

Uncovering the Effect of Foot Orthoses in Patients with Midfoot Arthritis

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The logo for ITHACA, featuring the word "ITHACA" in a bold, serif font, enclosed in a white rectangular box.

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The logo for the University of Rochester, featuring the words "UNIVERSITY of" in a smaller font above "ROCHESTER" in a larger, bold, serif font, all enclosed in a white rectangular box.

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Introduction

- Arthritis: One of the leading causes of disability *(CDC, 2007)*
- Midfoot Arthritis: High potential for chronic secondary disability



Incidence and Prevalence

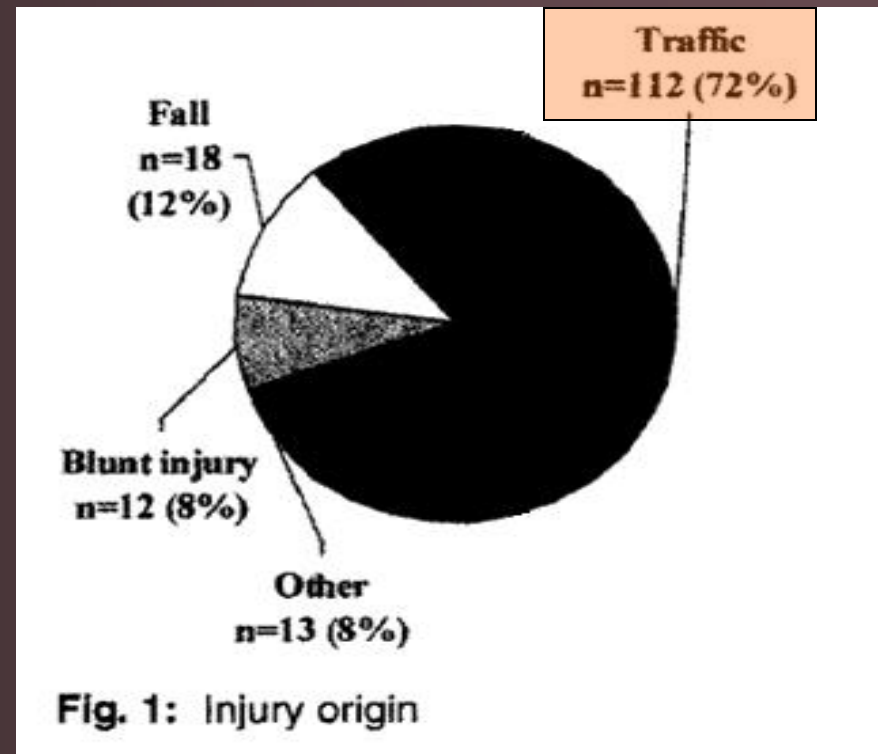
- Midfoot Injuries

- Alarming increase in incidence secondary to motor vehicle trauma.

(Smith et al. 2005)

- As many as 20% are missed or misdiagnosed.

(Goossens and De Stoop 1983)

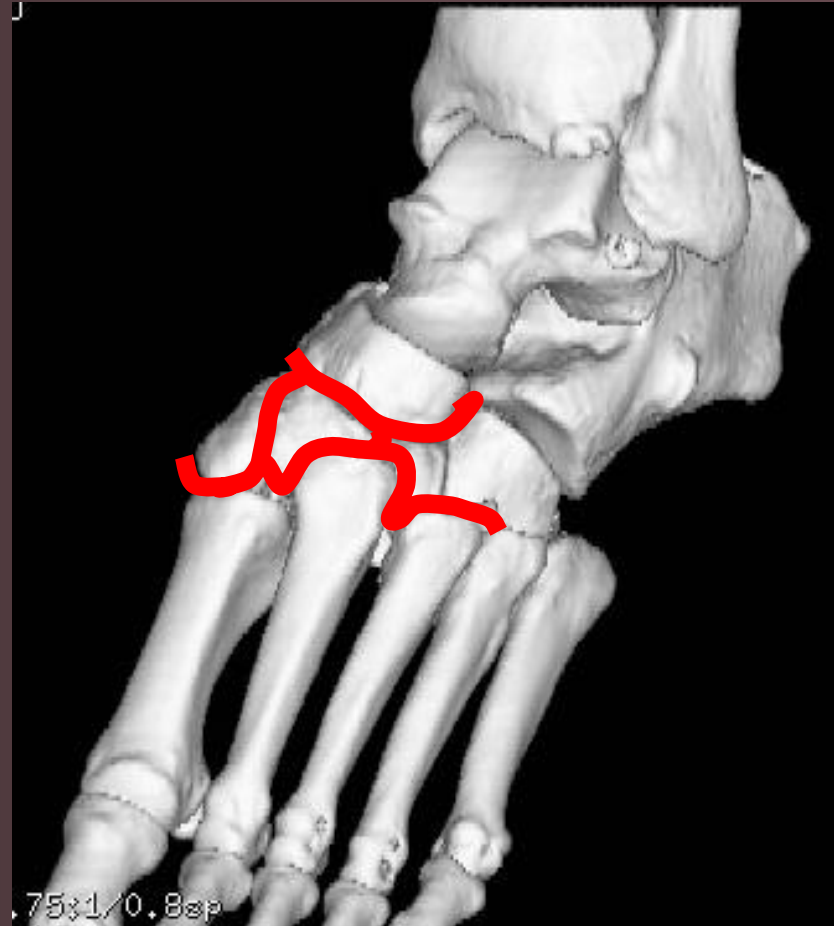


(Richter et al. 2001)

