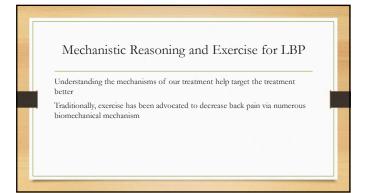


# Mechanistic Reasoning

Mechanism: The pathway between a cause and an effect.

- Diagnostic Mechanism: <u>How</u> a diagnosis causes an effect How do weak core muscles cause low back pain How do demons cause low back pain
- Treatment Mechanism: <u>How</u> a treatment causes an effect
- How does exercising increase core muscle strength and thereby decrease low back pain How does exercising remove demons and thereby decrease low back pain

4



	n Hypothesized Treatment- Mechanisms for LBP
Treatment	Mechanism
Motor Control Exercises -	
Core Stabilization	> Strength in core muscles protects damage to other back struct
Yoga	Flexibility and core strength protect back
Postural Exercises	<ul> <li>Poor posture causes back pain</li> </ul>
Spinal Manipulation	Misaligned joints cause back pain
Directional Preference	Reduces disc herniation and takes pressure of painful areas

# Mechanistic Clinical Reasoning

To determine that a movement dysfunction or tissue pathology (or demons) needs to be treated via exercise for low back pain to improve, we need to establish 5 fundamental truths/conditions, in this order:

**#1.** We can accurately and reliably measure the movement dysfunction (e.g., ROM, core instability, posture) or the presence of tissue pathology (e.g., disc degeneration, meniscal tears)

**#2.** We can confirm that the measured movement dysfunctions, or the presence tissue pathology, occur in people who have pain and do NOT occur in people who do not have pain

 ${\rm \#3.}$  We have an intervention that can change the movement dysfunction and/or tissue pathology (and, we can measure that change, which is related to  ${\rm \#1)}$ 

#4. When we apply this intervention to the movement dysfunction and/or tissue pathology it causes change, and when we don't apply the intervention to the movement dysfunction, there is no change #5. When we do change this movement dysfunction or tissue pathology, there is a resolution of symptoms And when we don't change this movement dysfunction or tissue pathology, there isn't

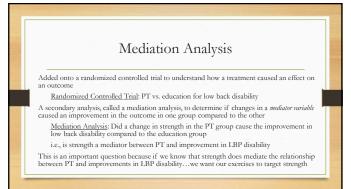
### Mechanistic Clinical Reasoning

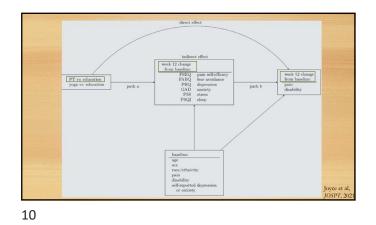
#3. We have an intervention that can change the movement dysfunction and/or tissue pathology/demons (and, we can measure that change, which is related to #1)

#4. When we apply this intervention to the movement dysfunction it causes change, and when we don't apply the intervention to the movement dysfunction, there is no change

**#5.** When we do change this movement dysfunction or tissue pathology, there is a resolution of symptoms. And when we don't change this movement dysfunction or tissue pathology, there isn't

This is the key research that helps us understand treatment mechanism



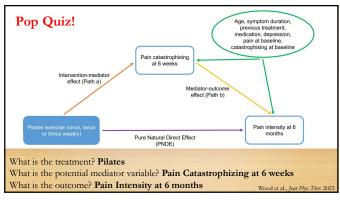




Plates exercise (once, twice Plates exercise (once, twice or thrice weekly) Pure Natural Direct Effect (PNDE) What is the treatment? What is the potential mediator variable? What is the outcome? Wood et al., *Jour Phys Ther.* 2022



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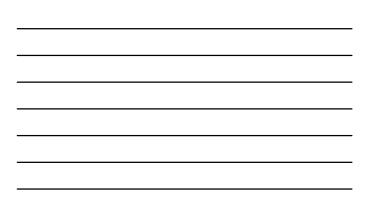


	Table 2 Causal mediation analysis of pain	intensity at 6 months aft	er randomisation.	Wood et al Phys Ther.	
	Variable	Pain catastrophising (n = 255)	Kinesiophobia (n = 255)		
		Mean differe	ence (95% CI)		
	Intervention-mediator effect (path a)	-4.17 (-7.17 to -1.17)	-4.65 (-6.70 to -2.60)		
	Mediator-outcome effect (path b)	-0.03 (-0.09 to 0.03)	-0.00 (-0.09 to 0.09)		
	TNIE	-0.21 (-0.47 to -0.03)			
	PNDE Proportion mediated (treated)	-0.75 (-1.62 to 0.07) 0.20 (0.03 to 1.08)	-0.67 (-1.50 to 0.19) 0.30 (0.03 to 1.45)		
	Total effect	-0.96 (-1.75 to -0.17)	-0.98 (-1.79 to -0.14)		
	TNIE = total natural indirect effec	t; PNDE = pure natural di	rect effect.		
	total effect of -0.96 of Pilat n into Total Natural Indirect				
<ul> <li>In other work</li> </ul>	rds, change in pain catastrop	hizing mediated -0.2	1 points of the total tr	reatment effect	
of Pilates or	n pain intensity	0			
<ul> <li>About 20% in pain catas</li> </ul>	(.20) of the treatment effect strophizing	of Pilates on low ba	ck pain intensity was o	due to a change	





