

Interventions to Enhance Disease-Oriented and Patient-Oriented Impairments in Those with Chronic Ankle Instability

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Conflicts of Interest/Disclosures

N00014-18-C-2025

Department of Defense

Office of Naval Research

Role: Co-Investigator



W81XWH-17-DMRDP-CRMRP-NMSIRR

Department of Defense

Congressionally Directed Medical
Research Program

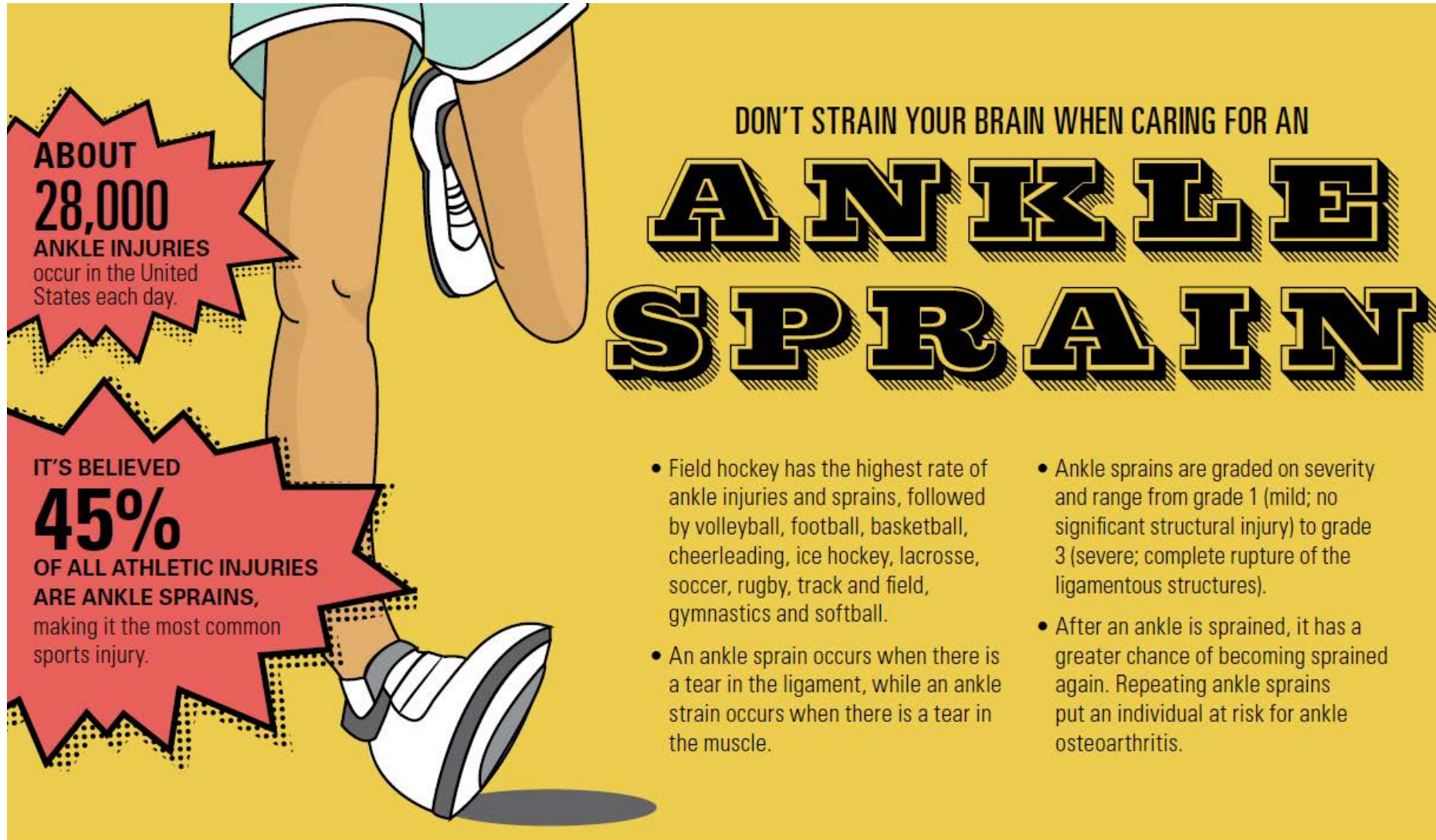
Role: Co-Investigator



Objectives

1. Understand the common disease and patient-oriented impairments associated with chronic ankle instability.
2. Analyze the efficacy of the available evidence based treatment strategies to improve the common impairments associated with chronic ankle instability.
3. Discuss the incorporation of a multifaceted treatment plan to address a holistic view of impairments in those with chronic ankle instability.

Ankle Sprains: A Public Health Issue



ABOUT 28,000
ANKLE INJURIES
occur in the United States each day.

IT'S BELIEVED 45%
OF ALL ATHLETIC INJURIES
ARE ANKLE SPRAINS,
making it the most common sports injury.

DON'T STRAIN YOUR BRAIN WHEN CARING FOR AN

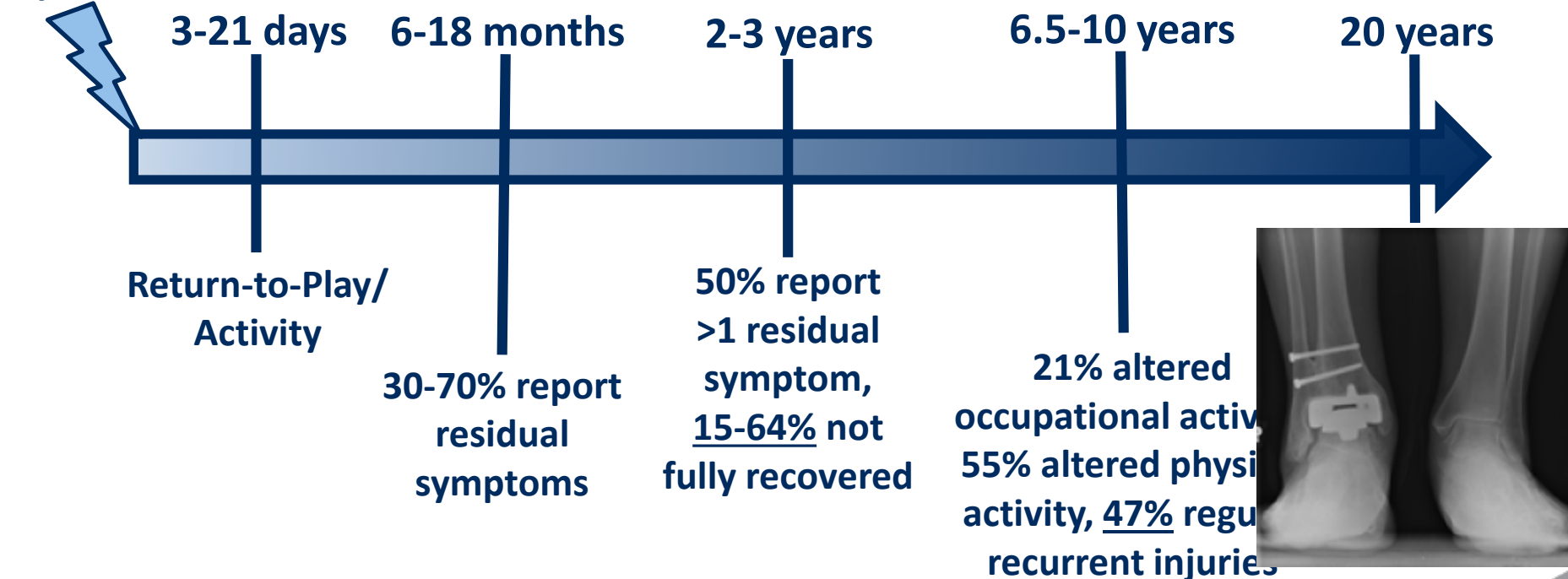
ANKLE SPRAIN

- Field hockey has the highest rate of ankle injuries and sprains, followed by volleyball, football, basketball, cheerleading, ice hockey, lacrosse, soccer, rugby, track and field, gymnastics and softball.
- An ankle sprain occurs when there is a tear in the ligament, while an ankle strain occurs when there is a tear in the muscle.
- Ankle sprains are graded on severity and range from grade 1 (mild; no significant structural injury) to grade 3 (severe; complete rupture of the ligamentous structures).
- After an ankle is sprained, it has a greater chance of becoming sprained again. Repeating ankle sprains put an individual at risk for ankle osteoarthritis.

Ankle Sprains: A Public Health Issue

Residual problems are common following ankle sprain
(pain, swelling, instability, weakness, re-injury)

Initial Ankle Sprain



Chronic Ankle Instability

Chronic ankle instability (CAI) is characterized by:

- Recurrent ankle sprains
- Residual symptoms
- Repetitive Episodes of Ankle instability (“Giving way”)

40%
Developed
CAI

Recovery From a First-Time Lateral Ankle Sprain and the Predictors of Chronic Ankle Instability

A Prospective Cohort Analysis

C
1 Cailbhe Doherty,^{*†} PhD, Chris Bleakley,[‡] BSc(Hons), PhD, Jay Hertel,[§] PhD, ATC, Brian Caulfield,[†] PhD, John Ryan,^{||} FCEM, FRCSEd, FFSEM, DCH, DipSportsMed, and Eamonn Delahunt,^{†¶} PhD

ability to
at 40 per
Freeman
cesses to

Chronic Ankle Instability

CAI has been associated with long-term consequences

- Decreased physical activity Hubbard-Turner 2015, Wikstrom et al. 2018
- Decreased health related quality of life Houston et al. 2015
- Risk for posttraumatic osteoarthritis Valdaerrabano et al 2006

