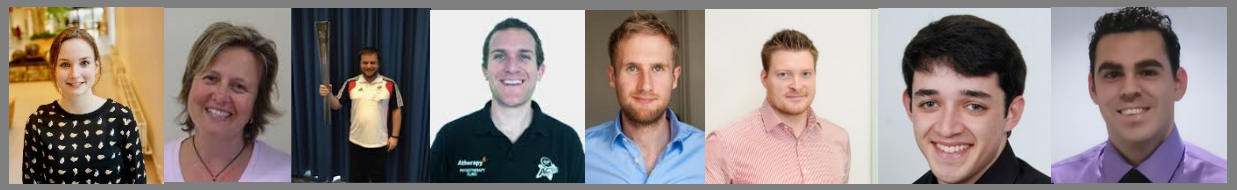

‘How to’

prescribe exercise for patellofemoral pain

Dr Christian Barton

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Sport and Exercise Medicine Research Centre, La Trobe University, Melbourne, Australia
Clinical Director and Physiotherapist, Complete Sports Care, Melbourne, Australia
Centre for Sports and Exercise Medicine, Queen Mary University of London, UK
Associate Editor British Journal of Sports Medicine and Physical Therapy in Sport

MIND THE GAP

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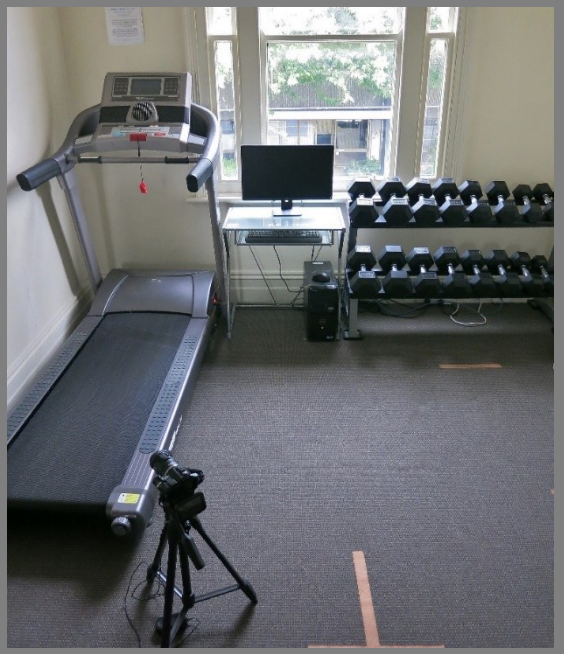

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CONSENSUS

Exercise Therapy

1) Exercise

2) Combining hip and knee exercises.

British Journal of Sports Medicine

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Br J Sports Med doi:10.1136/bjsports-2016-096268

Consensus statement

2016 Patellofemoral pain consensus statement from the 4th International Patellofemoral Pain Research Retreat, Manchester. Part 2: recommended physical interventions (exercise, taping, bracing, foot orthoses and combined interventions)

OPEN ACCESS

Kay M Crossley[1], Marienke van Middelkoop[2], Michael J Callaghan[3,4], Natalie J Collins[5], Michael Skovdal Rathleff[6], Christian J Barton[1]

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CONSENSUS

Other considerations

3) Combined interventions

4) Foot orthoses

British Journal of Sports Medicine

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CONSENSUS

Other considerations

5) Patellofemoral, knee and lumbar mobilisations may not improve outcomes

6) Electrophysical agents may not improve outcomes

Prognosis

- Reports indicate that between **71 and 91%** of individuals with PFP continue to experience recurring pain 20 years later (Devereaux 1984; Nimon 1998; Stathopulu 2003; Rathleff 2014)

- Recent prognostic paper indicated that **57% of people with PFP are likely to report unfavourable outcomes 5-8 years after** being enrolled in a clinical trial (Lankhorst 2016)

What are we missing?

Exercise appears to be key

British Journal of Sports Medicine

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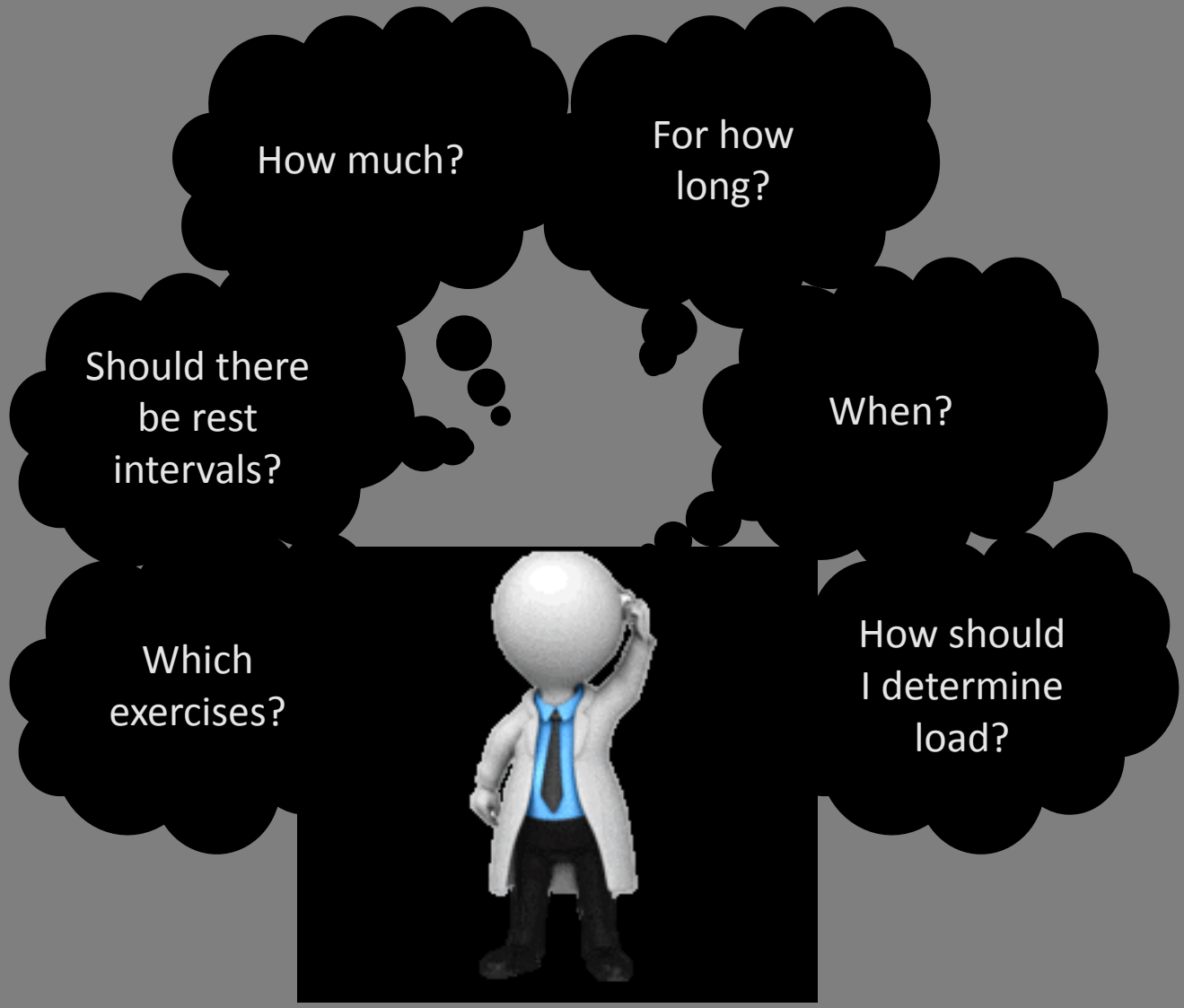
What about the ‘how to’



Review

How can we implement exercise therapy for patellofemoral pain if we do not know what was prescribed? A systematic review

Sinead Holden,[1,2] Michael Skovdal Rathleff,[1] Martin Bach Jensen,[1] Christian J Barton[3]

AIMS

1) Evaluate the **completeness of descriptions of exercise interventions**

2) Determine if authors are able to provide additional information

3) Provide guidance on 'how to' prescribe exercise to clinicians

Two ind… regardin…

TIDIER Che… …escriptors

a

- x_1, load magnitude
- x_2, number of repetitions
- x_3, number of sets
- x_4, rest in-between sets ([s] or [min])
- x_5, number of exercise interventions (per [d] or week)
- x_6, duration of the experimental period ([d] or weeks)
- x_7, fractional and temporal distribution of the contraction modes per repetition and duration [s] of one repetition
- x_8, rest in-between repetitions ([s] or [min])
- x_9, time under tension ([s] or [min])
- x_{10}, volitional muscular failure
- x_{11}, range of motion
- x_{12}, recovery time in-between exercise sessions ([h] or [d])
- x_{13}, anatomical definition of the exercise (exercise form)

Classical set of descriptors

New set of descriptors

Complete set of mechano-biological descriptors

b

	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}	x_{11}	x_{12}	x_{13}
A	75% 1RM	6	1	-	2 per week	10 weeks	2 s shortening 0 s isometric 2 s lengthening	-	24+5 s	no	60%	24 h	no
B	75% 1RM	6	1	-	2 per week	10 weeks	10 s shortening 2 s isometric 4 s lengthening	-	96+10 s	yes	100%	72 h	yes

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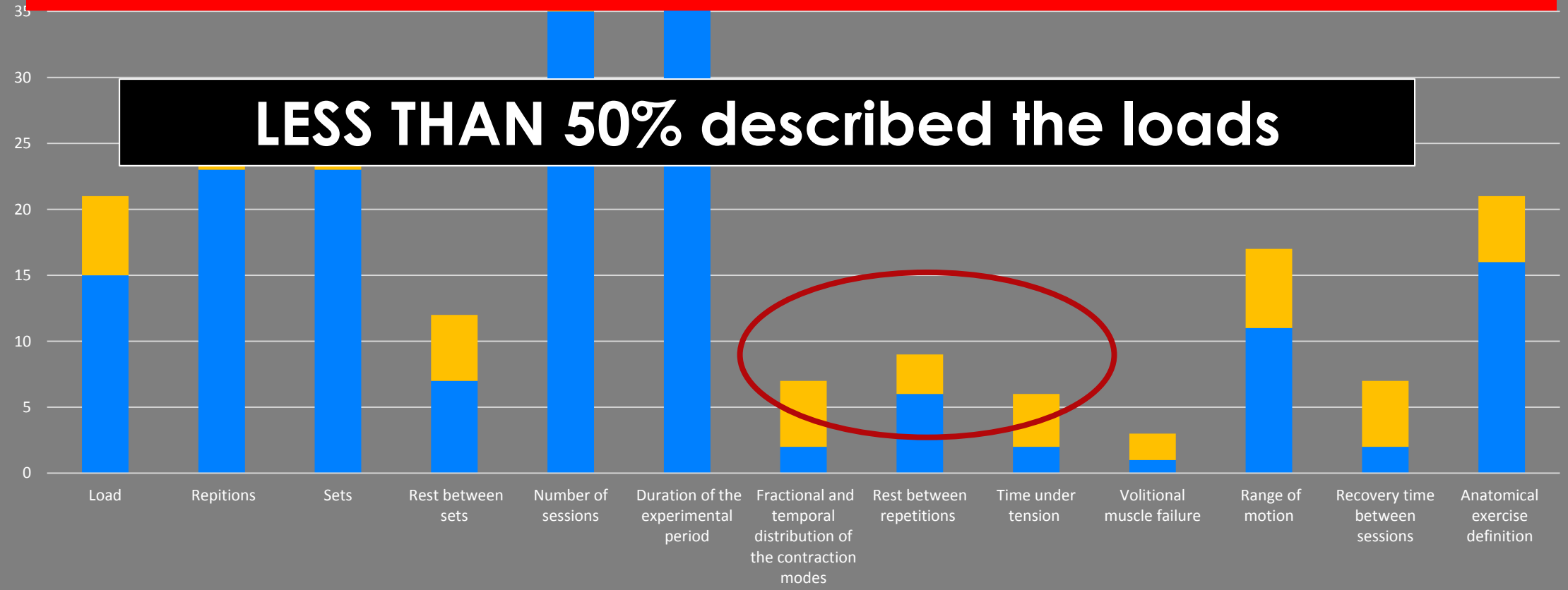
Exercise descriptors in interventions for PFP

Only 3/38 studies reported fidelity and adherence



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Holden et al. BJSM 2017

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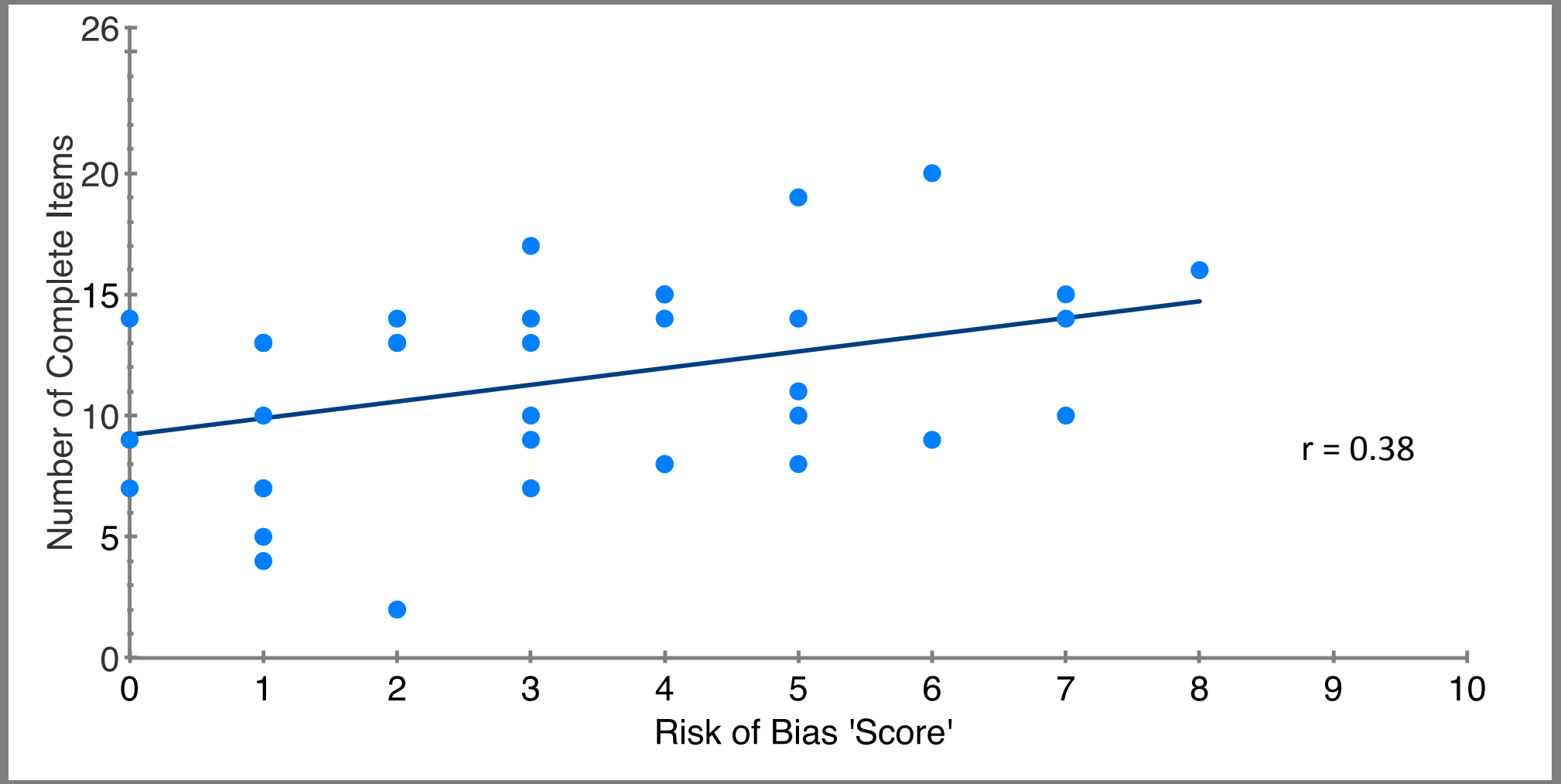
Additional information?

