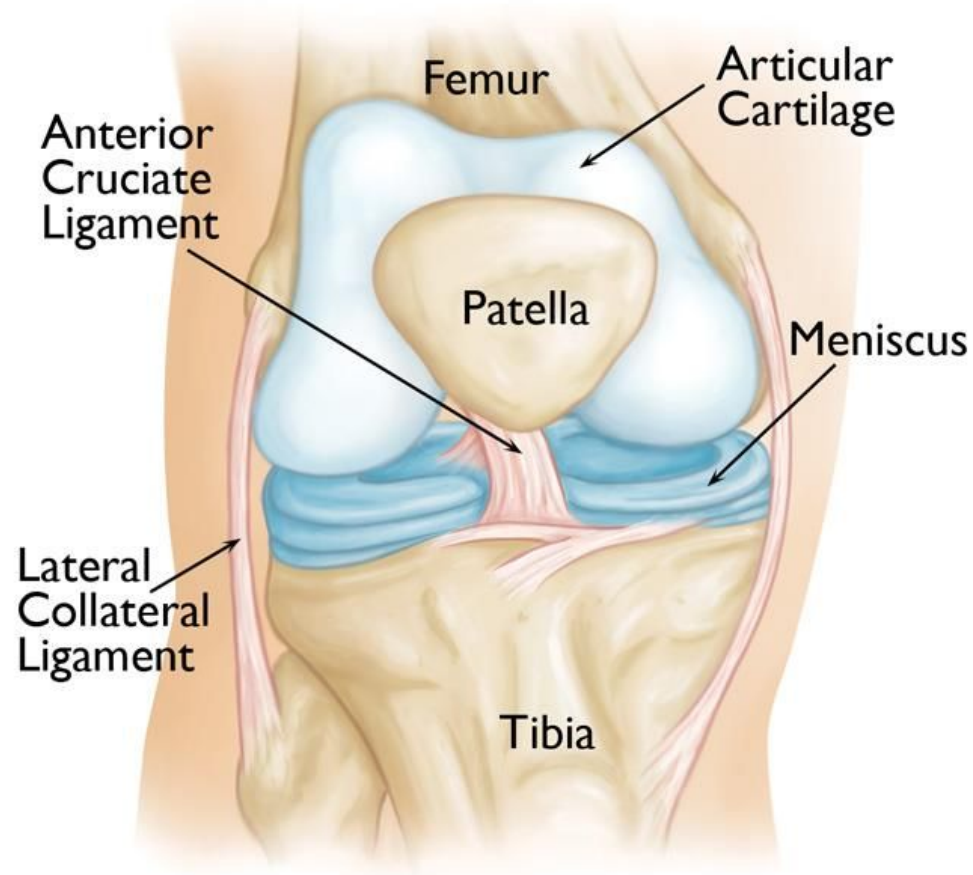




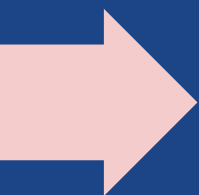
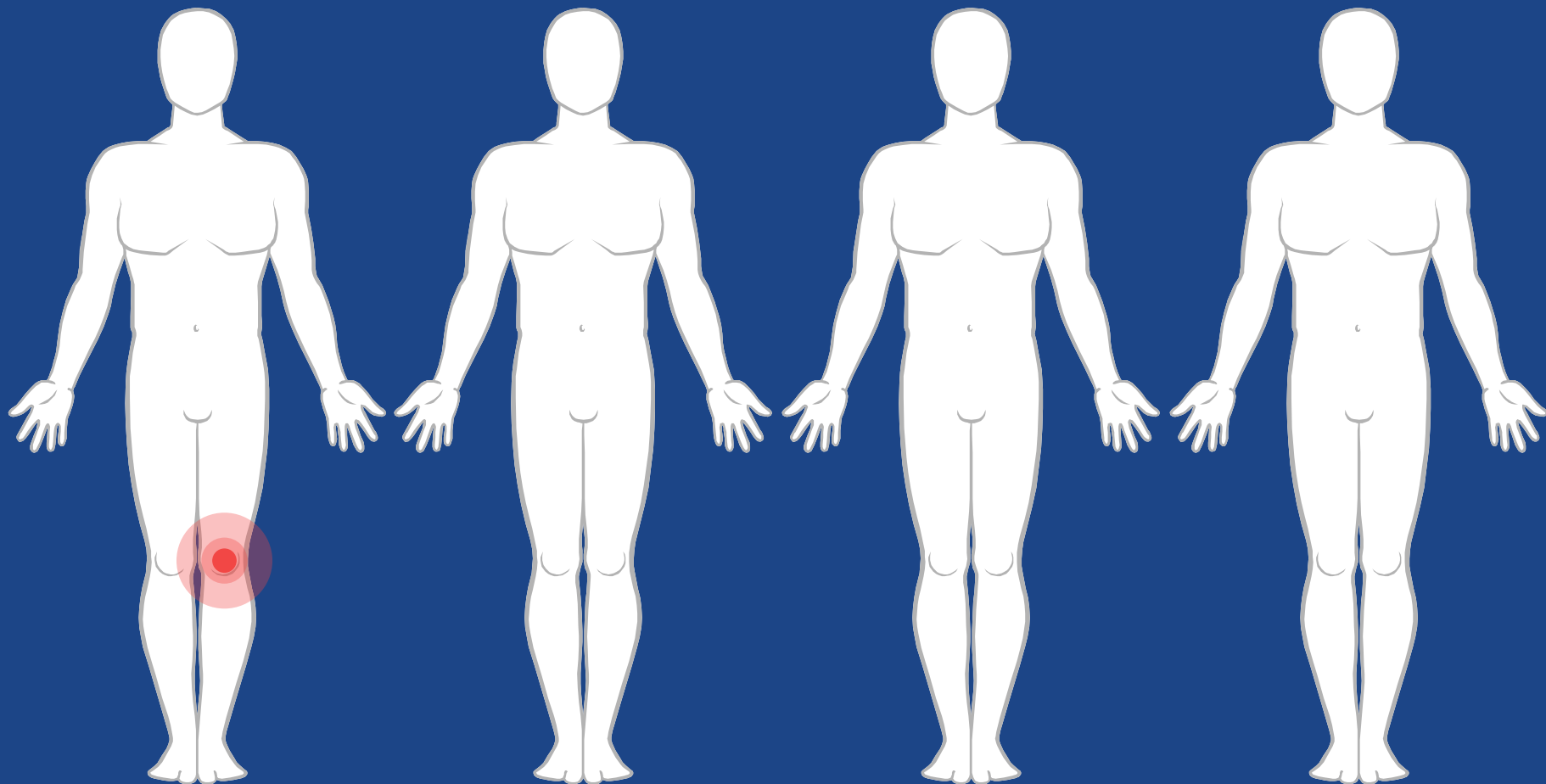
# **Analyzing the Effects of Hip and Knee Exercise on Patellofemoral