


Can minimal footwear improve knee osteoarthritis?



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www.usp.br/labimph/



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Disclosure

Nothing to disclose

There are no commercial relationships or of any other
type that may lead to a conflict of interest

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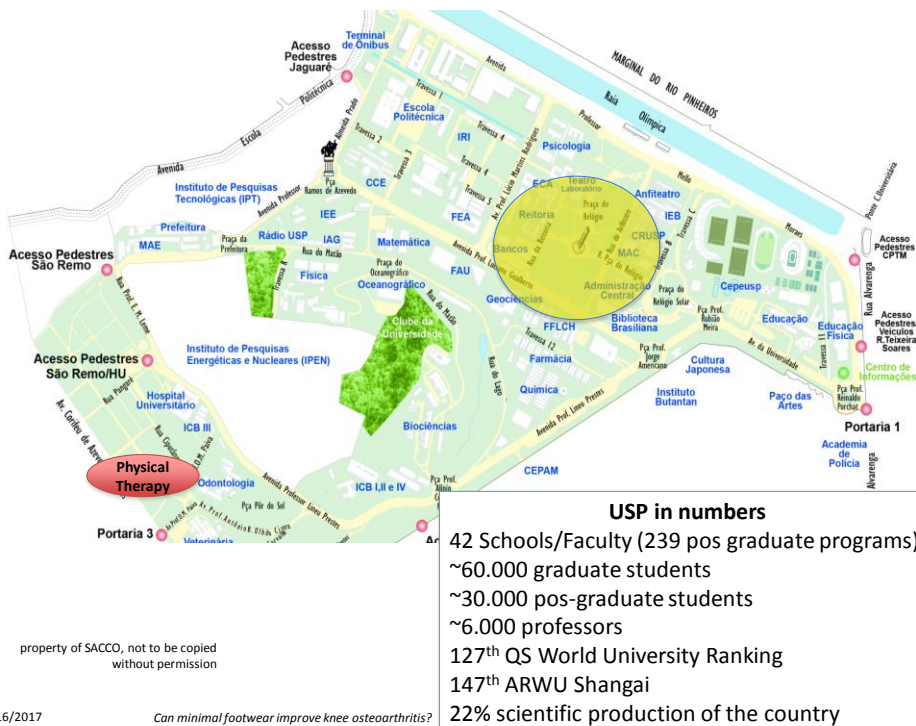
Session Learning Objectives

1. It will be presented and discussed evidences for the use of minimal footwear for orthopedic conditions, such as *knee osteoarthritis*.
2. It will be discussed the effect of minimal footwear on knee mechanics that lead to and exacerbate knee osteoarthritis.
3. It will also be discussed the effect of minimal footwear on functional outcomes in this population.

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Rheumatic disease highly prevalent (Woolf & Pfleger, 2003)

Knee: 37% (Senna *et al.*, 2004)



Each increase of 1.5 units of overload (torque) increases the risk of OA progression in 6.5 times



OSTEOARTHRITIS (OA)

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Internal forces direct measurement



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Mechanical properties of modern footwear (with “high” heels) used for walking negatively affect the progression of OA

(Kerrigan *et al.*, 1998; Kerrigan *et al.*, 2001; Kerrigan *et al.*, 2005)



ARTHRITIS & RHEUMATISM
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DOI 10.1002/art.22123
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Shakoor e Block, 2006

Walking Barefoot Decreases Loading on the Lower Extremity Joints in Knee Osteoarthritis

Najia Shakoor and Joel A. Block



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Theory: barefoot locomotion

(Robbins & Hanna, 1987; Bergman *et al.*, 1995; Shakoor & Block, 2006)

Better:

- Sensorial perception
- Foot & ankle ROM/ functionality
- intra-articular forces shifts
- forces attenuation before reaching the knee