The exercise program that was used in our study was as published. There is no additional information about our exercise protocol

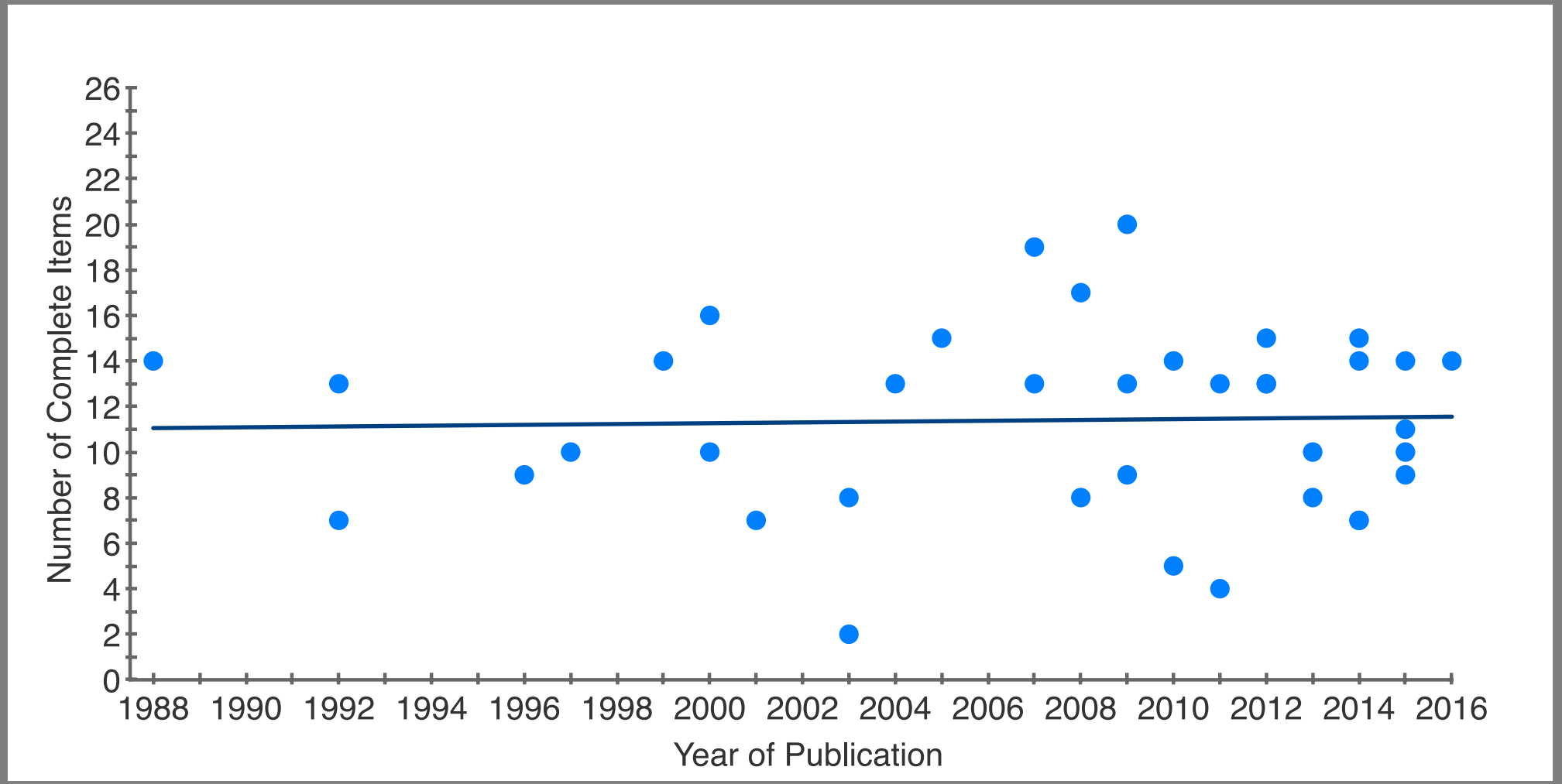
I am so sorry, but we have now deleted all raw data as this was published so long ago

No, only the information cited in the manuscript

Was there any association between external applicability and traditional measures of bias?



Are we getting any better…?



How to Fix Chronic Knee Pain

537,644 views

4K 134 SHARE

Live Sonima
Published on Apr 28, 2015

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Watch this video to learn how to work steadily towards realignment of the joints wit a few simple movements. Here, Pete Egoscue, an anatomy expert and founder o Method for non-medical pain relief, provides insight about the root cau correct it

Let's move on ……

How can we implement exercise interventions for pat[illegible]ral pain?

DOES IT MATTER????

VMO is the answer right?

Delayed Vastus Medialis Obliquus to Vastus Lateralis Onset Timing Contributes to the Development of Patellofemoral Pain in Previously Healthy Men

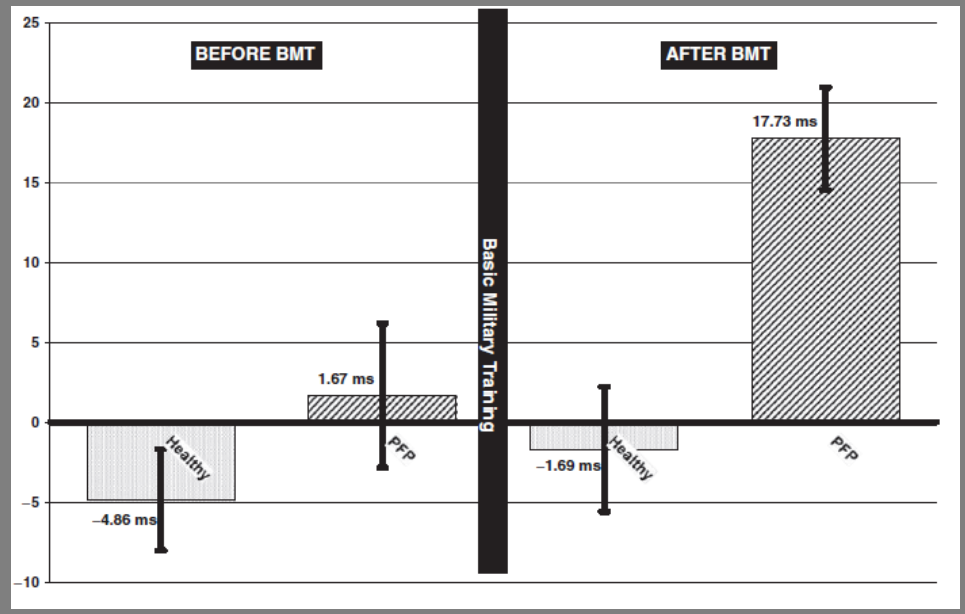
A Prospective Study

Damien Van Tiggelen,*†‡ PT, Sallie Cowan,§ PT, PhD, Pascal Coorevits,‖ PT, PhD, Nathalie Duvigneaud,† PT, PhD, and Erik Witvrouw,‡ PT, PhD

- 92 military recruits

(13 developed other injuries)

- 26/79 developed PFP (31%)
- VMO delayed in those developing PFP
- Delay greater after BMT



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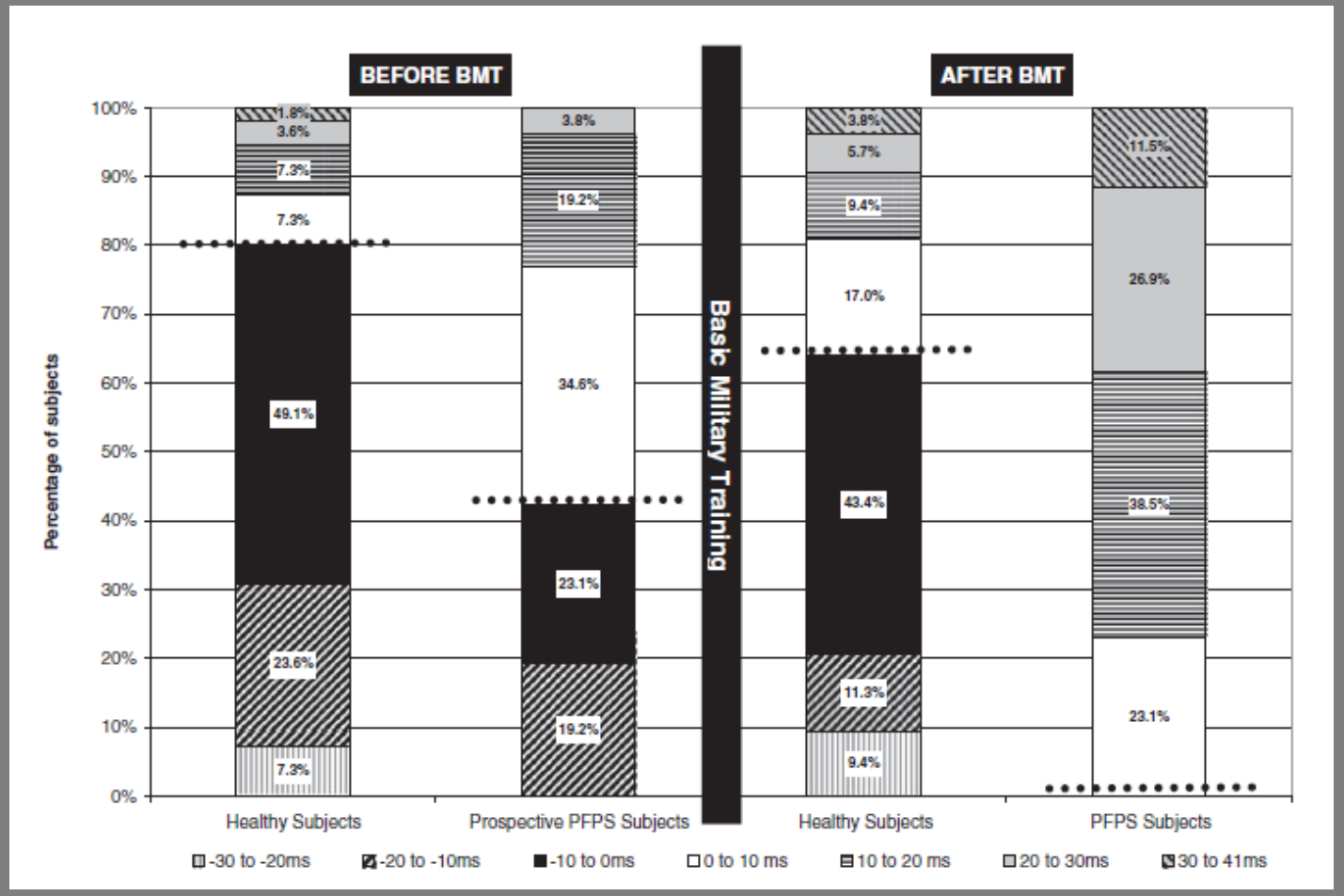
Pain leads to greater delays
Onset times are highly variable



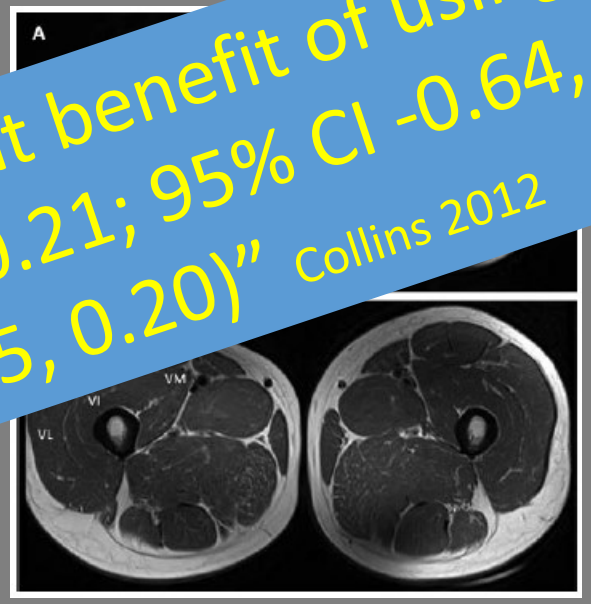
The American Journal of Sports Medicine
http://ajs.sagepub.com/

Vastus Medialis Obliquus Atrophy : Does It Exist in Patellofemoral Pain Syndrome?

Els Pattyn, Peter Verdonk, Adelheid Steyaert, Luc Vanden Bossche, Wouter Van den Broecke, Youri Thijs and Erik Witvrouw

Am J Sports Med 2011 39: 1450 originally published online April 12, 2011
DOI: 10.1177/0363546511401183

"Patients with patellofemoral problems exhibited atrophy of the VMO."