Joint Pain Recovery**



# Introduction



**Figure 1.** Diagram of the knee joint



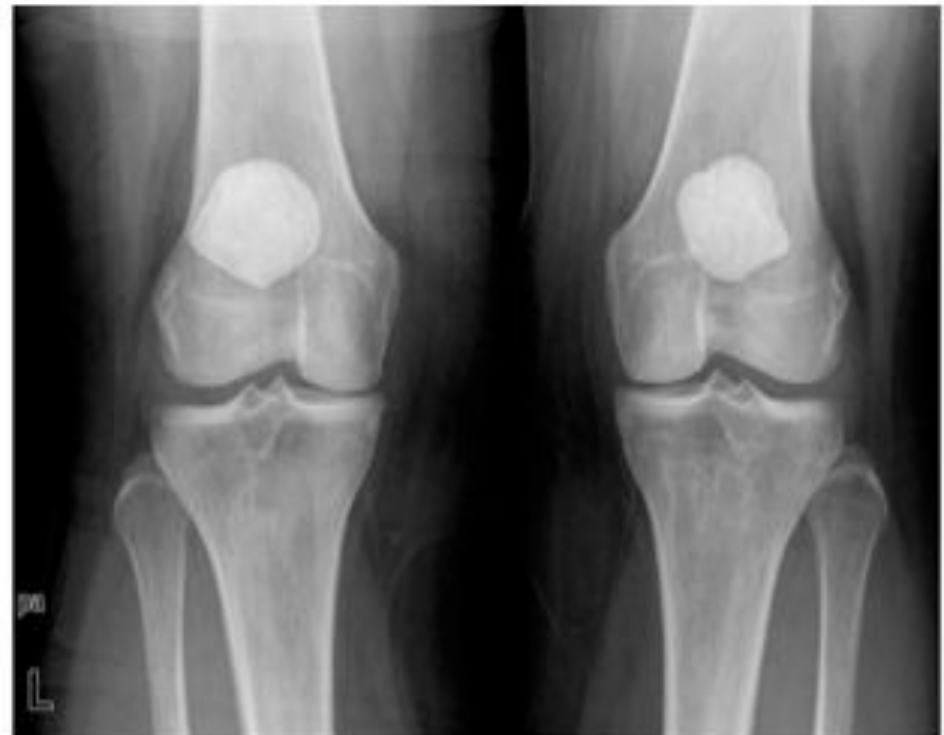
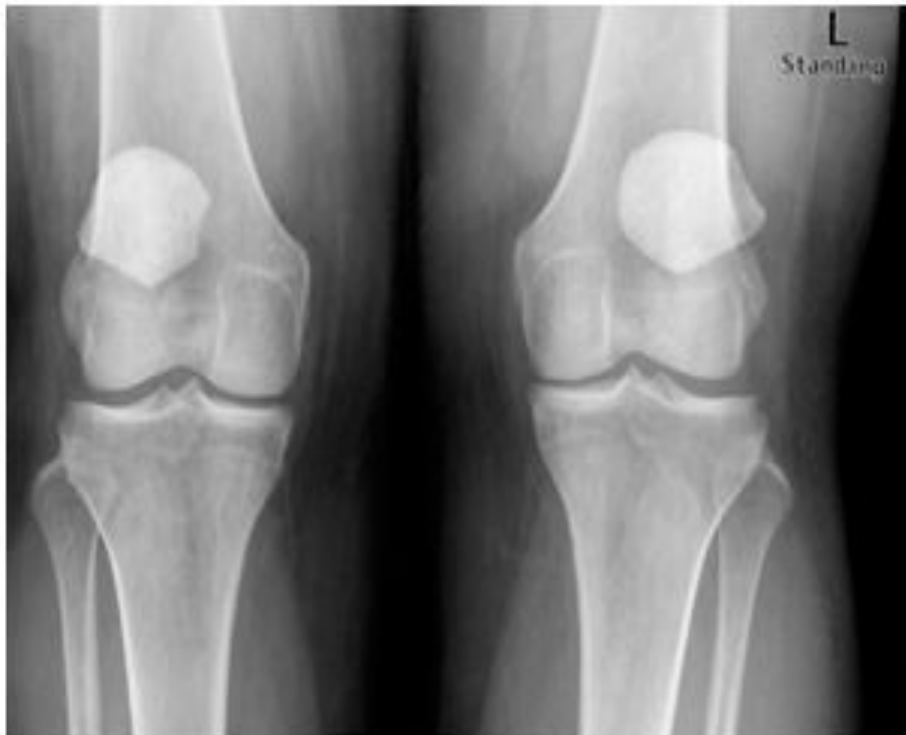
**25-40 %** knee problems