#### Low Back Pain Guidelines

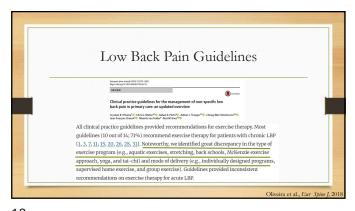
Low back pain and sciatica in over 16s: assessment and management

NICE guideline [NG59] Published: 30 November 2016 Last updated: 11 December 2020

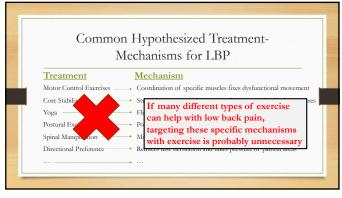
Consider a group exercise program (biomechanical, aerobic, mindbody, or a combination of approaches) for people with a specific episode or flare-up of low back pain with or without sciatica. Take **people's specific needs, preferences, and capabilities** into account when choosing the type of exercise.

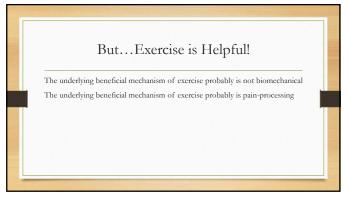
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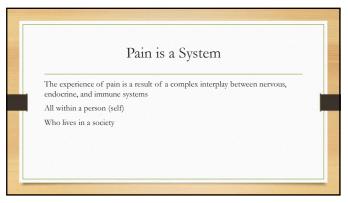


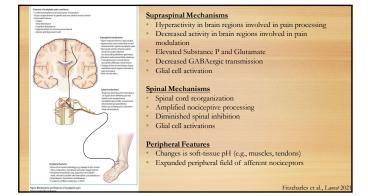


Commo	n Hypothesized Treatment-
1	Mechanisms for LBP
Treatment	Mechanism
Motor Control Exercises -	
Core Stabilization	> Strength in core muscles protects damage to other back structu
Yoga	Flexibility and core strength protect back
Postural Exercises	→ Poor posture causes back pain
Spinal Manipulation	Misaligned joints cause back pain
Directional Preference	· Reduces disc herniation and takes pressure of painful areas









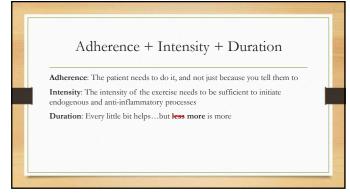
Supraspinal Mechanisms	
Hyperactivity in brain regions involved in pain processing     Decreased activity in brain regions involved in pain     modulation     Elevated Substance P and Glutamate     Decreased GABAergic transmission	
<ul> <li>Glial cell activation</li> <li>Spinal Mechanisms</li> <li>Spinal cord reorganization</li> <li>Amplified nociceptive processing</li> <li>Diminished spinal inhibition</li> <li>Glial cell activations</li> </ul>	Exercise beneficially affects all these mechanismand more
Peripheral Features           Changes is soft-tissue pH (e.g., muscles, tendons)           Expanded peripheral field of afferent nociceptors	

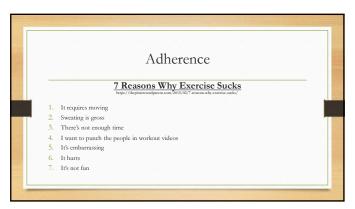
## Pain Mechanisms of Exercise References

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- Lesnak JB, Berardi G, Sluka KA. Influence of routine exercise on the peripheral immune system to prevent and alleviate pain. Neurobiol Pain. 2023;13:100126. Published 2023 Mar 21. doi:10.1016/j.ympai.2023.100126
- Lima LV, Abner TSS, Sluka KA. Does exercise increase or decrease pain? Central mechanisms underlying these two phenomena. J Physiol. 2017;595(13):4141-4150. doi:10.1113/JP273355
- Sluka KA, Frey-Law I, Hoeger Bement M. Exercise-induced pain and analgesia? Underlying mechanisms and clinical translation. Pain. 2018 Sep;159 Suppl 1 (Suppl 1):S91-S97. doi: 10.1097/j.pain.000000000001235. PMID: 30113953; PMCID: PMC6097240.