MRI with CSA divisions – atrophy:

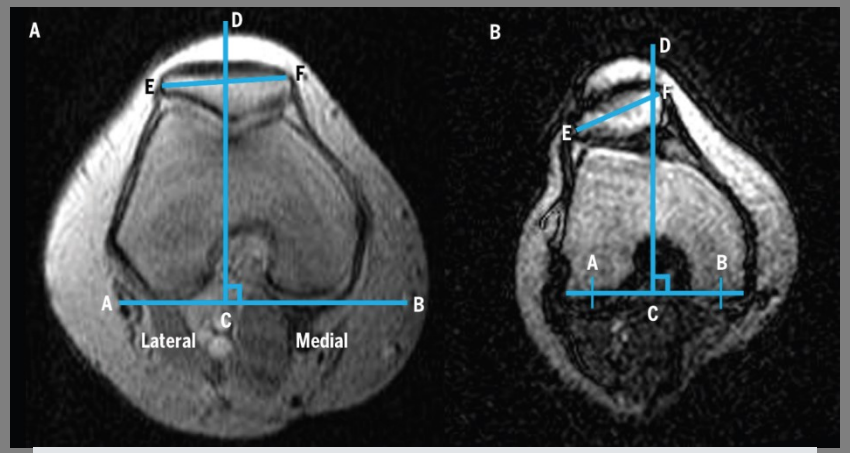
- VMO atrophy
- VL and RF atr
- T

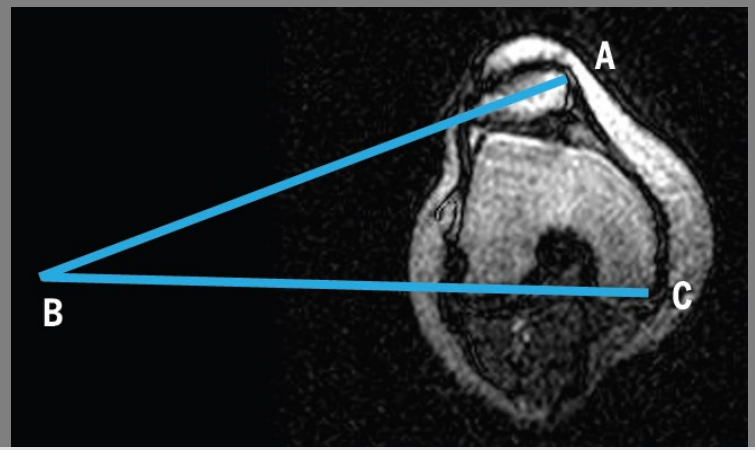
"Pooled data from two studies showed no significant benefit of using EMG biofeedback with exercise at 4 weeks (SMD -0.21; 95% CI -0.64, 0.21), or at 8 to 12 weeks (SMD -0.22; 95% CI -0.65, 0.20)" Collins 2012

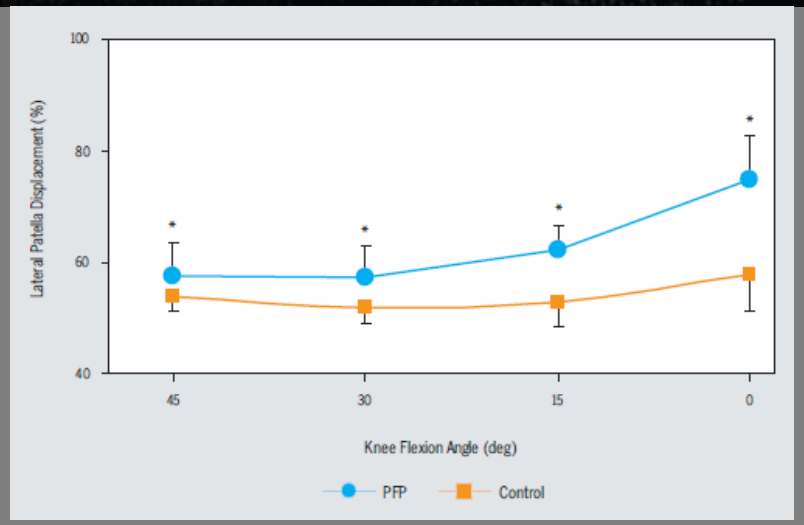
Components in PFPS Patients and Healthy Controls[a]

		PFPS Mean CSA (SD), cm^2	Control Mean CSA (SD), cm^2	Corrected Mean Difference (95% CI)	P
	VMO	16.67 (4.97)	18.36 (5.25)	−2.02 (−3.94 to −0.10)	.040[b]
	VL	5.90 (3.30)	6.59 (2.66)	−0.90 (−2.26 to 0.46)	.192
	VMO:VL	3.53 (1.99)	3.02 (0.86)	0.54 (−0.25 to 1.34)	.179
Midthigh level	VMVI	31.47 (8.28)	33.26 (8.92)	−1.61 (−4.44 to 1.21)	.259
	VL	24.83 (5.43)	27.19 (6.28)	−2.62 (−4.79 to −0.44)	.019[b]
	RF	11.23 (2.59)	12.11 (3.18)	−1.21 (−2.02 to −0.37)	.006[b]
	Total Q	66.99 (15.06)	70.83 (15.30)	−4.52 (−9.50 to 0.46)	.074

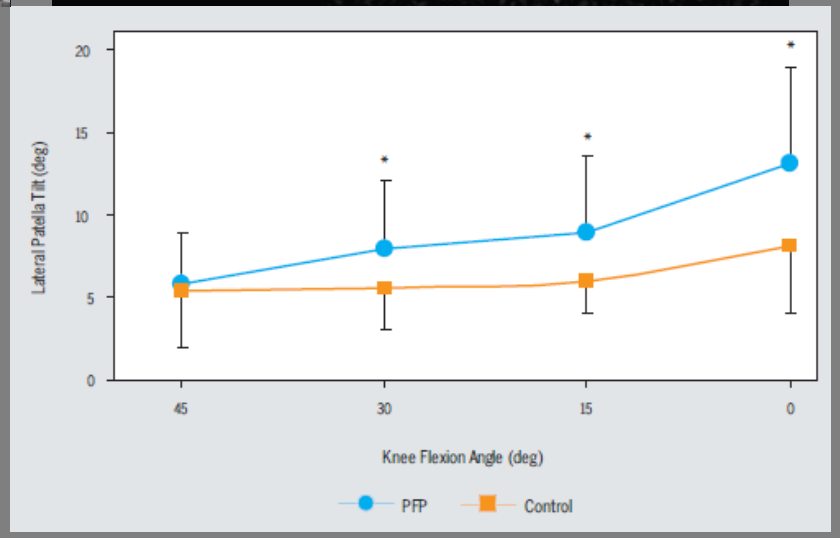
Is the patellar or the hip the cause of altered tracking? PFP V Healthy



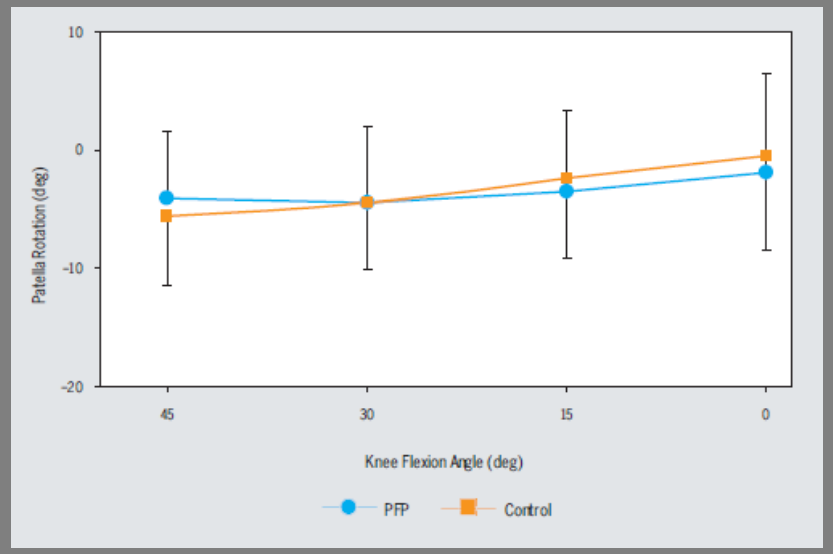


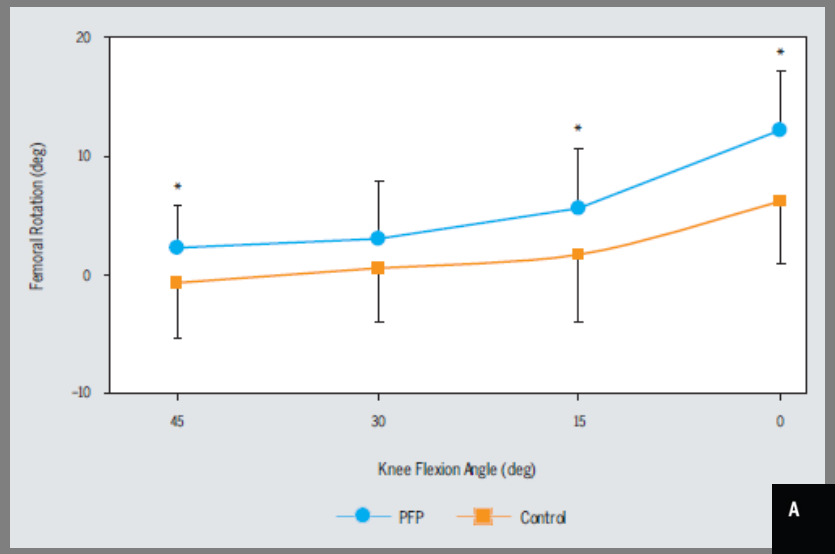


(Souza 2010)

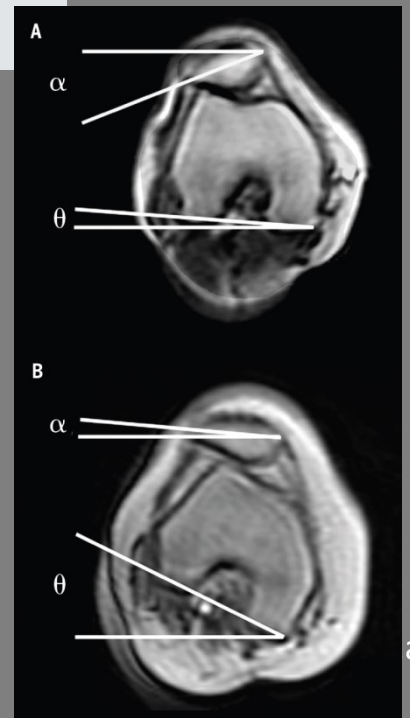


Control of the femur may be the key?





- Femoral motion responsible for maltracking in WB (Souza 2010)
- The opposite occurs in NWB (i.e. the patellar tilts on the femur) (Powers 2003)



Gluteal muscle activity and patellofemoral pain syndrome: a systematic review

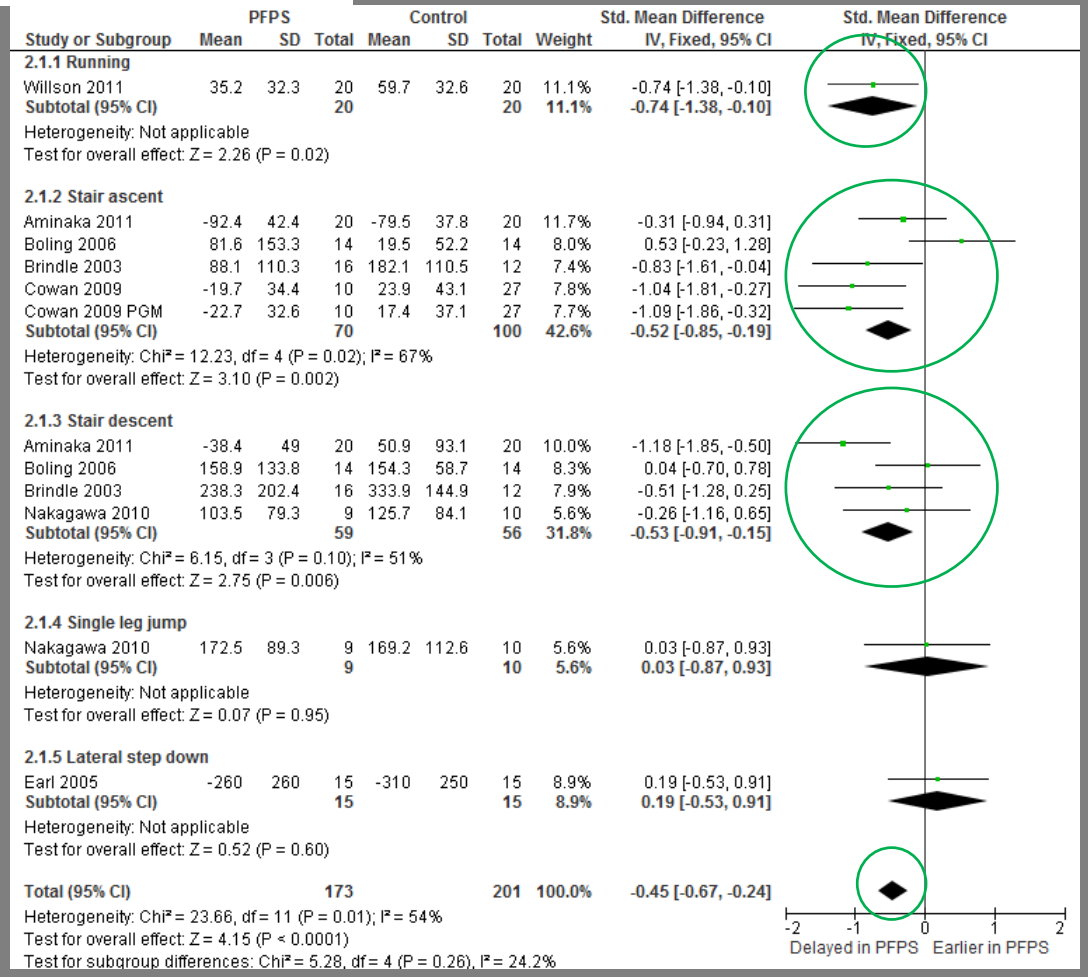
Christian J Barton, Simon Lack, Peter Malliaras, et al.

