Product Evaluation
Knee Braces
Product Evaluation Introduction

The Product Evaluation Group is a national team of Steeper employed Orthotists that meet every 6-8 weeks to discuss a range of specified orthotic products.

The aim of the evaluation is to inform and educate whilst assisting the reader in the comparison of products, highlighting the features, benefits and disadvantages of each product. The views and opinions expressed in this document are those of a small number of experienced practitioners and may not represent the views of Steeper, therefore this report is for internal guidance only.

In order to ascertain the products to be evaluated within each category, the order history for the category was analysed. The most popular products and the newest products on the market were selected to be analysed.

The evaluation process consists of

- Direct Evaluation
- Expert Opinion
- Online Survey
- Clinical Evidence
- Patient Perspective (taken from patient feedback received from the group of Orthotists)

Knee Brace Document Guide

Document Code – SPEG0006V1

Product Evaluation Group –

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Executive Summary

The knee braces selected in this report were highlighted from the Steeper Group ordering history. The braces selected are the most popular and commonly used by our clinicians.

There are two varieties of brace frame within the group of braces; the step through design and the lay on design. There is also a further variation highlighted and this is a flexible or rigid calf and thigh section.

The majority of functional braces we have evaluated have rigid calf and thigh sections which seems to be the industry standard. The rigid variety poses the problem of a stock shape brace possibly being fitted to a ‘none stock’ shape leg. It is also consistently commented on by our expert users that the thigh section digs in, doesn’t contour well or is simply uncomfortable on all but two braces.

Throughout the course of the document you will see the PEG PICKS icon. This is to highlight the top rated product as recommended by the Product Evaluation Group.

Best Brace for...

Knee Instability

Ossur CTi Brace
Clinical Research

Whilst the use of knee braces is documented, the majority of recent evidence is on OA of the knee rather than combined instabilities. This may be because of the high influx in these braces being released over the last 5 years. Specific and up to date evidence for individual braces is low, however the use of functional knee braces is well documented and supported. This summary is a brief overview of the literature readily available, for a more detailed analysis please contact, adam.horrocks@steepergroup.com

In 1983 the Lennox Hill brace (similar to the Steeper Plus Point) was proven to be effective in quite a large case study of 36 patients. This brace was proven to reduce anterolateral rotatory instability by 89% of patients with grade 1 instability, and 45% improvement with grade 2 instability. Although Bassett and Fleming found a strong correlation between reductions in rotation, this evidence is now over 30 years old. Since then, biomechanical kinematic data has been more accurately reported in recent years.

An in depth study of shear forces acting upon the anterior cruciate ligament (ACL) was carried out in 1997 by Beynnon et al. This study proved that the forces acting on the ACL were significantly reduced whilst wearing functional knee braces. The method of this study was to implant a variable reluctance transducer onto the ACL and measure the strain behaviour whilst sitting and standing, which mimics the injury mechanism of the ACL.

In 1995, a review of current recommendations regarding knee braces in sport was carried out by Albright et al. This study suggested that the ACL benefits most from wearing functional knee braces. The method of this study was to reduce anterolateral rotatory instability by 89% of patients with grade 1 instability, and 45% improvement with grade 2 instability. Although Bassett and Fleming found a strong correlation between reductions in rotation, this evidence is now over 30 years old. Since then, biomechanical kinematic data has been more accurately reported in recent years.

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Key Observations and Recommendations

The Ossur CTi offered the maximum support medio-laterally with no movement on either of the side members. The strong features of the CTi brace are that the brace has flexible thigh and calf cuffs meaning optimum fit is achieved with the vast majority of patients. The lay on design rather than the step through variety favoured by some manufacturers is easy for the patient and clinician to fit and adjust using the pads supplied. The fit of the orthosis is imperative in controlling the unstable knee and the best way of doing this has been previously highlighted. For that reason the Ossur CTi is the only knee brace the PEG recommends.

The only side note to this, is that if a locking function is required the Ossur Flex would be the brace of choice. Offering an accessible and easy to use locking mechanism whilst maintaining supportive and lightweight design.

