



Orthotic Medicolegal Report dated 12/08/2024

Regarding claimant Mr John Hartland

Prepared for the Court by Mr Martin Middleton
HCPC Registered Orthotist

Instructed by Slater and Gordon UK Ltd

Orthotic Report of Mr Martin Middleton

Dated: 12/08/2024

Claimant:	Mr John Hartland
Date of birth:	07/07/1964
Claimant's address:	3 North Star Court Kings Lynn Norfolk PE30 2NF
Date of accident:	07/09/2022
Date and duration of examination:	09/08/2024; 2 hours
Identification verified by:	Passport
Middleton Medicolegal Ref:	MM/JH/090824
Slater and Gordon UK Ltd Ref:	HAR63825/1
Premex Ref:	P+T2SI/2912160/NDA/SBR-QULS

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1. Introduction

- 1.1 The Author: I am Martin Middleton, and my field of expertise is Orthotics. I have a BSc (Hons) degree in Prosthetics and Orthotics and have been practising since 2003. My Health and Care Professions Council registration number is PO01128. Additionally, I am a member of the British Association of Prosthetists and Orthotists and hold an Expert Witness Certificate from Bond Solon/Cardiff University. I have extensive clinical experience in orthopaedic and neurological conditions, having held a long-term position at the Royal National Orthopaedic Hospital NHS Trust and consulted at various independent neuro-rehabilitation facilities. Full details of my qualifications and experience are in Appendix B.
- 1.2 Technical terms: I have marked technical terms with an asterisk (*), and the definitions can be found in the glossary in Appendix C.

2. Instructions

- 2.1 Slater and Gordon UK Ltd instructed me to provide a medicolegal report detailing Mr Hartland's current and future orthotic needs. In preparing this report, it is also necessary to examine the medical history before the accident, his current condition, the extent and duration of any ongoing disabilities, the possibility of future deterioration, and any additional investigations or treatments necessary.

3. Summary

- 3.1 This report will show that, in my opinion, orthotic treatment can play a role in managing Mr Hartland's condition. On 07/09/2022, he suffered a subtrochanteric fracture of the right proximal femur, requiring open reduction internal fixation with an intramedullary nail. He reported ongoing mobility impairment with back and hip pain affecting daily activities. He has been under the care

of a podiatrist since 2010, receiving custom foot orthoses to address foot symptoms. This orthotic treatment is unrelated to his accident and will not be significantly impacted by his new accident-related issues.

3.2 After discussion and examination, I identified that the only pertinent accident-related issue is a 35 mm right leg length discrepancy, causing postural asymmetry and gait deviations. To address this, I recommend a corrective shoe raise inserted into shop-bought footwear. I suggest an initial batch of four raises to modify all his current footwear, plus one footwear adaptation per year after that to account for new purchases. Annual costs will be around £640 in the first year and £210 each year thereafter.

3.3 Correcting his limb length will notably enhance his posture and gait, probably providing substantial relief for his back symptoms. He should be more comfortable engaging in daily upright tasks, with better balance and less risk of stumbling. However, the issues he reported with crouching, kneeling, and ladder work will probably remain unaffected.

4. Investigation of the facts

4.1 Documents supplied by the instructing party

- a. GP notes to January 2024.
- b. Hospital records to December 2023.
- c. Ambulance records.
- d. Previous Orthotics records.
- e. Reports of Mr Andrew Carrothers, consultant orthopaedic surgeon, dated 13/04/2023. September 2023 and 25/01/2024.
- f. Report of Dr Neil Hunt, Consultant Psychiatrist, dated 31/08/2023.

Accident details and subsequent events

4.2 On 07/09/2022, Mr Hartland was injured in a road traffic accident. He was cycling along a road when the Defendant, who was parked on the side of the road, opened his door across. Mr Hartland impacted the door and fell to the ground, sustaining injuries. The emergency services attended the scene and conveyed him to the Accident and Emergency Department of Queen Elizabeth Hospital.

4.3 Mr Hartland's injury details and treatment history have been extensively documented in the medical records. A brief overview is as follows: his primary injury was a reverse oblique subtrochanteric fracture of the right proximal femur, which necessitated open reduction internal fixation with an intramedullary nail on 08/09/2022. Additionally, he suffered a soft tissue injury to his right foot. He was discharged home on 20/09/2022 with crutches and was restricted to 50% weight-bearing for three months. He subsequently completed a phased return to full weight-bearing and independent mobility.

