. Kerbs with the added distraction of vehicles, pets and bicycles make the activity more real to life as does a change in surface as you descend a step or kerb i.e. from grass onto concrete.

Other community specific activities that a wearer may wish to be introduced to by the physiotherapist are:

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

If the wearer is confident wearing the Avior outside they may wish to consider low level fitness activities and hobbies such as golf, joining a low level walking group or attending the gym.

Cycling and swimming will require the use of alternative limbs.