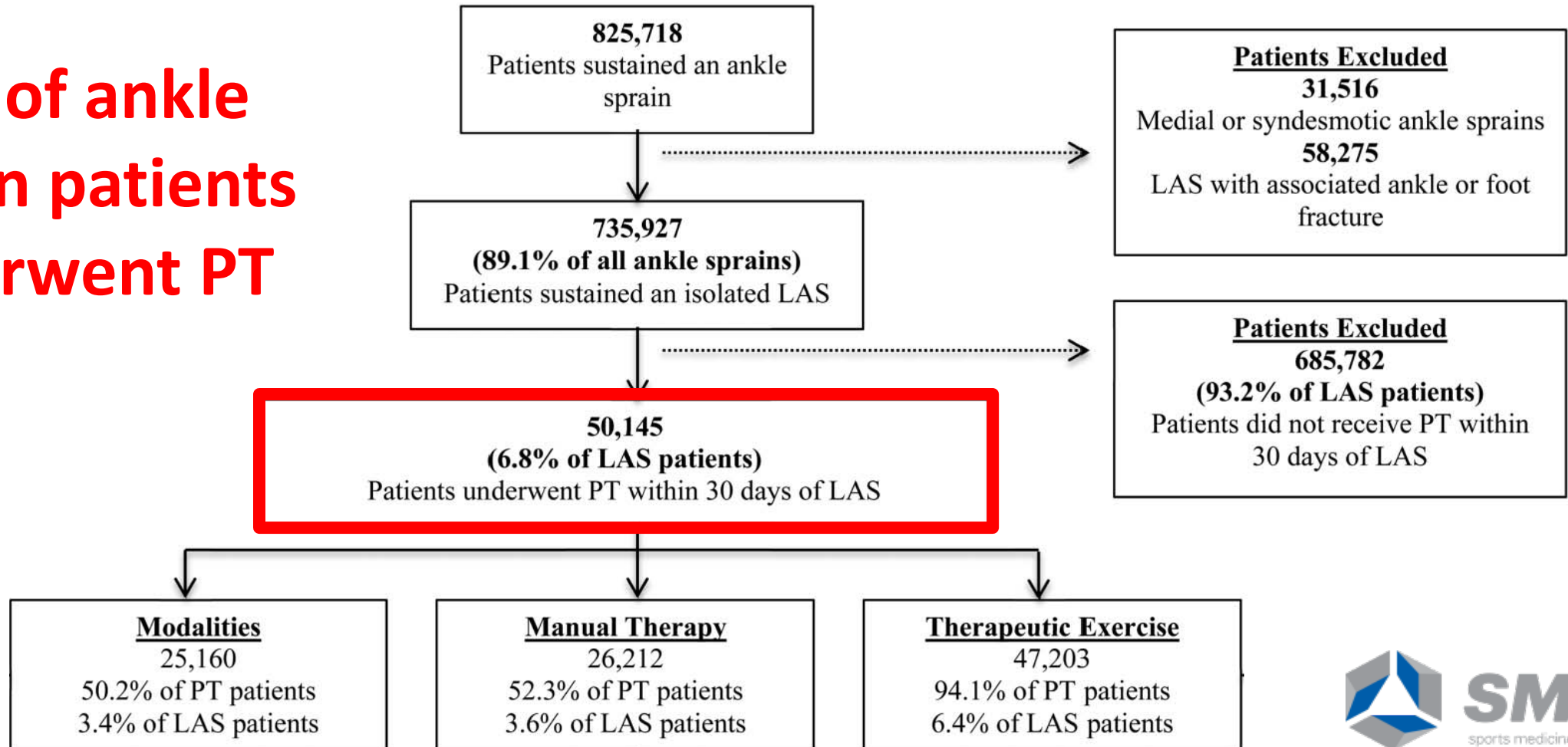


Can we disrupt this cycle?

Current Trends in the Management of Lateral Ankle Sprain in the United States

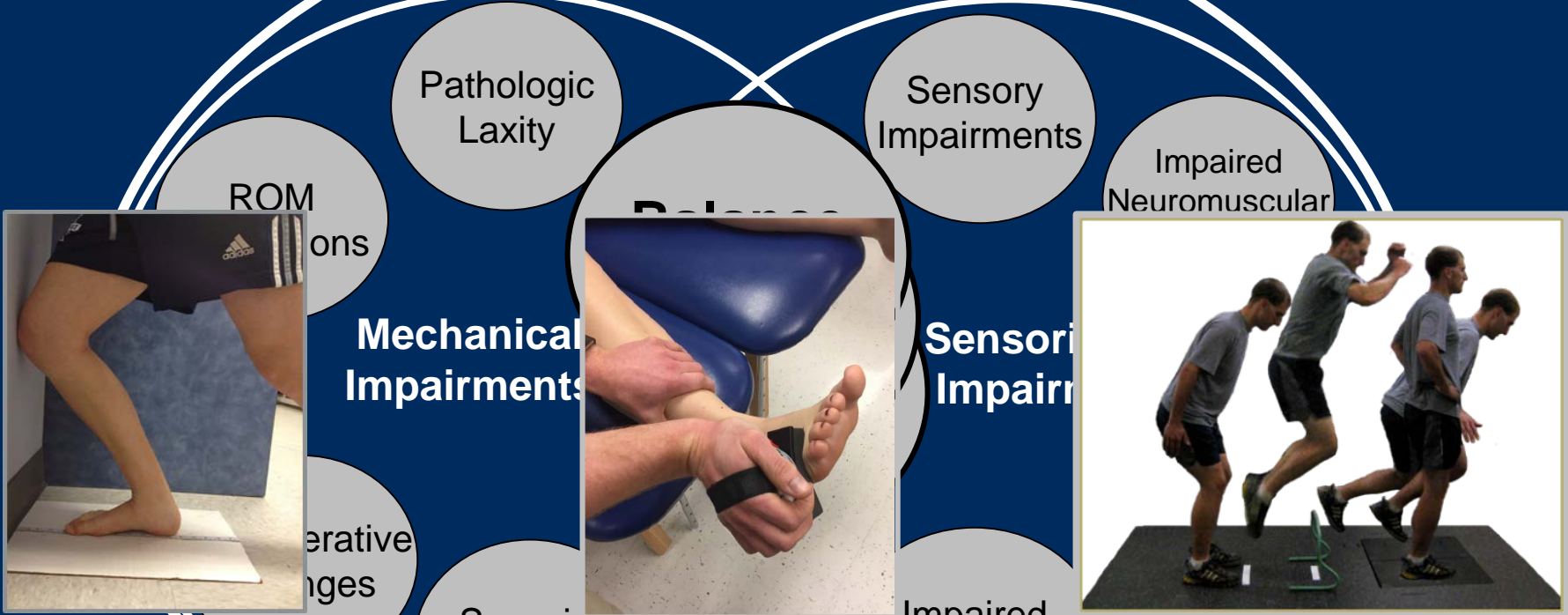
Mark A. Feger, PhD, ATC,* Neal R. Glaviano, MEd, ATC,* Luke Donovan, PhD, ATC,†
Joseph M. Hart, PhD, ATC,* Susan A. Saliba, PhD, ATC, MPT,* Joseph S. Park, MD,*
and Jay Hertel, PhD, ATC*

**< 7% of ankle
sprain patients
underwent PT**





Chronic Ankle Instability



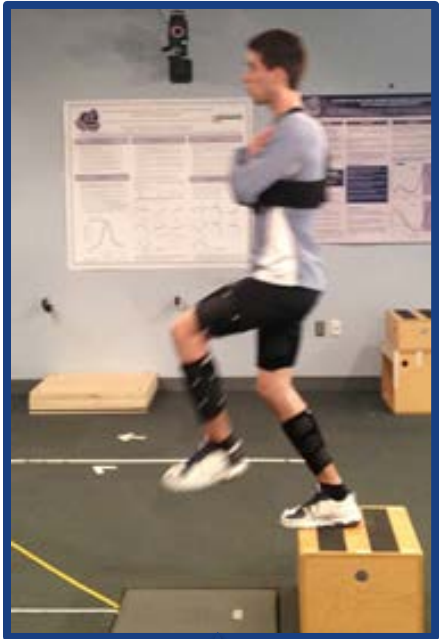
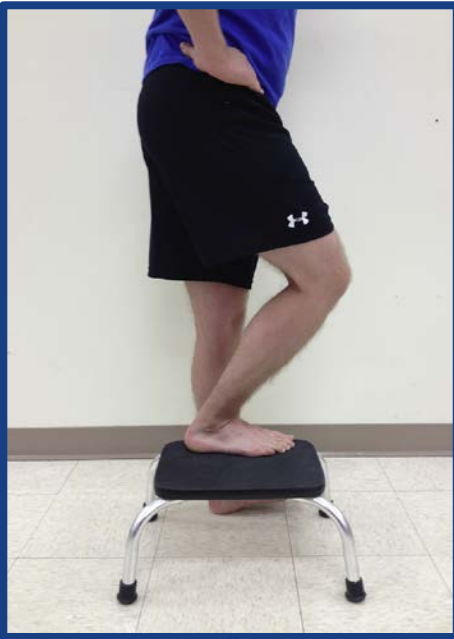
**Important and Modifiable
Core Impairment Areas**

Hertel 2002 JAT

ROM Deficits

Strength Deficits

Balance Deficits



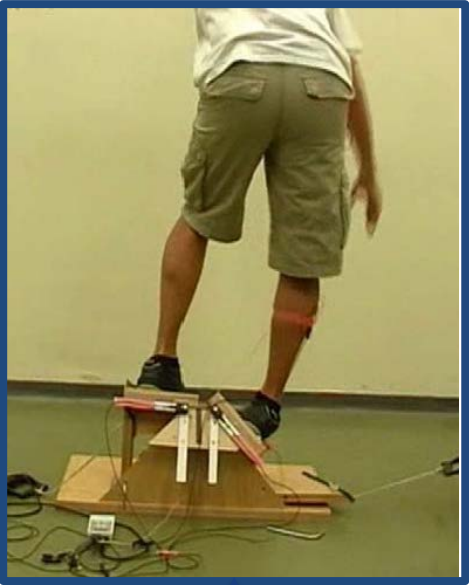
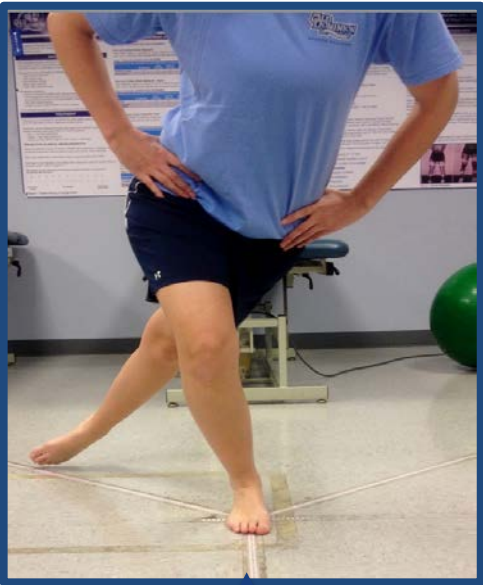
Hoch 2012; Gaven 2014; Grindstaff 2017; Basnett 2013; Houston 2015