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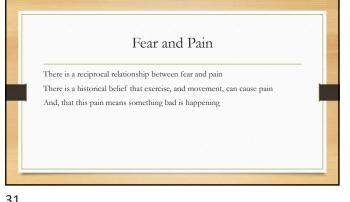


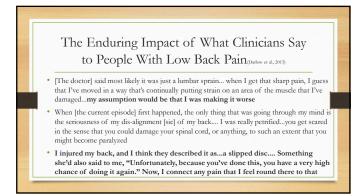


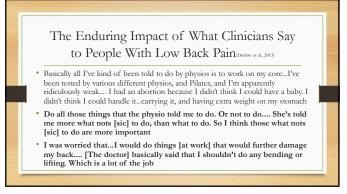




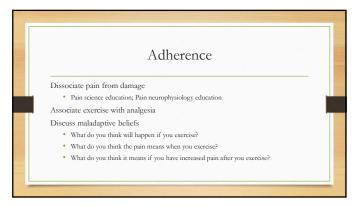


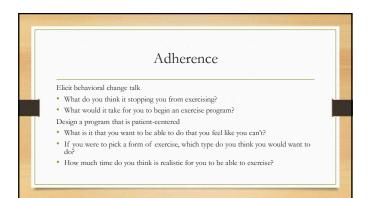




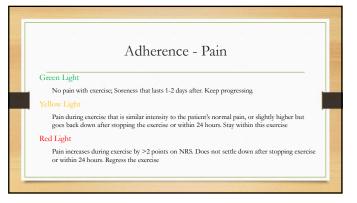


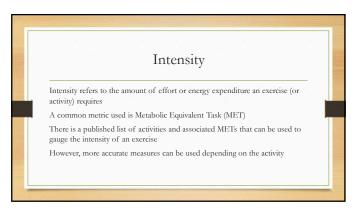




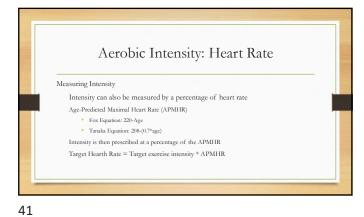


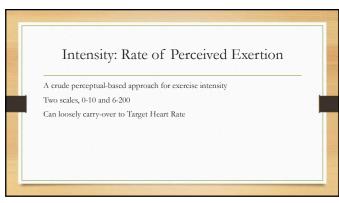




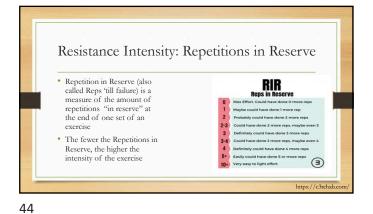


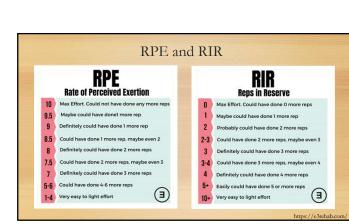
Intensity:	Metabolic Equ	iivalent Task
Light (1.6-3.0 METs)	Moderate (3.0-6.0 METs)	Vigorous (6.0+ METs)
Waking-slowly     Sitting-using computer     Standng-light work (cooking, washing dihea)     Fahing-sitting     Playing most instruments	Walking-very britis (4 mph)     Casning-many (seating windows,     wacauming, morphing)     Mouring lawn (walking power mower)     Bicycling-layts dirst (10-22 mph)     Bicycling-layts dirst (10-22 mph)     Bichmithon-ecclestional     Termis-doubles	Walkinghilding     Joggrap at 6 mph     Sinverling     Canying heavy loads     Becketing fast (H4–16 mph)     Beaketing fast (H4–16 mph)     Soccer gene     Ternis-singles





		C	
BORG RPE	Modified RPE	BREATHING	% MAX H
6	0	No exertion	
7	U		50% - 60%
8	1	Very Light	
9	1		
10	2	Notice breathing deeper, but still	
11	1.5	comfortable. Conversations possible.	60% - 70%
12	3	Aware of breathing harder; more difficult	
13	3		70% - 80%
14	4	to hold a conversation	
15	5	Starting to breathe hard and get	80% - 90
16	6	uncomfortable	0070-00
17	7	Deep and forceful breathing,	
18	8	uncomfortable, don't want to talk	90% - 100
19	9	Extremely hard	30% - 100
20	10	Maximum exertion	





## Exercise Intensity and Duration Guidelines

Exercise intensity needs to be sufficient to elicit the endogenous analgesic effects of exercise

There is no specific intensity guidelines, however, there are physical activity guidelines that can be followed At least 75-150 minutes of **vigorous-intensity** aerobic exercise week OR 150-300 minutes of **moderate-intensity** aerobic exercise OR a combination of both, per week

minutes of moderate-intensity aerobic exercise OR a combination of both, per week At least 2 days of moderate-vigorous strengthening exercises involving all major muscle groups