Summary Table

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<tr>
<th>Product</th>
<th>PEG Picks</th>
<th>Price</th>
<th>Best Features</th>
<th>Orthotist Rating</th>
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<tbody>
<tr>
<td>Ossur CTi</td>
<td>Yes</td>
<td>£316.60</td>
<td>Allows for a great fit</td>
<td>Above average</td>
</tr>
<tr>
<td>Ossur Flex</td>
<td>No</td>
<td>£189</td>
<td>Lightweight and lockable</td>
<td>Below Average</td>
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<tr>
<td>Steeper Plus Point</td>
<td>No</td>
<td>£199</td>
<td>Good patient/clinician instructions</td>
<td>Below Average</td>
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<tr>
<td>Medi M4s Functional Rigid Brace</td>
<td>No</td>
<td>£325</td>
<td>Good cosmesis</td>
<td>Above average</td>
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<tr>
<td>Townsend Rebel TMS Pro</td>
<td>No</td>
<td>£286.44</td>
<td>Good cosmesis and a variety of colour options</td>
<td>Above average</td>
</tr>
<tr>
<td>Townsend Bold</td>
<td>No</td>
<td>£250</td>
<td>Low profile and good conformity</td>
<td>Above average</td>
</tr>
<tr>
<td>Donjoy Armour</td>
<td>No</td>
<td>£325</td>
<td>Good cosmesis and comfort</td>
<td>Above average</td>
</tr>
<tr>
<td>Donjoy Legend</td>
<td>No</td>
<td>£295</td>
<td>Lightweight and low profile padding</td>
<td>Above average</td>
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## Knee Braces

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*For Internal purpose only, for further details about the Product Evaluation Group please contact Marketing. All information was correct at time of print, for current pricing and recomendations please contact Customer Services.*

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T: +44 (0) 113 270 4841
Knee Support Brace
Ossur CTi

Supplier: Ossur

Application:
• ACL Injuries.
• LCL Injuries.
• MCL Injuries.
• PCL Injuries.

Expert Opinion
‘This great looking brace allows for a great fit on a variety of different body shapes and accommodates a high level of support.’

Evaluation

Features
The CTi is available in an “Off the Shelf (OTS) and Custom made version. They both feature two frame options, Standard and Pro Sport. The Pro Sport frame is made with additional layers of carbon fibre to withstand impact in sports such as Motocross.
• Carbon Fiber. Rock-solid, lightweight protection.
• Accutrac Hinges. Smooth move - smooth ride.
• Sensil silicone and SenseEdge. No slip-ups!

Cost
£316.60

Evidence
There is no evidence to support this brace.

PEG Observations
Flexible thigh and calf aids fitting allowing for a forgiving fit. The silicone on the padding helps with migration and the brace is generally a very comfortable fit. Adjustable straps give plenty of flexibility to gain the optimum fit for the clinician adjusting, this combined with the ‘lay on’ design rather than the step through makes this brace easy to fit and adjust. The CTi comes with extension stops as standard, new pad sets are available along with knee protectors for extreme sports and a full refurbish from Ossur is available. The support level gained form the brace is very high and is suitable for high impact sports or those needing increased stability.

Expert User Comments
• A great range of extras for different needs/sports.
• Because of the flexible nature of the thigh cuff, perfect fit can be achieved to pretty much any shape of leg - functional knee brace of choice for me.
• Does not come with flexion, extension control kit has to be ordered separately.
• Quick and easy to fit. Fits patients that are not in proportion well. Great for sport, non-slip lining pads helps prevent migration. Extremely sturdy.
• Tend to use for sporty patients where extra control is needed.

Orthotist Perspective
Number of Orthotist that have used this 18/31.

PEG PICKS – Top Rated Product

Knee Support Brace
Ossur Flex

Supplier: Ossur

Application:
• ACL, MCL, LCL, PCL, rotary and combined instabilities.
• Long-term use for post-op, rehab and functional support.

Expert Opinion
‘A lightweight sporty looking brace with the ability to lock in full extension.’

Evaluation

Features
Flex is a viable post-op/functional rehab solution offering more versatility in both shape and function than most other options. Its heat-mouldable, carbon composite frame accommodates edema and/or changes in leg shape during recovery from surgery, while its Accutrac® range-of-motion hinges provide flexion and extension control. Gel Fit™ condylar pads improve suspension and are comfortable for tender knees recovering from trauma.

Cost
£189

Evidence
There is no evidence to support this brace.

PEG Observations
A lighter weight brace than the CTi with a rigid design round the tibia and thigh section. Sporty looking with carbon braid pattern but not quite as rigid as the CTi in terms of support. To gain a good fit measurements must be accurate as the shell is not flexible. The shell is however heat mouldable to gain an optimum fit. Excellent instructions for clinicians and patient. It comes with flexion and extension stops along with the tools to fit and adjust in a handy pack. Able to lock in full extension which is the only brace of those evaluated which could do this.