Surgical Management

- Operative intervention
 - Challenging!
 - Complex anatomy and function
- Surgical outcomes
 - Decreased pain
 - Only modest improvements in function

(Teng and Pinzur, 2002)





Arthrodesis of the TMT joints

- Complications following surgery
 - Non-union, broken screws and wound problems
 - May necessitate further surgery involving revision, arthrodesis, hardware removal



Conservative Management

- Orthotics
 - Viable alternative
 - Goal: Pain relief by modifying load at the tarsometatarsal complex
- Little objective evidence to guide prescription
 - Selection often a matter of trial and error
 - Increased expense
 - Equivocal outcomes



Custom molded three quarter length (3Q) orthoses

- Recommended treatment
- Clinical experience suggests variable efficacy



Full Length carbon graphite orthoses as an alternative

- Recent retrospective review
 - 56 patients with MFA
 - previous 3Q users with persistent midfoot complaints
 - 2 year follow-up

(Pletka et al 2006)



Full Length Carbon Graphite Foot Plate (FL)

- 63% reported a significant decrease (greater than 50%) in pain within four weeks of using the full length carbon foot plate (FL)
- However, mechanisms underlying pain relief unknown.

Purpose:

1. Assess the effect of 4 week intervention using the FL on pain and functional outcomes
2. Examine the effects of foot orthoses on segmental loading in patients with midfoot arthritis
 - Shoe alone
 - Shoe with 3Q insert
 - Shoe with FL insert

Subjects

- 17 female patients
 - Age: 62 (55 - 71) years
 - BMI: 30.4 (19.9 - 38.1)
- 13/17 used 3Q with persistent midfoot complaints
- Sought care at the University of Rochester's Outpatient Orthopedic Foot and Ankle Clinic
- Fellowship trained Foot and Ankle Orthopaedic Surgeon

Patient presentation

- Clinical:

- Pain on dorsum, localized to TMT region
- Aggravated by walking
- Stair descent



- Radiographic:

- Joint space reduction
- Osteophytes
- ‘Dorsal bossing’



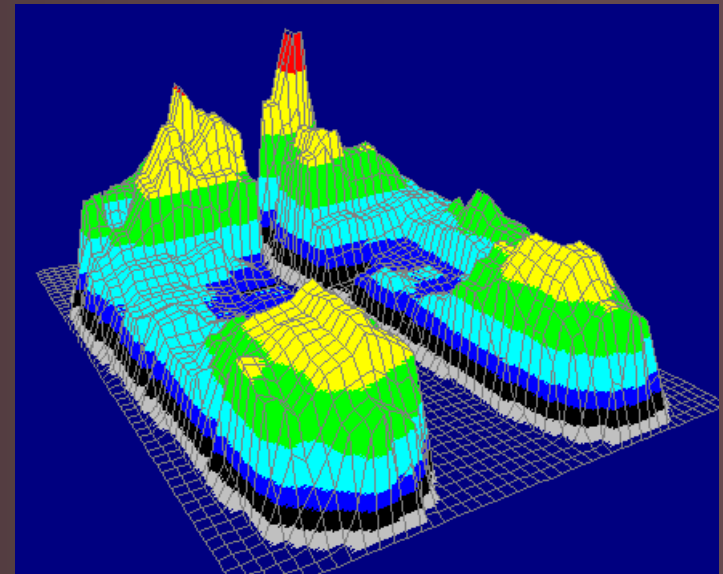
Functional Outcomes

- Foot Function Index – Revised (FFI-R)
 - Pain
 - Stiffness
 - Disability
 - Activity Limitation
 - Social

(Budiman-Mak, E et al, 2006)

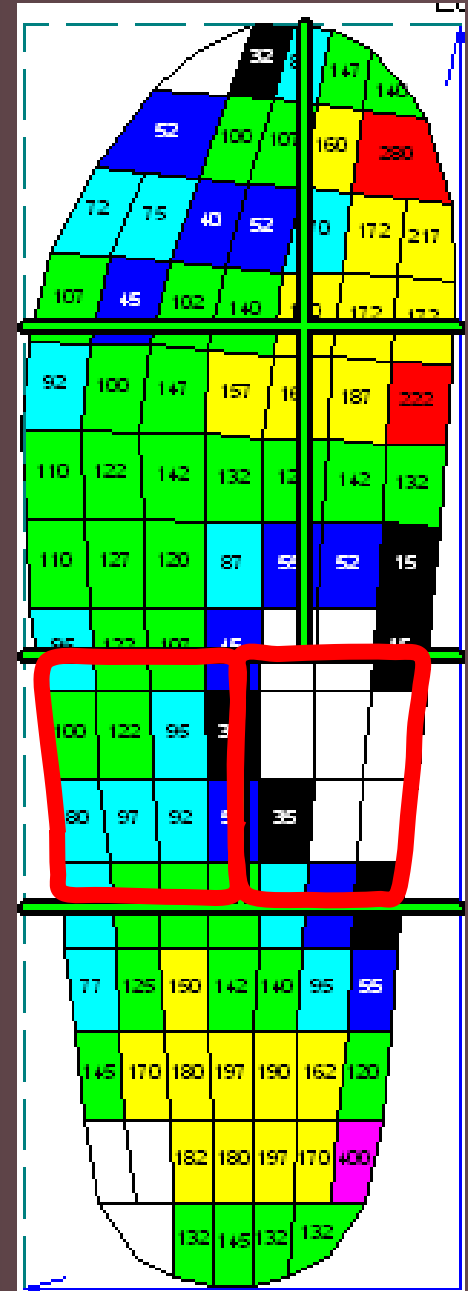
Plantar Loading

- Data Acquisition
 - Pedar™
 - Mid gait protocol
 - Patient-preferred walking speed
 - 15 steps collected for each condition
 - Same shoes for all walking conditions
 - Shoe alone
 - Shoe with 3Q
 - Shoe with FL



