



The STAK Tool (*Self-Treatment Assisted Knee*)

Tackling Arthrofibrosis Post-TKR – Innovations in Rehabilitation

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STAKOrtho



STAK Orthopaedics Ltd



WE'RE SPEAKING AT **THE PRIMARY CARE SHOW 2025**



Sara Aspinall

PhD, MSc, BSc (Hons) Physiotherapy, MCSP
Director, STAK Orthopaedics



Liz Jacobs

Extended Scope Practitioner (Knee), The Royal
Devon and Exeter NHS Foundation Trust

TACKLING ARTHROFIBROSIS POST-TKR – INNOVATIONS IN REHABILITATION



WEDNESDAY, 14 – 15 May 2025



NEC Birmingham

Introduction:

Sara Aspinall

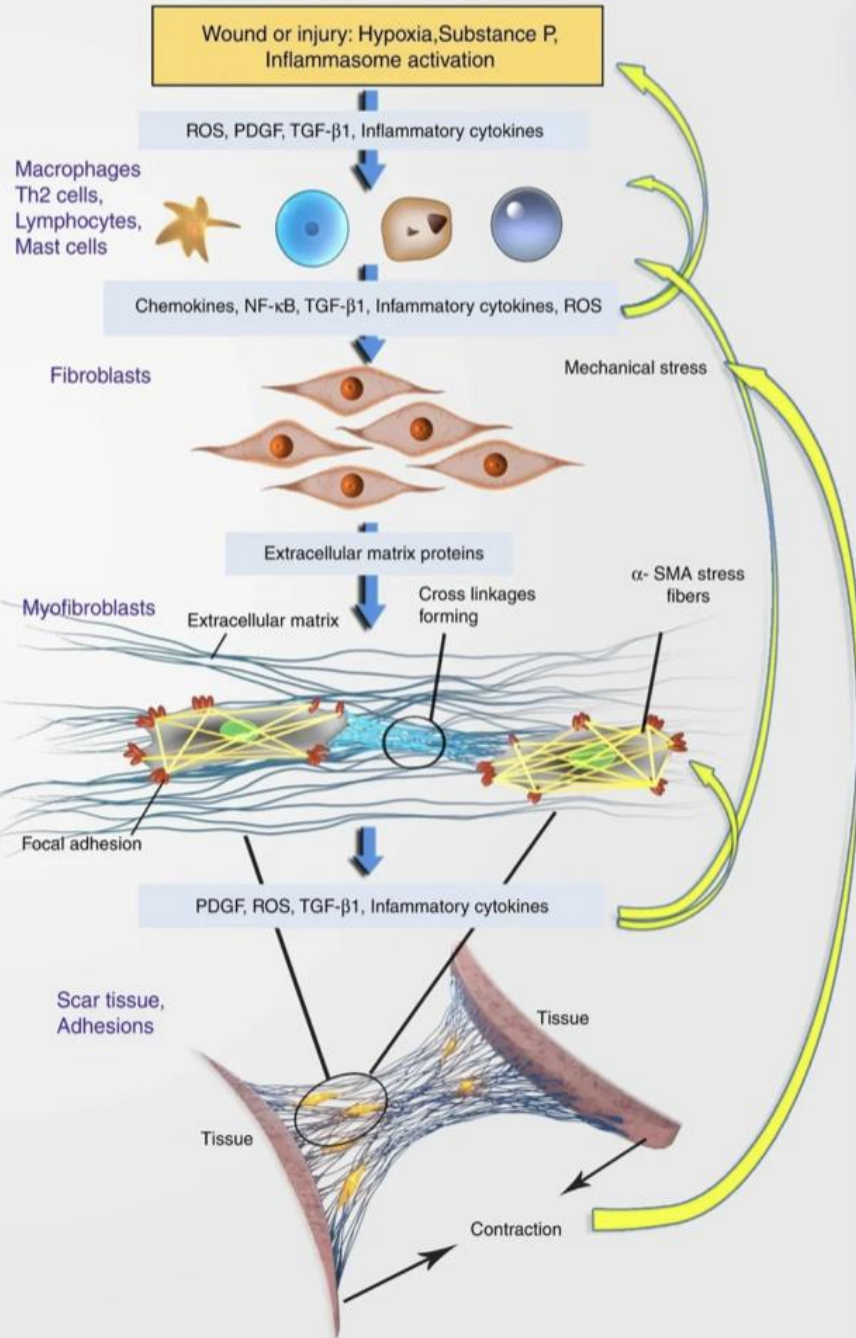
- Practicing Physiotherapist (18 years)
- Idea for device evolved from a patient collaboration
- Leicester Hospitals Charity funding: £6500
- PhD – supported by Loughborough University
- Set up and completed Clinical Trial at UHL NHS Trust