ROM
Deficits

Strength
Deficits

Balance
Deficits

EVERSION STRENGTH

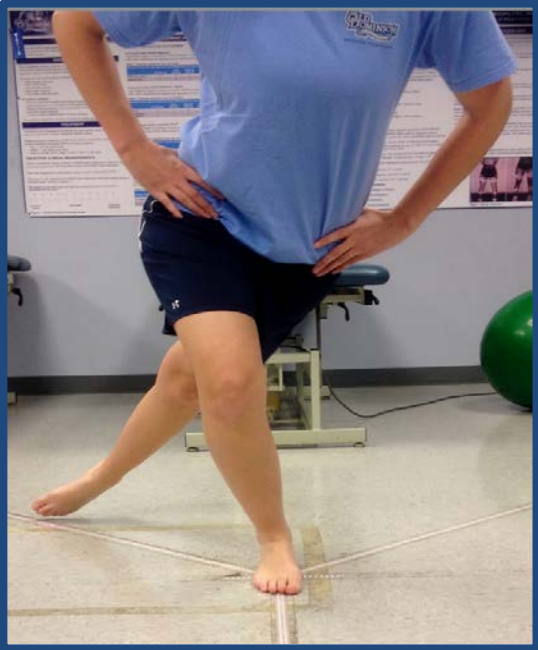


Arnold et al 2009, Thompson et al 2018; Houston 2015, Feger et al. 2015, Echaute et al 2009

ROM
Deficits

Strength
Deficits

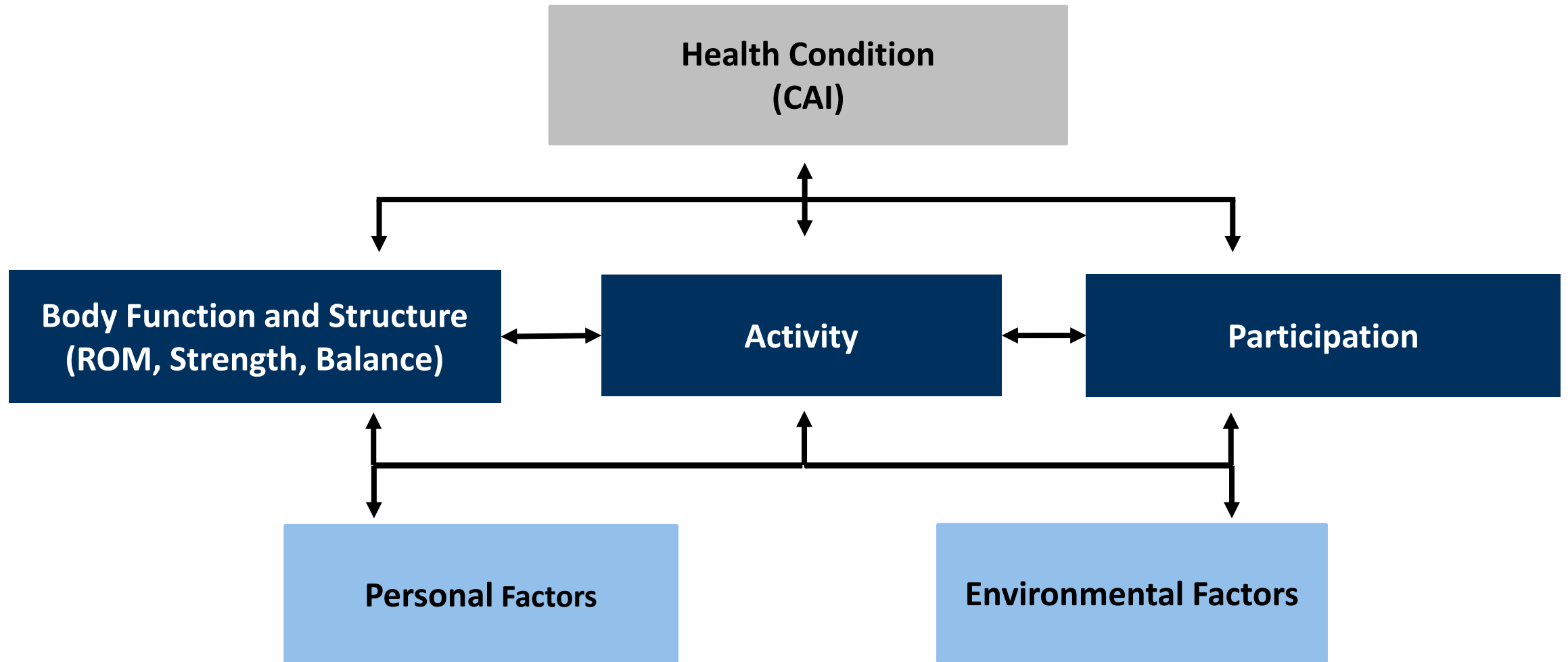
Balance
Deficits



← **STATIC** **DYNAMIC** →

Arnold et al 2011, Thompson et al 2018; Wikstrom 2009

Disease versus Patient-Centered Focus (ICF Model)



Health-Related Quality of Life

Health-related quality of life (HRQOL) is a personal evaluation of everyday functioning and well-being.

Physical, mental, and psychosocial health

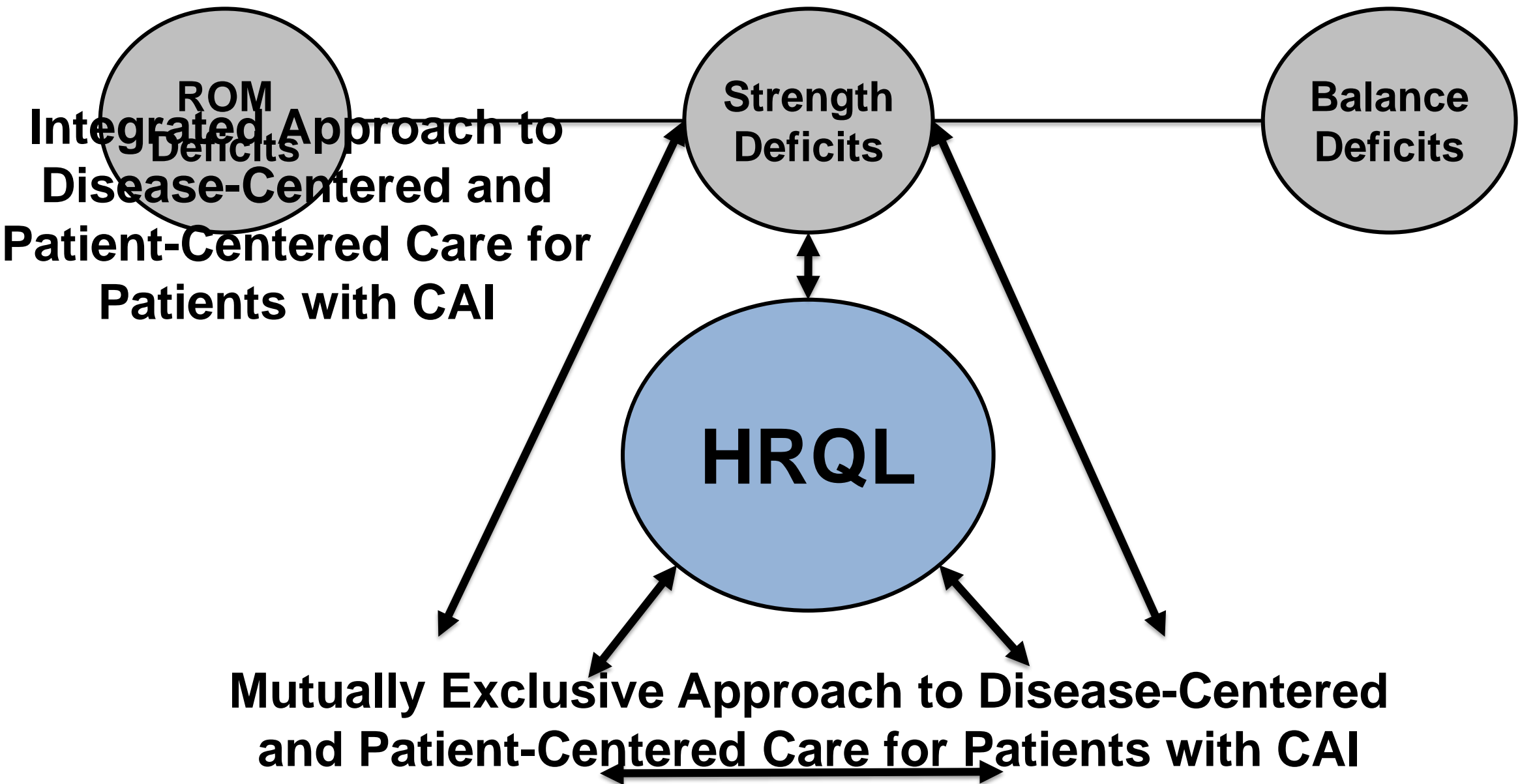
HRQOL is often assessed using patient-reported outcome (PRO) instruments.

Measure of patient's perceived health status

Individuals with CAI have reported decreased HRQOL using PROs designed for foot and ankle conditions. Houston et al. 2015

PROs

- ✓ Health-related quality of life (HRQOL)
- ✓ Symptoms
- ✓ Function
- ✓ Satisfaction with care or symptoms
- ✓ Adherence to prescribed medications or other therapy
- ✓ Perceived value of treatment



Adapted from Donovan et al 2016

How Do We Treat The Core Impairments?