Br J Sports Med published online September 3, 2012
doi: 10.1136/bjsports-2012-090953

Neuromotor differences

- Delayed onset of Gluteus Medius
- Shorter duration of Gluteus Medius

>> Unclear if a cause or effect



Review

Is hip strength a risk factor for patellofemoral pain? A systematic review and meta-analysis

M S Rathleff,[1,2] C R Rathleff,[1] K M Crossley,[3] C J Barton[4,5,6,7]

Discord between prospective and retrospective for hip strength

B

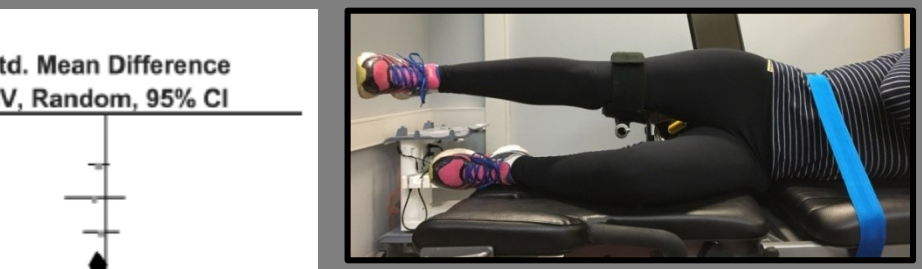
Study or Subgroup	PFP Mean	PFP SD	PFP Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
2.2.1 Prospective isometric								
Finnoff 2011	2.87	0.45	5	2.79	0.61	92	10.2%	0.13 [-0.77, 1.03]
Thijs 2011	2.4	0.64	16	2.59	0.58	61	20.6%	-0.32 [-0.87, 0.24]
Subtotal (95% CI)			**21**			**153**	**30.8%**	**-0.19 [-0.67, 0.28]**

Heterogeneity: Tau² = 0.00; Chi² = 0.69, df = 1 (P = 0.41); I² = 0%
Test for overall effect: Z = 0.81 (P = 0.42)

C

Study or Subgroup	PFP Mean	PFP SD	PFP Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
2.3.1 Prospective isometric								
Boling 2009B	0.21	0.04	40	0.22	0.05	1279	7.5%	-0.20 [-0.52, 0.11]
Finnoff 2011	1.34	0.26	5	1.44	0.31	92	3.1%	-0.32 [-1.22, 0.58]
Thijs 2011	1.72	0.31	16	1.76	0.31	61	5.3%	-0.13 [-0.68, 0.42]
Subtotal (95% CI)			**61**			**1432**	**15.9%**	**-0.19 [-0.46, 0.07]**

Heterogeneity: Tau² = 0.00; Chi² = 0.13, df = 2 (P = 0.93); I² = 0%
Test for overall effect: Z = 1.46 (P = 0.14)



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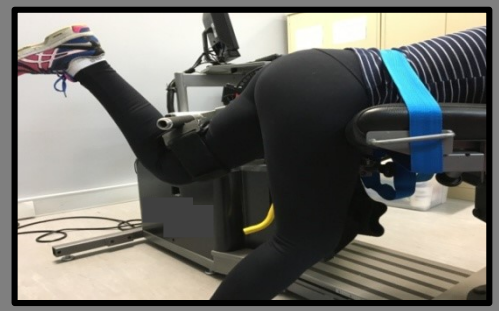
M S Rathleff,[1,2] C R Rathleff,[1] K M Crossley,[3] C J Barton[4,5,6,7]

Reduced isometric and eccentric hip abduction strength exists

1.1.2 Mixed gender isometric								
Bazett-Jones 2013	0.384	0.07	19	0.388	0.07	19	3.7%	-0.06 [-0.69, 0.58]
Cowan 2009 Aug	13.07	4.52	10	13.39	4.08	27	3.3%	-0.07 [-0.80, 0.65]
Dierks 2008 Aug	15.3	2.2	20	17.3	2.6	20	3.6%	-0.81 [-1.46, -0.17]
Ferber 2011 Mar-Apr	12.91	4.12	15	18.11	3.89	10	2.8%	-1.25 [-2.13, -0.36]
Nakagawa 2012 Sep Frontal	0.96	0.18	40	1.19	0.2	40	4.3%	-1.20 [-1.67, -0.72]
Piva 2005 Dec	18	7.3	30	21	4	30	4.1%	-0.50 [-1.02, 0.01]
Rathleff2013	25.5	4.4	20	24.4	3.8	20	3.7%	0.26 [-0.36, 0.89]
Roach 2013	34.6	9.8	26	42	9.1	26	3.9%	-0.77 [-1.34, -0.21]
Souza 2009 Differenes	1.39	0.41	19	1.62	0.26	19	3.6%	-0.66 [-1.31, -0.00]
Souza 2009 Predictors	1.39	0.41	21	1.62	0.26	20	3.7%	-0.65 [-1.28, -0.02]
Willson 2008	21.1	6.03	20	24.9	5.67	20	3.7%	-0.64 [-1.27, 0.00]
Subtotal (95% CI)			**240**			**251**	**40.5%**	**-0.58 [-0.85, -0.30]**
Heterogeneity: $Tau^2 = 0.11$; $Chi^2 = 21.22$, df = 10 (P = 0.02); $I^2 = 53\%$								
Test for overall effect: Z = 4.14 (P < 0.0001)								
1.1.3 Mixed gender eccentric								
Boling 2009 Cross sec	0.048	0.017	20	0.061	0.015	20	3.6%	-0.79 [-1.44, -0.15]
Nakagawa 2012 Trunk	0.67	0.2	40	0.81	0.19	40	4.4%	-0.71 [-1.16, -0.26]
Subtotal (95% CI)			**60**			**60**	**8.0%**	**-0.74 [-1.11, -0.37]**
Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 0.04$, df = 1 (P = 0.83); $I^2 = 0\%$								
Test for overall effect: Z = 3.90 (P < 0.0001)								
1.1.4 Mixed gender concentric								
Boling 2009 Cross sec	0.061	0.018	20	0.064	0.021	20	3.7%	-0.15 [-0.77, 0.47]
Subtotal (95% CI)			**20**			**20**	**3.7%**	**-0.15 [-0.77, 0.47]**
Heterogeneity: Not applicable								
Test for overall effect: Z = 0.47 (P = 0.64)								



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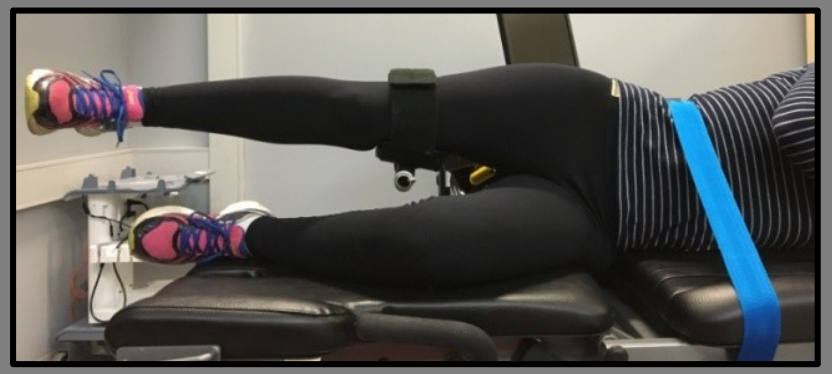
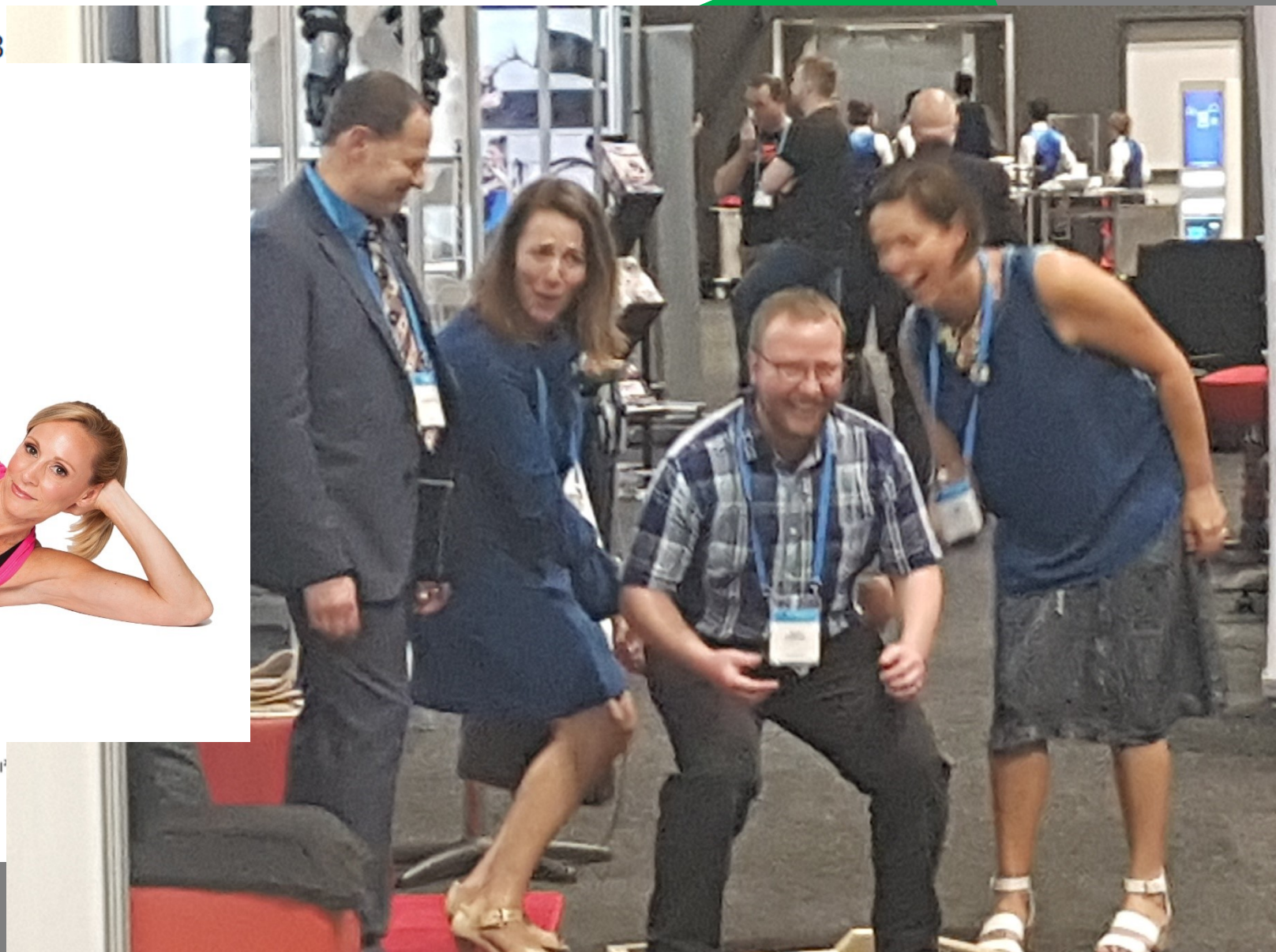


Where do we start???

OPEN ACCESS

Proximal muscle rehabilitation is effective for patellofemoral pain: a systematic review with meta-analysis

Simon Lack,[1] Christian B



Subtotal (95% CI)
Heterogeneity: Chi² = 0.37, df = 1 (P = 0.54); I²
Test for overall effect: Z = 3.37 (P = 0.0007)

@DrChrisBarton

3 sets of 10 right?

What is our prescription?

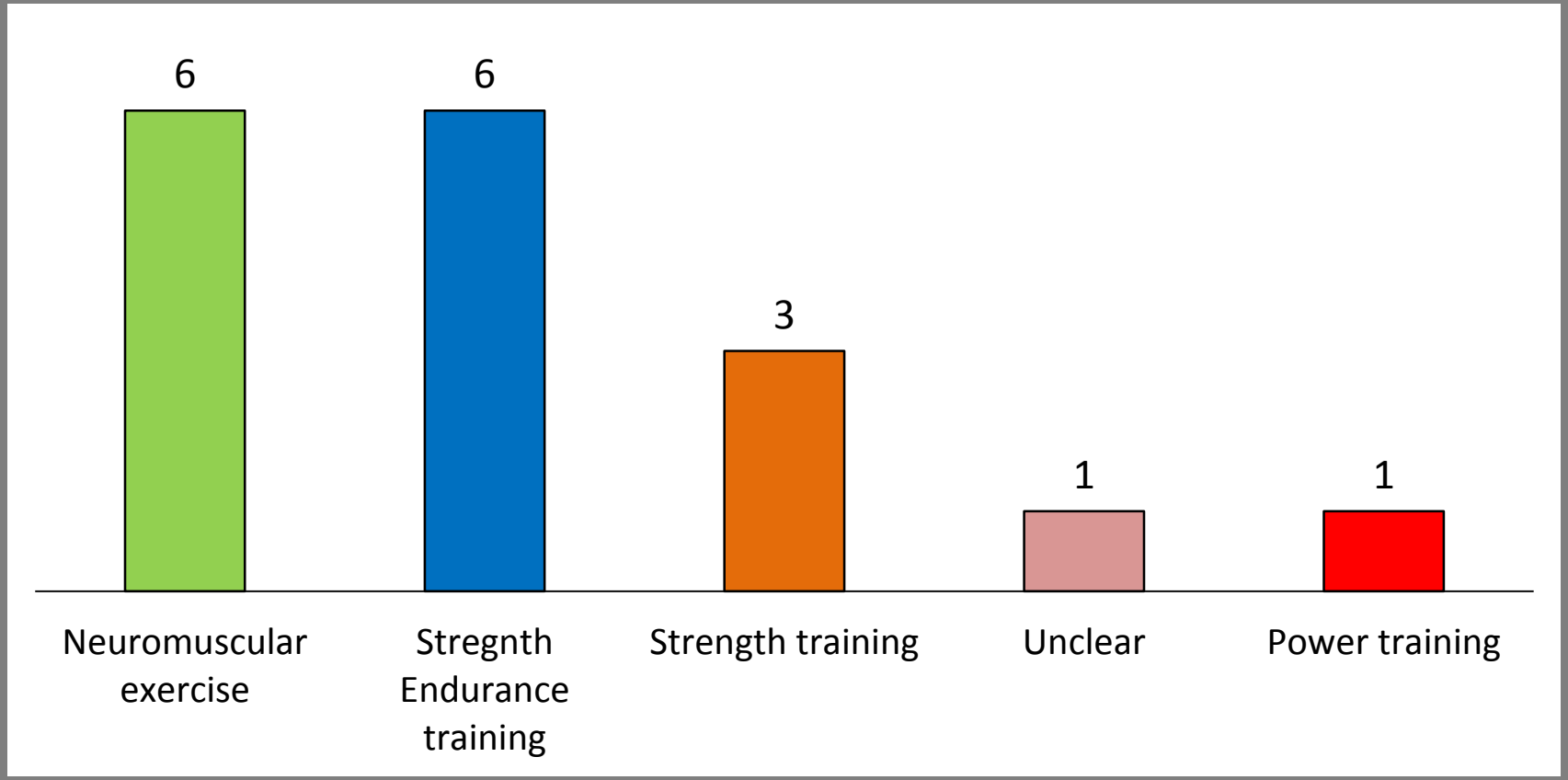
13/14 studies suggested they were targeting strength

TREK
TRANSLATING RESEARCH EVIDENCE AND KNOWLEDGE

Proximal muscle rehabilitation is effective for patellofemoral pain: a systematic review with meta-analysis

Simon Lack,[1] Christian Barton,[1,2,3,4] Oliver Sohan,[1] Kay Crossley,[5] Dylan Morrissey[1,6]

Br J Sports Med 2015;**0**:1–13.