Proper mechanisms of foot rollover and consequently, less damage joint loads

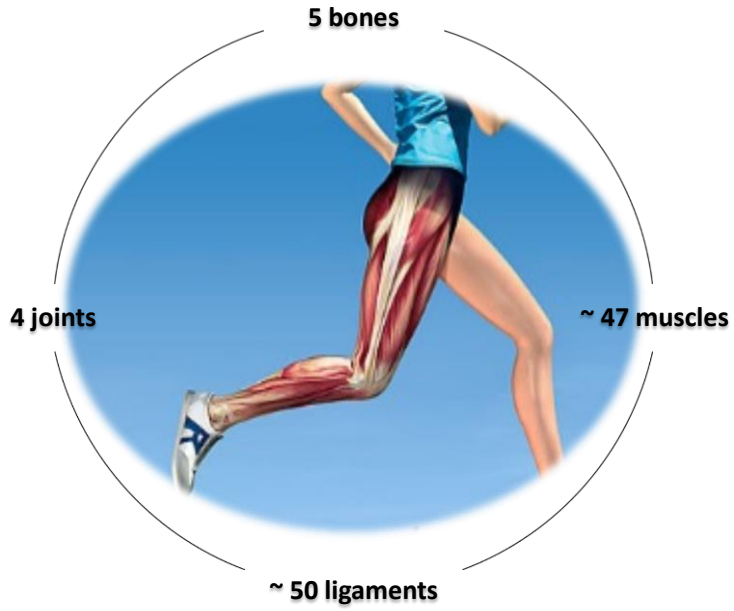
(Shakoor & Block, 2006, Doidge, 2007)



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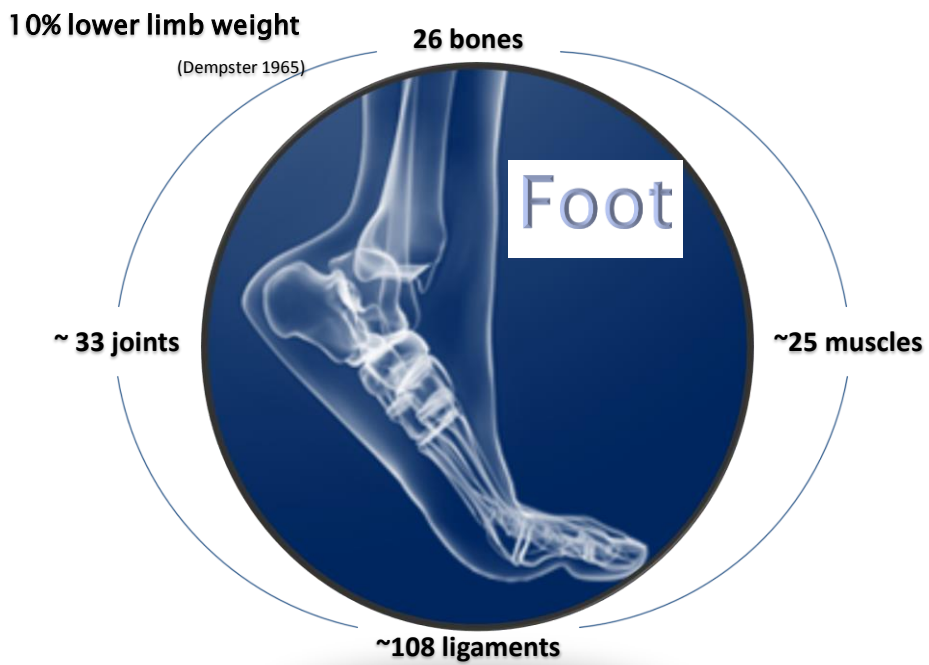
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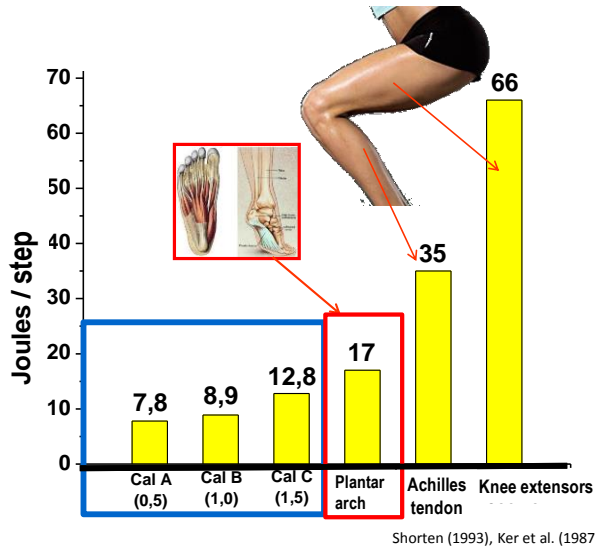


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Impact attenuation



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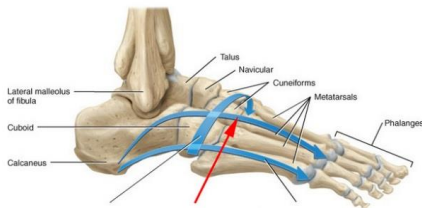
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The Foot