Plantar Loading Analysis

- Masks
 - Midfoot
 - Forefoot and Rearfoot
- Dependent variables
 - Average Pressure
 - Duration of Loading (Contact Time)



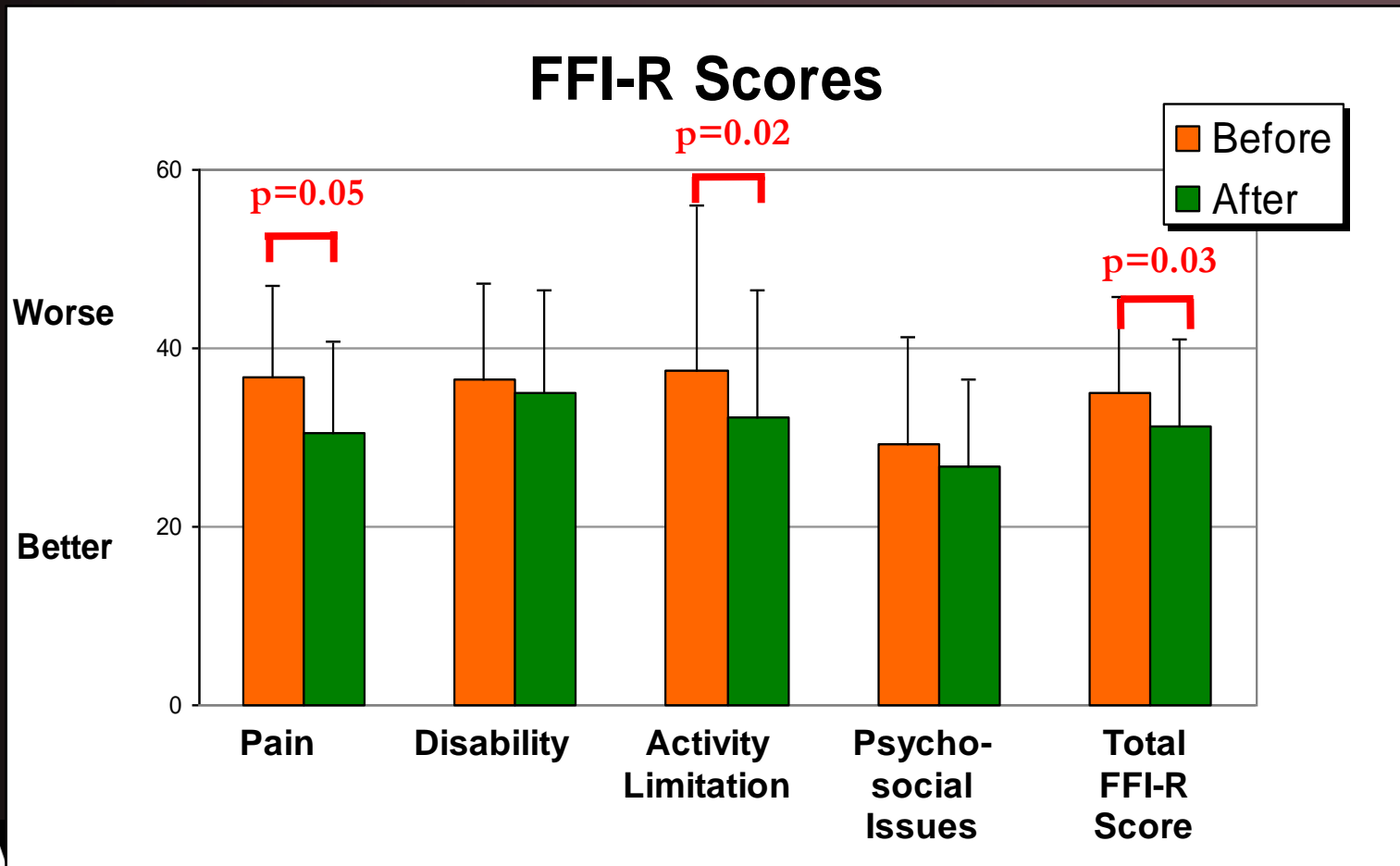
Statistical Analysis

- 5 steps analyzed for each condition
- Repeated measures ANOVA with Bonferroni post-hoc tests
- 3 subjects lost to follow-up