Expert User Comments
• Slim, lightweight and easy to fit.

Orthotist Perspective
Number of Orthotist that have used this 2/31.

PEG PICKS – Top Rated Product
Knee Support Brace
Steeper Plus Point

Supplier
Steeper

Application
• Ligament instabilities - ACL / PCL / MCL / LCL.
• Pre or post surgical stabilisation.
• Injury prevention.

Expert Opinion
‘A good brace offering a moderate level of support. The step through design could present challenges.’

Evaluation
Features
The design utilises a 4-point dynamic leverage system. Anatomically pre-moulded frame made from ultra-light/high strength aluminium alloy (8082 T6). New rotating buckle fixations allow easier positioning of brace, improve stability and help prevent distal migration. The Plus Point Short has been developed specifically for patients with a shorter leg length. The PlusPoint Short offers total comfort and stability and is designed to be worn with any type of ski boot.

Cost
£199

Evidence
There is no evidence to support this brace.

PEG Observations
A step through design with fairly rigid thigh and calf sections. The brace comes with good patient/clinician instructions along with flexion/extension stops and spare condyle pads. Accurate measuring is a must as there is not much adjustability in the thigh/calf section. Moderate level of support and quite low level of adjustment available to the clinician. Whilst the step through design could present a challenge to some patients.

Expert User Comments
• Slim and lightweight.
• Similar to Medi’s M4s brace.

Orthotist Perspective
Number of Orthotist that have used this 4/31.

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Knee Support Brace
Medi M4s Functional Rigid Brace

Supplier
Medi

Application
• ACL or PCL rupture, in isolation or with secondary injuries, severe instability.
• Complex rupture of the collateral ligament and/or partial cruciate rupture or overstretch.
• Severe collateral ligament instability with meniscus lesion.
• Cruciate ligament reconstruction/repair (ACL or PCL rupture, in isolation or with secondary injuries).
• Meniscus refixation in pre-existing instability of the knee joint.

Expert Opinion
‘This brace offers a high level of support with a low level of adjustment and good cosmesis.’

Evaluation
Features
• S’ profile improves torsional stability whilst following natural alignment of femur and tibia.
• Physioglide hinges closely mimic natural roll/glide movement of knee joint.
• Strong, low profile, light weight frame and hinge construction.
• Numbered straps ensure a simple fastening sequence.

Cost
£325

Evidence
There is no evidence to support this brace.

PEG Observations
A step through design with rigid thigh and calf sections. Good cosmesis, particularly for younger patients. You can adjust circumference by bending calf and thigh sections. M4s instructions are good generally but not specific about how to mould brace for adjustability. Comes with flexion/extension stops as standard and various sizes of condyle pads. Numbering of straps is good for enabling consistent fit when patient does themselves. High level of support but low level of adjustability. May not be suitable for every patient depending on leg shape.

Expert User Comments
• Not as popular with wearer as the orthotist, plenty of adjustment but bulky for female wearers.
• Rigid thigh section hinders gaining a perfect fit.
• The joints are bulky which make the brace looks bulkier than it needs to be.
• Does not fit everyone well, as the whole shell is rigid so often digs in at the top of the thigh.
• Good brace, lightweight, good suspension.
• Have found this brace easy to fit and had good patient feedback.
• Strap numbering is clear and does not come off.

Orthotist Perspective
Number of Orthotist that have used this 28/31.
Knee Support Brace
Townsend Rebel TM5 Pro

Supplier: Beagle

Application
• Ligament instabilities - ACL / PCL / MCL / LCL
• Pre or post surgical stabilisation
• Injury prevention

Expert Opinion
'Moderate to high level of support with good cosmesis and a variety of colour options.'

Evaluation

Features
• Rigid aircraft aluminium superstructure.
• Ultra low profile TM5 Townsend motion hinge.
• Patented suspension technology prevents brace migration.
• Available in size XS - XL and in left and right models.
• Very lightweight.
• Black textured powder coat finish.
• Spare liners with each brace.
• Packed in soft protective sports bag.

Cost
£286.44

Evidence
There is no evidence to support this brace.

PEG Observations
Lay on knee brace with rigid thigh and calf sections. Good cosmesis with a variety of colour options available. Straps can be trimmed and adjusted but rigid sections cannot be adjusted. Only two sizes of condylar pads. Instructions for donning are good but poor for explaining how to adjust hinges. Moderate to high level of support (better than Steeper Plus Point, not as good as M4s/CTi). Rebel Pro is approximately an inch shorter than the other knee braces tried today.