Arthrokinematic



Joint Mobilizations



Osteokinematic



Stretch



Reassess ROM

Reassess ROM



Concentric



Concentric Exercises



Reassess Strength

Eccentric



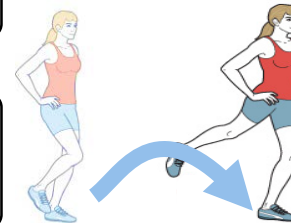
Eccentric Exercises

Reassess Strength

Static



Static Balance Exercises



Reassess Balance

Dynamic



Dynamic Balance Exercises

Reassess Balance



(Donovan and Hertel 2012)

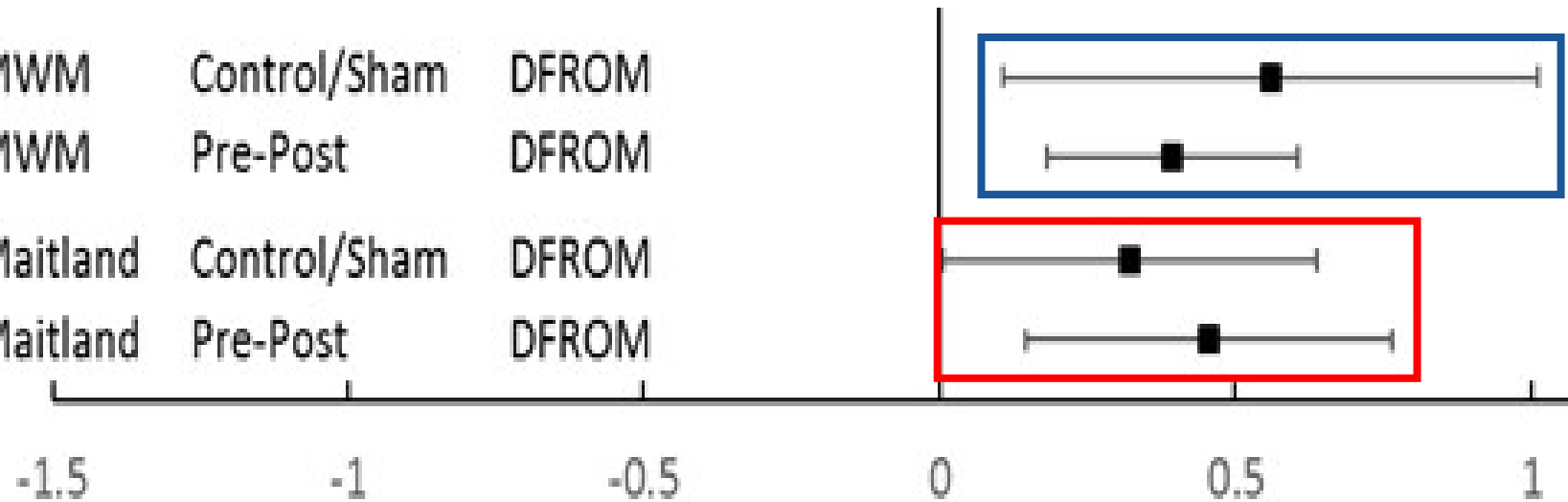
Isolated Joint Mobilizations - Range of Motion

Changes in Dorsiflexion and Dynamic Postural Control After Mobilizations in Individuals With Chronic Ankle Instability: A Systematic Review and Meta-Analysis

Robert A. Vallandingham, DAT, LAT, ATC; Stacey L. Gaven, PhD, LAT, ATC; Cameron J. Powden, PhD, LAT, ATC



MWM	Control/Sham	DFROM
MWM	Pre-Post	DFROM
Maitland	Control/Sham	DFROM
Maitland	Pre-Post	DFROM



Grade A and B Evidence

Joint Mobilizations - HRQL

Health-Related Quality of Life

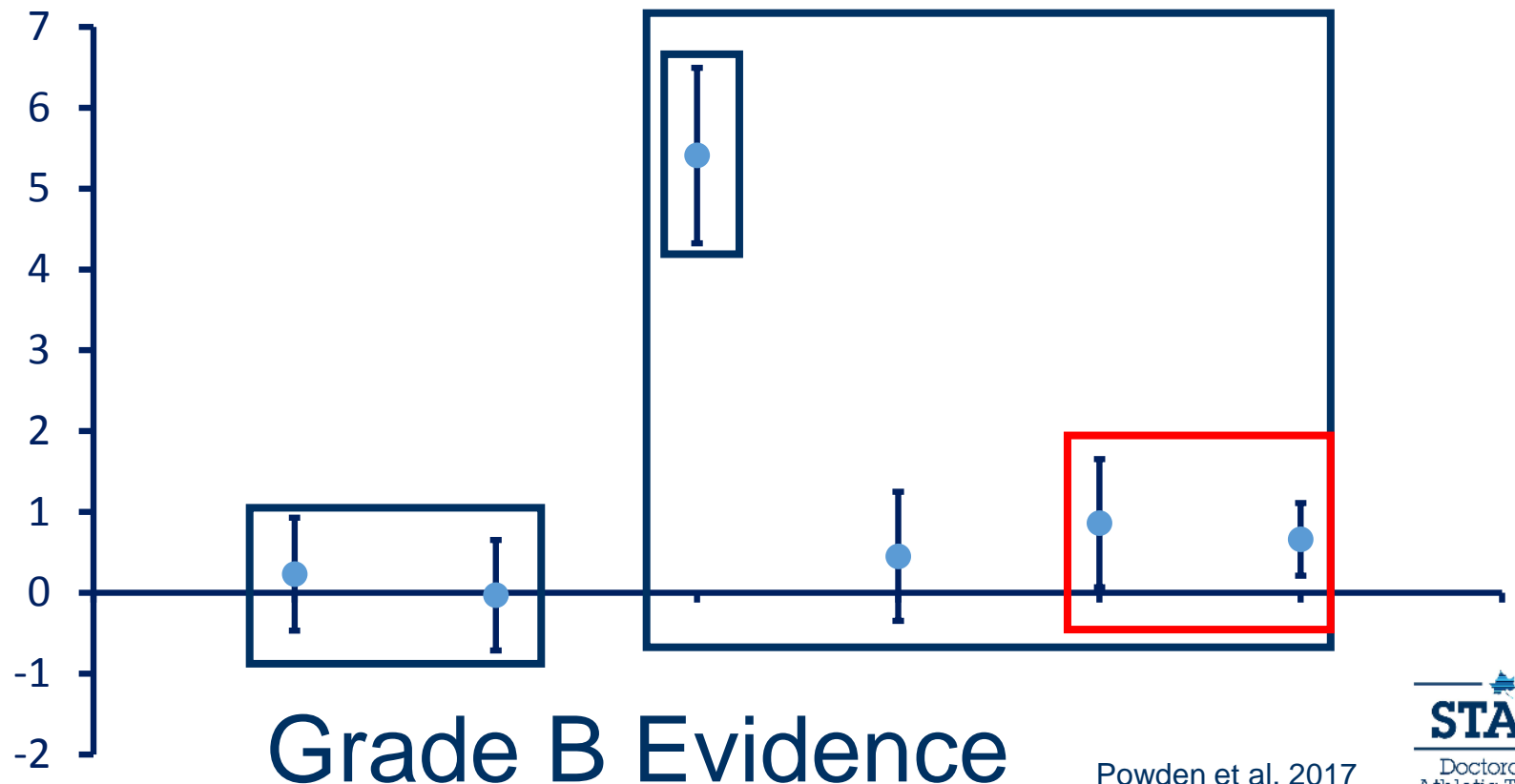
The Outlier

Mobilizations for Dorsiflexion

Fibular Manipulations

Rehabilitation and Improvement of Health-Related Quality-of-Life Detriments in Individuals With Chronic Ankle Instability: A Meta-Analysis

Cameron J. Powden, PhD, LAT, ATC*; Johanna M. Hoch, PhD, ATC†; Matthew C. Hoch, PhD, ATC†

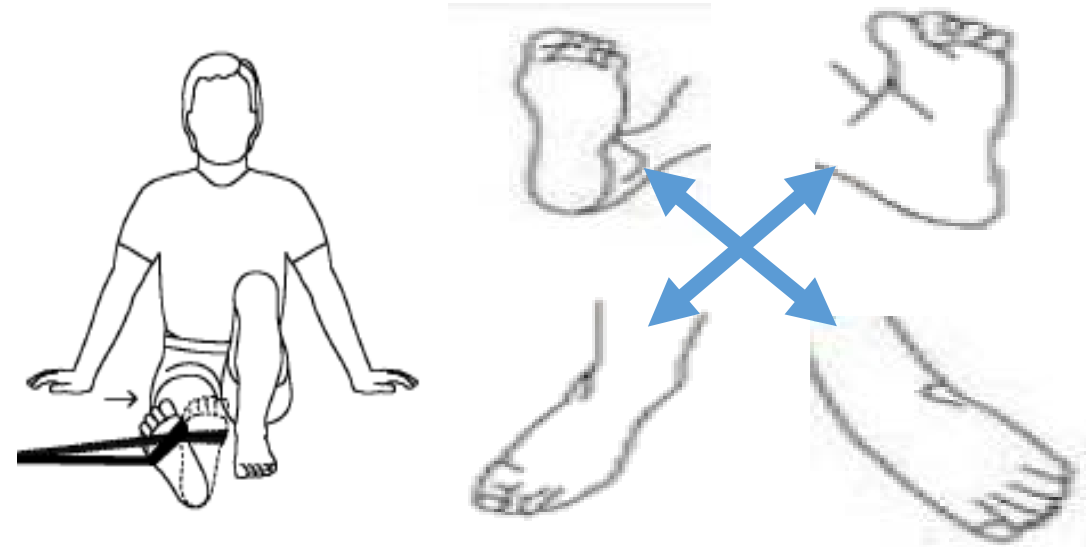


Powden et al. 2017

Isolated Strength Interventions

The Effectiveness of Strength Training Protocols on Strength Development in Participants With Chronic Ankle Instability: A Critically Appraised Topic

Emily A. Hall, MS, ATC, Jordan Frank, MS, LAT, CSCS, and Carrie L. Docherty, PhD, ATC, FNATA • Indiana University



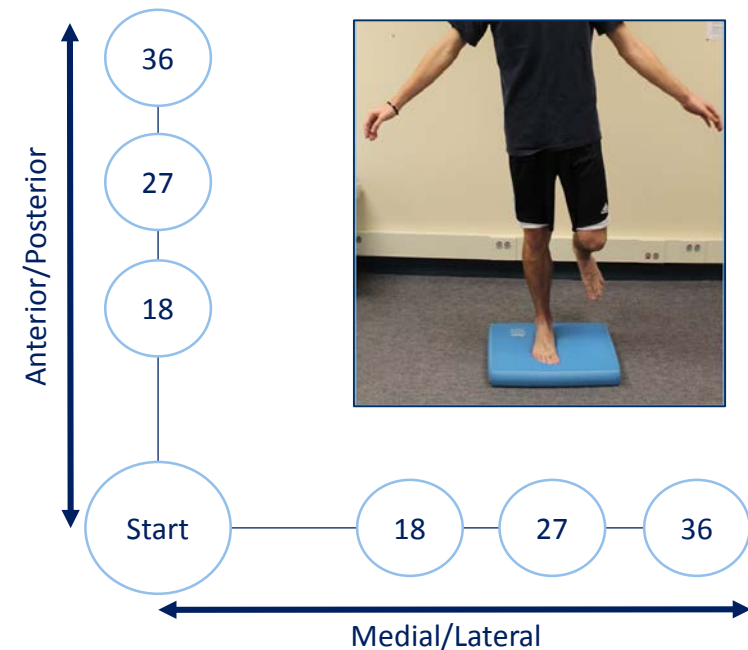
Week	Resistance-Band		Proprioceptive Neuromuscular Facilitation
	Resistance	Sets × Repetition	Sets × Repetition
1	Heavy (light blue)	3 × 10	2 × 10
2	Heavy (light blue)	4 × 10	2 × 15
3	Super heavy (dark blue)	3 × 10	3 × 10
4	Super heavy (dark blue)	4 × 10	3 × 15
5	Ultra heavy (purple)	3 × 10	4 × 10
6	Ultra heavy (purple)	4 × 10	4 × 15