Relevant excerpts from the medical evidence

4.4 Report of Mr Carrothers, dated 25/01/2024:

- a. Pages 5-6: *"Mr Hartland has been left with a shortened right leg in the order of 1.5 to 2cm and a painful right hip. He denies having any pain in his right hip prior to the accident. He has had an MRI scan of his right hip performed on 23 June 2023 which has confirmed his mild to moderate osteoarthritic radiographic features within the right hip joint. Clinically, he is currently displaying moderate osteoarthritic features... he will need to consider removal of the metalwork and likely right-sided total hip replacement surgery within the next 1-3 years."*
- b. Page 10: *"His limb length discrepancy is shown in the attached photographs and continues to be in the region of 3-3.5cm."*
- c. Page 16: *"He should be considered for orthotic review to equalise his leg length and try*

and minimise his lower back pain, in the context of his right hip osteoarthritis which is deteriorating.”

5. Orthotic treatment history and footwear matters

5.1 Orthotics before the accident:

- a. I note NHS podiatry records starting on 29/04/2010. An assessment on 12/05/2010 records a history of plantar “R/F” pain for five years, during which Mr Hartland had bought some insoles. Early hallux limitus was diagnosed, and he was referred for biomechanical investigation. On 08/09/2010, he complained that both of his big toes felt bruised, and sometimes the right first MTPJ was painful during activity. He found supportive footwear and insoles beneficial. A mobile pes cavus foot type with excessive pronation* was recorded. He was prescribed custom foot orthoses, which were fitted on 01/12/2010. A review on 12/01/2011 noted a substantial reduction in symptoms.
- b. On 29/06/2012, new orthoses were commissioned with a plan for Mr Hartland to collect them.
- c. On 22/07/2015, Mr Hartland returned for an examination, complaining of bilateral first MTPJ pain. His insoles were degraded. Replacement orthoses were commissioned and supplied.
- d. On 02/08/2019, he attended, complaining of plantar fasciitis, and his orthoses were examined and found to be heavily decayed. New foot orthoses were prescribed and were ready to collect by 17/10/2019.
- e. Mr Hartland confirmed the above, but his recollection was imprecise. He was unsure if he had had additional foot orthoses before the accident. He used the foot orthoses daily, finding that they offered substantial pain relief from aching sole discomfort and right 1st MTPJ discomfort. He described his feet as “absolutely fine” in the lead-up to the accident. He has not encountered any difficulties accommodating the orthoses within footwear.

5.2 Orthotics after the accident:

- a. After the accident, he could not use the orthoses for about three months due to swelling. He then resumed near-continuous use for ambulation, both indoors and outdoors. He currently has two sets in use. I inspected them, noting a custom medium-density EVA* half-length base offering arch support (Figure 1). They are well-worn but in serviceable condition. Mr Hartland stated they remain effective, and his feet are not painful.
- b. Regarding orthotic treatment for his limb length discrepancy, Mr Hartland stated that he has not received any orthotic input, nor has he tried any self-directed solutions.



Figure 1

- 5.3 Footwear: Mr Hartland stated that the fit and styles of his footwear have not been affected by the accident. He predominantly wears trainers and currently has three pairs in use, along with one pair of sliders, which he only wears occasionally at home or on holiday. He estimated that he buys, on average, one new pair of footwear per year. He did not report any crucial footwear features except for a preference for thick soles with underfoot cushioning.

6. Mobility and function reported by Mr Hartland

- 6.1 Mr Hartland stated that his condition has plateaued, and mobility remains encumbered. Referencing the UCLA Activity Score*, an instrument for assessing a person's activity levels, he selected a score of 8-9, i.e. *regularly participates in active events, such as golf or bowling, to, sometimes participates in impact sports such as jogging, tennis, skiing, acrobatics, ballet, heavy labour or backpacking.*

6.2 Walking aids and orthoses: In addition to consistently wearing foot orthoses, he occasionally uses a walking pole, recalling 2-3 instances in the six months preceding our consultation. He employs it when his back is painful, finding that it eases the pain by stabilising his trunk, which he is aware sways excessively due to his leg length discrepancy.

6.3 Gait:

- a. Walking: He described his gait as slower than it was before the accident, and he is aware of asymmetry caused by a discrepancy in leg length.
- b. Balance: He stated that he feels clumsier than before the accident, with a greater risk of tripping, which he attributed to the leg length discrepancy inducing asymmetry. He reported stumbling 2-3 times per week, but he is able to recover, thus preventing falls.
- c. Running: He stated that he has not attempted to run since the accident.