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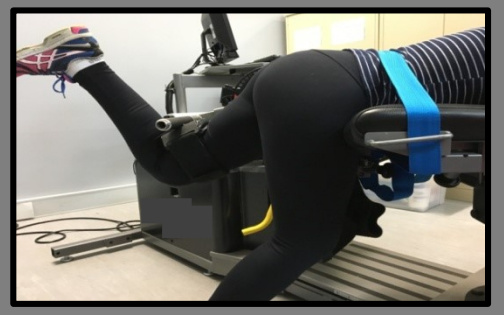
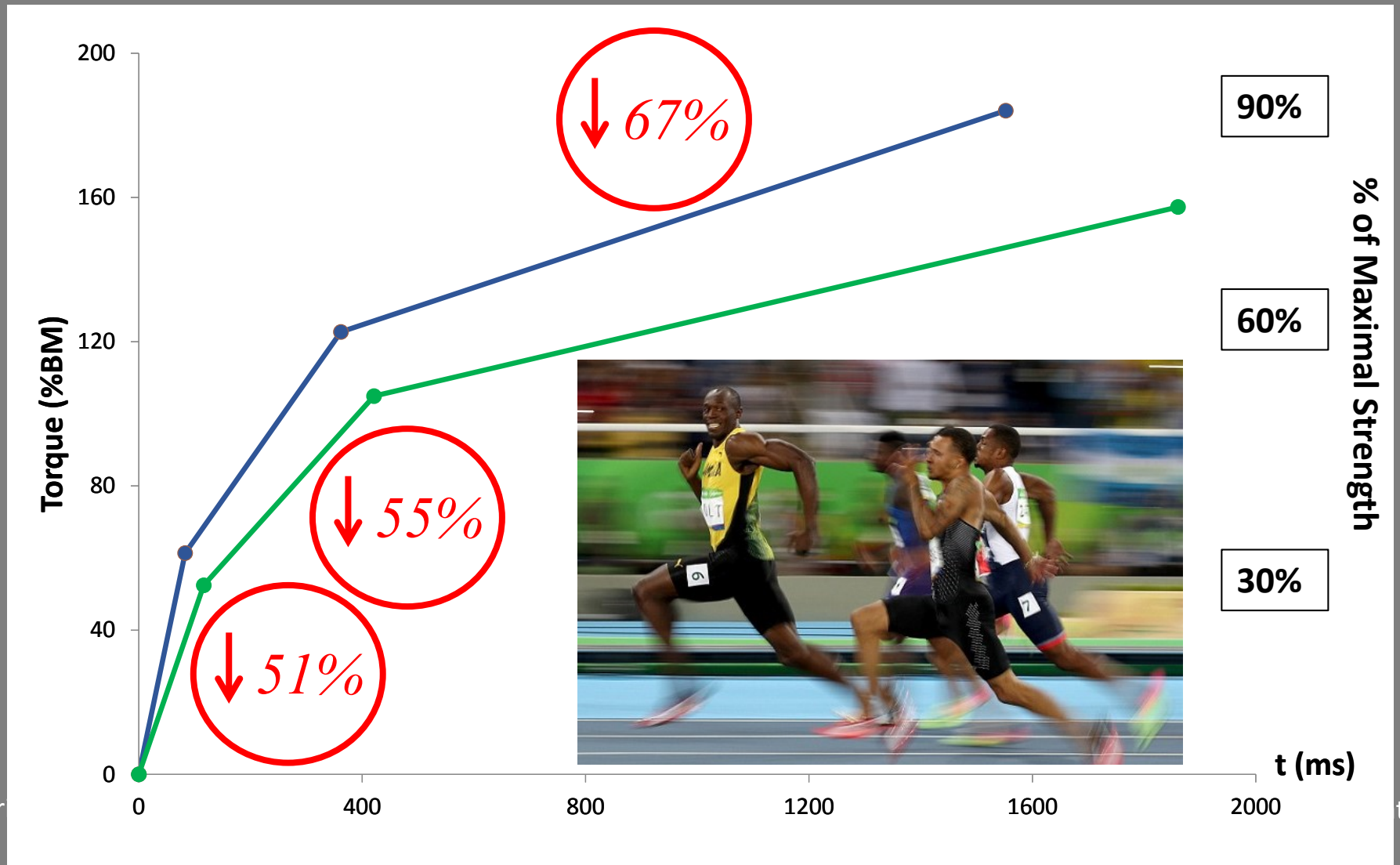
RFD - Hip Extensors

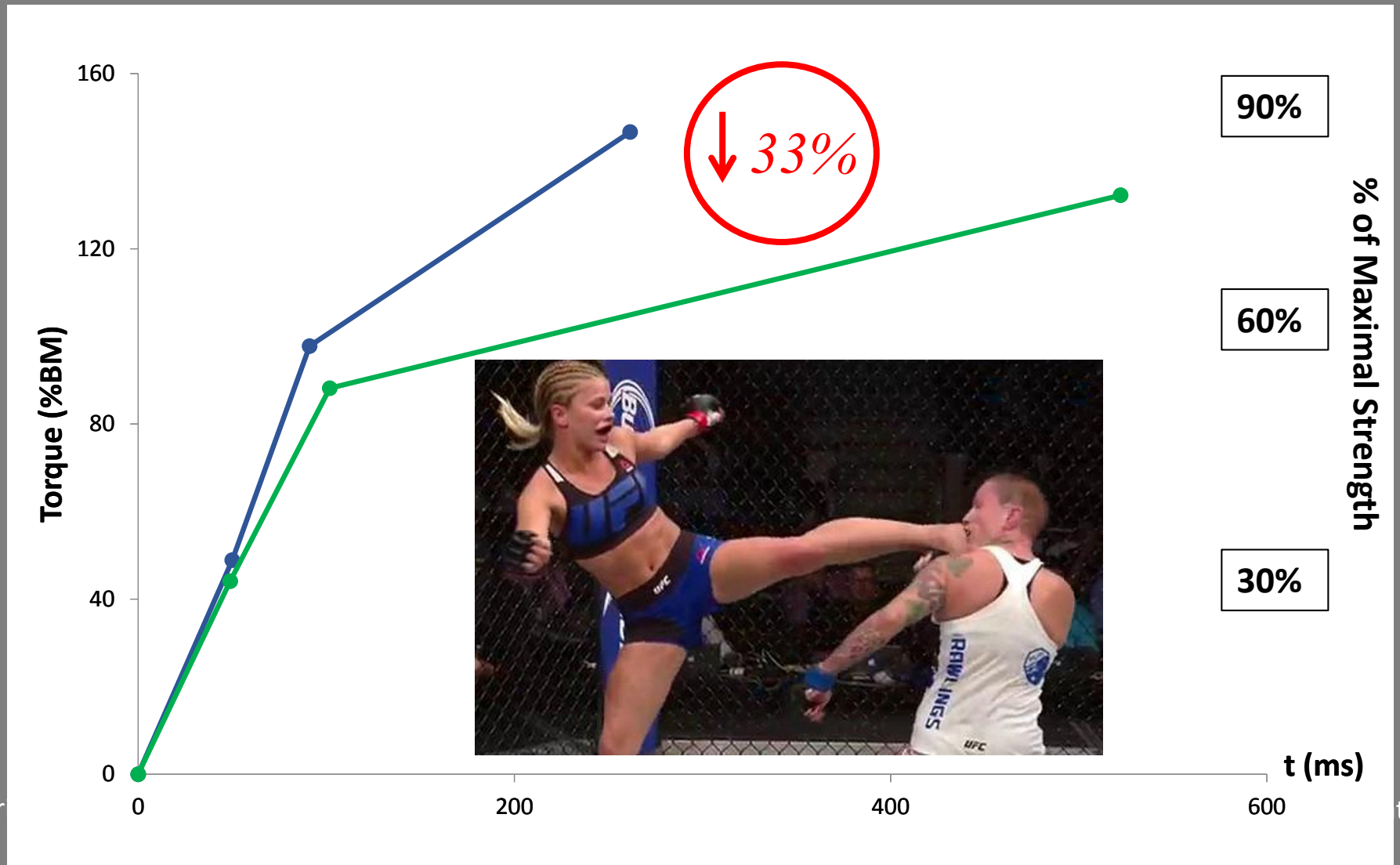


Control Group
PFP Group



RFD - Hip Abductors

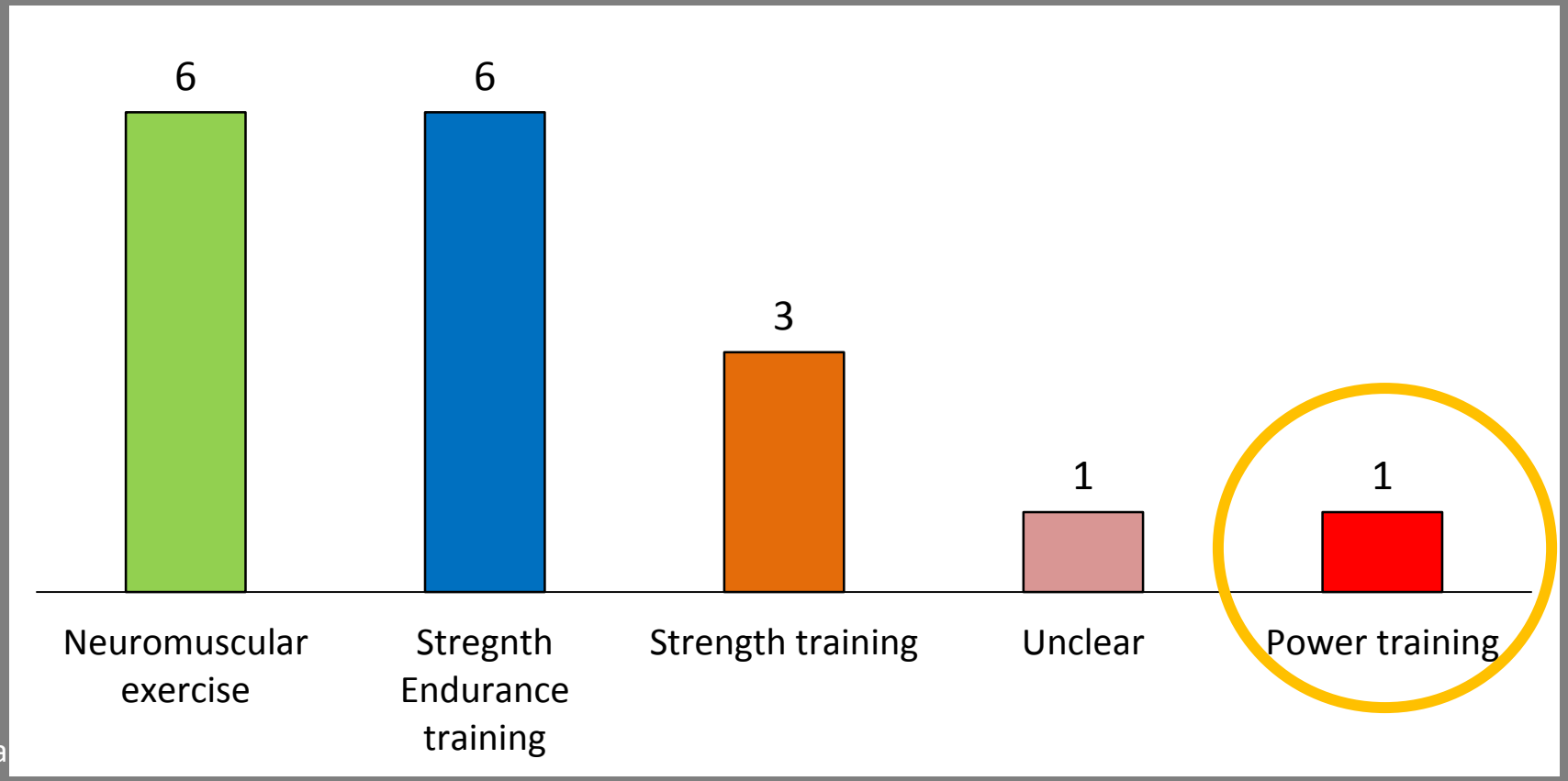
Control Group
PFP Group



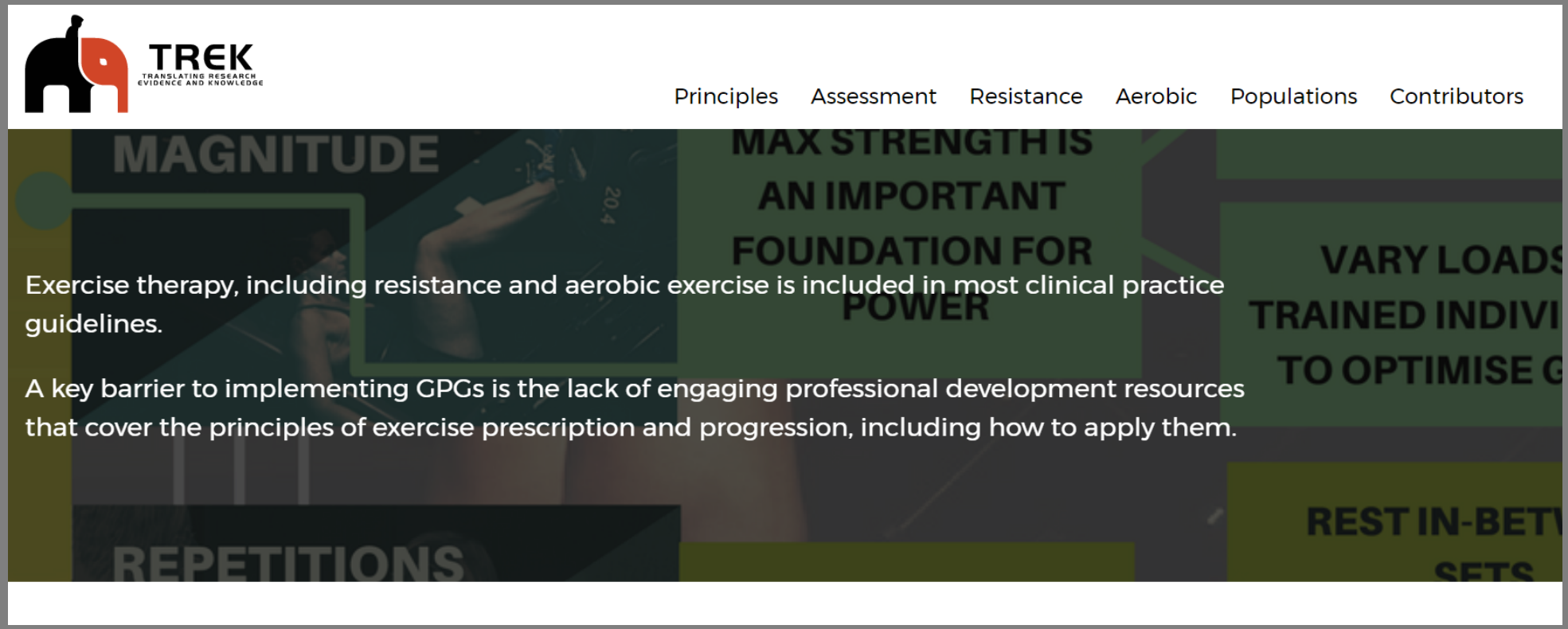
Proximal muscle rehabilitation is effective for patellofemoral pain: a systematic review with meta-analysis

Simon Lack,[1] Christian Barton,[1,2,3,4] Oliver Sohan,[1] Kay Crossley,[5] Dylan Morrissey[1,6]

Br J Sports Med 2015;**0**:1–13.



@DrChrisBa


TREK
TRANSLATING RESEARCH EVIDENCE AND KNOWLEDGE
Principles
Assessment
Resistance
Aerobic
Populations
Contributors
MAGNITUDE
MAX STRENGTH IS
AN IMPORTANT
FOUNDATION FOR
POWER
VARY LOADS
TRAINED INDIVI
TO OPTIMISE G
REPETITIONS
REST IN-BETW
SETS
Exercise therapy, including resistance and aerobic exercise is included in most clinical practice guidelines.
A key barrier to implementing GPGs is the lack of engaging professional development resources that cover the principles of exercise prescription and progression, including how to apply them.