# 2.5 million

*sports-related knee injuries among adolescents*

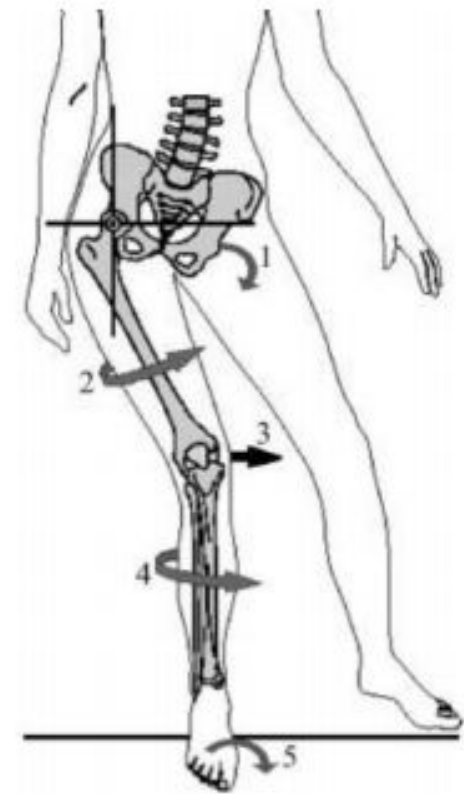
PFP-affected

Normal



# Causes of Patellar Shifting

- 1) pelvic drop (1)
- 2) overpronation of foot (5)
  - internal femoral rotation (2)
  - internal tibial rotation (4)
- knee valgus (3)



**Figure 3.** Multifactorial conditions causing PFP (Okkonen, 2015)

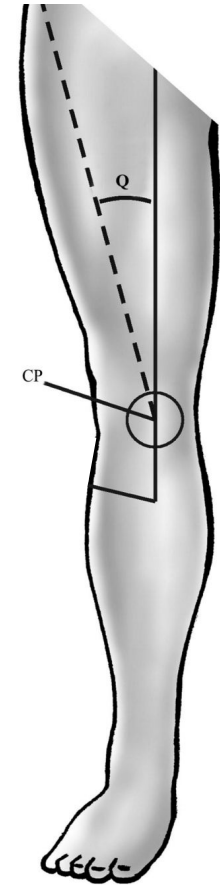
# Who is Affected?