6.4 Mobility capacity: Mr Hartland stated that although he has back and right hip pain, he has re-established enough capacity to conduct his normal lifestyle without limitation; he can mobilise for extended periods.

6.5 Stairs: He manages stairs with a normal reciprocal gait, but he seeks a handrail for support.

7. Symptoms reported by Mr Hartland

7.1 Back pain: He reported variable back pain in the thoracic and lumbar regions. The pain feels skeletal centrally and muscular on both sides. It is experienced daily and typically emerges almost immediately when ambulating, intensifying with duration. Standing still is more aggravating than walking, but the pain dissipates quickly with sitting rest. He attributes the back pain to the discrepancy in leg length. Bending and carrying can also be aggravating. Referring to an analogue

pain scale* and the month preceding our consultation, he reported an absolute minimum of 0 at rest, an average of 4 when mobilising, and an absolute maximum of 6. He manages the pain with rest, sometimes positioning his back in an extended alignment.

7.2 Right hip: He reported aching lateral musculoskeletal hip pain, which he experiences approximately weekly during walking excursions. The pain typically emerges after approximately 100 yards of walking and then intensifies with duration. He has not noticed any other aggravating factors. He stated an absolute minimum of 0 at rest, an average of 4 when mobilising, and an absolute maximum of 6. He manages the pain with rest.

7.3 Right knee: He stated that he has not suffered from right knee pain for a few months. Previously, he experienced mild intermittent pain (grade 3) provoked by walking and some gym leg exercises, primarily around the medial aspect of the joint. Each bout would last for a few hours.

7.4 Feet: He stated that his feet and ankles are pain-free.

7.5 Swelling: He denied suffering from any swelling.

8. Effect on lifestyle reported by Mr Hartland

8.1 Lower Extremity Functional Scale (LEFS): A 20 point questionnaire about the ability to perform everyday tasks. The LEFS can be used to measure initial function, ongoing progress, and outcome, as well as to set functional goals. It can evaluate the functional impairment of a patient with a disorder of one or both lower limbs. The lower the percentage score, the greater the disability. I have presented Mr Hartland's responses in Appendix D; **he scored 44%**.

- a. Extreme difficulty or inability to run and hop.
- b. Quite a bit of difficulty squatting, doing heavy household tasks and standing for one hour.

- c. Moderate difficulty with his usual work and recreational activities, getting into or out of the bath, lifting an object like a bag of groceries from the floor, getting into or out of a car, walking two blocks, walking a mile and rolling over in bed.
- d. A little bit of difficulty walking between rooms, putting on shoes or socks, doing light household tasks, and going up or down a flight of stairs
- e. Reported no difficulty sitting for one hour.

8.2 Activities of daily living:

- a. He stated that before the accident, he was independent and could conduct a standard range of housekeeping activities, including DIY and gardening.
- b. He stated that since the accident, he has re-established independence in the home and can conduct a wide range of mid-height housekeeping tasks. He has resumed some gardening but reported difficulty with heavy DIY tasks that involve lifting and carrying, such as moving patio slabs and bags of sand. He avoids ladder work and climbing on platforms because he feels his balance is compromised, and he fears falling, which could cause further injury. He cited relying on his wife to repair a curtain pole. Also, some low-level tasks are awkward due to right hip stiffness, which hinders crouching and kneeling.

8.3 Occupation:

- a. At the time of the accident, he worked full-time as a self-employed psychotherapist, renting office space in his local town.
- b. After the accident, he could not work for 3 weeks. He then started a gradual return, initially with online video consultations, and shortly after, resumed in-person consultations. He now completes a similar volume of work to before the accident but did not return to his commercial office space. He commented that working from home causes some disruption to home life.

8.4 Recreational activities: He stated that he enjoyed a variety of pursuits before the accident, some of which have been negatively affected, including:

- a. Cycling: Before the injury, he enjoyed cycling daily for recreation and commuting. He resumed cycling in June 2024 but highlighted that he still has some difficulty mounting and dismounting due to the hip action. Once on, his cycling action is fine, but he feels there is a minor power deficit.
- b. Music: Before the accident, he enjoyed playing the guitar and has resumed this activity, although it can aggravate his back pain, especially when sitting.
- c. Gym: He did not attend a gym before the accident, but he now attends 6 days per week with input from a personal trainer twice per week. He started this to aid rehabilitation and has found it very beneficial, observing ongoing improvements in leg strength which boosts his confidence. Sessions include cardiovascular, strength, and stretching exercises.