Grade A Evidence

Isolated Balance Interventions

Balance Training Improves Function and Postural Control in Those with Chronic Ankle Instability

PATRICK O. MCKEON¹, CHRISTOPHER D. INGERSOLL², D. CASEY KERRIGAN², ETHAN SALIBA², BRADFORD C. BENNETT², and JAY HERTEL²



4 week program

- 12 supervised sessions
- Approximately 20 min in length

Consisted of 5 activities

- Hop to stabilization
- Hop to stabilization and reach
- Unanticipated hop to stabilization
- Single-limb balance eyes closed
- Single-limb balance eyes open

7 levels to each task

- Individually progressed based on performance

Isolated Balance Interventions

Balance Training Improves Function and Postural Control in Those with Chronic Ankle Instability

PATRICK O. MCKEON¹, CHRISTOPHER D. INGERSOLL², D. CASEY KERRIGAN², ETHAN SALIBA², BRADFORD C. BENNETT², and JAY HERTEL²

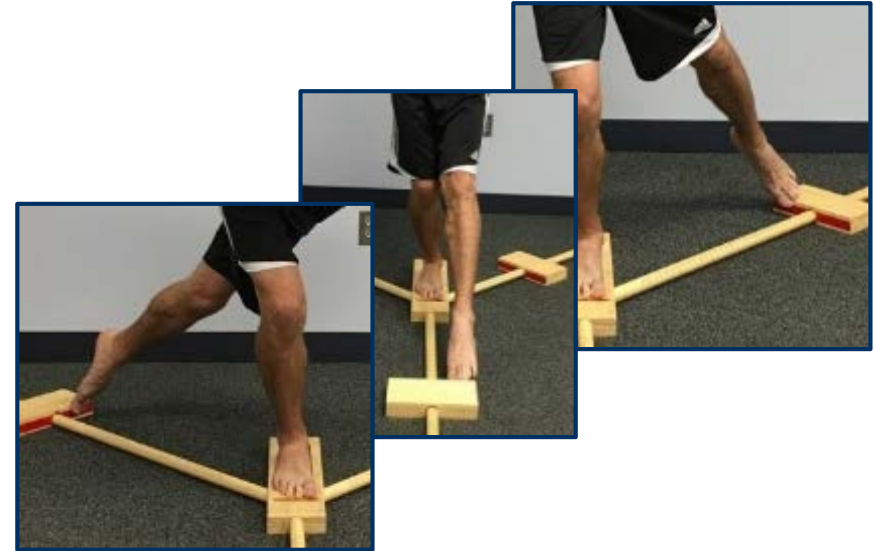
Effects of a 4-Week Dynamic-Balance-Training Program Supplemented With Graston Instrument-Assisted Soft-Tissue Mobilization for Chronic Ankle Instability

Jessica L. Schaefer and Michelle A. Sandrey

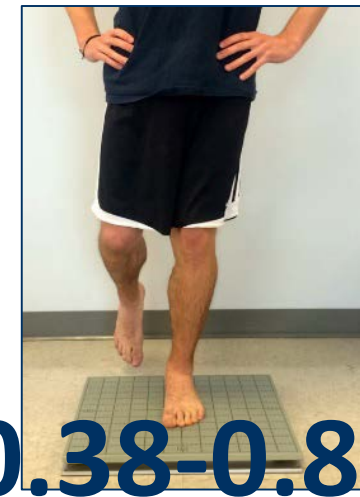
Balance Training Versus Balance Training With STARS in Patients With Chronic Ankle Instability: A Randomized Controlled Trial

Christopher J. Burcal, Alejandra Y. Trier, and Erik A. Wikstrom

Grade A Evidence



0.52-1.44



0.38-0.80

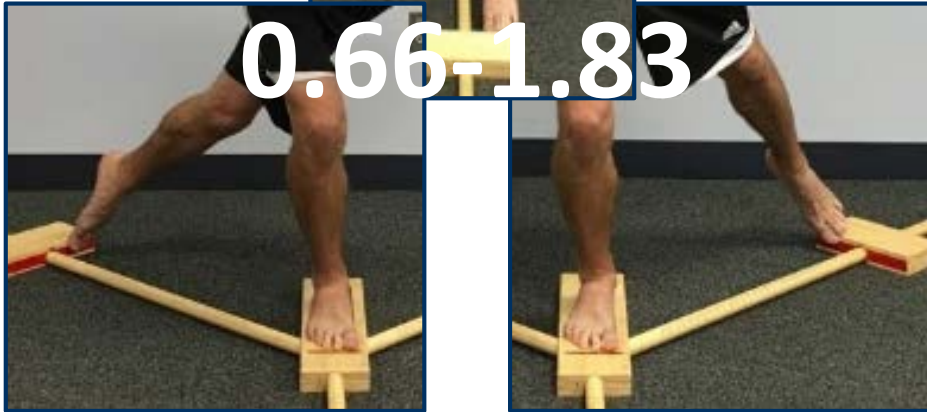
Isolated Balance Interventions

Effects of 6 Weeks of Balance Training on Chronic Ankle Instability in Athletes: A Randomized Controlled Trial

D. Cruz-Diaz, R. Lomas-Vega, M. C. Osuna-Pérez, F. H. Contreras, A. Martínez-Amat

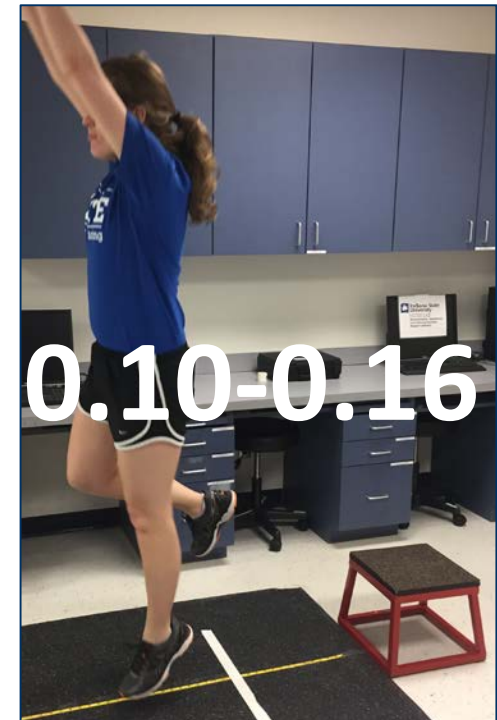


0.66-1.83



Effect of a Home-based Balance Training Protocol on Dynamic Postural Control in Subjects with Chronic Ankle Instability

R. De Ridder¹, T. M. Willems¹, J. Vanrenterghem², P. Roosen¹

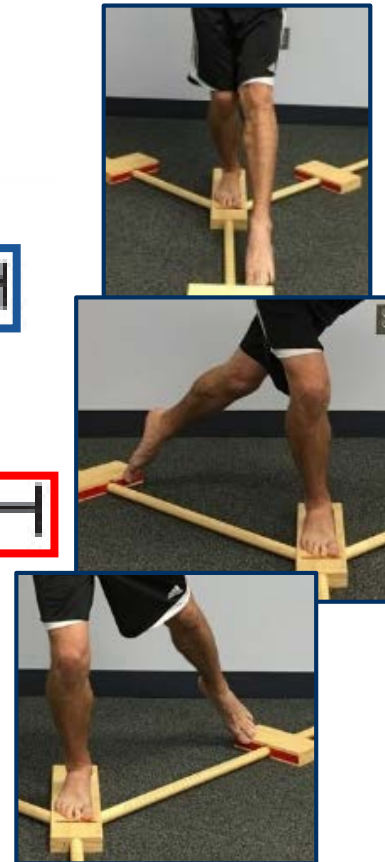
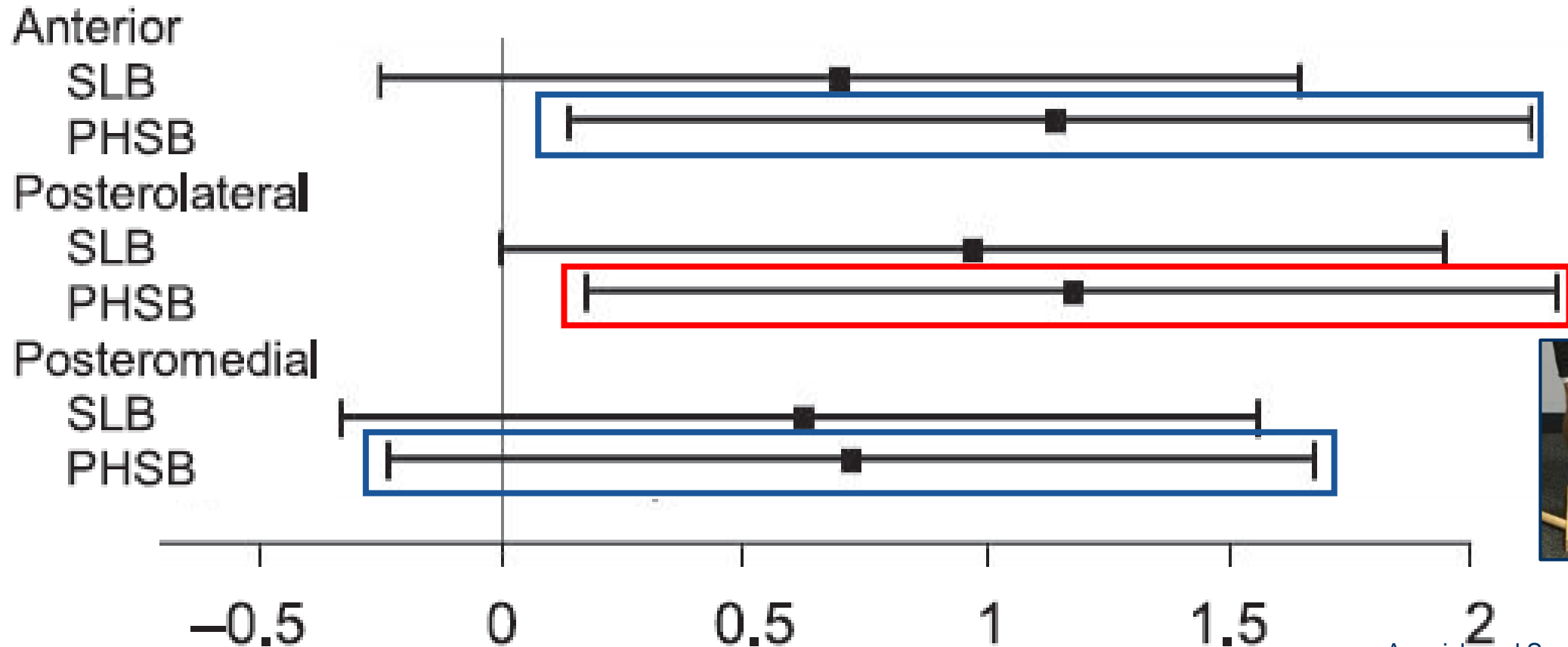