## Intrinsic:

- wide range of ages
  - up to 40 years old
  - more common in adolescents
- men and women
  - 18% vs. 33%

## Extrinsic:

- activity level



**Figure 4.** Image of the Q-angle (Tsakoniti, 2008)



# Implications



## Physical Health

- cardiovascular disease
- diabetes
- osteoporosis
- osteoarthritis
- ACL injury

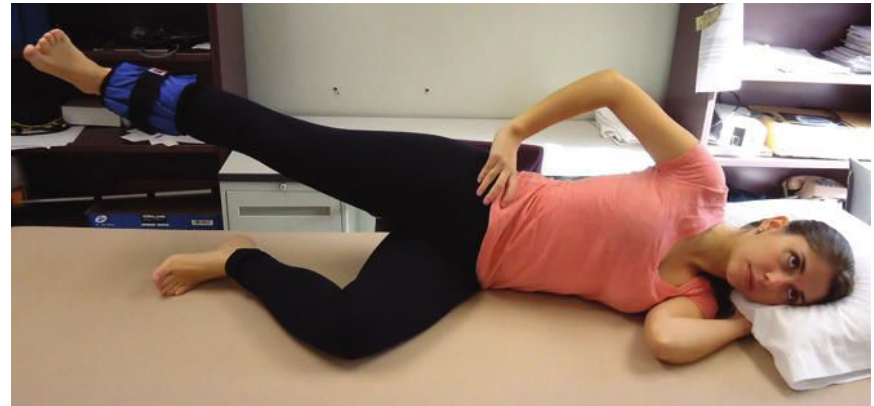


## Mental Health

- depression
- anxiety
- hostility
- stress
- pain catastrophizing
- low QOL

# Current Treatments

- **Exercise therapy**
  - knee/quadriceps
  - hip
  - core
  - foot
- **Taping**
- **Orthotics**



**55%**

unfavorable recovery after 3 months

---

**40%**

unfavorable recovery after 1 year

---

**≤ 20 years**

patients affected



Does the combination of hip and knee exercise result in accelerated recovery for PFP patients compared to knee-only exercise?

# Purpose

- Identify most effective exercise treatment
  - cost efficient
  - easily accessible
  - most consistent in treating symptoms

# Alternate Hypothesis

Combination of exercises  
= faster recovery

# Null Hypothesis

Combination of exercises  
≠ faster recovery



# Methods

# Research Process

## Data Search

Google Scholar,  
Elsevier,  
PUBMED-NCBI,  
ResearchGate,  
ScienceDirect,  
Wiley Interstate  
Journals, SAGE  
Publications, etc.

## Article Collection

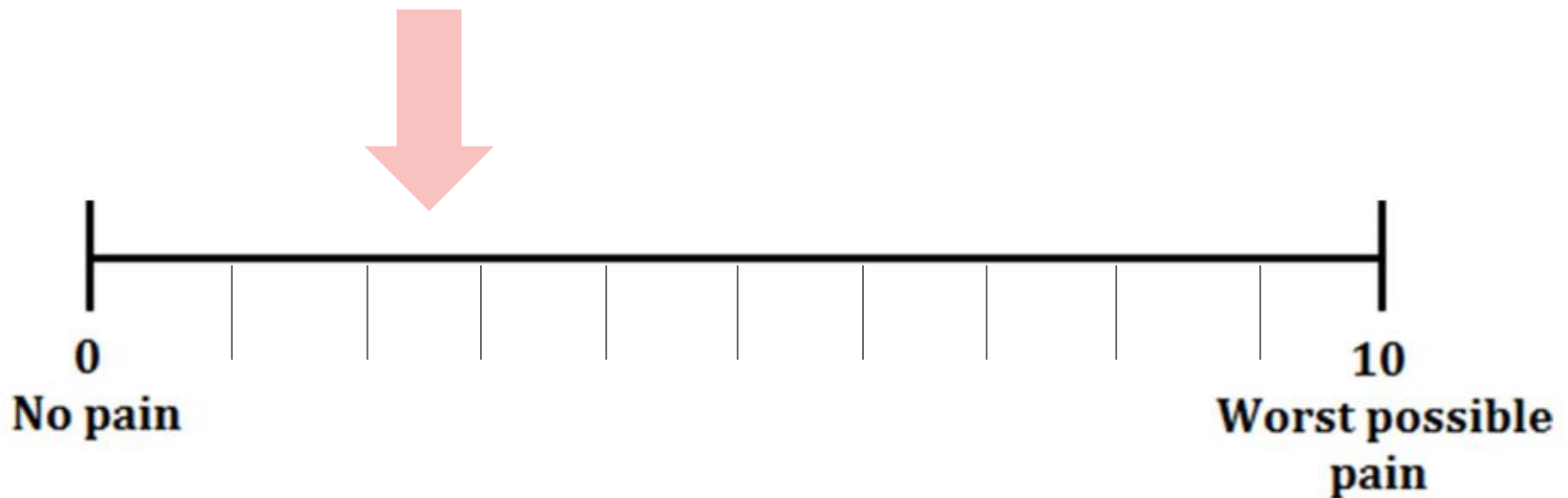
- screen articles
- hand pick articles from reference page

## Data Collection

- record
  - 1) trial characteristics
  - 2) knee pain
- compare lengths of time until pain decrease