Results

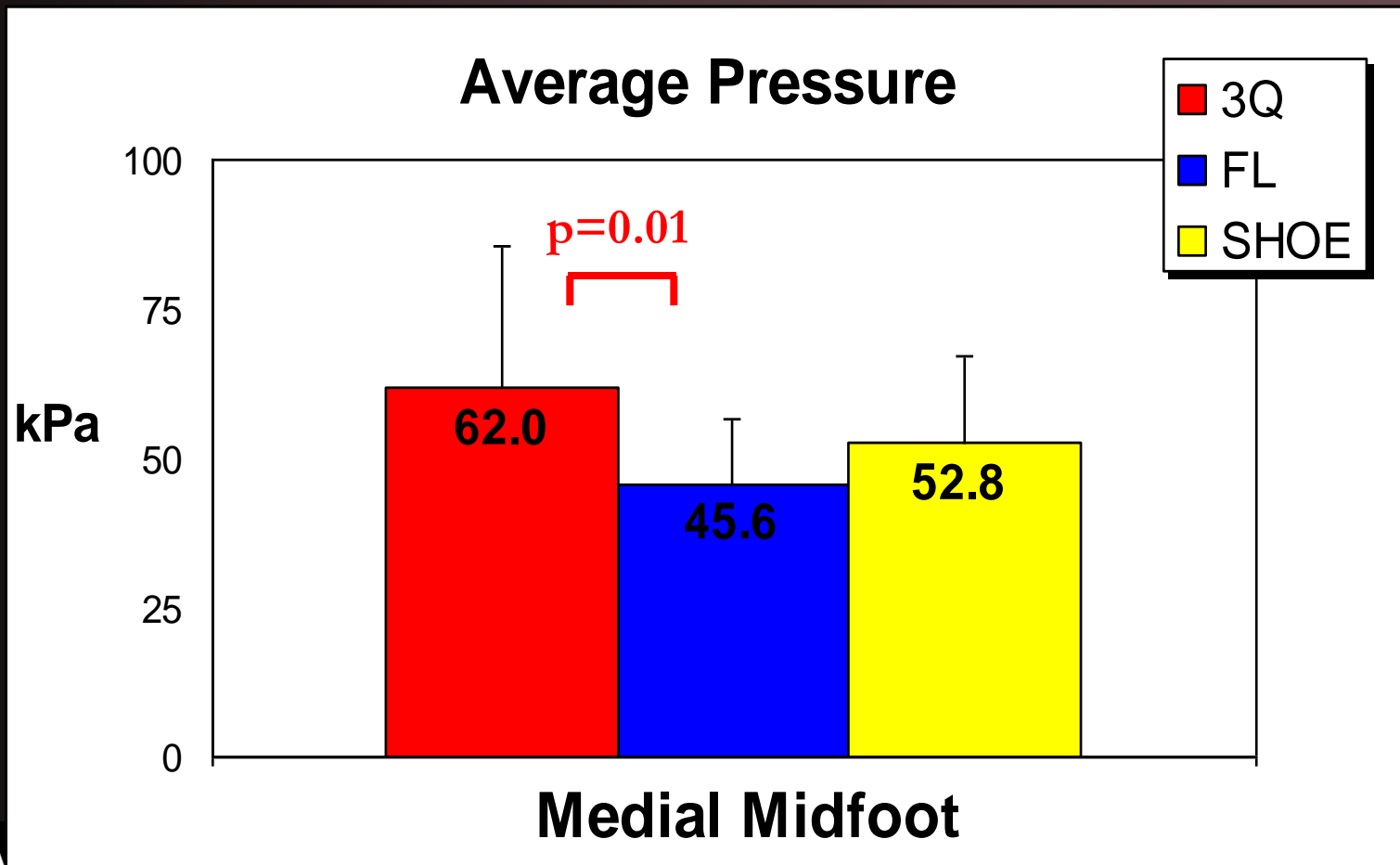
Pain and Functional Outcomes

Significant symptomatic improvement



Plantar Loading

Reduction in Medial Midfoot Average Pressure with FL when compared to 3Q

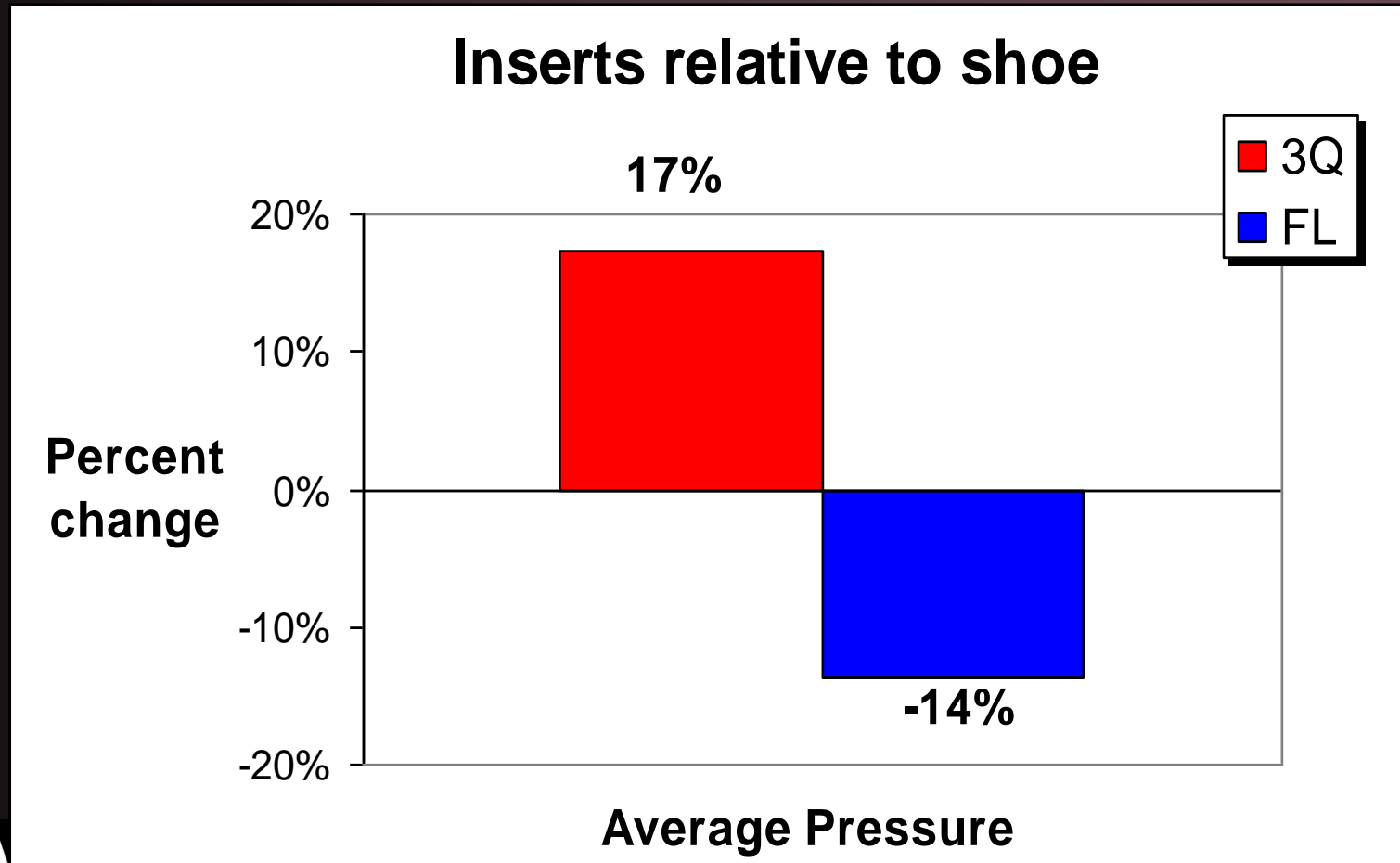


Medial midfoot average pressure

Compared to the Shoe Condition:

