THE WALK3D PATHWAY

IDENTIFY THE ROOT-CAUSE

3D GAIT ANALYSIS

Using the same technology as specialist gait laboratories (and film studios!), infrared cameras accurately measure 3D joint kinematics and automatically identify the risk-factors associated with common running injuries .

COMPLETE THE PUZZLE

OBJECTIVE MSK EXAM

An integrated assessment of muscular strength, range of motion, alignment and neuromuscular control provides further insight into biomechanical function and other contributing factors.

TARGET THE ISSUES

TREATMENT & REHAB

Correctly identifying the underlying problems is fundamental to developing an effective and long-term treatment protocol. A targeted rehabilitation programme can now be created.

FOLLOW THE EVIDENCE

GAIT RETRAINING

Our real-time technology enables evidence-based gait retraining protocols to be replicated in our clinics if it is appropriate for you.

CELEBRATE THE RESULT

RETURN TO ACTIVITY

HOW WALK3D CAN HELP

Hip Osteoarthritis (OA)

Hip osteoarthritis (OA) has a significant impact on the mobility and activity levels of older adults. It is a leading cause of gait impairment and the only treatments available to relieve pain and improve function are rehabilitation or surgical intervention. Hip OA affects 1 in 4 people over a lifetime and most total hip arthrosplasty surgeries are performed on adults over 65 years.

1. IDENTIFIES RISK FACTORS

BIOMECHANICS: POWER PLANE

- ↑ Pelvic tilt at toe-off
- ↓ Hip extension at toe-off & peak
- ↓ Hip flexion (peak)
- ↓ Knee flexion (peak)
- ↓ Knee extension (peak)

BIOMECHANICS: CONTROL

- ↑ Ipsilateral trunk movement
- ↑ Pelvic obliquity (peak)
- ↑ Pelvic rotation (peak)
- ↓ Hip internal rotation (max)

BIOMECHANICS: FOOT & ANKLE

- ↑ Ankle dorsiflexion at toe-off

TEMPORAL & ALIGNMENT

- ↑ Varus knee alignment
- ↓ Stride-length
- ↓ Step-length
- ↓ Cadence
- ↓ Walking speed

MUSCLE STRENGTH & FUNCTION

- ↓ Hip abductors
- ↓ Hip extensors

MUSCLE IMBALANCE & INFLEXIBILITY

- ↓ Hip adduction & abduction
- ↓ Hip flexion & extension
- ↓ Hip internal rotation
- ↓ Hip external rotation

2. TARGETS TREATMENT

- Gait retraining
- Muscle strengthening
- Footwear recommendations
- Improving muscle imbalances and range
- Orthotic intervention
- Neuromuscular re-education

3. FACILITATES GAIT RETRAINING

- Improve spatio-temporal parameters: Stride-length, step-length, and cadence
- Increase hip extension at toe-off
- Improve hip and pelvic movement in the control plane

ABOUT RUN3D

We are an Oxford University spin-out company, dedicated to bringing the latest advances in running injury research to clinicians and runners.

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OUR CLINICS

Run3D is available through our expert clinical partners. Visit run3d.co.uk to find your nearest provider.

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Visit run3d.co.uk for further information.

References

Allison, K., Hall, M. Wrigley, T. et al. 2018, Sex-specific walking kinematics and kinetics in individuals with unilateral symptomatic hip osteoarthritis: A cross sectional study, Gait & Posture, Vol. 65, pp. 234-239.

Beaulieu, M., Lamontagne, M., Beaule, P. 2010, Lower limb biomechanics during gait do not return to normal following total hip arthroplasty, Gait and Posture, Vol. 32, pp. 269-273.

Bennette, D., Humphreys, L, et al. 2008, Gait kinematics of age-stratified hip replacement patients – a large scale, long-term follow-up study, Gait and Posture, Vol. 28, pp. 194-200.