8.5 Driving: Mr Hartland has resumed driving and he did not raise any concerns.

9. Physical examination

9.1 Inspection, palpation, and sensation:

- a. The right leg has scars related to the accident, including two proximal hip/thigh scars measuring 5 cm and 2.5 cm, plus two small distal thigh scars. Additionally, he has patch-like posterior thigh scars with discolouration. Otherwise, the skin condition was unremarkable on the legs, with no discernible swelling.
- b. Examination of the soles of his feet found localised callus under the right fifth metatarsal head and under the left fifth metatarsal base.
- c. Lower limb sensation was intact.
- d. Palpation revealed tenderness around the right midfoot and, to a lesser extent, the left

lateral forefoot and right medial knee.

- e. His foot and ankle proportions were visually symmetrical and within the normal range.

9.2 Range of motion: I examined range using passive stretches and compared the results to the expected norm, as presented in Appendix C.

Joint	Movement	Right	Left
Hip	Flexion	100°	110°
	Extension	≥0°	≥0°
Knee	Flexion	Full	Full
	Extension	Full	Full
Ankle	Dorsiflexion	Full	Full
	Plantarflexion	Full	Full
Subtalar	Inversion	Full	Full
	Eversion	Full	Full
Midtarsal	Inversion	Full	Full
	Eversion	Full	Full
1 st MTPJ	Extension	Full	Full

9.3 Muscle power: Assessed using the Modified Medical Research Council Scale*, where 0 denotes no muscle contraction and grade 5 indicates full power.

Joint	Movement	Right	Left
Hip	Flexion	5	5
	Extension	5	5
Knee	Flexion	5	5
	Extension	5	5
Ankle	Dorsiflexion	5	5
	Plantarflexion	5	5
	Inversion	5-	5-
	Eversion	5	5

9.4 Standing posture:

- a. Posture was asymmetrical due to a substantial right-side leg length discrepancy of 35 mm (Figure 2). He habitually flexes the left knee to artificially shorten the longer leg, rebalancing the pelvis, which would otherwise be oblique.

- b. When positioned on a corrective raise, his posture normalised, and both knees were extended (Figure 3).
- c. I measured leg length while weight-bearing using a pelvic spirit level, which I believe is the most accurate manual method, though I still expect a 5 mm margin of error.

9.5 Foot alignment: Both feet exhibited a normal alignment (Figure 4).



Figure 2



Figure 3



Figure 4

9.6 Functional tests:

- a. **Single leg balance:** He could balance on one leg on both sides.
- b. **Supination resistance test*:** Moderate resistance bilaterally.
- c. **Hubscher manoeuvre*:** Normal motion transfer but relatively high resistance.
- d. **Single heel raise test*:** Heel rise was limited to 80% on both sides, and he reported forefoot discomfort from the isolated pressure.
- e. **Walking on tiptoes:** Normal function.
- f. **Walking on the heels:** Normal function.

10. Gait analysis

10.1 Barefoot gait: I have included a diagram showing the phases of gait in Appendix C. He exhibited an asymmetrical gait, which aligns with his medical history and the findings of my examination. Speed, step length, and cadence were within the normal range. The principal gait deviations included pelvic obliquity* and errant motion of the pelvis and trunk, which are attributable to the discrepancy in leg length.

11. Orthotic opinion

11.1 On 07/09/2022, Mr Hartland suffered a subtrochanteric fracture of the right proximal femur, requiring open reduction internal fixation with an intramedullary nail. He reported ongoing mobility impairment with back and hip pain affecting daily activities. Despite these symptoms, Mr Hartland has resumed work and recreational activities but faces difficulties with heavy manual tasks, especially those involving crouching and climbing.

11.2 Mr Hartland has been under the care of a podiatrist since 2010, receiving custom foot orthoses to address bilateral foot symptoms. This treatment has been greatly beneficial, and he reported that his foot symptoms are kept at bay with daily use. This orthotic treatment is unrelated to his accident and will not be significantly impacted by his new need for a corrective shoe raise to address the 35 mm limb length discrepancy caused by the accident. I recommend shoe raises that can be used in combination with his existing foot orthoses. See the explanation below.

35 mm shoe raise to equalise limb length.

11.3 Examination revealed a right leg length discrepancy of approximately 35 mm, causing substantial postural asymmetry and gait deviations. I recommend a 35 mm shoe raise inserted into shop-bought footwear to equalise leg length, which will fundamentally resolve this issue and largely

mitigate the biomechanical consequences. To ensure optimal results, the modification should be applied to a range of footwear. Each pair of shoes should be considered individually, and the raise should be distributed as a combination of an external shoe raise +/- a small internal heel raise.