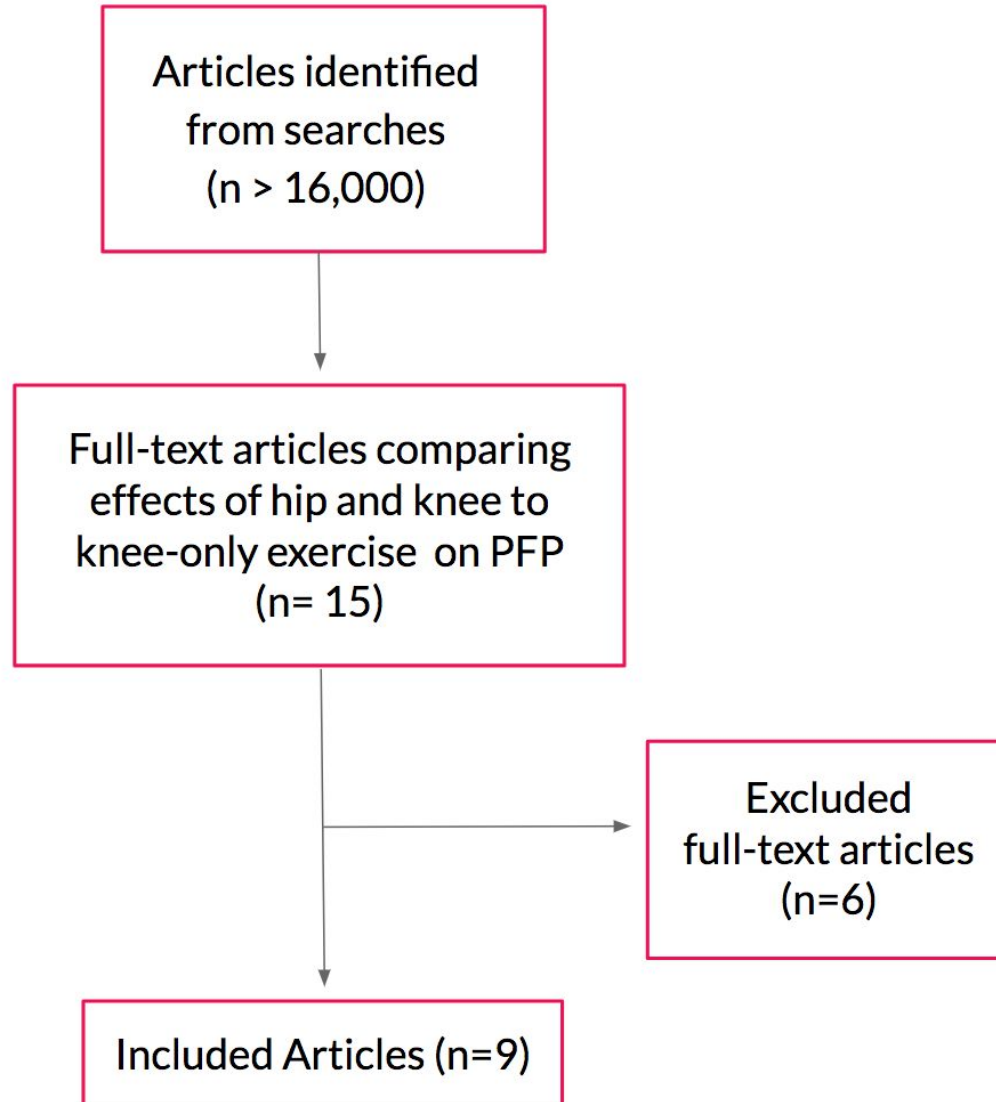


# How Pain was Measured: VAS



**Figure 5.** 10 cm visual analogue scale (VAS). Patients mark their pain level at a given time, and this mark is measured to determine the VAS score (Crellin et al., 2017).