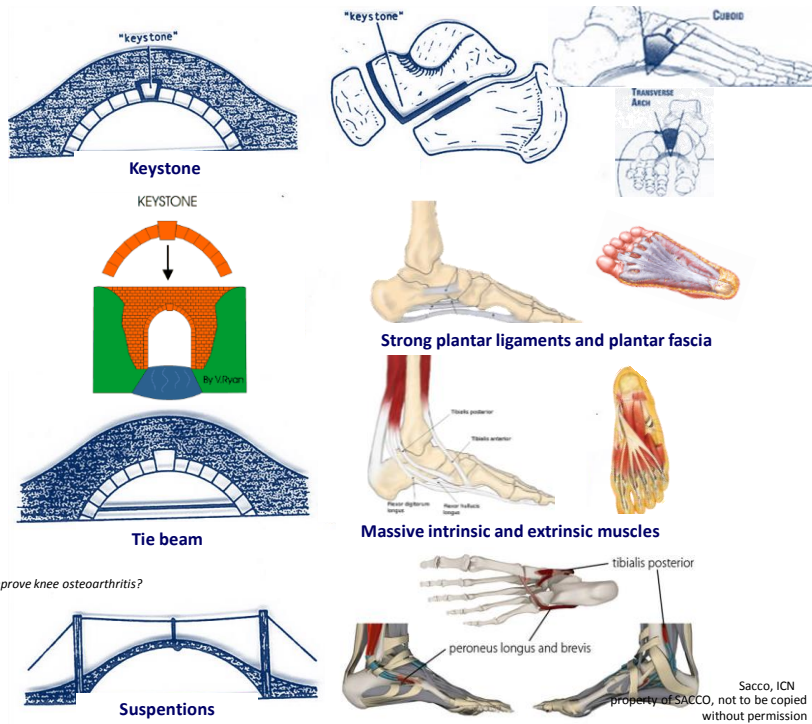
A powerful tool with a structured **arch**, rigid and flexible within a single step to promote safe and efficient progression



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“The human foot is a masterpiece of engineering and a work of art”

Leonardo da Vinci



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Maasai tribe (Kenya)

known for their agility, strength and habit of walking barefoot

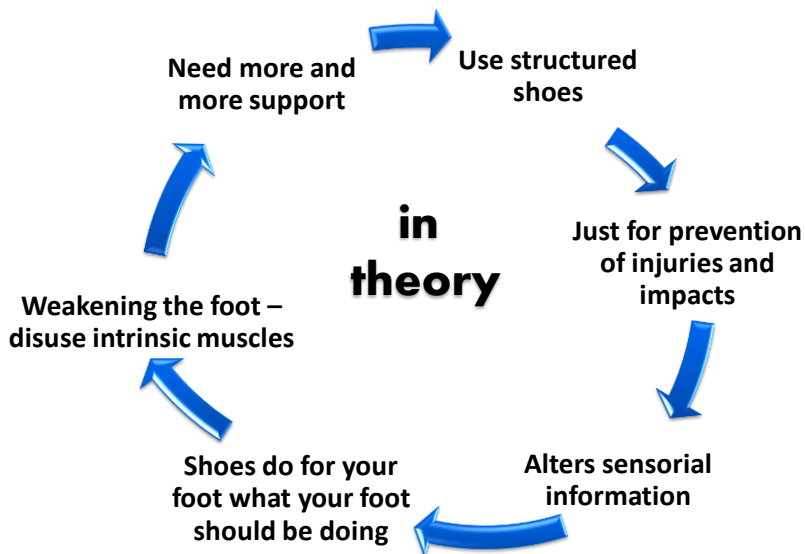


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Evidences that muscles may loss CSA in more structured shoes: Brüggemann et al.2005 (XX ISB Proceedings), Miller et al.2014 (J Sport Health Sci)



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Walking Barefoot Decreases Loading on the Lower Extremity Joints in Knee Osteoarthritis



Shakoor et al., 2008

Najia Shakoor and Joel A. Block

Acute usage
 Positive results



Shakoor et al., 2010

High cost for development or for purchase by elderly people of middle / lower middle social class

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Gait & Posture 34 (2011) 126-130

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Gait & Posture



journal homepage: www.elsevier.com/locate/gaitpost



Inexpensive footwear decreases joint loading in elderly women with knee osteoarthritis