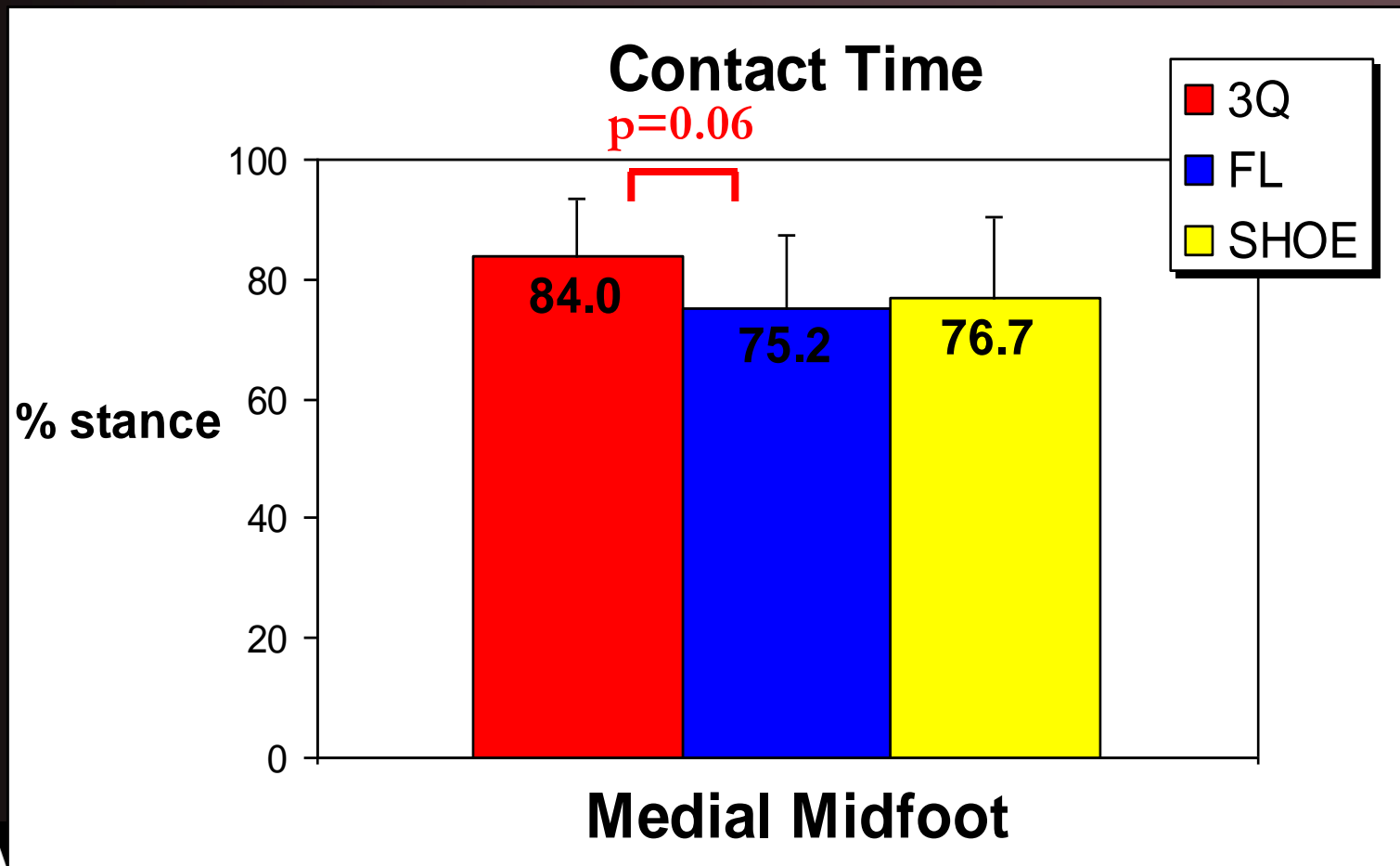
FL = 14% decrease

3Q = 17% increase

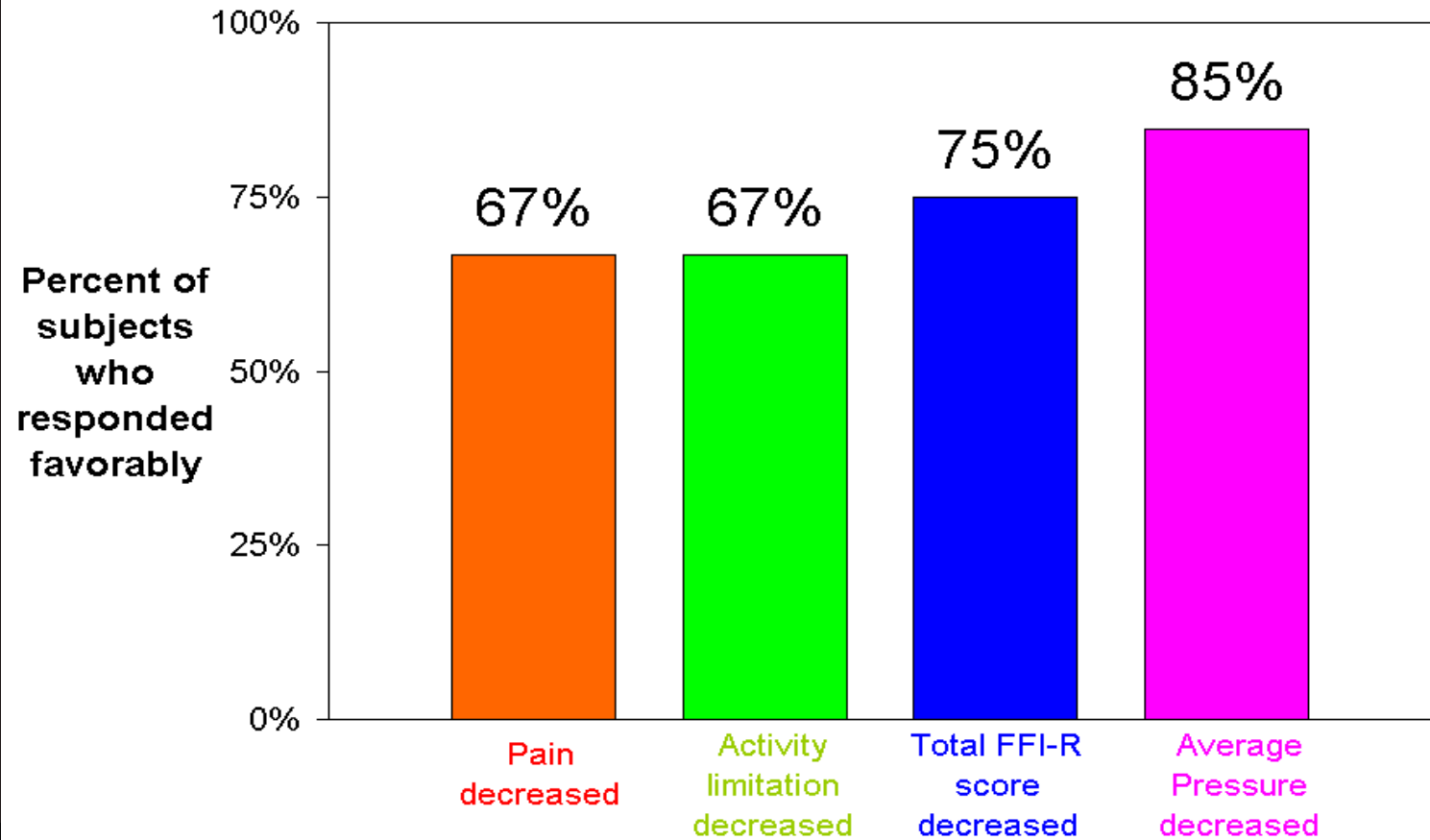


Contact Time

Reduction in Medial Midfoot Contact Time with FL compared to 3Q

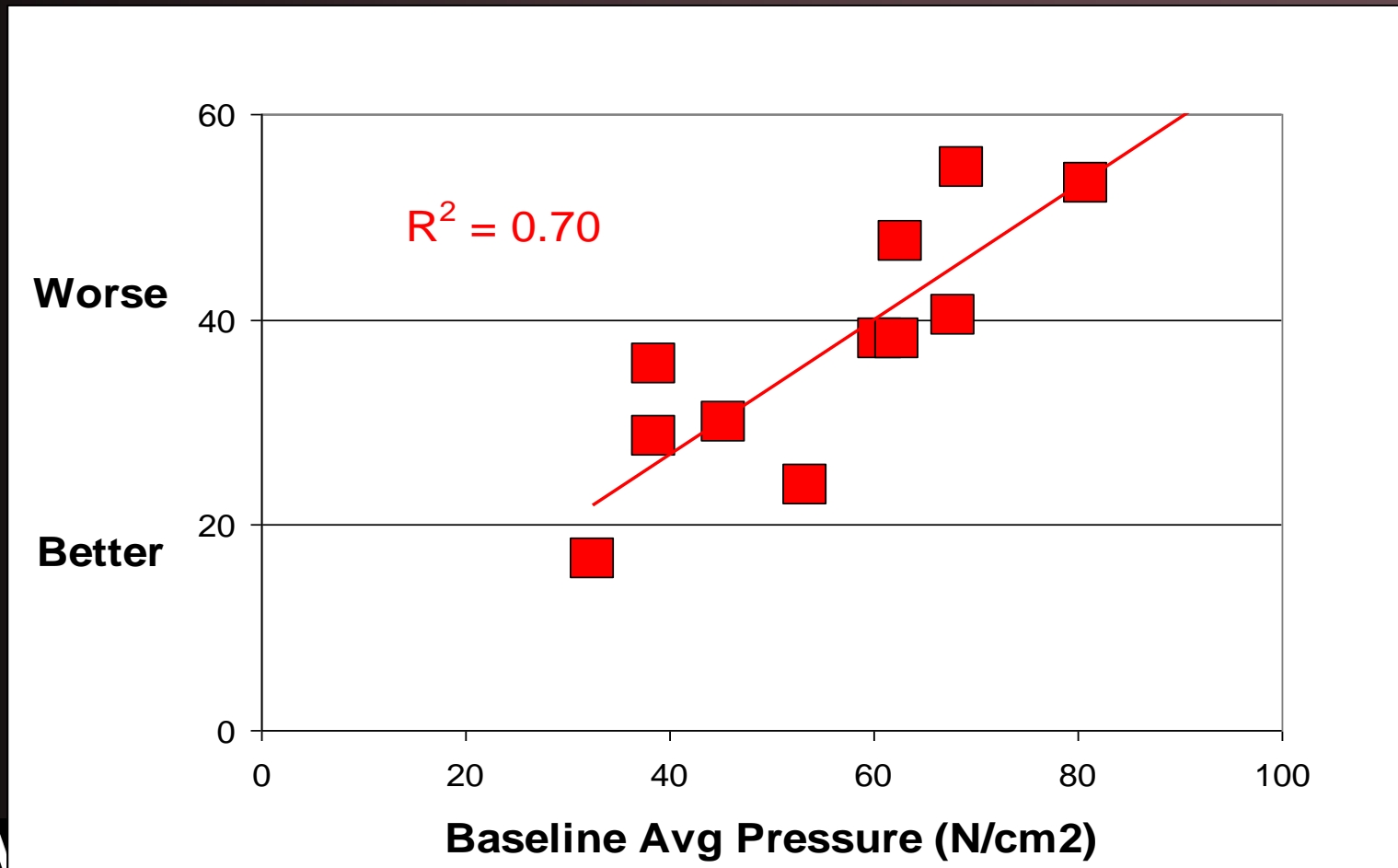


Variability of Patient Response to Orthotic Intervention