0.10-0.16

Static Balance Training Vs Hop-to-Stabilization

Two 4-Week Balance-Training Programs for Chronic Ankle Instability

Ben Anguish, MS, ATC*; Michelle A. Sandrey, PhD, ATC†



Effect of Isolated Balance Training - HRQL

Health-Related Quality of Life

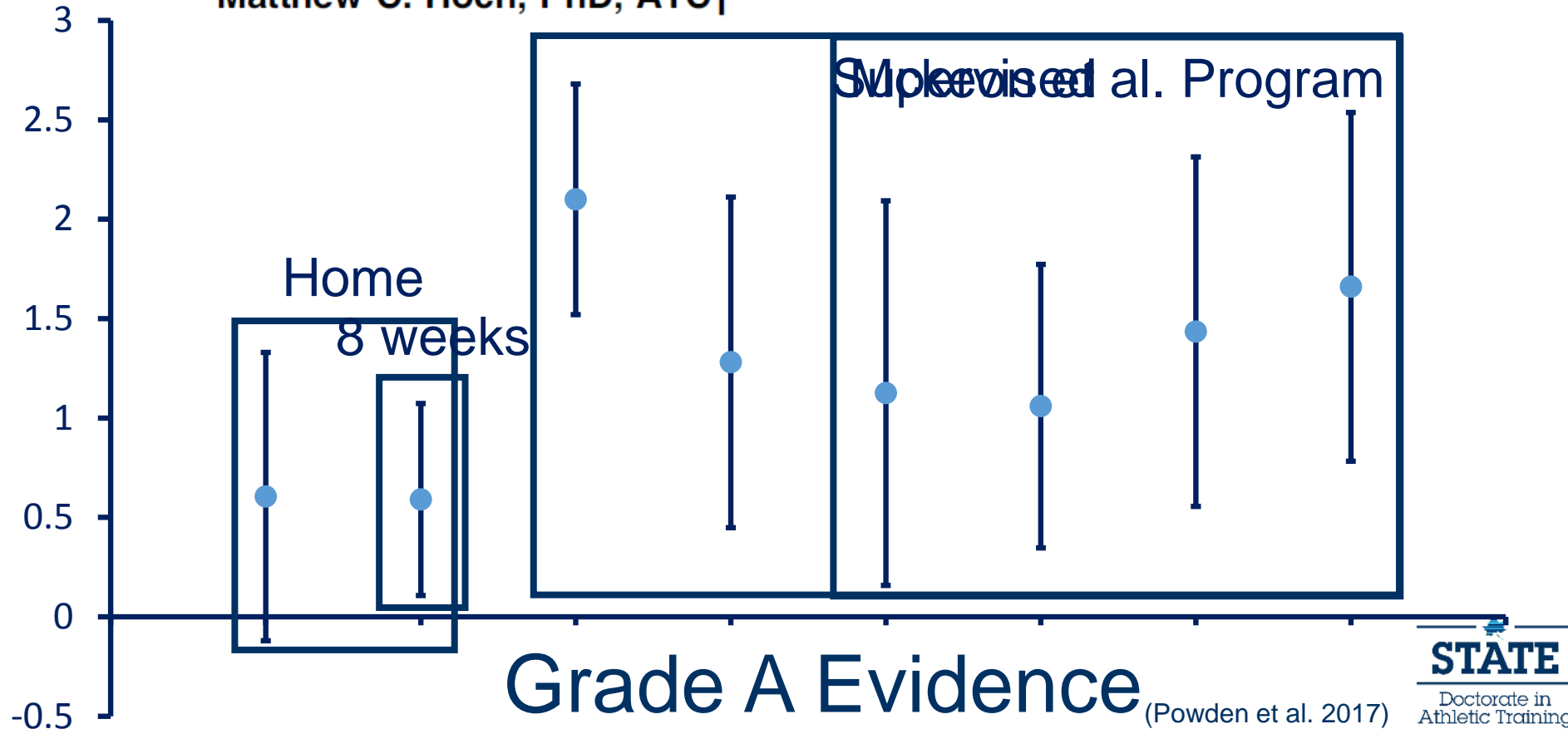
Home vs. Supervised

4 week

- 8 weeks showed no difference

Mckeon et al. balance training program

- Mckeon et al. 2008



Balance Training in Combination - HRQL

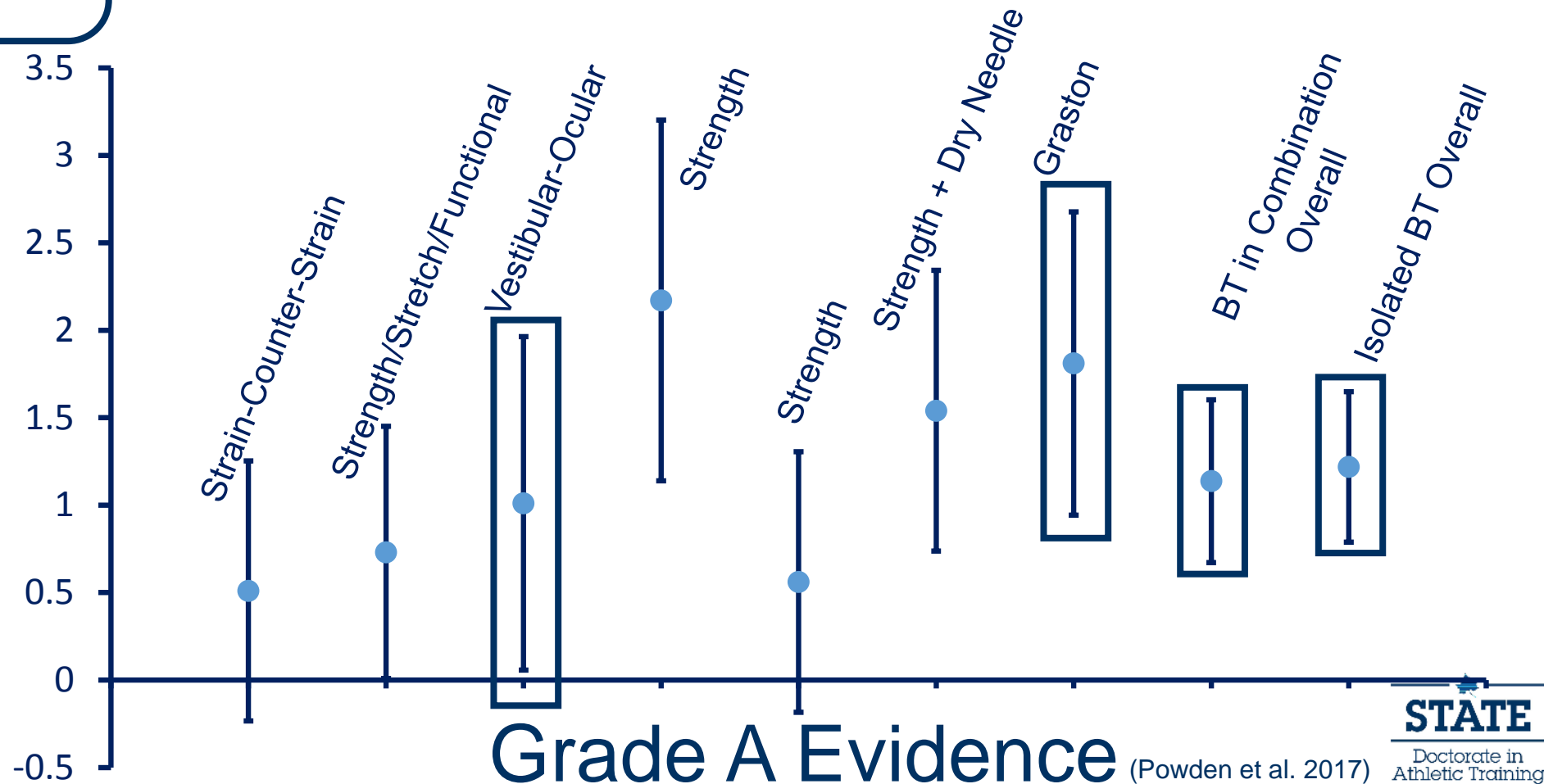
Health-Related Quality of Life

Rehabilitation and Improvement of Health-Related Quality-of-Life Detriments in Individuals With Chronic Ankle Instability: A Meta-Analysis