Arthritis Care & Research
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ORIGINAL ARTICLE

Francis Trombini-Souza^{a,*}, Aline Kimura^a, Ana Paula Ribeiro^a, Marco Butugan^a, Paula Akashi^a, Anice C. Pássaro^a, Antônio C. Arnone^b, Isabel C.N. Sacco^a

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Joint Loading Decreased by Inexpensive and Minimalist Footwear in Elderly Women With Knee Osteoarthritis During Stair Descent

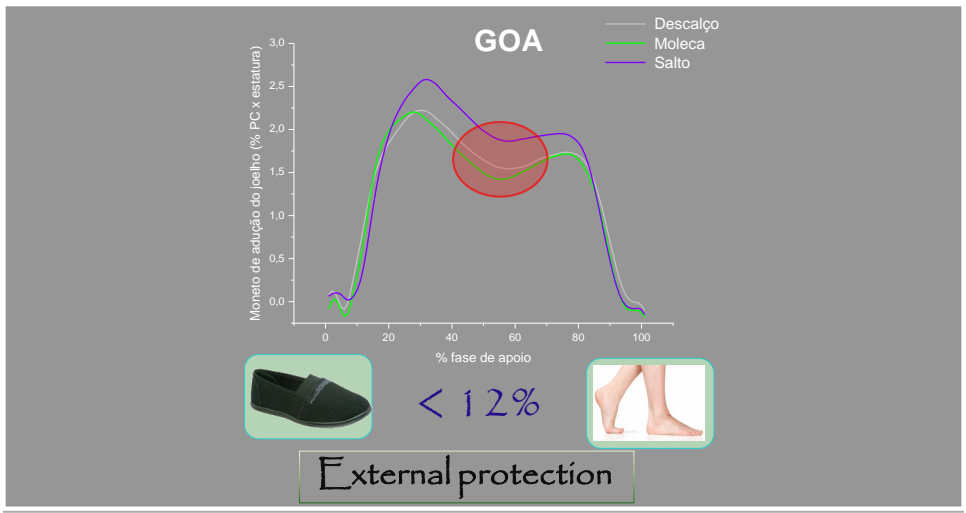
L. C. N. SACCO, F. TROMBINI-SOUZA, M. K. BUTUGAN, A. C. PÁSSARO, A. C. ARNONE, AND R. F. T. F. F.

Expressive reduction in the knee loads acutely: walking and stair descent

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Expressive reduction in the knee loads acutely

Trombini-Souza, Sacco *et al.*, 2010, Sacco *et al.*, 2012

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	>		Shakoor <i>et al.</i> , 2008
	< 12% ≡		
	≡		Shakoor <i>et al.</i> , 2010

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Effectiveness of a long-term use of a minimalist footwear versus habitual shoe on pain, function and mechanical loads in knee osteoarthritis: a randomized controlled trial

Francis Trombini-Souza¹, Ricardo Fuller², Alessandra Matias¹, Mariane Yokota¹, Marco Butugan¹, Claudia Goldenstein-Schainberg² and Isabel C N Sacco^{1*}

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BMC Musculoskeletal Disorders 2012, **13**:121 doi:10.1186/1471-2474-13-121

The electronic version of this article is the complete one and can be found online at: <http://www.biomedcentral.com/1471-2474/13/121>



No conflict of interest.
Independent of any industry partnership.

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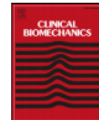
Clinical Biomechanics 30 (2015) 1194–1201



Contents lists available at ScienceDirect

Clinical Biomechanics

journal homepage: www.elsevier.com/locate/clinbiomech



Long-term use of minimal footwear on pain, self-reported function, analgesic intake, and joint loading in elderly women with knee osteoarthritis: A randomized controlled trial[☆]



Francis Trombini-Souza^a, Alessandra B. Matias^a, Mariane Yokota^a, Marco K. Butugan^a, Claudia Goldenstein-Schainberg^b, Ricardo Fuller^b, Isabel C.N. Sacco^{a,*}

^a Department of Physical Therapy, Speech, and Occupational Therapy, School of Medicine, University of São Paulo, Brazil
^b Rheumatology Division, School of Medicine, University of São Paulo, Brazil