# Flow of Studies



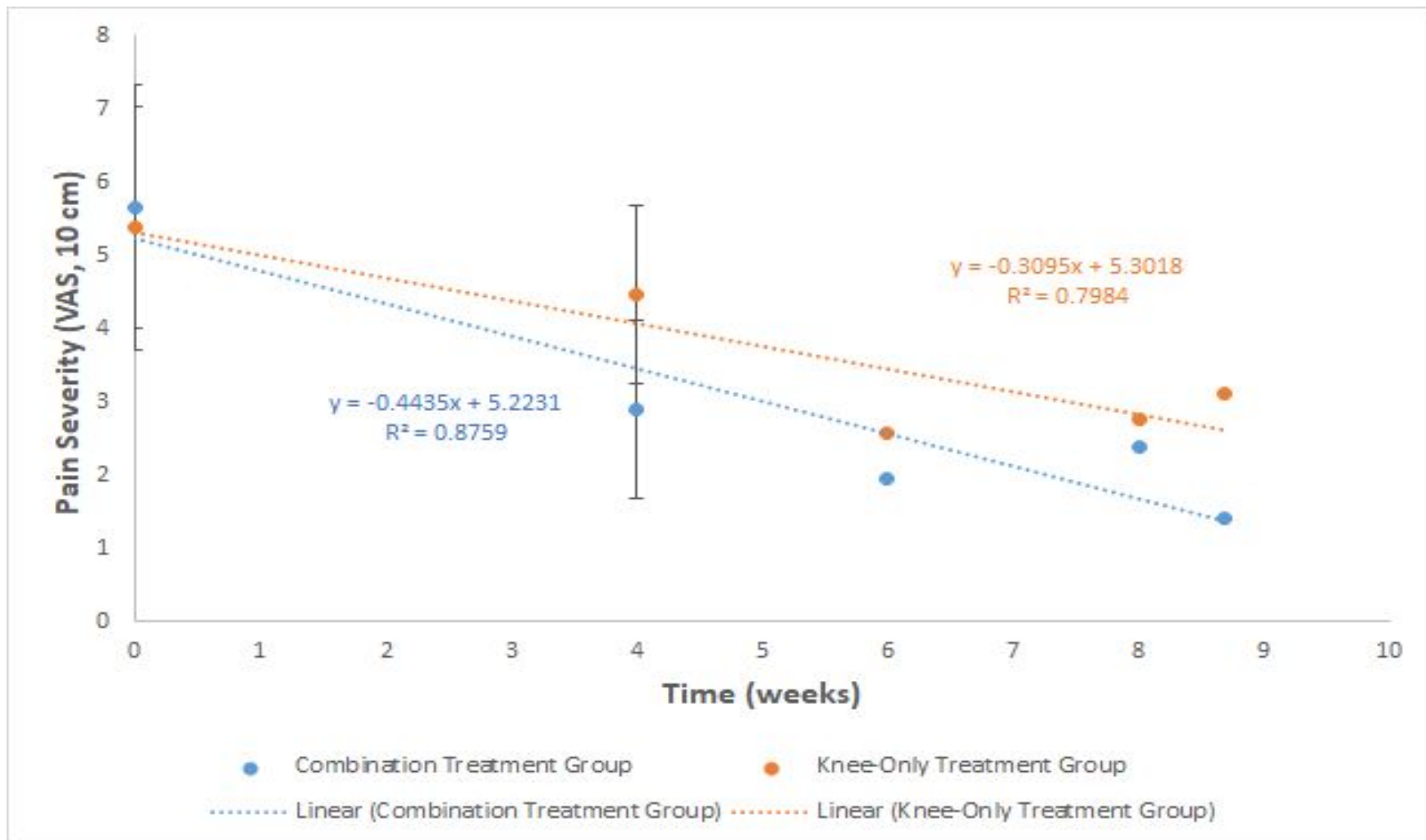
# Reliability of Trials: PEDro Scores

Study	Total
Bolgia et al (2016)	6
de Marche Baldon et al (2014)	5
Dolak et al (2011)	6
Ferber et al (2015)	6
Ismail et al (2013)	8
Khayambashi et al (2014)	5
Nakagawa et at (2008)	6
Razeghi et al (2010)	4
Song et al (2009)	8

≥ 6 :  
“moderate to  
high quality”