Our mission is to:

- Transform the lives of knee replacement patients
- Reducing pain, improving ROM, function and quality of life
- Eliminating the need for MUA and further surgery.
- **Facilitates remote monitoring/support through virtual appointments offering flexible treatment options.**

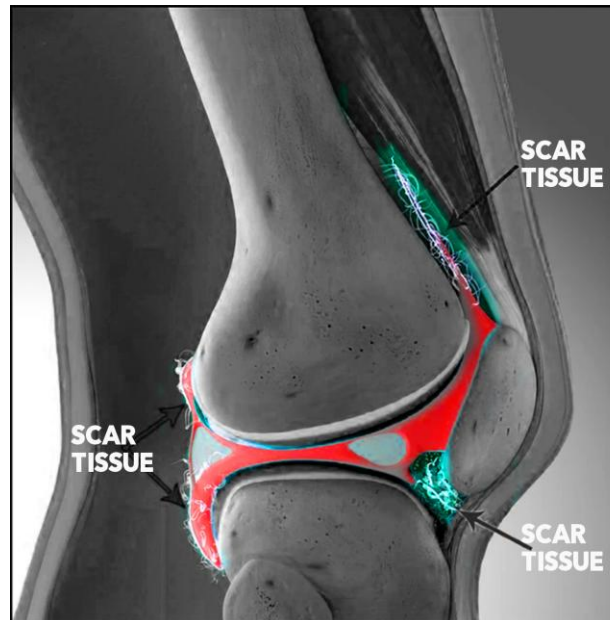
STAK Tool – A ‘WIN WIN’ SOLUTION





What is arthrofibrosis?

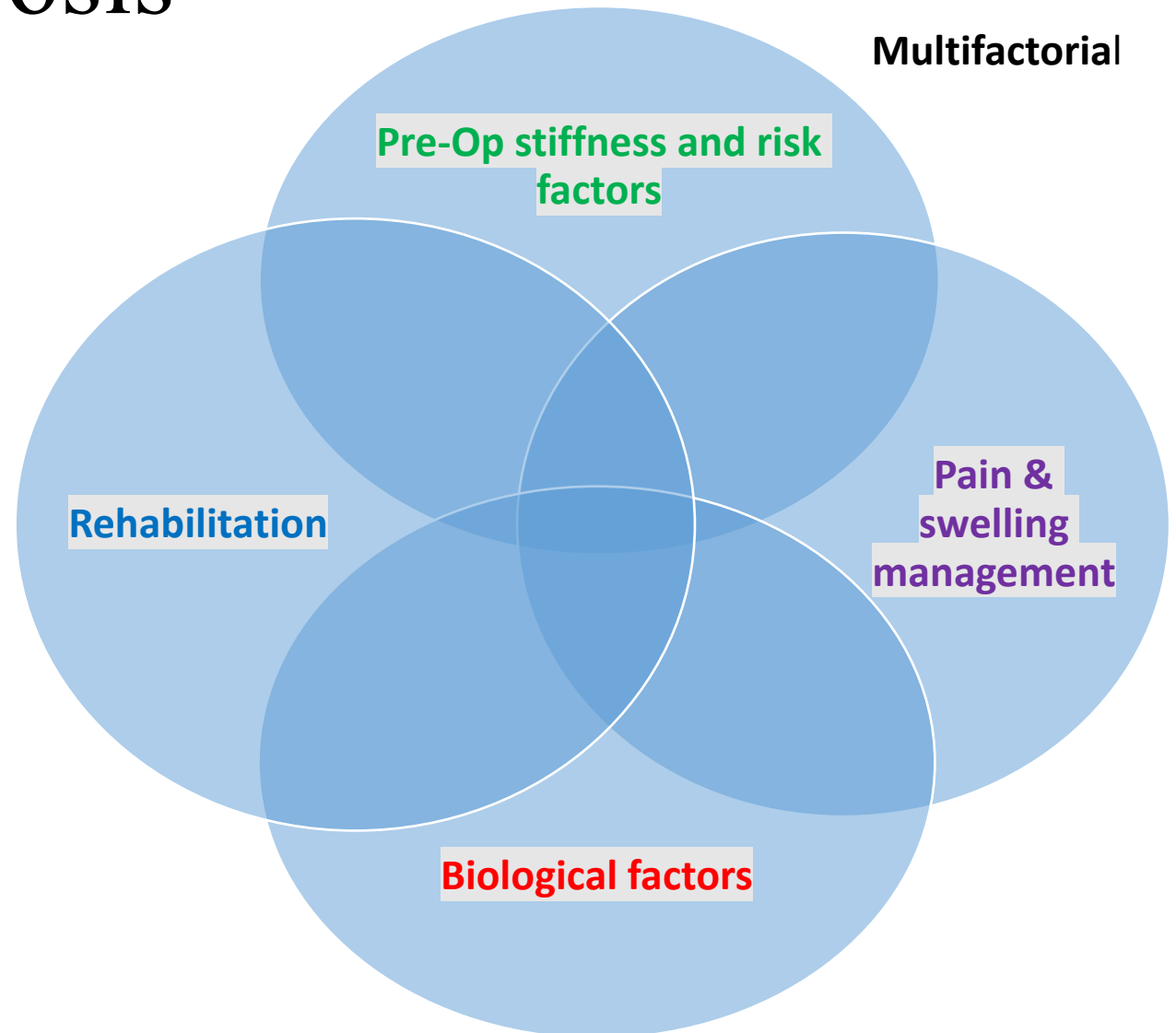
- Exaggerated inflammatory response to injury or surgical procedure.
- Followed by the production of fibroblastic cells and an increase in the deposition of extracellular matrix proteins → dense scar tissue.
- Uninhibited proliferation of fibro-connective tissue
- Functional cell types replaced by connective tissue.