11.4 Technical note:

- a. Internal heel raise: A simple, discreet piece of dense material positioned inside the shoe, under the heel, and that can be combined with foot orthoses (Figure 5). Normally, a maximum of 10-15 mm can be accommodated securely within lace or Velcro-fastened footwear without affecting fit and stability. This method is not suitable for open footwear like sandals or for most shallow formal styles such as slip-on shoes.
- b. External shoe raise: The raise is integrated into the outer sole by splitting the sole and inserting the necessary material (Figure 6). This method guarantees no impact on shoe fit but compromises aesthetics as the raise remains visible. This technique is essential for raises above 10-15 mm and is, therefore, the type Mr Hartland needs.



Figure 5



Figure 6

11.5 Based on my experience and Mr Hartland's statements, I recommend an initial batch of four raises to modify all his current footwear, plus one footwear adaptation per year going forward to account for footwear degradation and new purchases. Mr Hartland's feet are normally proportioned, and the shoe raise can be applied to a wide range of practical styles without disrupting fit. Therefore, orthotic/bespoke footwear is not indicated. See Appendix A for costs.

The benefits of orthotic treatment

- 11.6 Correcting limb length will notably enhance his posture and gait. Mr Hartland attributed his back pain and partly his hip pain to the leg length discrepancy, and I concur that the discrepancy is likely a significant factor in his back pain. Equalising his leg length should provide substantial relief for his back symptoms. In my experience, hip symptoms are less reliably correlated to limb length discrepancy, so the outcome regarding his hip pain is uncertain.
- 11.7 The functional advantages of a shoe raise apply to upright activities. Mr Hartland's comfort when standing and walking will probably be enhanced, translating into easier engagement in everyday tasks. With better symmetry and movement efficiency, he should feel more balanced and less prone to stumbling. Additionally, he should feel somewhat better performing lifting and carrying tasks, though heavy manual handling tasks will probably remain impaired. Orthoses cannot resolve issues related to crouching, kneeling, and ladder work.

12 Range of opinion

- 12.1 I anticipate that the key issues and related orthotic objectives outlined above will remain relatively stable. However, there may be some variations in the following areas:
- a. Clinical fees: I expect moderate variation, primarily dependent on the perceived time involved in instituting and maintaining the orthosis. I have based my projections on my experience and the BAPO best practice guidelines.
 - b. Shoe raise quantity: In my experience, most gentlemen require an initial batch of up to 5 shoe raises, followed by 1-4 raises per year to account for wear and new purchases. I have tailored the quantity of my recommendations based on Mr Hartland's reported past and anticipated future footwear volume.
 - c. Orthosis costs: The cost of orthotic hardware can vary greatly. In Appendix A, I have provided my understanding of typical costs at established private clinics.

13. Declaration and statement of truth

- I understand my duty as an expert witness is to the court. I have complied with that duty and will continue to comply with it. This report includes all matters relevant to the issues on which my expert evidence is given. I have given details in this report of any matters which might affect the validity of this report. I have addressed this report to the court. I further understand that my duty to the court overrides any obligation to the party from whom I received instructions.
- I confirm that I am aware of the requirements of CPR Part 35, the Practice Direction to CPR Part 35 and the Guidance for the Instruction of Experts in Civil Claims 2014.
- I confirm that I have made clear which facts and matters referred to in this report are within my own knowledge and which are not. Those that are within my own knowledge I confirm to be true. The opinions I have expressed represent my true and complete professional opinions on the matters to which they refer. I understand that proceedings for contempt of court may be brought against anyone who makes, or causes to be made, a false statement in a document verified by a statement of truth without an honest belief in its truth.
- I confirm that I have no conflict of interest of any kind, other than any which I have already set out in this report. I do not consider that any interest which I have disclosed affects my suitability to give expert evidence on any issue on which I have given evidence and I will advise the party by whom I am instructed if, between the date of this report and the trial, there are any change in circumstances which affects this statement.



Mr Martin Middleton **12/08/2024**
HCP C Registered Orthotist No. PO01128

Appendix A: Orthotic costing schedule

The following is the annual cost schedule for the prescribed orthoses. It includes the quantity needed, the average cost of the orthosis and clinical services, and the estimated replacement interval. The quantity indicates the number of orthoses required at any given time. The costs are based on industry averages. The replacement interval is determined based on the patient’s weight, mobility, environment, and the construction method of the orthosis. The lifespan of the orthosis depends on usage, not just time, so the replacement interval may vary if multiple orthoses of the same type are in use. The cost of the orthoses does not include VAT. VAT is not normally payable if the equipment is intended for personal use and the client signs an exemption certificate.