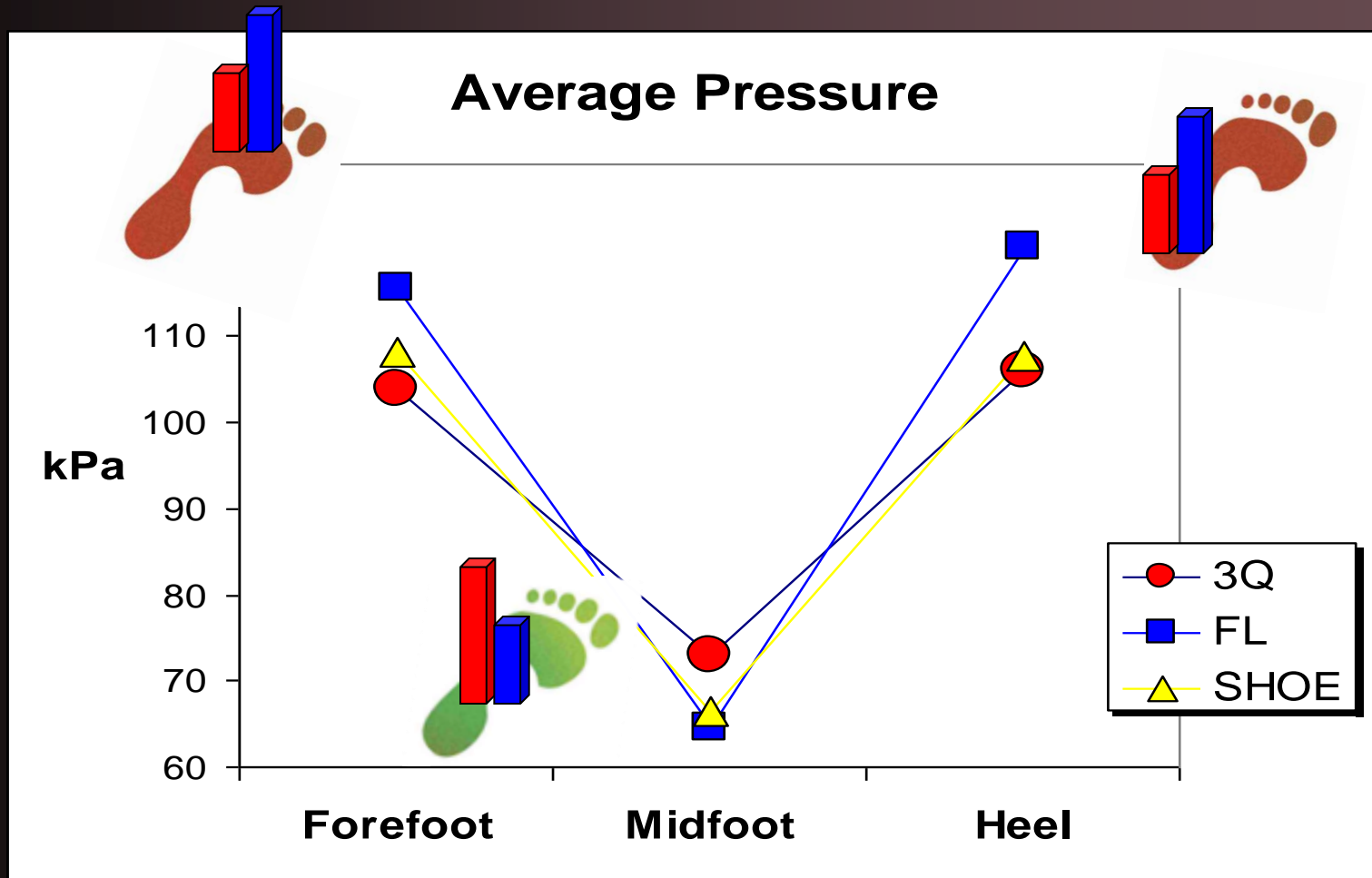


Factors contributing to Baseline Pain

Baseline average pressure explained
50-70% of the variance in pain ($p = 0.03$)



Load Redistribution with Orthoses Use

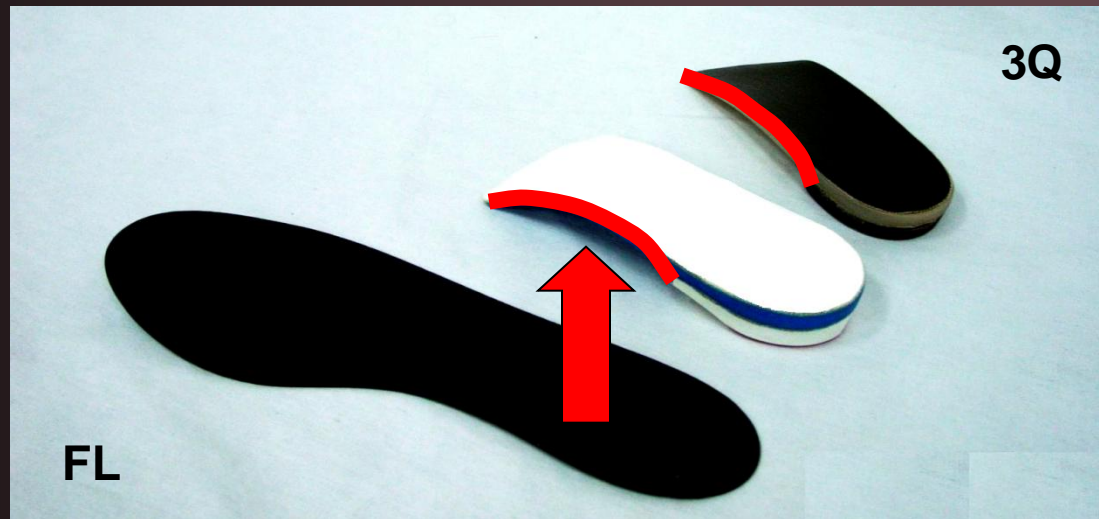


Key Findings

- FL effective in reducing **magnitude** and **duration** of medial midfoot loading in patients with MFA