Overview of treatments

Isolate vs Combination

McKeon et al. protocol



Core Impairment - Summary

Joint Mobilizations

Range of Motion

Balance

Health-Related Quality of Life

Balance Training

Balance

Health-Related Quality of Life

Strength Training

Strength

CAI Rehabilitation Paradigm – Revisited

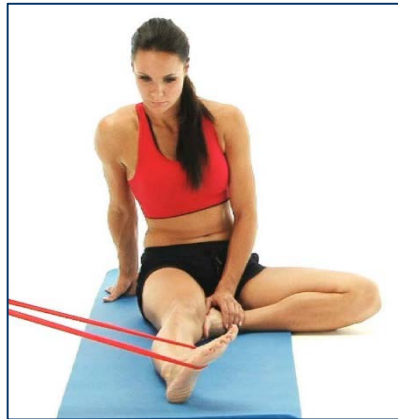
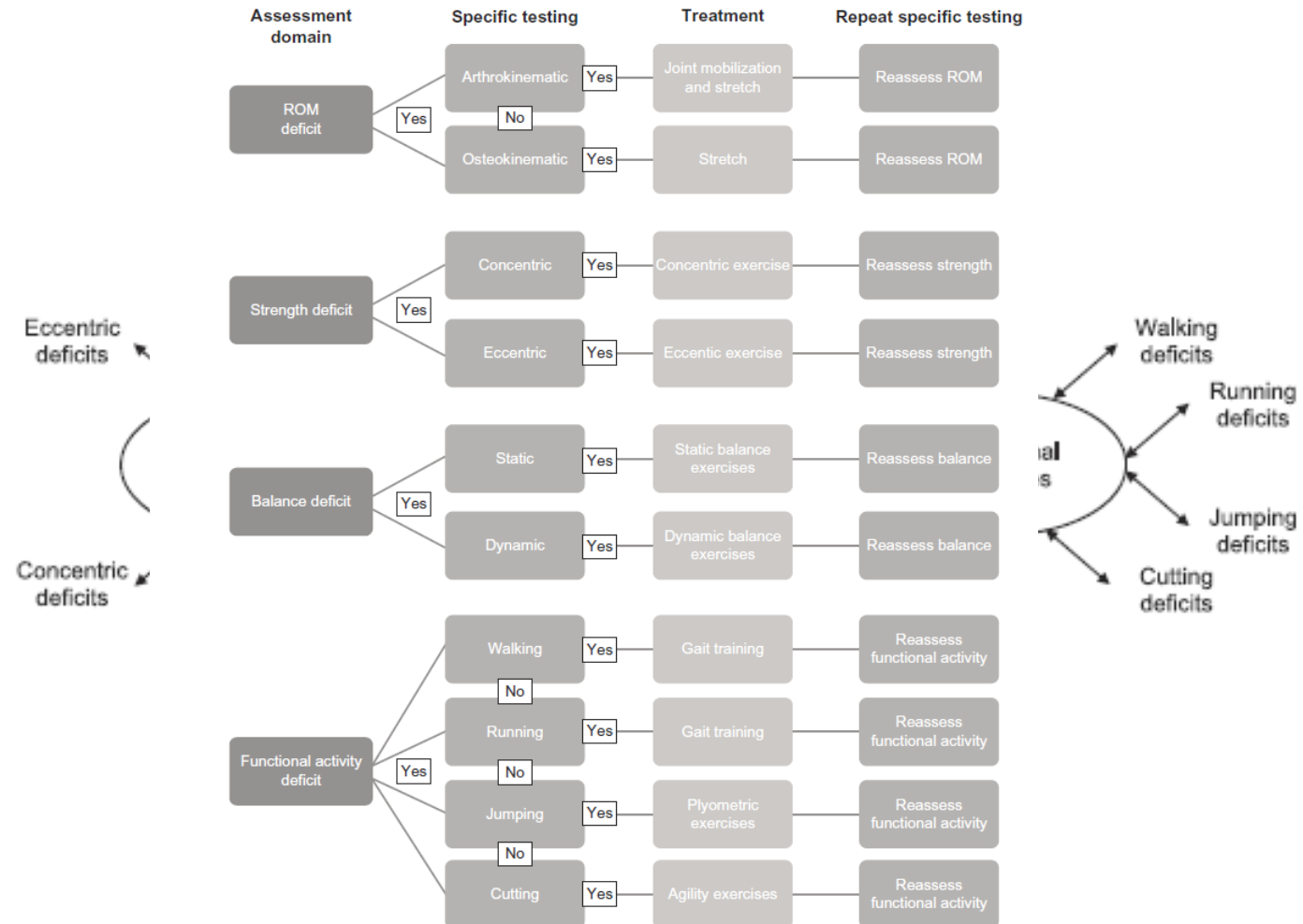


Figure 1. An assessment and treatment paradigm for patients with chronic ankle instability.

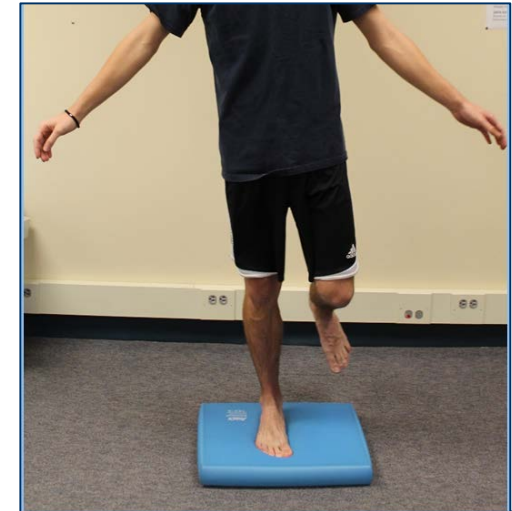
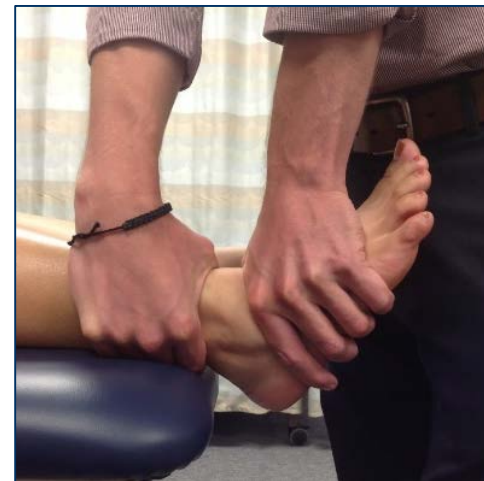
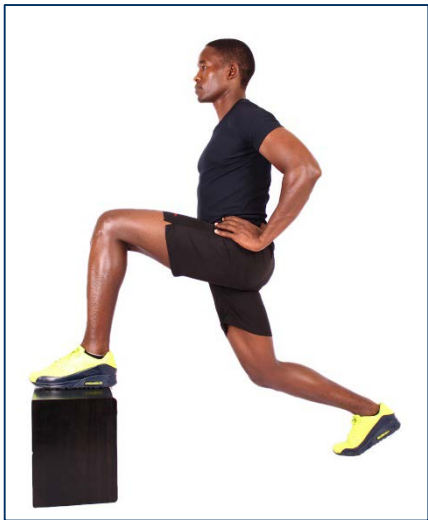
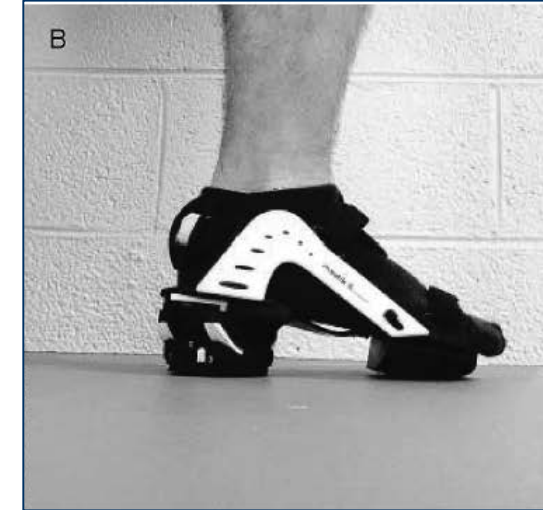


(Donovan and Hertel 2012; Donovan et al. 2016)

Multimodal Interventions for CAI

Rehabilitation for Chronic Ankle Instability With or Without Destabilization Devices: A Randomized Controlled Trial

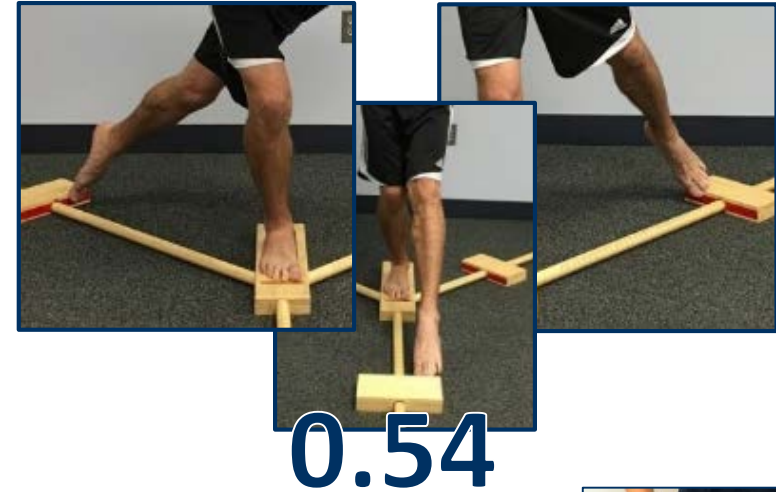
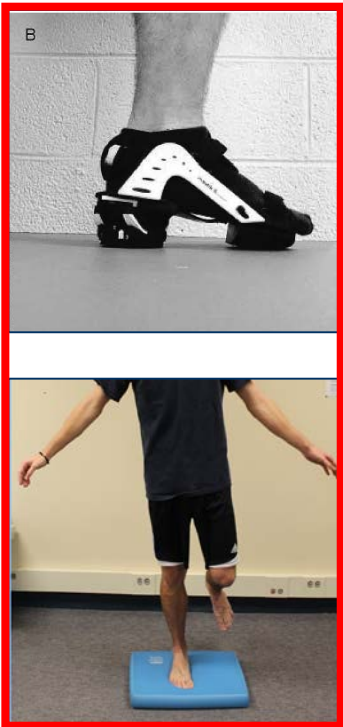
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Multimodal Interventions for CAI

Rehabilitation for Chronic Ankle Instability With or Without Destabilization Devices: A Randomized Controlled Trial