EXERCISE PRESCRIPTION

@TREK_group

ENDURANCE

LOAD MAGNITUDE

Start low (< 50% 1RM)

FOCUS ON VOLUME + EXERCISE FORM

REPETITIONS AND SETS

>15 REPS
3 SETS minimum
(> number of sets are most effective)

REST IN-BETWEEN SETS
30-90 SECS

SHORTER REST B/W SETS MAY ALLOW ENDURANCE

TIME UNDER TENSION

VELOCITY
(slow-moderate)

UNTRAINED INDIVIDUALS
4-5 SEC PER REP

Reference: American College of Sports M (2009)
Garber CE, et al (2011)

Designed by @fisioterapianet

TREK
TRANSLATING RESEARCH EVIDENCE AND KNOWLEDGE

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EXERCISE PRESCRIPTION

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STRENGTH

LOAD MAGNITUDE

↑ LOAD will more effectively ↑ STRENGTH

- NOVICE TO INTERMEDIATE 60-70% 1RM
- ADVANCED OR EXPERIENCED >80% 1RM

REPETITIONS AND SETS

8-12 REPS
1-3 SETS
(3 sets are most effective)

- REST IN-BETWEEN SETS 2-3 MIN
- 2-10 SEC REST B/W SETS MAY ALLOW ↑ LOADS

TIME UNDER TENSION

VELOCITY (slow-moderate)

- UNTRAINED INDIVIDUALS START AT 1-2 SEC
- ↑ TENSION TIME may ↑ STRENGTH GAINS

Reference: American College of Sports M (2009)
Garber CE, et al (2011)

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EXERCISE PRESCRIPTION

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POWER

LOAD MAGNITUDE

MAX STRENGTH IS AN IMPORTANT FOUNDATION FOR POWER

- START WITH LIGHT LOADS (<60% 1RM)
- VARY LOADS IN TRAINED INDIVIDUALS TO OPTIMISE GAINS

REPETITIONS AND SETS

3-6 REPS
3-6 SETS

- REST IN-BETWEEN SETS 3-5 MIN
- ↑ REST CAN HELP OPTIMISE MOVEMENT VELOCITY

TIME UNDER TENSION

EXPLOSIVE MOVEMENTS

- VARY VELOCITY ACCORDING TO PATIENT NEEDS
- ↑ VELOCITY TO OPTIMISE PEAK POWER GAINS

Reference: American College of Sports M (2009)
Garber CE, et al (2011)

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EXERCISE PRESCRIPTION

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PLYOMETRIC

LOW INTENSITY

10-30 REPS
10-15 SETS

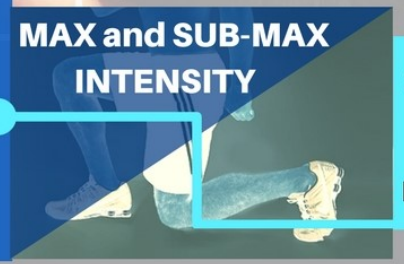
- MEDICINE BALL, LOW SHORT HOPS, TWO LEG JUMPS HOPS & STEPS
- REST IN-BETWEEN SETS 2-3 MIN

MODERATE INTENSITY

10-25 REPS
10-20 SETS

- TWO LEG JUMPS FROM HEIGHT UPPER BODY, MEDICINE BALL FOR DISTANCE SHOT
- REST IN-BETWEEN SETS 3-5 MIN

MAX and SUB-MAX INTENSITY



SUB 5-15 REPS
5-15 SETS

MAX 3-5 REPS
10-20 SETS

- HIGH REACTIVE JUMPS, SHOCK HITS HEAVY, IMPLEMENTS IN DEPTH JUMPS
- REST IN-BETWEEN SETS 5-7 MIN 8-10 MIN

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TRANSLATING RESEARCH EVIDENCE AND KNOWLEDGE

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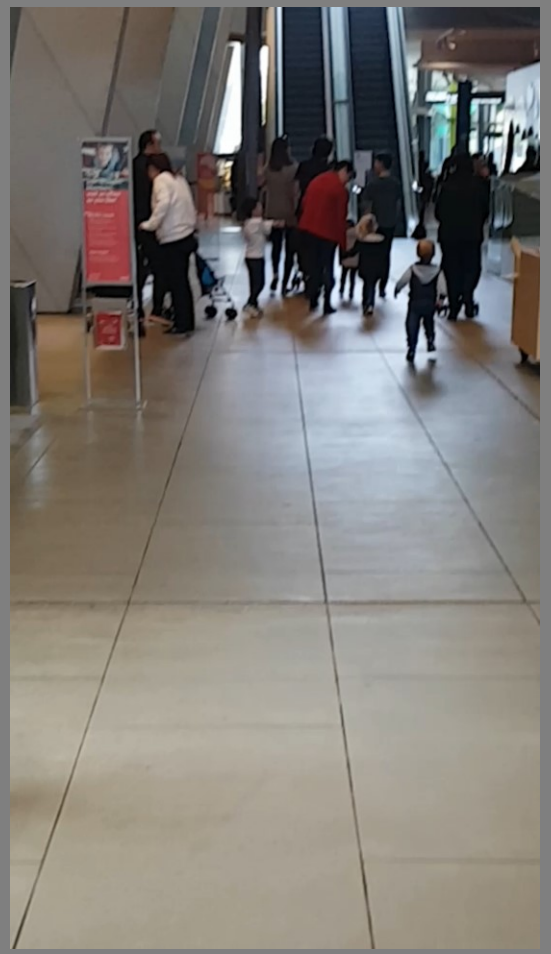
Is it that simple?

Meet Frankie



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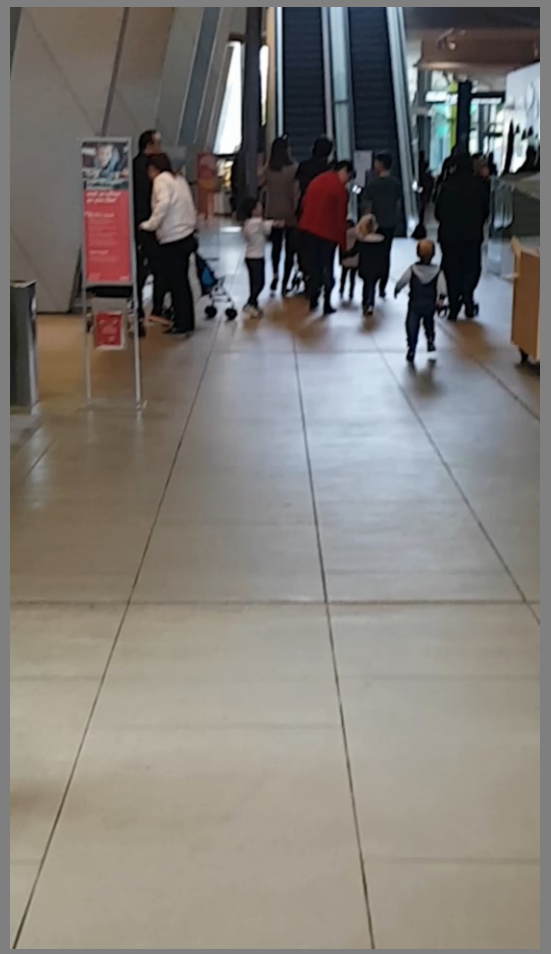
Meet Frankie



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People with PFP also present movement protection mechanisms

ELSEVIER

Journal of Orthopaedic Research 22 (2004) 267–274

Journal of Orthopaedic Research

www.elsevier.com/locate/orthres

Knee flexion during stair ambulation is altered in individuals with patellofemoral pain ☆

Kay M. Crossley [a,b,*], Sallie M. Cowan [a], Kim L. Bennell [a], Jenny McConnell [a,c]

[a] *Centre for Sports Medicine Research and Education, School of Physiotherapy, The University of Melbourne, Victoria 3010, Australia*
[b] *Olympic Park Sports Medicine Centre, Swan St, Melbourne 3004, Australia*
[c] *McConnell and Clements Physiotherapy, 4 Bond St, Mosman 2088, Australia*

Received 10 March 2003; accepted 20 August 2003

Reduced knee flexion climbing stairs

ELSEVIER

Contents lists available at ScienceDirect

Clinical Biomechanics

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

Reduced knee flexion is a possible cause of increased loading rates in individuals with patellofemoral pain

Danilo de Oliveira Silva [a], Ronaldo Valdir Briani [a], Marcella Ferraz Pazzinatto [a], Deisi Ferrari [b], Fernando Amâncio Aragão [c], Fábio Mícolis de Azevedo [a,*]

[a] *Physical Therapy Department, School of Science and Technology, University of São Paulo State, Presidente Prudente, Brazil*
[b] *Post-Graduation Program Interunits Bioengineering EESC/FMRP/IQSC-USP, University of São Paulo, São Carlos, Brazil*
[c] *Physical Therapy Department, State University of West Parana, Cascavel, Parana, Brazil*

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People with PFP also present movement protection mechanisms

Are Patellofemoral Pain and Quadriceps Femoris Muscle Torque Associated With Locomotor Function?

Christopher M Powers, Jacquelin Perry, Arthur Hsu and Helen J Hislop

PHYS THER. 1997; 77:1063-1075.

Reduced cadence climbing stairs

@DrChrisBarton

Clinical Biomechanics 35 (2016) 56–61

Contents lists available at ScienceDirect

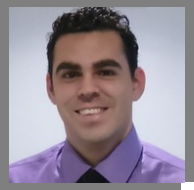
Clinical Biomechanics

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

Proximal mechanics during stair ascent are more discriminate of females with patellofemoral pain than distal mechanics

Danilo de Oliveira Silva [a], Christian John Barton [b,c], Marcella Ferraz Pazzinatto [a], Ronaldo Valdir Briani [a], Fábio Mícolis de Azevedo [a,*]

[a] *Physical Therapy Department, School of Science and Technology, University of São Paulo State, Presidente Prudente, Brazil*
[b] *Lower Extremity Gait Studies, La Trobe University, Australia*
[c] *Centre for Sports and Exercise Medicine, Queen Mary University of London, London, UK*



Knee Surg Sports Traumatol Arthrosc (2013) 21:1562–1568
DOI 10.1007/s00167-012-2238-5

KNEE

Influence of kinesiophobia and catastrophizing on pain and disability in anterior knee pain patients

Julio Domenech · Vicente Sanchis-Alfonso · Laura López · Begoña Espejo

KINESIOPHOBIA

Kinesiophobia in PFP → Pain and Function

0.26

- 0.53

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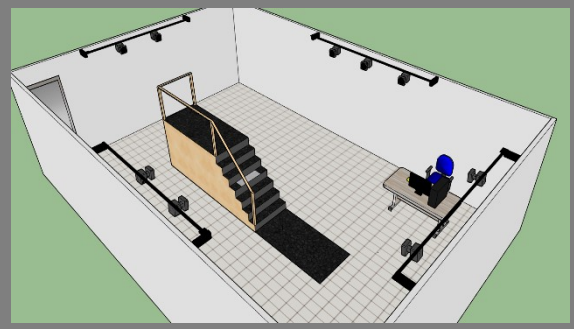
Participants

24 women with PFP

Characteristics	Mean (SD)
Age (years)	22.3 (3.4)
Body mass (kg)	60.9 (10.7)
Height (m)	1.61 (0.05)
Symptoms duration (months)	73.9 (47.2)
Worst pain last month (VAS 0 -100 mm)	58.8 (14.5)

Methods

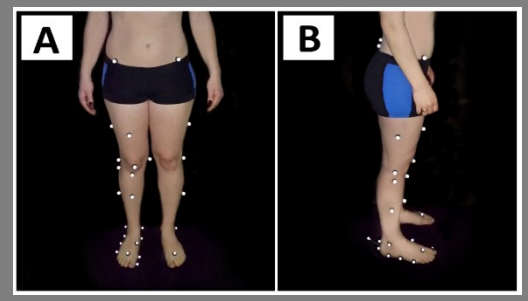


Kinesiophobia

TAMPA

Cadence climbing stairs

Peak knee flexion climbing stairs



Peak knee extensor strength (isometric, concentric and eccentric)

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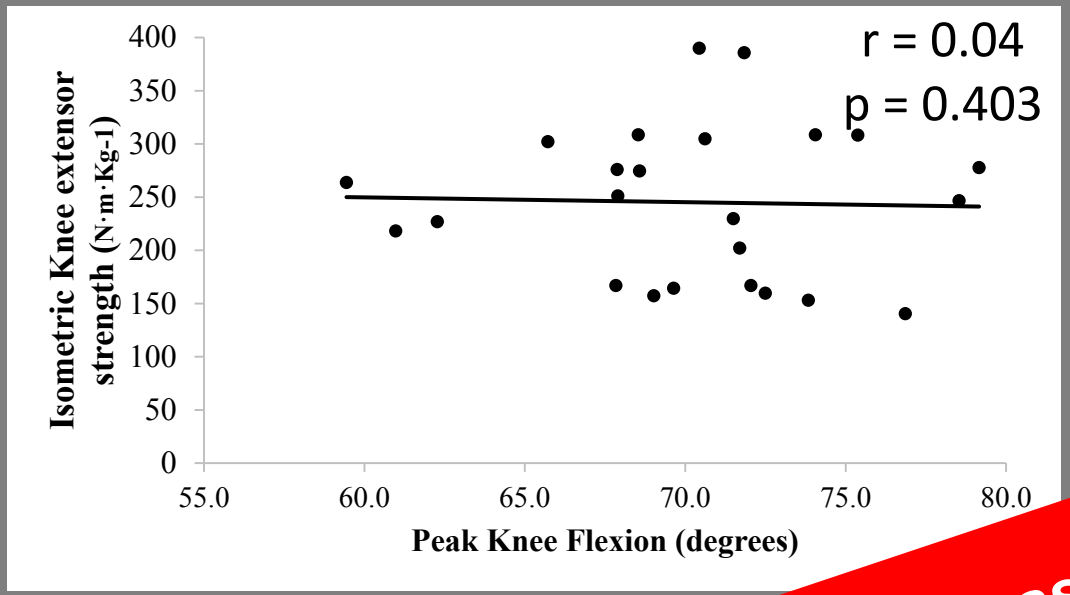
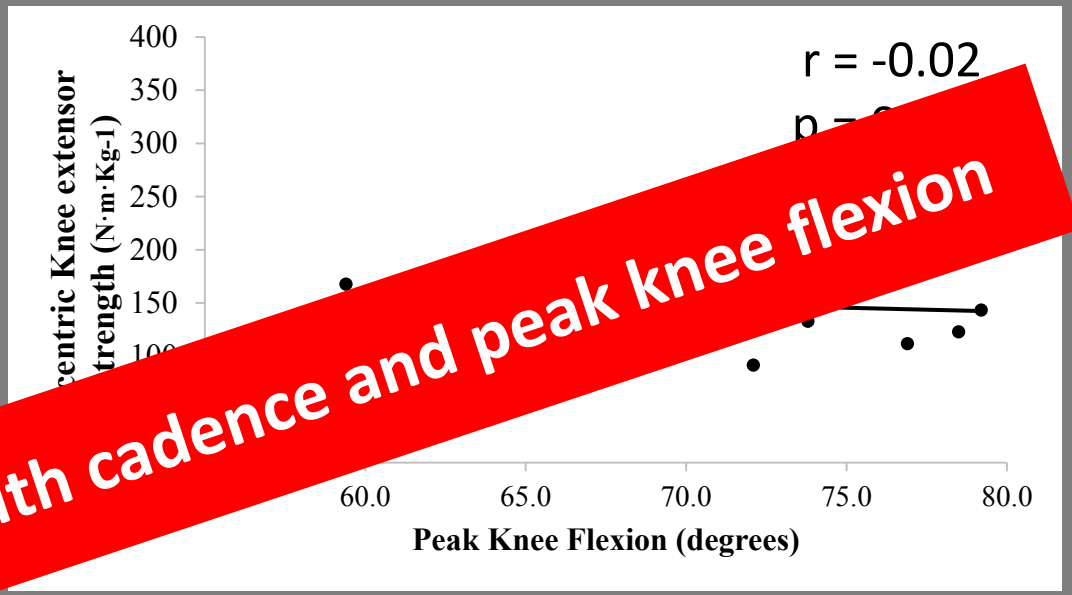
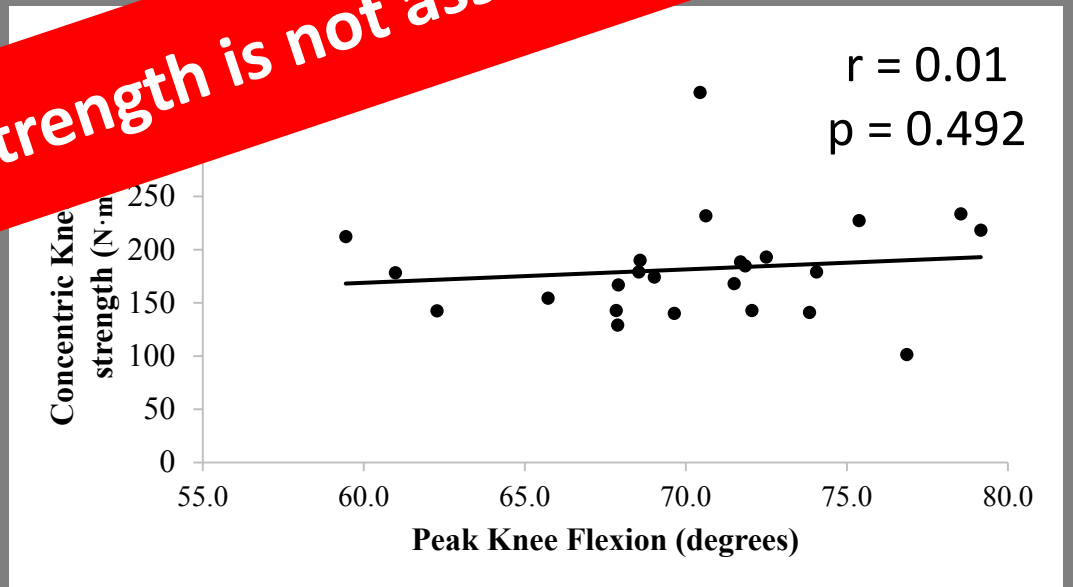
RESULTS – Strength and Kinematics