Randomized controlled blinded trial

- 6 months of usage
- 5x/week – 6 daily active hours
- Daily Living Activities



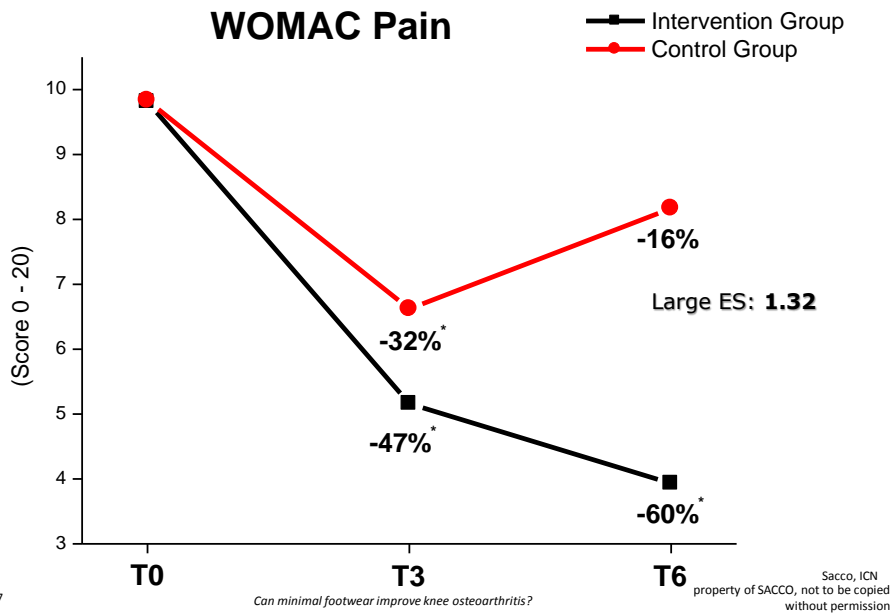
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Primary outcome



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Effect size: **1.32**

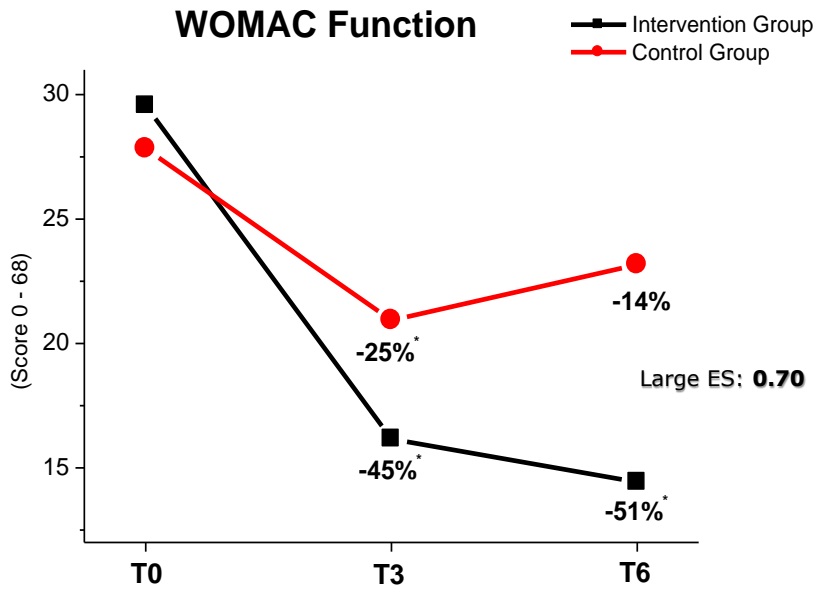


Effect size: **0.21**
(Zhang *et al.*, 2004)