- Reduction in loading accompanied by **pain relief** and **improved functional outcomes**
- Effective in over **75%**

Discussion

- Load redistribution
- Differences in loading may stem from design features



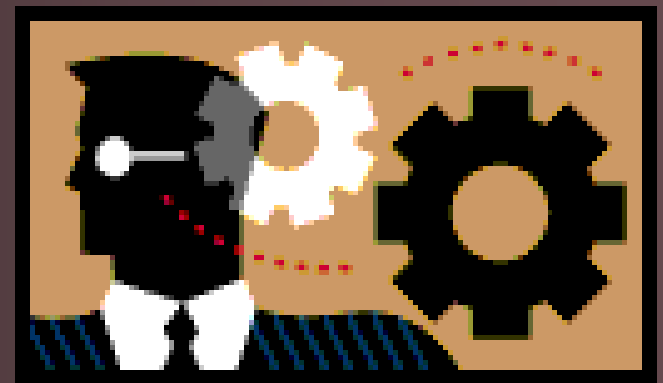
Discussion

- Implications for Costs
 - \$ 30-70 for FL
 - \$ 300-400 for 3Q
- Early effective intervention may delay the progression of degenerative symptoms



Limitations and Future Studies

- Research Design
- $n = 17$, enrollment continues
- Longer term follow-up
- Alternative hypotheses



Thank You!

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