Causes of post surgical stiffness (PSF)/ /fibrosis / arthrofibrosis

- PSF defined as “fibrosis of the soft tissues that was not present pre-operatively, and not due to other causes such as prosthetic conflict, pain or infection”

(Kalson et al. 2016)



CLASSIFICATION OF POST SURGICAL FIBROSIS

Post-Surgical Fibrosis (PSF) classification is crucial for assessing knee stiffness following joint surgeries like total knee replacement

Severity	Flexion	Extension
Mild	90°-100°	5°-10°
Moderate	70°-89°	11°-20°
Severe	<70°	>20°

Base on an international consensus (Kalson et al. 2016)

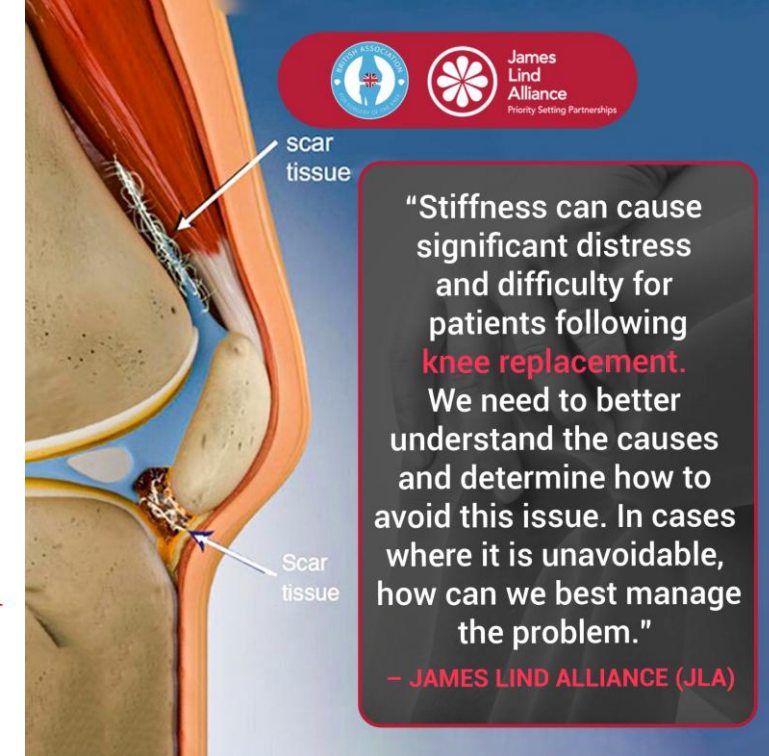
1 in 5 patients are
not satisfied

with the results of
their total knee
replacement surgery.¹



Exponential growth in arthrofibrosis following TKR

- ▶ Over 100,000 TKR UK in 2023
- ▶ 20% very dissatisfied
- ▶ 15% arthrofibrosis, 10% minimum severe arthrofibrosis
- ▶ New government is expanding TKR volumes
- ▶ Huge back logs
- ▶ Long waiting lists – more severe OA, ↓ROM pre op, more revision TKR



Range of movement for quality of life



→ 115° riding a bike



105° descending stairs

**110° needed for most
daily activities..**

ROM is Crucial for Quality of Life



→ 90° walking up slopes



Up to 120° to
manage chairs



QUALITY OF LIFE DESTROYED

▶ Below 80° ROM people have virtually no quality of life. Due to stiffness, pain and loss of ROM (Cheuy et al 2017)

▶ Eg Problems... sleeping, getting up off a chair, sitting, walking, managing stairs, getting in and out of a car.