Knee extensor strength is not associated with cadence and peak knee flexion



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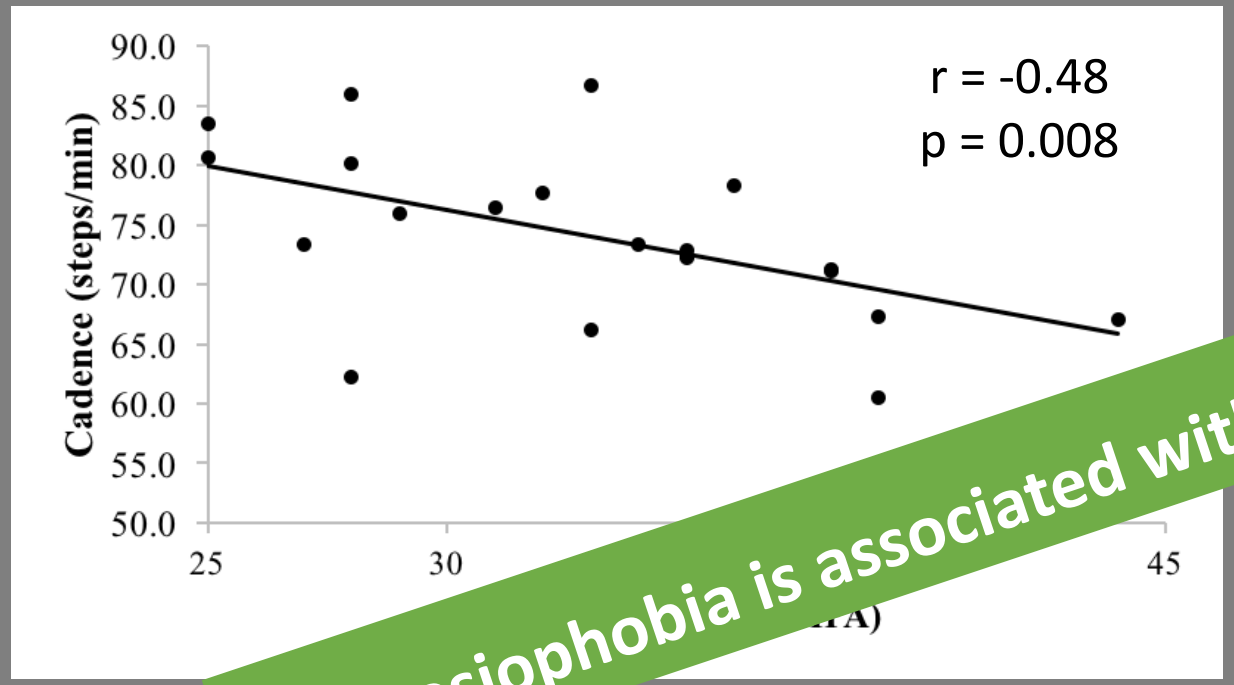
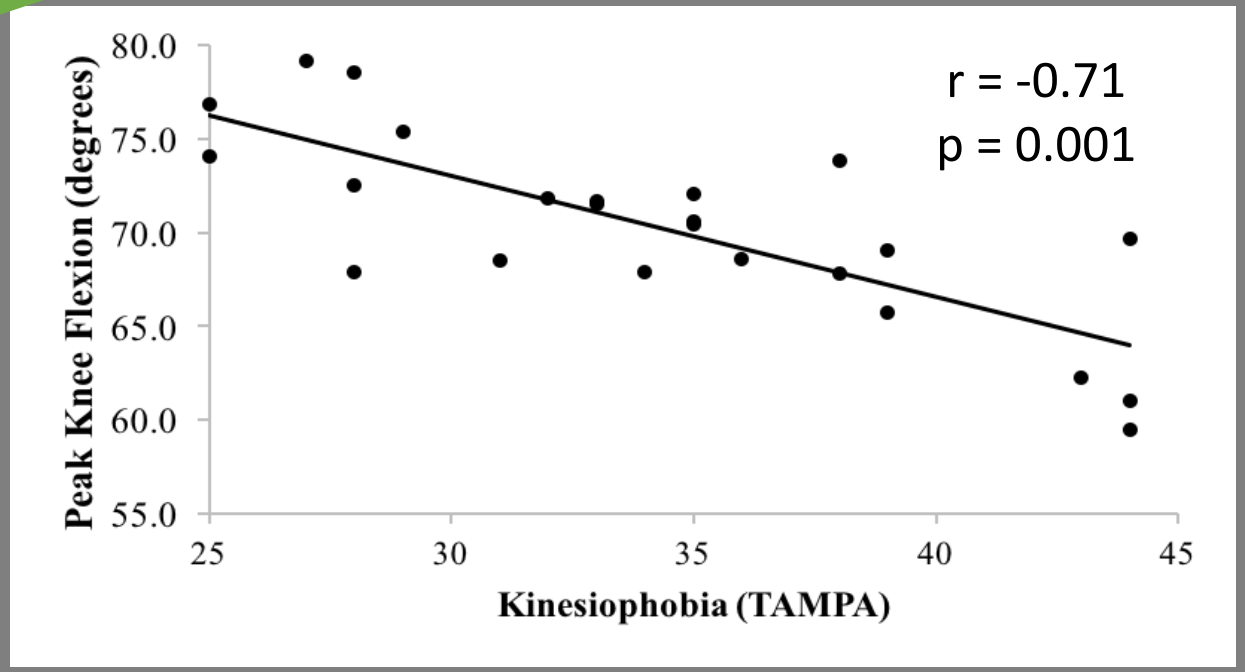
RESULTS – Kinematics and Kinesiophobia



Kinesiophobia is associated with ↓ cadence and peak knee flexion



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IT IS QUITE COMMON FOR PEOPLE WITH KNEE PAIN TO BE FEARFUL OF WALKING ON STAIRS DUE TO CONCERN THAT THEIR PAIN MAY WORSEN
YOU MAY FIND THE FOLLOWING HELPFUL!

1. Start by stepping up and down on a thin book
   Do this between 10 and 20 times each day

2. When you feel confident. Try using a thicker book

3. When you are more confident. Try stepping up and down one normal step

4. Next, try multiple steps (e.g. 3 steps) in one go

5. When you feel confident enough. Try go up and down a flight of stairs

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ELSEVIER

Physiotherapy

Physiotherapy 99 (2013) 126–131

Dose–response effects of medical exercise therapy in patients with patellofemoral pain syndrome: a randomised controlled clinical trial

Berit Østerås [a,*], Håvard Østerås [a], Tom Arild Torstensen [b], Ottar Vasseljen [c]

[a] *Department of Physiotherapy, Faculty of Health Education and Social Work, Sør-Trøndelag University College, Trondheim, Norway*
[b] *Holten Institute, Lidingö, Sweden*
[c] *Department of Public Health and General Practice, Faculty of Medicine, Norwegian University of Science and Technology, Trondheim, Norway*

Table 2
Baseline characteristics of the study population. Mean (standard deviation) values unless otherwise stated.

	Experimental group ($n = 21$)	Control group ($n = 19$)
Age (years)	33 (12.3)	26.8 (10.5)
Duration of symptoms (years)	3.6 (2.7)	2.9 (3.1)
Bilateral knee symptoms, *n* (%)	15 (71.4)	13 (68.4)
Female gender, *n* (%)	15 (71.4)	17 (89.5)

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DOSE?

Table 1
Therapeutic exercise regimens in the two groups.

Experimental group (high dose)	Control group (low dose)
Stationary bike (global) 20 minutes Deloaded step up (semi-global) 3 × 30 Seated deloaded knee extension (local) 5 minutes Deloaded squat (semi-global) 3 × 30 Stationary bike (central/global) 5 minutes Deloaded step down (semi-global) 3 × 30 Seated deloaded knee extension (local) 5 minutes Seated loaded knee extension (local) 3 × 30 Stationary bike (central/global) 10 minutes	Stationary bike (global) 10 minutes Step up (semi-global) 2 × 10 Seated knee extension (local) 2 × 10 Squat (semi-global) 2 × 10 Step down (semi-global) 2 × 10
Duration: approximately 1 hour	Duration: approximately 20 minutes

ELSEVIER

Physiotherapy

Physiotherapy 99 (2013) 126–131

Dose–response effects of medical exercise therapy in patients with patellofemoral pain syndrome: a randomised controlled clinical trial

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[b] *Holten Institute, Lidingö, Sweden*
[c] *Department of Public Health and General Practice, Faculty of Medicine, Norwegian University of Science and Technology, Trondheim, Norway*

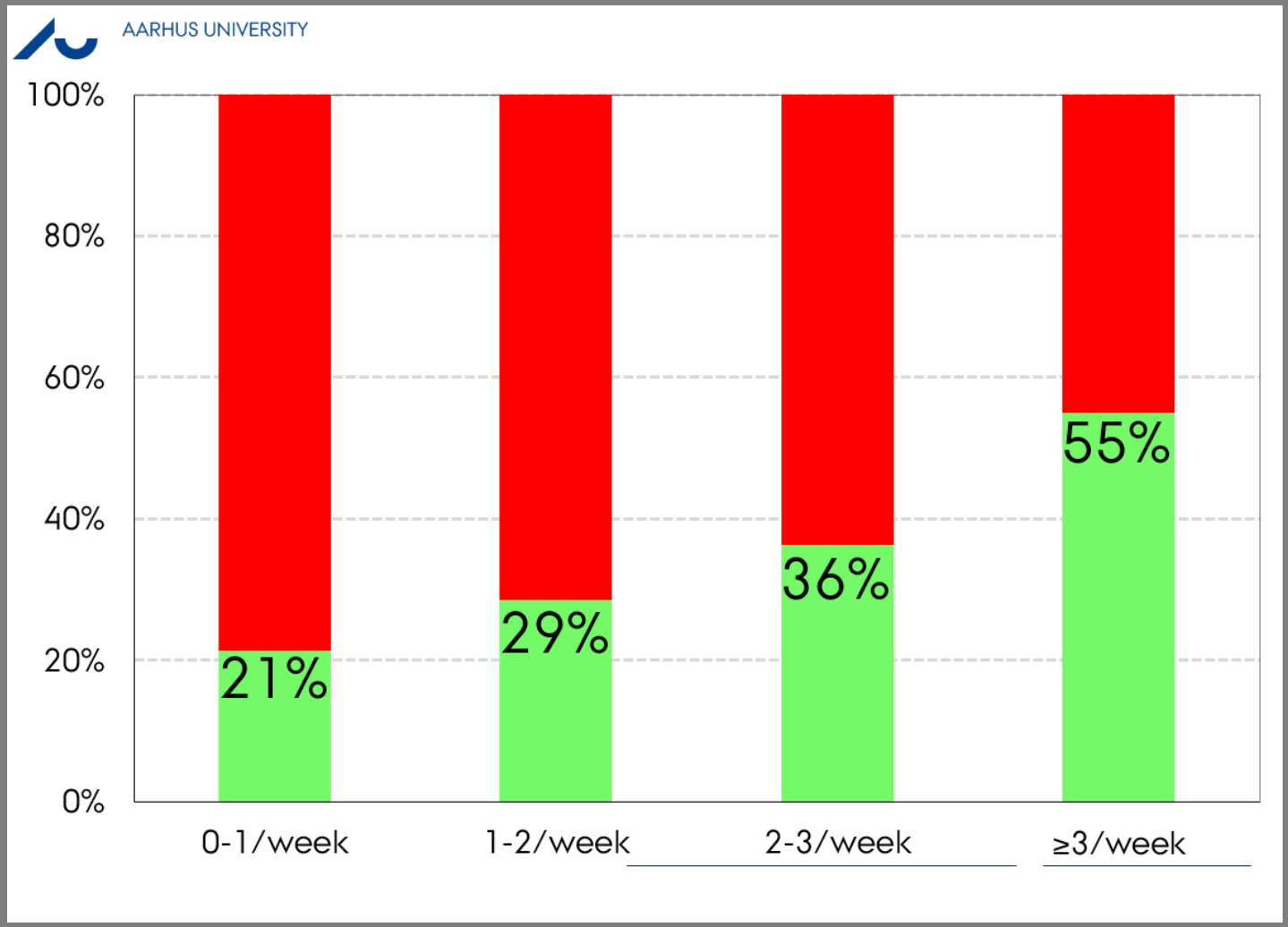
DOSE?

Table 3
Mean (standard deviation) pain and function in the groups at pre- and post-test, mean (standard deviation) within-group changes, and adjusted mean (95% confidence interval) difference between groups after the interventions.