Annualised costing schedule:

Note: I recommend an additional hour of clinical time (£160) in the first year of treatment to account for the assessment and orthosis refinement process, plus three extra shoe raises (£270). Therefore, annualised costs will be around £640 in the first year and £210 every year after that.

Recommended Orthosis/Service	Item cost (£)	Quantity	Replacement Interval (years)	Annualised Cost (£)
Clinical Time (per hour)	160	0.75	1	£120.00
Footwear adaption - 35 mm raise	90	1	1	£90.00
			TOTAL	£210.00

Appendix B: CV

Mr Martin Middleton BSc (Hons)

Contact details:

- Telephone: 0798 3535 989
- Email: middletonmedicolegal@gmail.com
- Website: www.middletonmedicolegal.com

Qualifications, accreditation and professional memberships:

- BSc(Hons) Prosthetics and Orthotics, University of Strathclyde, 1999-2003.
- Expert Witness Certificate, Bond Solon, Cardiff University 2012.
- Registered member of the Health and Care Professions Council.
- Member of the British Association of Prosthetists and Orthotists.

Profile:

A highly experienced and accomplished clinical orthotist and expert witness with a proven track record of providing evidence-based treatment and impartial, objectively reasoned medicolegal reports. Offering expertise in complex cases and innovative technologies, including 3D-printing, PDE AFOs, and high-definition silicone.

Experience:

2015-Present, Middleton Medicolegal Ltd, Nationwide - Consulting Orthotist and Expert Witness

Established a nationwide reputation as an expert witness, handling over eighty cases annually. Demonstrated expertise in providing impartial and evidence-based orthotic reports, serving a balanced clientele of 60% claimants, 35% defendants, and 5% joint cases. Leading an orthotic clinical service centred in Hertfordshire, collaborating closely with orthopaedic and neuro-rehabilitation consultants and therapists.

2008-Present, Dorset Orthopaedic/Pace Rehabilitation- Consulting Orthotist and Expert Witness

Contributed to the success of Pace Rehabilitation, now merged with Dorset Orthopaedic, a leading UK Prosthetic rehabilitation service and recipient of the prestigious Rehabilitation Provider of the Year award. I provided medicolegal services and specialist clinical treatment for complex cases. Working with innovative technologies such as PDE AFOs and high-definition silicone cosmetic covers, catering to high-profile clients, including paralympic athletes.

2017-2020, Andiamo - Consulting Orthotist and Advisor

Played a pivotal role at Andiamo, an award-winning company at the forefront of 3D printing and scanning technology in the orthotic/healthcare sector. Provided clinical consultations, gait laboratory analysis, and technical advice, collaborating on research projects with institutions including Queen Mary University and Barts Health NHS Trust.

2003-2016, Royal National Orthopaedic Hospital - Band 7 Senior/Specialist Orthotist

Worked as a Senior/Specialist Orthotist at the internationally renowned Royal National Orthopaedic Hospital, specialising in complex foot/ankle conditions, spinal deformity, spinal cord injury, brachial plexus injury, and traumatic limb reconstruction. Led the orthotic management of neuromuscular and idiopathic scoliosis as the clinical lead, contributing to enhanced patient outcomes.

Spearheaded advancements in Brachial Plexus injury treatment as the clinical and developmental lead. Gained expertise in foot and ankle conditions and actively mentored junior staff and final-year orthotic students.

2007-2013, HCA Healthcare: The Wellington Hospital, Consulting Orthotist

Delivered orthotic treatment to clients at the largest private neuro-rehabilitation facility in the UK. Collaborated closely with multidisciplinary therapy teams to provide orthotic interventions to stroke and traumatic brain injury patients undergoing extensive physiotherapy and gait re-education.

2007-Present, North West London NHS Trust - Consulting Orthotist

Consulted on the orthotic management of spinal cord injuries, specialising in cases of myeloma and TB. Developed guidelines and patient pathways to ensure the efficient application of custom spinal orthoses to preserve spinal cord integrity and enable safe mobility.

2006, Hope Rehabilitation Society, Pakistan - Consulting Orthotist and Advisor

Provided education and training to enhance the standard of orthotic treatment, focusing on scoliosis management. Implemented modern clinical and manufacturing techniques, introducing multi-purpose AFOs and foot orthoses to optimise patient care.