**6 / 10**

# Average Hip and Knee Pain Throughout Intervention



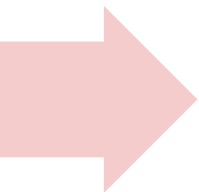


**p=**



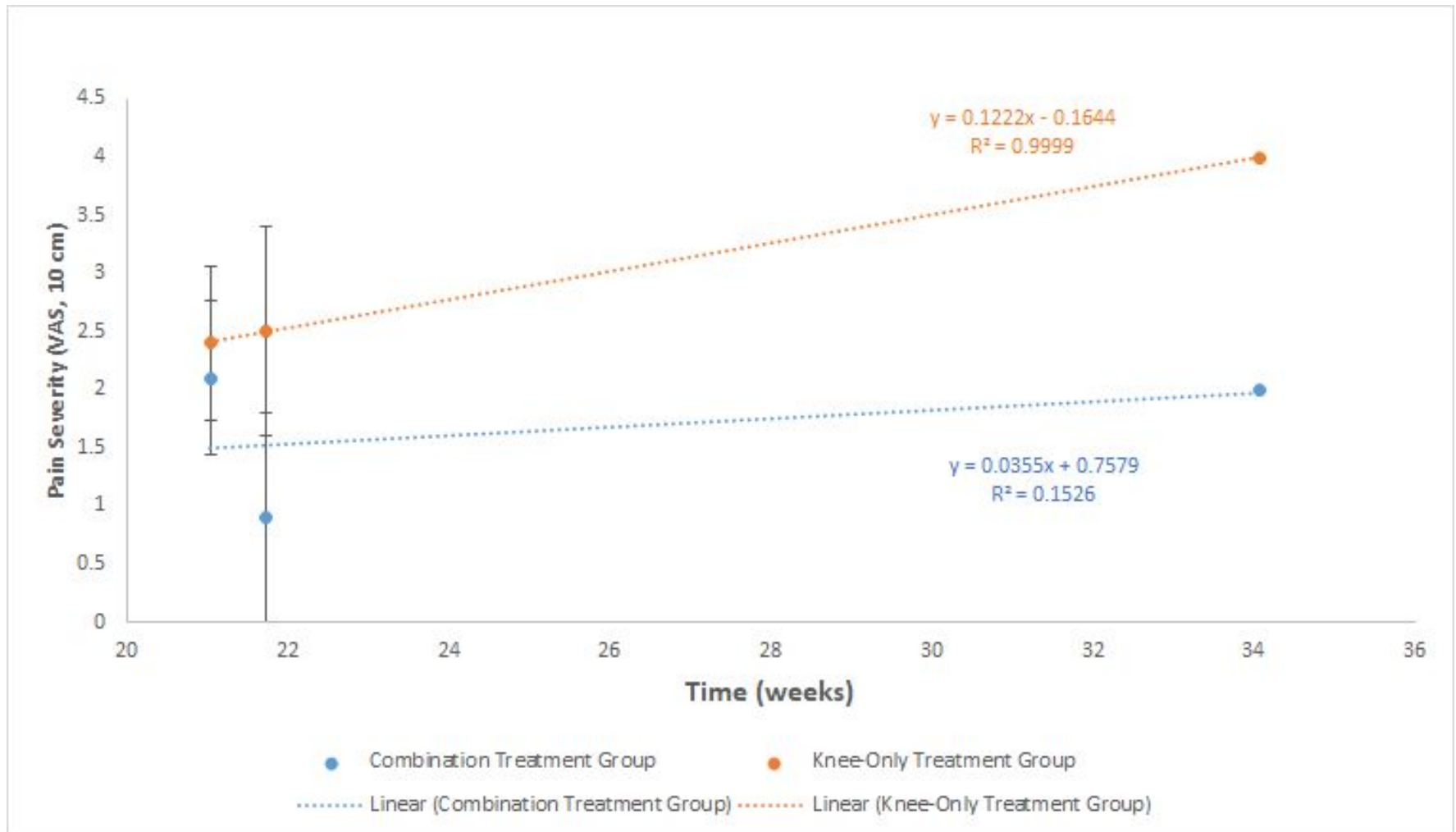
**0.05**

\*\* statistically significant



combination of exercises = faster recovery

# Average Follow-Up Hip and Knee Pain



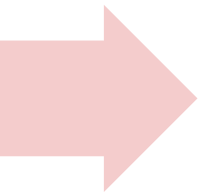


$p =$



0.06

\*\* statistically insignificant



insignificant difference in pain between groups

# Discussion: Likely Explanations

## Decrease in Pain Throughout Intervention



stability to knee

as a result of more muscle groups exercised

## Increase in Pain Post-Intervention



stability to knee

as a result of muscle atrophy





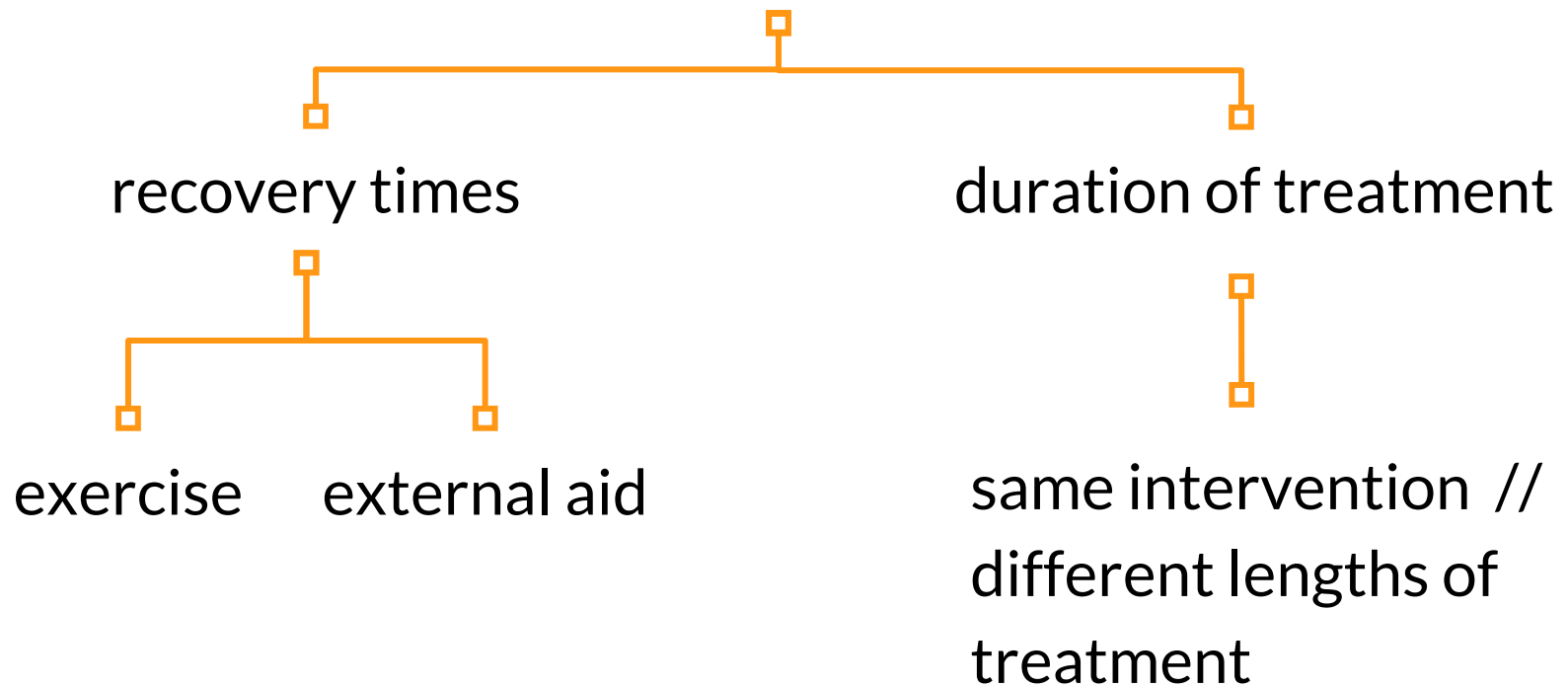
# Conclusion

# Limitations

- small number of available articles
- $\frac{1}{3}$  of studies measured follow-up pain

# Further Work

## What to Analyze



# Acknowledgements

- MPT Rebecca Guinn
- Dr. Jared Sinn
- Dr. Karen Givvin
- Dr. Zin Htway
- Ms. Michelle Magnusson
- Dr. Nikki Malhotra

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# **Analyzing the Effects of Hip and Knee Exercise on Patellofemoral Joint Pain Recovery**

# Participant Breakdown

Study	Number of Participants	Gender Breakdown	Participants per Group	Age Range; Average Age (years)	Activity Level