▶ **Impact of all aspects of patients' lives – physically mentally, socially, financially**
- Leading to frustration and depression.



values by approximately 10° [31,32]. The severity of patients' poor health including pain, stiffness and physical function in this study are emphasised by one quarter of the patients reporting EQ-5D utility values of less than zero, which indicate that they consider their health state to be 'worse than death'. A probable explanation for

BREAKTHROUGH IN MANAGEMENT OF PATIENTS WITH STIFFNESS AND LOSS OF ROM FOLLOWING TKR:

Conclusion:

If 82° ROM is not achieved by 4 weeks post-surgery, they are very unlikely to reach 90° ROM by 8 weeks.

Implications for Practice

Monitoring: <50° on day 1 post-op require careful monitoring.

Action: 4 weeks <82° = STAK

MUSCULOSKELETAL SURGERY (2019) 103:289–297
<https://doi.org/10.1007/s12306-019-00588-0>

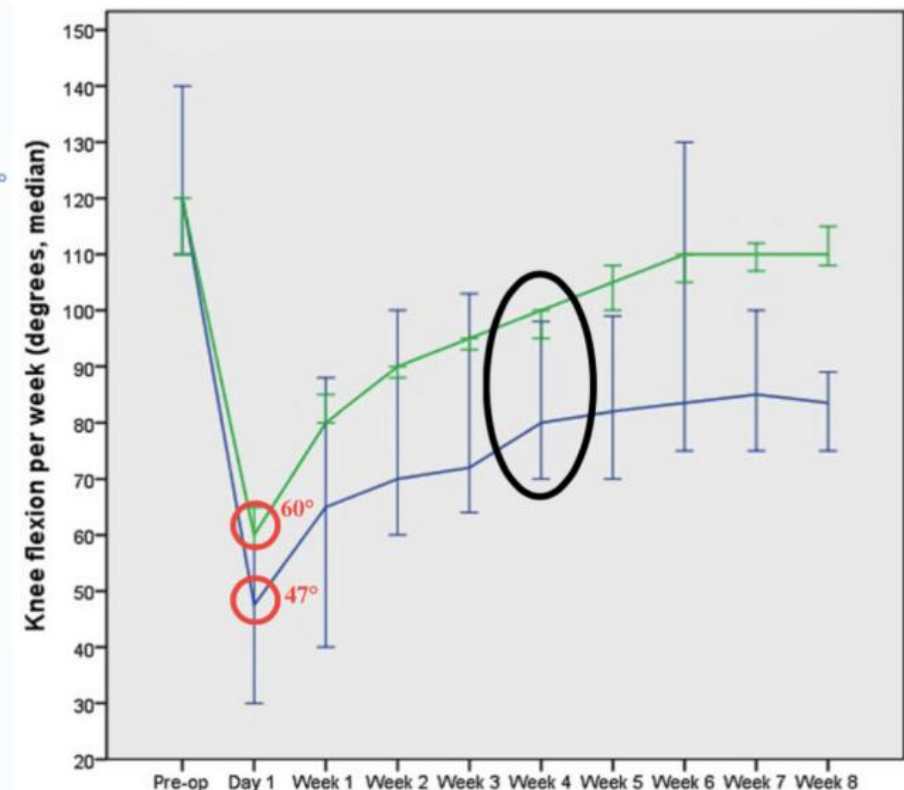
ORIGINAL ARTICLE



Recovery of knee range of motion after total knee arthroplasty in the first postoperative weeks: poor recovery can be detected early

A. Kornuijt¹ · G. J. L. de Kort² · D. Das² · A. F. Lenssen³ · W. van der Weegen²

Sufficient ROM group >90°
Insufficient ROM group <90°
At 8 weeks of postoperatively



The STAK tool: evaluation of a new device to treat arthrofibrosis and poor range of movement following total knee arthroplasty and major knee surgery



The STAK tool for preventing and treating knee stiffness

Medtech innovation briefing

Published: 9 February 2021

www.nice.org.uk/guidance/mib252



8 weeks STAK versus 8 weeks standard treatment and maintained at long term follow up

Mean ROM increase **30°** **8°** (p<0.0001)

WOMAC Score increase: **19** **3** (p<0.0001)

(Pain, Stiffness and Physical Function)

4 had undergone failed MUA prior to entering study

Standard Treatment – daily HIS not possible

- ▶ Insufficient appointments
- ▶ High Intensity Stretching to end joint range is needed EVERY DAY.
- ▶ Home exercises not specific to the knee - torque 10% of torque applied by a physiotherapist (Uhl et al 2011)

Problem: Patients unable to generate the high intensity stretch necessary to breakdown scar tissue and increase ROM every day using standard physiotherapy home exercises.