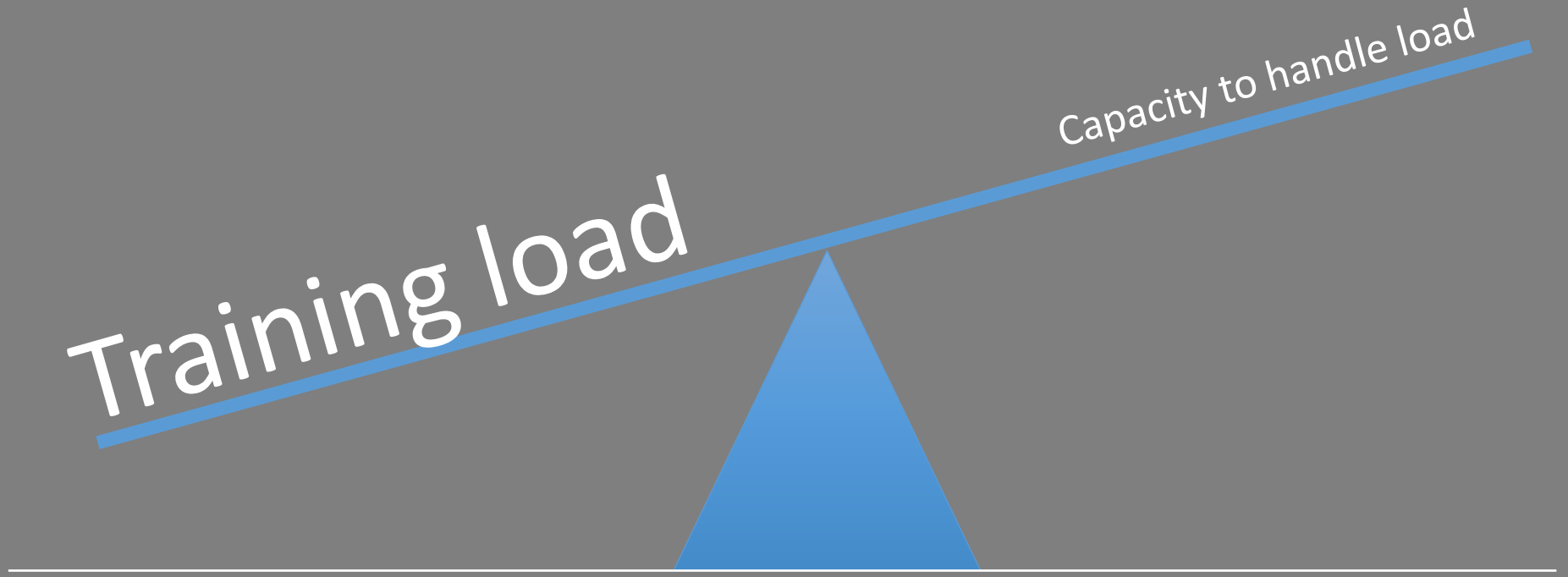
Outcome	Groups				Difference within groups[b]		Adjusted difference between groups[c]	Effect size
	Pre-test		Post-test		Experimental	Control		
	Experimental	Control	Experimental	Control				
Visual analogue scale	3.2 (2.0)	3.7 (1.8)	0.7 (0.7)	2.6 (2.0)	−2.5 (1.7)	−1.1 (1.8)	−1.6[a] (−2.4. to −0.8)	0.80
Step-down test	10.0 (7.2)	6.8 (8.0)	18.6 (7.2)	9.2 (9.2)	8.5 (3.9)	2.4 (3.9)	6.5[a] (3.8 to 9.2)	0.81
Functional Index Questionnaire	10.1 (3.5)	9.9 (3.4)	13.5 (2.6)	9.8 (4.0)	3.4 (3.7)	−0.1 (2.7)	3.1[a] (1.2 to 5.0)	0.89

[a] The adjusted differences between groups were significant at $P<0.05$, all in favour of the experimental group.
[b] Post-test minus pre-test scores.
[c] Post-test scores were adjusted for baseline values, gender and duration of symptoms.

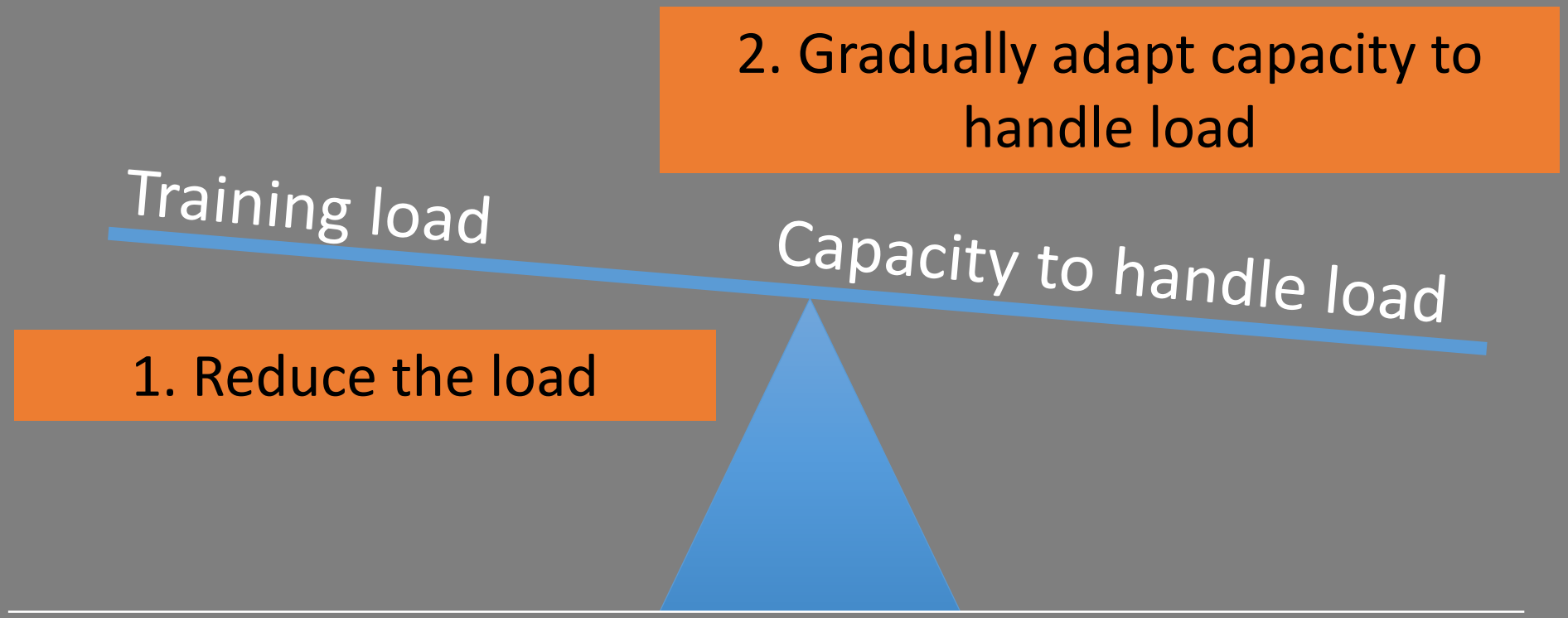
Adherence to the program?



Load management



Load management



The effect of load management in adolescents between 10 and 14 years of age with patellofemoral pain

Michael Skovdal Rathleff, PhD.

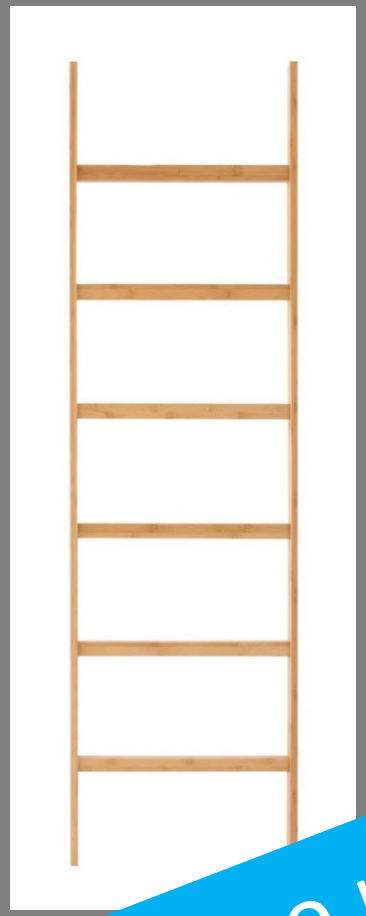
@michaelrathleff

RESEARCH UNIT FOR GENERAL PRACTICE

AALBORG, DENMARK

SMI

OptiYouth



Return to sport

Running at high pace Walking/bicycling

Running at medium pace

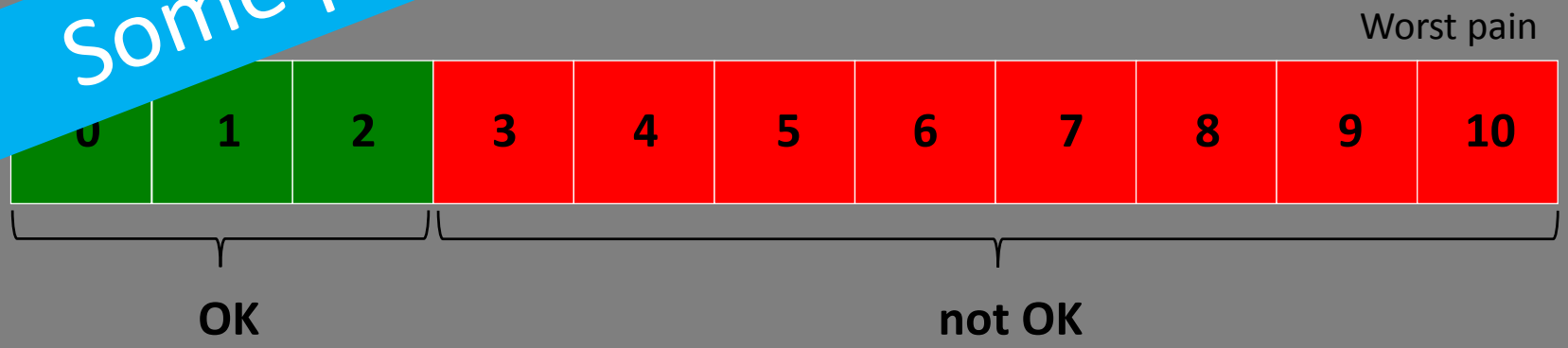
Stairs

Slow running

Fast wa[illegible]ium to hard bicycling

[illegible]/bicycling

Some promising findings coming soon



‘How to’ prescribe exercise?

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ACL INJURY MANAGEMENT & OUTCOMES: A MULTI-DISCIPLINARY APPROACH SEMINAR 2017

La Trobe Sport and Exercise Medicine Research Centre

La Trobe Sport & Exercise Medicine Research Centre are proud to facilitate a two day symposium aimed at advancing **ACL injury management & outcomes through a multi-disciplinary education approach**. We have arranged a world class line up of speakers that hosts not only top talent from Victoria but also from across the globe. This line up will host sports doctors, physiotherapists, strength & conditioning coaches, psychologists, surgeons, athletes and coaches offering a unique learning experience.

SPEAKERS INCLUDE

- Professor Kay **CROSSLEY** (Physiotherapist)
- Mr Tim **WHITEHEAD** (Orthopaedic Surgeon)
- A/Professor Kate **WEBSTER** (Psychologist)
- Dr Christian **BARTON** (Physiotherapist)
- Dr Adam **CULVENOR** (Physiotherapist)
- Ms Megan **DAVIS** (Psychologist)
- Mr Rod **WHITELEY** (Sports Physiotherapist)
- Mr Mick **HUGHES** (Physiotherapist & Exercise Physiologist)
- Ms Alanna **ANTCLIFF** (Sports Physiotherapist – Netball Australia)

#LaTrobeACL

*****WHEN*****

Friday 17th November
3.00PM to 7.00PM
Saturday 18th November
9.00AM to 12.30PM

*****WHERE*****

West Lecture Theatre
La Trobe University
Kingsbury Drive
Bundoora

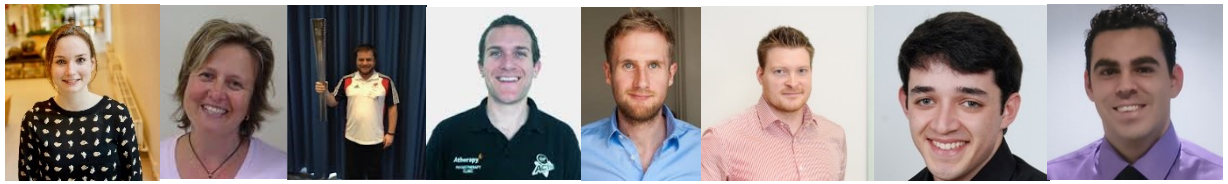
*****COST*****

Early Bird (Ends October 24th)
$300 – Two day attendance
$180 – One day attendance
$90 – Student

Standard
$330 – Two day attendance
$210 – One day attendance
$120 – Student

*****REGISTER*****

https://latrobe.onestopsecure.com/onestopweb/EvTrips/booking?e=SPORT_EV97



QUESTIONS?

TREK

TRANSLATING RESEARCH EVIDENCE AND KNOWLEDGE

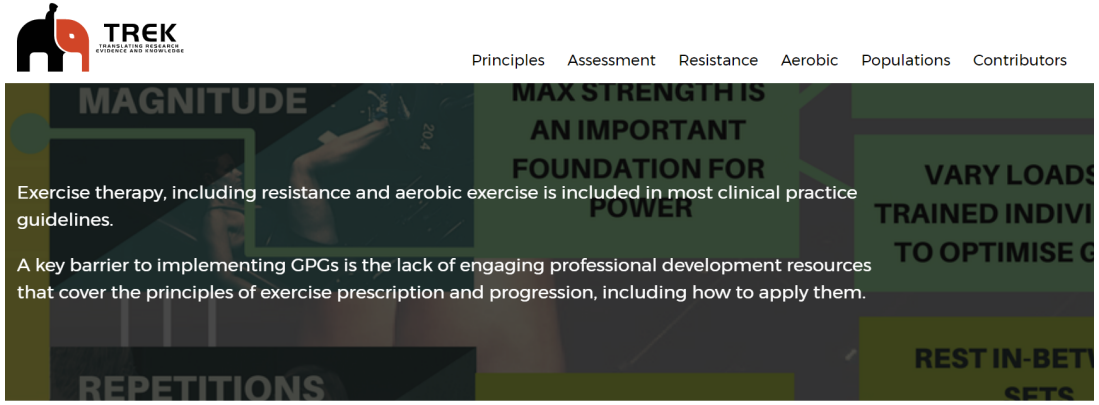
iPFRN

HOME ABOUT US CONFERENCE CLINICAL SYMPOSIUM NEWS CONTACT

Exercise Guide

Recommendations – based on patellofemoral RCTs and exercise prescription literature

https://ipfrn.org/exercise-guide/



c.barton@latrobe.edu.au