Expert User Comments
• Excellent fit with semi-custom option, anti-migration guarantee.
• Often digs in at the top of the thigh. Looks good.
• This manufacturer does a semi-custom version which I have found useful, especially with PT who are border KAFO patients.
• Can be customised to leg measurements.

Orthotist Perspective
Number of Orthotist that have used this 17/31.

Knee Support Brace
Townsend Bold

Supplier: Beagle

Application
• Ligament instabilities.
• Pre or post surgical stabilisation.

Expert Opinion
'A low profile and modern sleek looking brace that conforms well.'

Evaluation

Features
• Very lightweight design incorporates Townsend's TM5 hinge mimics the natural motion of the knee.
• Patented suspension technology prevents brace migration.
• Anti-migration padding - unique liner allows moisture to wick away whilst enhancing suspension and control.
• Aluminium superstructure gives support in the areas where it is required
• Self-Formable nylon thigh and tibia shells, due to the shape of the shells a larger surface contact to the lateral side of the leg, more containment will occur past midline.
• Shaping on the tibial shell offers rotation control.
• Extension stops.

Cost
£250

Evidence
There is no evidence to support this brace.

PEG Observations
Similar design to CTI. Low profile and calf and thigh sections not rigid so conforms well to different leg shapes. Cosmesis is good - modern looking and slim design but stands out with reflective front which some patients. Good tib ant shaping for comfort. No numbering on straps so patients may not don correctly. Instructions are very basic (good for patient but not for orthotist). Comes with flexion/extension straps.

Expert User Comments
• Good looking brace

Orthotist Perspective
Number of Orthotist that have used this 1/31.
### Knee Support Brace
#### Donjoy Armour

**Supplier**  Donjoy  

**Application**  
- Moderate to Severe ACL, PCL, CI, MCL and LCL instabilities.

**Expert Opinion**  
A good looking brace, however not easily adjustable and stickered number straps that will eventually fall off.

**Evaluation**

**Features**  
- Enhanced 4-Points-of-Leverage™.  
- Adjustable resistance offered in 25°-0°, 35°-10°, 45°-20° (shipped with 35°-10°).  
- Gradual “soft” stop to extension.  
- Flexion-extension control.  
- 7 sizes and 2 lengths.  
- Short calf for boot clearance.  
- Mouldable, medial swooping frame for custom fit.  
- Strong 6061 T6 aircraft aluminium frame.  
- 1 year warranty on frame and hinge.  
- Standard anti-migration Supra Condylar Pad.  
- Swiveling strap tabs.

**Cost**  £325  

**Evidence**  
There is no evidence to support this brace.

**PEG Observations**  
Step through design, so more difficult to don. Confusing patient instructions as instructions are for different braces not just the armour. Moderate to high level support. Not easily adjustable. Cutaway medial thigh to improve comfort. Cosmesis is good. Numbered straps so improved fitting by patient. Numbers are stickers which will eventually fall off.

**Expert User Comments**  
- No expert users commented

**Orthotist Perspective**  
Number of Orthotist that have used this 13/31.  

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### Knee Support Brace
#### Donjoy Legend

**Supplier**  Donjoy  

**Application**  
- Moderate to Severe ACL, PCL, CI, LCL and MCL instabilities

**Expert Opinion**  
A lightweight brace with low profile padding and low strength, offering limited support.

**Evaluation**

**Features**  
- ACL and PCL versions feature a patented 4-Points-of-Leverage™ system.  
- Low-profile design.  
- 7 sizes.  
- Removable doeskin liner (extra set included).  
- Air-filled condyle pads for added comfort and fit.  
- Extension stops: 0°, 10°, 20°, 30° and 40° (10° installed).  
- Flexion stops: 45°, 60°, 75° and 90°.

**Cost**  £295  

**Evidence**  
There is no evidence to support this brace.

**PEG Observations**  
Poor M-L strength (able to bend bars in and out). Low profile padding. Lightweight. Step through design (more difficult to don). Numbered strapping which will aid patient donning. Numbers are stickers which will eventually fall off.

**Expert User Comments**  
- Looks nice, neat and sporty.  
- Often a poor fit around the thigh. Quite flimsy.  
- A good knee brace, not as light as the Medi M4s  
- Thigh circumference often seems small compared to the rest of the brace  
- Good sporty brace.

**Orthotist Perspective**  
Number of Orthotist that have used this 18/31.