Escalation of treatment

- ▶ Manipulation under anaesthetic → revision surgery



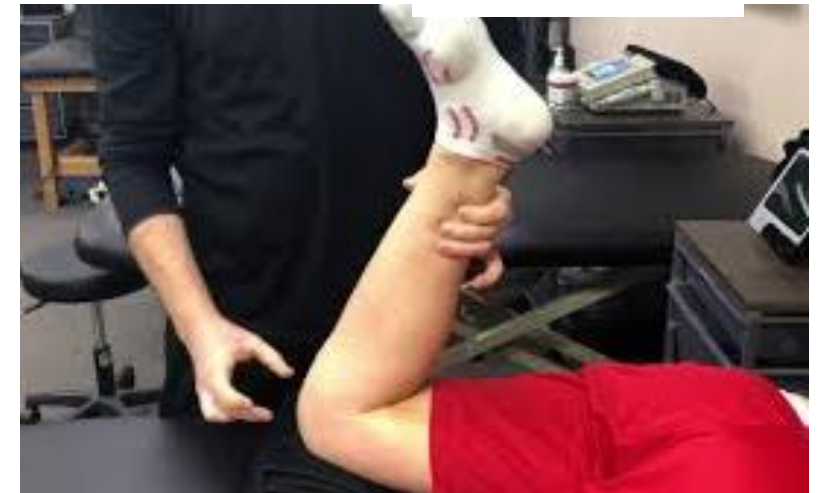
Low Intensity- Home Exercise Programmes

Home Exercises: 10% of torque applied by physiotherapist
Uhl et al (2011)



High Intensity Physiotherapy

For treatment to be effective tissues must be stretched every 24 hours(*Jacobs and Sciascia 2011*)



Manipulation under anaesthetic (MUA)

- Associated Risks (Eg quadriceps tendon rupture, fracture, may require GA) (Magit 2007)
- Good results (Esler 1999; Maloney 2001; Pariente 2006)
- Cost implications MUA ≈£5000
- Requires an anaesthetist
- Requires inpatient stay in hospital
- CMP machine required whilst in hospital
- Extra Outpatient Physiotherapy/Hydrotherapy

Treatments for arthrofibrosis- Stretching theory

- All connective tissue has the ability to stretch after it has been shortened due to its viscoelastic properties, including arthrofibrotic tissue.
- For treatment to be effective tissues must be stretched **every 24 hours** (Jacobs and Sciascia 2011)
- Elastic deformation - tissue reverts back to its original length once the force is removed
- Plastic deformation leads to permanent elongation and remodeling of the tissues (McElroy 2011)
- **Essential if ROM is to be restored.**

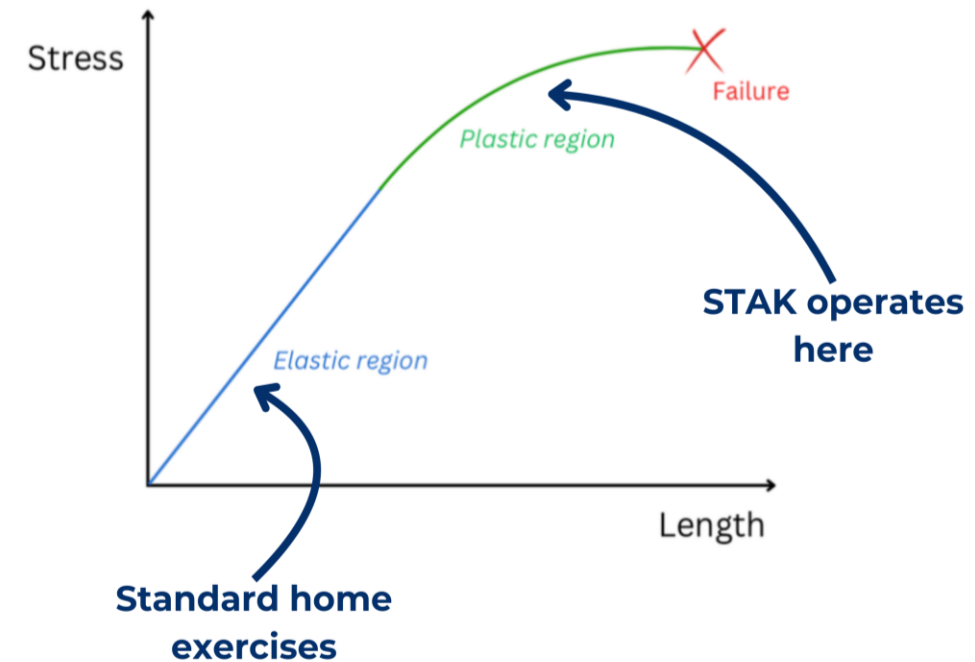


Fig. 1 Illustrating the length tension curve

- **Class 1 Medical Device**
- **High Intensity Stretch**
- **3 x 20 mins a day**
- **Patient in control of pain threshold**