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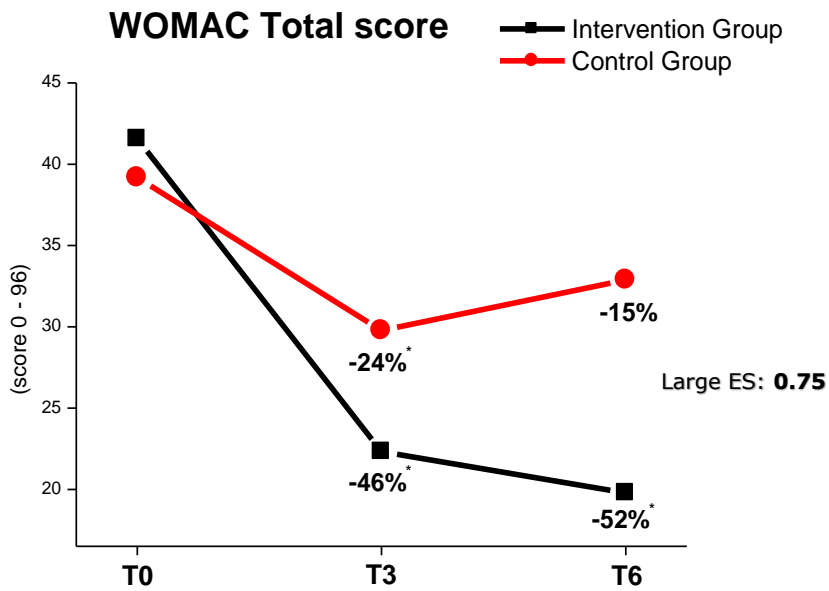
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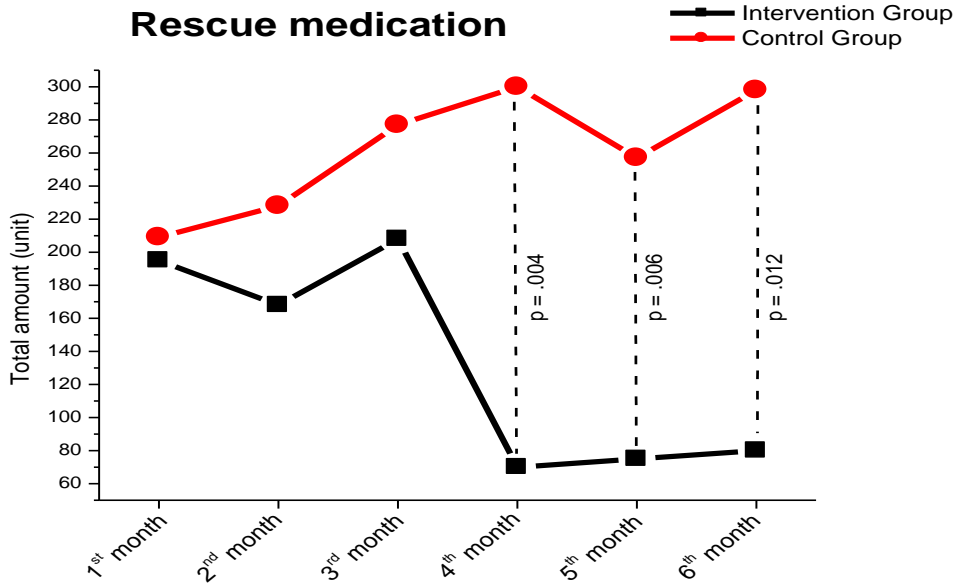
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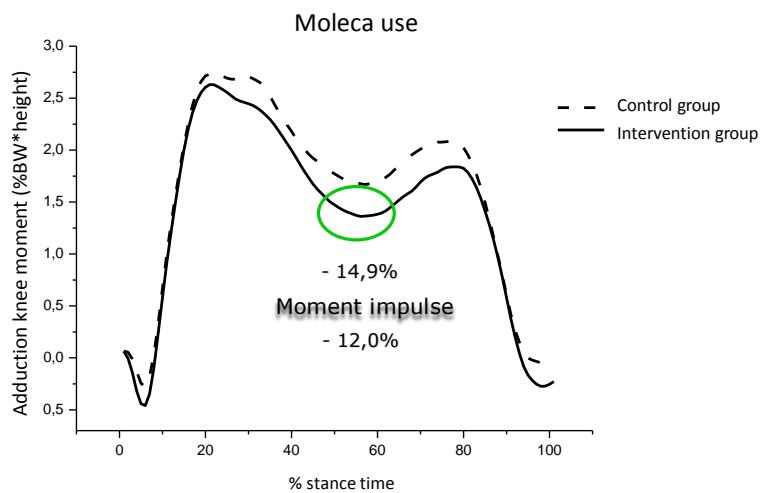


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Joint moments



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... a successful option of a conservative mechanical treatment for OA aiming at:

1. minimizing **PAIN (67%)**
2. improving **FUNCIONAL** aspects for ADLs (63%)
3. reducing **RESCUE MEDICATION** intake
4. attenuating **KNEE LOADS (15%)**
5. avoiding worsening of the clinical signs (joint edema and effusion)

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"The task is not so much to see what no one has yet seen, but to think what **nobody** has yet thought, about *that which* everyone sees."

Arthur Schopenhauer

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