Teaching, publications and presentations:

- Orthotic tutor at the Basic Sciences in Orthopaedics Course for FRCS (T&O) exam preparation, British Orthopaedic Association and Royal National Orthopaedic Hospital, 2012 to 2021.
- Orthotic tutor at the British Casting Certificate course, British Orthopaedic Association and Royal National Orthopaedic Hospital, 2010-2018.
- Contributor to Brachial Plexus Rehabilitation chapter of "Surgical Disorders of the Peripheral Nerves" book by Professor R. Birch.
- Article: "Development of dynamic elbow flexion orthosis," 2015.
- Article: "Composite materials, further development in Brachial Plexus management" BAPO 2013.
- Article: "Pre-Preg KAFO design case study", BAPO journal 2005.
- Article: "Developments in Brachial Plexus management" BAPO 2004.
- Article: "Cosmetic calf shaping for AFO case study", BAPO 2004.
- Presentation: "Orthotic technology", Pace Rehabilitation conference, 2015.
- Presentation: "Post-polio syndrome; gait and treatment", Royal National Orthopaedic Hospital, 2012.
- Presentation: "Principles and applications of ankle-foot orthoses", HCA Healthcare, 2009.
- Presentation: "Orthotic Treatment Modalities", Pace Rehabilitation conference, 2008.
- Presentation: "Developments in Brachial Plexus Management", Australian Hand Therapy Association National Conference, 2004.

Further training:

- 2021 Bond Solon, Masterclass in Report Writing.
- SDO/Lycra garments.
- Ottobock stance phase control orthoses, including C-Brace.
- Thuasne/orthotic composites, composite KAFO and AFO technology and design.
- NCTEPO: AFO management in children with Cerebral Palsy.
- NCTEPO: Adult Foot Problems.

Appendix C: Glossary of technical terms

Dorsiflexion: The turning of the foot or the toes upward.

Dorsum [of the foot]: The upper surface.

EVA: Ethylene-vinyl acetate is a dense foam type material that is available in varying densities.

Eversion: The movement of being turned outward.

External shoe raise: Incorporated into the shoe by splitting the outer sole and inserting the required amount of material. This method does not alter footwear fit but it does compromise footwear appearance.

Hallux: The 1st/big toe.

Hurbscher Manoeuvre: Also known as the “Jack test,” can determine the function of the windlass mechanism, which will be severely compromised by ligament disruption in the adult-acquired flatfoot. The examiner passively dorsiflexes the hallux and looks for movement transfer of supination of the hindfoot as well as external rotation of the tibia. In comparison to Stage I flatfoot, a Stage II deformity will lack tension in the plantar aponeurosis and connecting ligaments of the first ray, and no movement transfer will occur.

Inversion: The movement of being turned inwards.

Lateral: Structures distant from the midline of the body.

Medial: Structures near the midline of the body.

Pelvic Obliquity: Where the pelvis is not level. Pelvic obliquity can be caused by leg length inequality, contractures about the hips, as part of structural scoliosis or as a combination of these causes.

Plantarflexion: A toe-down motion of the ankle.

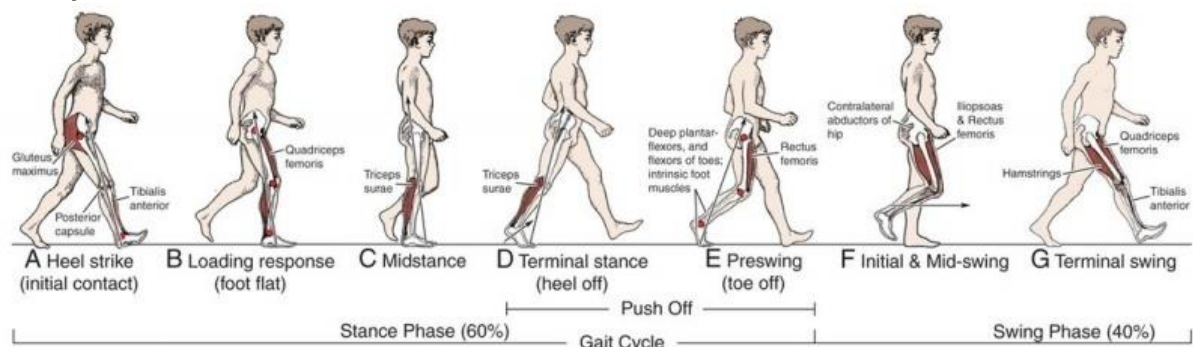
Pronation: The lowering or descending of the inner edge of the foot by turning the entire foot outwards.