de Marche Baldon et al (2014)	31	31 F	31 F HKG: 15 KG: 16	18-30; 22 ± 3	active
Dolak et al (2011)	27	27 F	HKG: 14 KG: 13	16-35; 26 ± 6	n/a
Ferber et al (2015)	199	133 F, 66 M	HKG: 111 KG: 88	n/a; 29 ± 7	active
Ismail et al (2013)	32	16 F, 16 F	HKG: 16 KG: 16	18-30; 21 ± 3	n/a
Khayambashi et al (2014)	36	18 F, 18 M	HKG: 18 KG: 18	n/a; 28 ± 7	sedentary
Razhegi et al (2010)	32	n/a	HKG: 16 KG: 16	18-30; 23 ± 3	sedentary
Nakagawa et al (2008)	14	10 F, 4 M	HKG: 7 KG: 7	17-40; 23.6 ± 5.9	n/a
Song et al (2009)	59	43 F, 16 M	HKG: 29 KG: 30	n/a; 39.4	n/a
Bolglia et al (2016)	185	124 F, 61 M	HKG: 105 KG: 80	18-35; 29.35	active

# Hip and Knee Pain Throughout Intervention

	Average VAS Scores	
Time (weeks) When Pain is Measured	Combination Treatment Group	Knee-Only Treatment Group
0	5.66	5.37
4	2.89	4.46
6	1.96	2.56
8	2.38	2.77
8.69 (2 months)	1.40	3.10



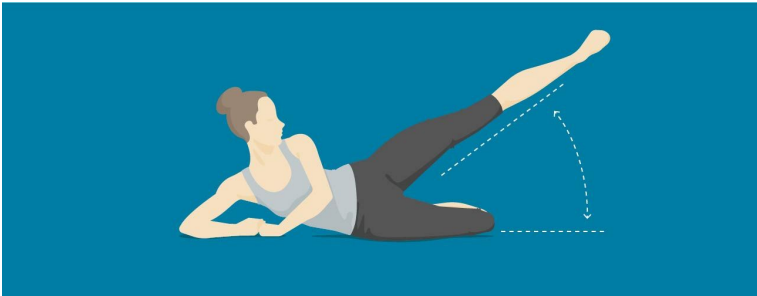
# Follow-up Hip and Knee Pain

	Average VAS Scores	
Number of Weeks Post-treatment When Pain is Measured	Hip and Knee Treatment Group	Knee-Only Treatment Group
21.04	2.10	2.40
21.73	0.90	2.50
34.07	2.00	4.00

# Exercise Programs

## Hip and knee exercises

- hip abduction (n=7)
- hip external rotation (n=7)



## Knee exercises

- squats (n=4)
- straight leg raises (n=3)