Bejek, Z., Paroczai, R., Illyes, A., & Kiss, R. 2006, The influence of walking speed on gait parameters in healthy people and in patients with osteoarthritis, Knee Surg Sports Traumatol Arthrosc, Vol. 14, pp. 612-622.

Dujardin F, AucouturierT, Bocquet G, et al. 1998, Kinematics of the healthy and arthritic hip joint during walking. A study of 136 subjects. Rev Chir Orthop Reparatrice Appar Mot. 84:689-699

Eitzen I, Fernandes L, Nordsletten L, Risberg MA. 2012, Sagittal plane gait characteristics in hip osteoarthritis patients with mild to moderate symptoms compared to healthy controls: a cross-sectional study. BMC Musculoskelet Disord. 2012;13:258. http://dx.doi.org/10.1186/1471-2474-13-258

Eitzen, I., Fernandes, L., Kallerud, H., Nordseltten, L., Knarr, B., & Risberg, M. 2015, Gait Characteristics, Symptoms, and Function in Persons with Hip Osteoarthritis: A longitudinal study with 6 to 7 years of follow-up, Journal Of Orthopaedic & Sports Physical Therapy, Vol 45, No. 7, pp. 539 – 549

Foucher, K. Hurwitz, D., Wimmer, M., 2007. Preoperative gait adaptations persist one year after surgery in clinically well-functioning total hip replacement patients, Journal of Biomechanics, Vol. 40, pp. 3432-3437.

Foucher, K., Hurwitz, D., Wimmer, M., 2009. Relative importance of gait vs. joint positioning on hip contact forces after total hip replacement, Journal of Orthopedics, Res. Vol. 27, pp. 1576-1582.

Levine, D., Richards, J., Whittle, M. 2012, Whittles Gait Analysis, Churchill Livingstone Elsevier, 5 th Edition.

Nankaku, M., Tsuboyama, T., Kakinoki, R., et al, 2007. Gait analysis of patients early stages after total hip arthroplasty: effect of lateral trunk displacement on walking efficiency, Journal of Orthopedic Science, Vol. 12, pp. 550-554.

Nantel J., Termoz, N. Vendittoli, P., et al, 2009, Gait patterns of after total hip arthroplasty and surface replacement arthroplasty and surface replacement arthroplasty, Arch. Phys. Med. Rehabil. Vol. 90, pp. 463-469.

Ornetti, P., Laroche, D., Morisset, C., et al. 2011, Three dimensional kinematics of the lower limbs in hip osteoarthritis during walking, Journal of back and musculoskeletal rehabilitation, Vol. 24, pp. 201-208

Perron, M., Maolouin, F., Moffet, H., et al. 2000, Three-dimensional gait analysis in women with total hip arthroplasty, Clinical Biomechanics, Vol. 15, pp. 504-515.

Rutherford, D., Moreside, J, Wong, I. 2015, Knee joint motion and muscle activation patterns are altered during gait in individuals with moderate hip osteoarthritis compared to asymptomatic cohort, Clinical Biomechanics, Vol 30. Pp. 578-584.

Schmitt, D., Vap, A., &Queen, R. 2015. Effect of end-stage hip, knee and ankle osteoarthritis on walking mechanics, Gait & Posture, Vol. 42, pp. 373-379.

Thurston, A., 1985, Spinal and Pelvic Kinematics in Osteoarthrosis of the Hip Joint, Spine, Vol. 10, No. 5, pp 467

Watelain E, Dujardin F, Babier F, Dubois D, Allard P. Pelvic and lower limb compensatory actions of subjects in an early stage of hip osteoarthritis. Arch Phys Med Rehabil. 2001;82:1705-1711. http://dx.doi.org/10.1053/ apmr.2001.26812

Zeni, J., Pozzi, F, Abujaber, S., Miller, L., 2015, Relationship between physical impairments and movement patterns during gait in patients with end-stage hip osteoarthritis, Journal of Orthopaedic Research, Vol 33, pp. 382 – 389.