- **Innovative**
- **Motivating**
- **Easy to use**



- Improves
 - ✓ knee flexion
 - ✓ extension
 - ✓ strength
- ✓ reduces Pain & swelling

USE DAILY AT HOME

- 3 x 20 mins a day
- Patient in control of pain threshold
- High Intensity Stretch
- Remote monitoring possible

Innovative
Motivating
Easy to use

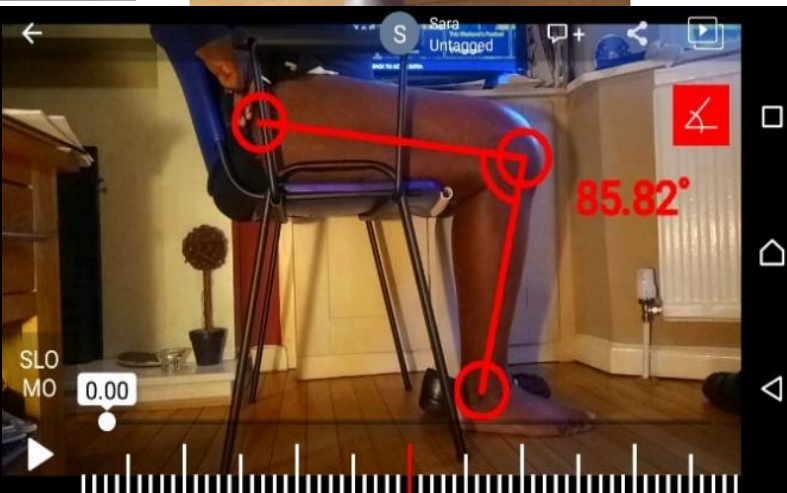
- Jacqueline
<https://youtu.be/DVuPLf84qME>



Clinician's Role

- Education
- Stretch on STAK - Immediate improvement
- Reassurance regarding pain relief
- Tailor STAK programme to individual
- Measure ROM
- Set targets / motivate
- Guide treatment

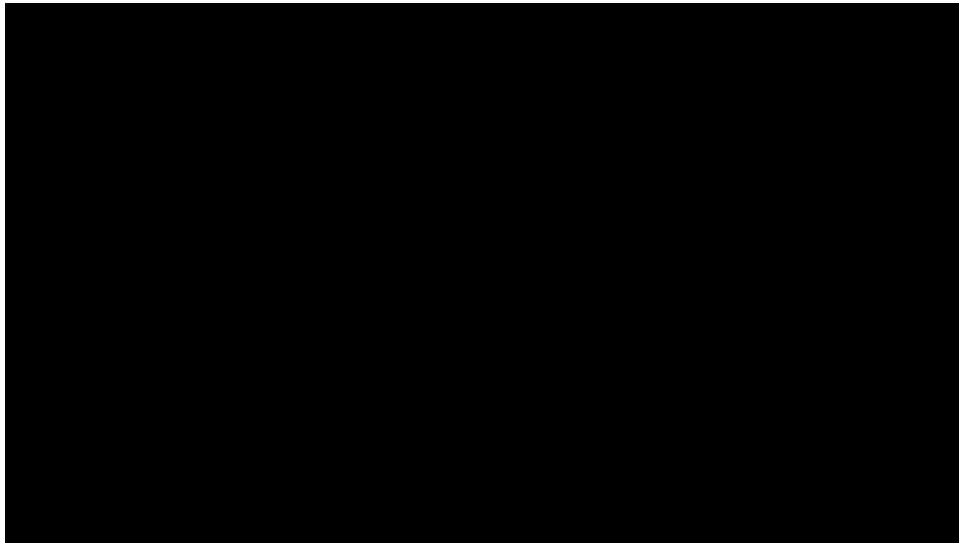




MUA severe arthrofibrosis – Meds
 Oramorph, codeine
 Diclofenac suppository
 Early Rx <5/7

54 years male
 4/12 post TKR
 (9 days post MUA)
 44° - 94°(increase 50°)

Patients' Stretching Techniques - Videos



<https://vimeo.com/742958930/75bc7b5990> Sandy Stretching Technique - 3 years following TKR
Prior to STAK was on pain patch – now pain free and no medication.