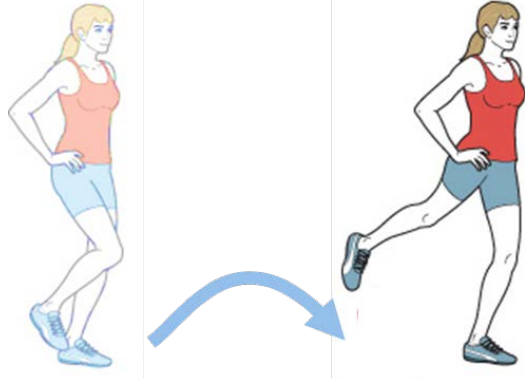
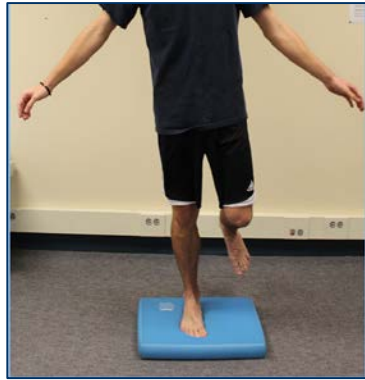
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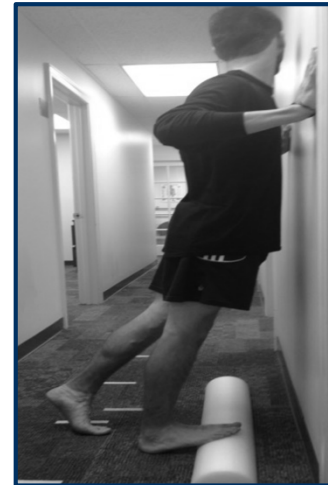
Multimodal Interventions for CAI

A 4-Week Multimodal Intervention for Individuals With Chronic Ankle Instability: Examination of Disease-Oriented and Patient-Oriented Outcomes

Cameron J. Powden, PhD, ATC*; Johanna M. Hoch, PhD, ATC†; Beth E. Jamali, PhD, PT‡; Matthew C. Hoch, PhD, ATC†



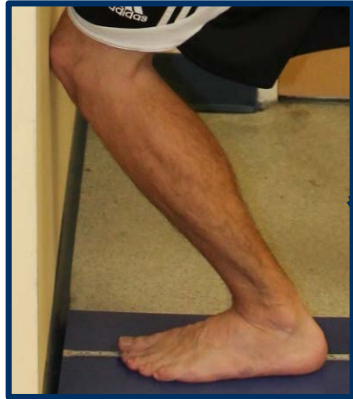
Home-Based Intervention



Laboratory-Based Intervention



Disease-Oriented Measures



Weight-bearing lunge test

Y-Balance Test

- Anterior
- Posteromedial
- Posterolateral

Isometric ankle strength

- Inversion
- Eversion
- Dorsiflexion
- Plantar flexion

Isometric hip strength

- Abduction
- Adduction
- Flexion
- Extension

Weight-bearing lunge test

Y-Balance Test

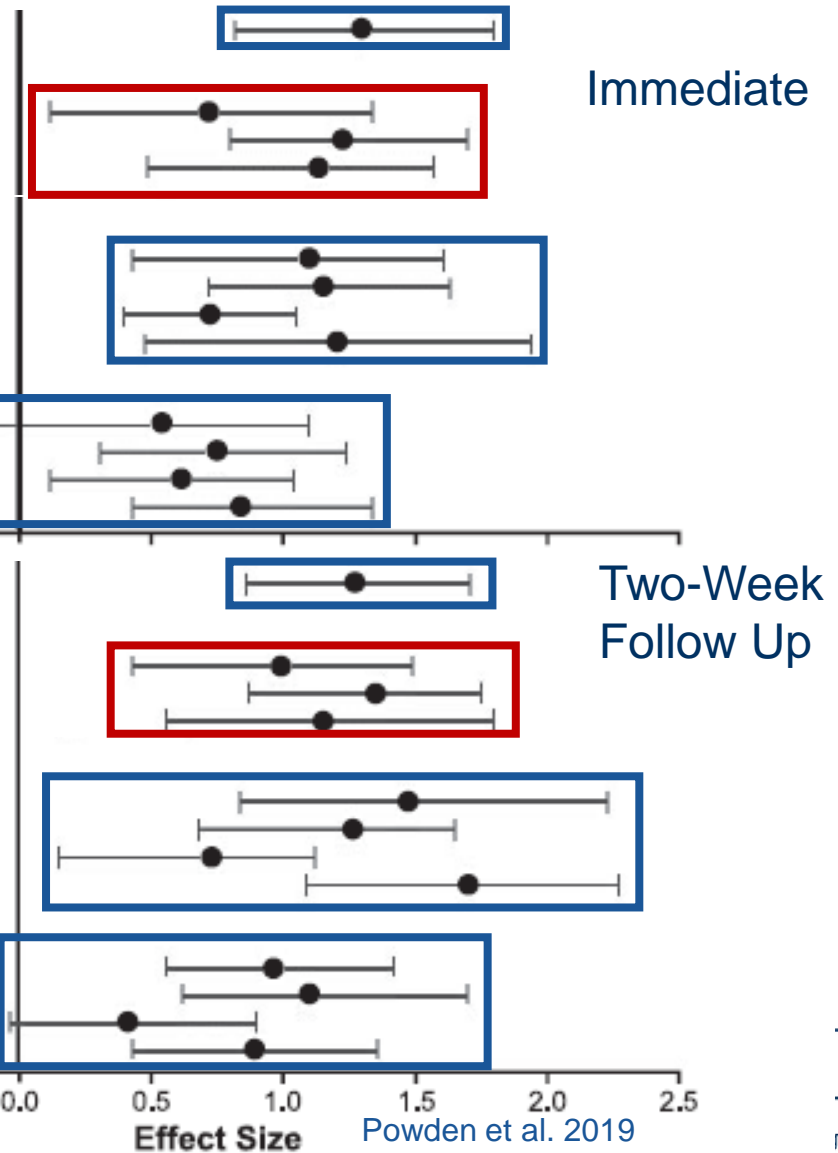
- Anterior
- Posteromedial
- Posterolateral

Isometric ankle strength

- Inversion
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Isometric hip strength

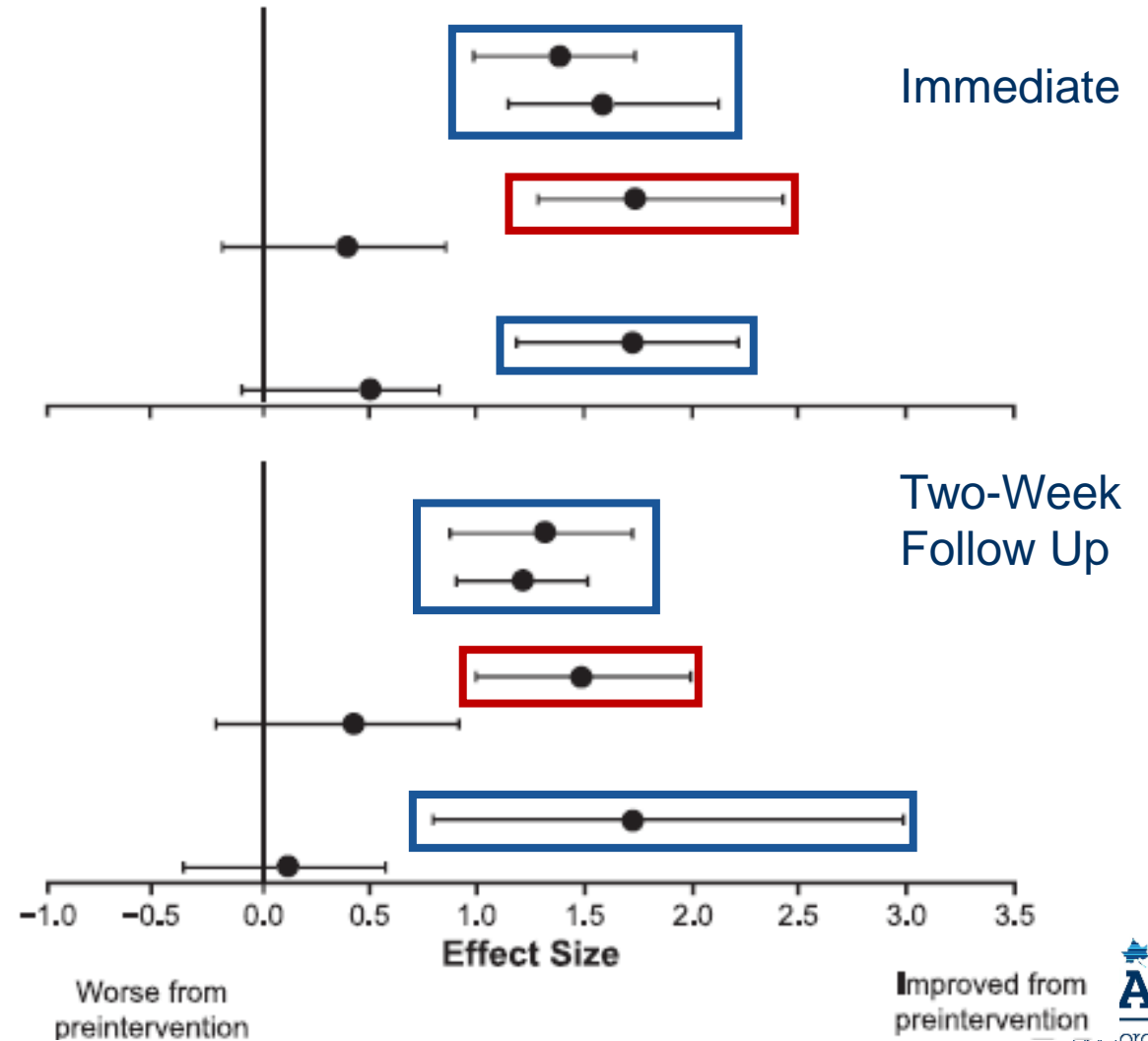
- Abduction
- Adduction
- Flexion
- Extension



Patient-Oriented Measures



A		Measure	
		<u>Foot and Ankle Ability Measure</u>	
		Activities of Daily Living subscale	
		Sport subscale	
		<u>Modified Disabement in the Physically Active scale</u>	
		Physical summary component	
		Mental summary component	
		<u>Fear-Avoidance Belief Questionnaire</u>	
		Physical Activity subscale	
		Work subscale	
		B	
		<u>Foot and Ankle Ability Measure</u>	
		Activities of Daily Living subscale	
	Sport subscale		
	<u>Modified Disabement in the Physically Active scale</u>		
	Physical summary component		
	Mental summary component		
	<u>Fear-Avoidance Belief Questionnaire</u>		
	Physical Activity subscale		
	Work subscale		



Summary and Future Directions

Strong Literature Regarding the Efficacy of Current CAI Interventions

- Grade A and B Evidence

Other Factors to Consider:

- Joint Position Sense
- Sensation
- CNS Alterations
- Functional Movement
- Re-injury



Clinical Prediction Rules

$$\boxed{A} + \boxed{B} = \boxed{\text{Success}}$$

Individualized Treatment Approaches



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