Single heel raise test: The subject is asked to stand on one leg and then plantarflex the ankle such that he will rise onto the toes. A normal result would be to observe full plantarflexion with inversion of the heel.

Supination: Inversion of the foot associated with internal rotation and increased arch height.

Supination resistance test: The test is performed by placing two fingers plantar to the talonavicular joint and applying a force in an upward direction. The amount of force needed to supinate the foot is estimated.

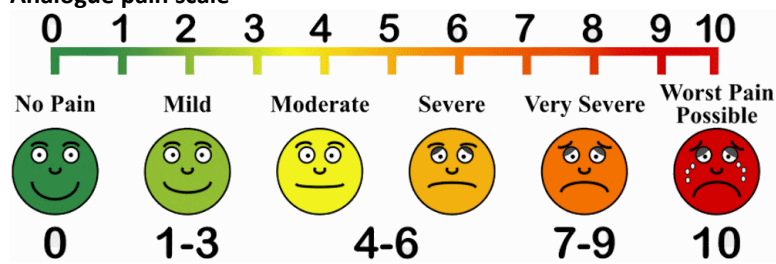
Gait cycle:



Average ranges of motion:

Joint	Movement	Range
Hip	Flexion	0-120
	Extension (hyper)	0-30
Knee	Flexion	0-135
Ankle	Dorsiflexion	0-20
	Plantarflexion	0-50
Ankle/Foot	Inversion	0-35
	Eversion	0-15

Analogue pain scale



Muscle Power - Modified Medical Research Council Scale

Grade	Definition
5	Normal strength
5-	Barely detectable weakness
4+	Same as grade 4, but muscle holds the joint against moderate to maximal resistance
4	Muscle holds the joint against a combination of gravity and moderate resistance
4-	Same as grade 4, but muscle holds the joint only against minimal resistance
3+	Muscle moves the joint fully against gravity and is capable of transient resistance, but collapses abruptly
3	Muscle cannot hold the joint against resistance, but moves the joint fully against gravity
3-	Muscle moves the joint against gravity, but not through full mechanical range of motion
2	Muscle moves the joint when gravity is eliminated
1	A flicker of movement is seen or felt in the muscle
0	No movement

Appendix D: Lower Extremity Functional Scale

Instructions: We are interested in knowing whether you are having any difficulty at all with the activities listed below because of your lower limb problem for which you are currently seeking attention. Please provide an answer for each activity.

Today, do you or would you have any difficulty at all with the following activities: -

Activities	Extreme difficulty or unable to perform activity	Quite a bit of difficulty	Moderate difficulty	A little bit of difficulty	No difficulty
1 Any of your usual work, housework, or school activities.			✓		
2 Your usual hobbies, re creational or sporting activities.			✓		
3 Getting into or out of the bath.			✓		
4 Walking between rooms.				✓	
5 Putting on your shoes or socks.				✓	
6 Squatting.		✓			
7 Lifting an object, like a bag of groceries from the floor.			✓		
8 Performing light activities around your home.				✓	
9 Performing heavy activities around your home.		✓			
10 Getting into or out of a car.			✓		
11 Walking 2 blocks.			✓		
12 Walking a mile.			✓		
13 Going up or down 10 stairs (about 1 flight of stairs).				✓	
14 Standing for 1 hour.		✓			
15 Sitting for 1 hour.					✓
16 Running on even ground.	✓				
17 Running on uneven ground.	✓				
18 Making sharp turns while running fast.	✓				
19 Hopping.	✓				
20 Rolling over in bed.			✓		

Appendix E: UCLA activity score

Check one box that best describes current activity level.

	1: Wholly Inactive, dependent on others, and can not leave residence.
	2: Mostly Inactive or restricted to minimum activities of daily living.
	3: Sometimes participates in mild activities, such as walking, limited housework and limited shopping.
	4: Regularly participates in mild activities.
	5: Sometimes participates in moderate activities such as swimming or could do unlimited housework or shopping.
	6: Regularly participates in moderate activities.
	7: Regularly participates in active events such as bicycling.
✓	8: Regularly participates in active events, such as golf or bowling.
✓	9: Sometimes participates in impact sports such as jogging, tennis, skiing, acrobatics, ballet, heavy labour or backpacking.
	10: Regularly participates in impact sports .