[Barbara: Static stretch at 6 weeks post TKR on Vimeo](#) = Barbara 5 weeks

[Barbara at 6wks - Static stretching technique hip off of chair on Vimeo](#) = Barbara – 6 weeks later

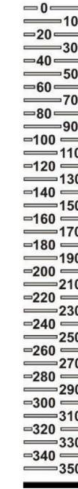
Patient Instructions videos

- Introduction
- Warm up
- STAK Technique
- Interim Exercises
- Cool Down

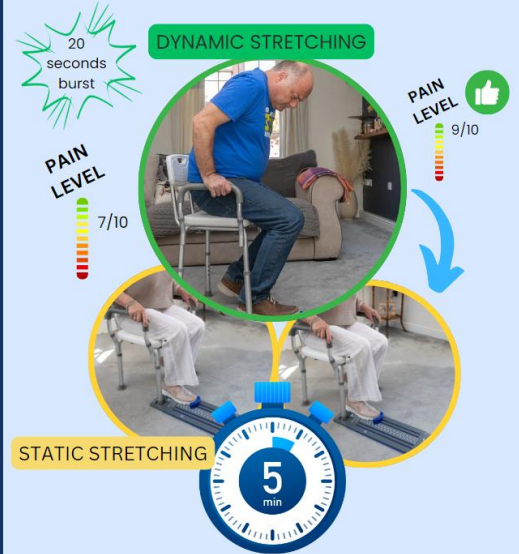
-Clinician Training video

STAK MEASURING TOOL

Please draw a line and tally on the scale below, the point on the scale you achieve and date it after each session you have used the STAK tool

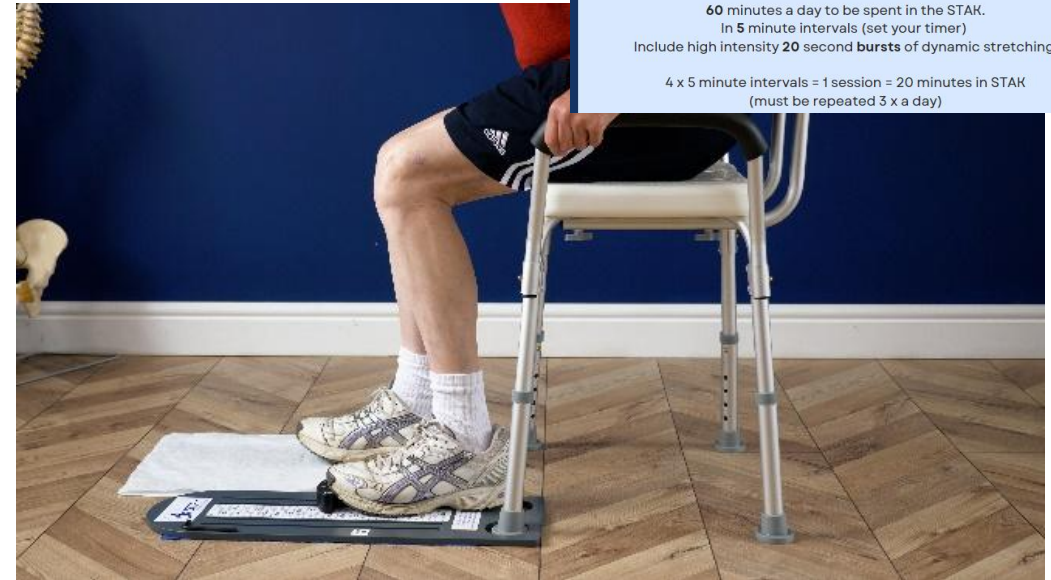


HOW TO STRETCH



60 minutes a day to be spent in the STAK.
In 5 minute intervals (set your timer)
Include high intensity 20 second bursts of dynamic stretching

4 x 5 minute intervals = 1 session = 20 minutes in STAK
(must be repeated 3 x a day)



STAK Tool Advantages

- MOTIVATIONAL scale
 - Promotes patient SELF-RESPONSIBILITY
 - REMOTE MONITORING of patient's progress
 - Patient in CONTROL of stretch/pain threshold
 - Usable at HOME and in hospital
-
- Potential for **Radical Improvements in Patient Treatment**
 - ££££ - **Cost Saving** for NHS and create potential **Revenue**

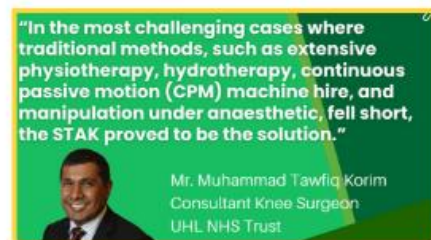
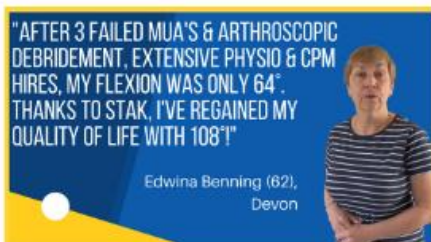




TESTIMONIALS & ENDORSEMENTS



Mr Jonathon Phillips (Orthopaedic Knee Consultant)





"Patients can do intense stretching at home in between our sessions. They control the stretch intensity and we can track progress easily using the motivational scale."

Jack Codd,
Physiotherapy Assistant,
Exeter Knee Reconstruction Unit

"In the most challenging cases where traditional methods, such as extensive physiotherapy, hydrotherapy, continuous passive motion (CPM) machine hire, and manipulation under anaesthetic, fell short, the STAK proved to be the solution."



Mr. Muhammad Tawfiq Korim
Consultant Knee Surgeon
UHL NHS Trust

Thank you for listening, questions please.



"TKR stiffness is a top priority, requiring ongoing innovation. The STAK significantly improves our non-surgical approach to this challenging issue"

Professor Andrew Toms,
National Clinical Lead for Revision Knee
Surgery



"There is only a finite amount of physiotherapy resource in both public and private sectors, STAK provides a measurable outcome improvement."

Professor Robert Ashford,
Consultant Musculoskeletal
Tumour & Joint Reconstruction
Surgeon

TESTIMONIALS

1. [Martin](#)
2. [Rhiannon](#)
3. [Phil](#)

"IT FEELS GOOD, A LOT BETTER,
IT FEELS AS IF IT'S LOOSENING
SOMETHING OFF AND I CAN
BEND IT MORE ALREADY!"

(AFTER USING THE STAK FOR ONE WEEK)

Lyndsey (47),
Market Harborough

AFTER 6 WEEKS "I'M NOW
BACK RIDING MY BIKE,
COACHING NETBALL AND
I'VE GOT MY LIFE BACK!"

Lyndsey (47),
Market Harborough



"AFTER 3 FAILED MUA'S & ARTHROSCOPIC
DEBRIDEMENT, EXTENSIVE PHYSIO & CPM
HIRES, MY FLEXION WAS ONLY 64°.
THANKS TO STAK, I'VE REGAINED MY
QUALITY OF LIFE WITH 108°!"

Edwina Benning (62),
Devon



"THE STAK WAS
FANTASTIC, YOU
COULD SEE AND FEEL
THE IMPROVEMENT"

Sheila (78),
Melton Mowbray



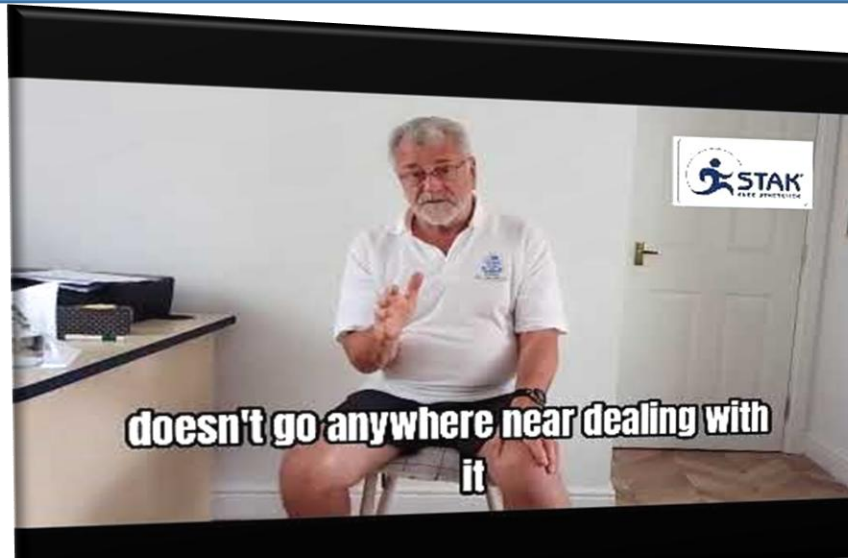
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- ▶ <http://getmotion.com/products-and-services/knees-and-ankles> (flexionater)

Videos – Patients' Views On Standard Treatment



Standard treatment

Physiotherapy to meet individual patient's needs including:-

- ▶ Advice and education
- ▶ AROM, PROM, strengthening exercises, home exercise programme
- ▶ Classes, hydrotherapy

Manual Therapy

- ▶ Accessory Movements
- ▶ Passive Physiological Stretching (high intensity stretching) (Maitland, 1973)
- ▶ MET's (muscle energy techniques) (Colby 2012, Chow 2010)

Problem: 1 session every 2 weeks is inadequate

- ▶ Manipulation under anaesthetic