Effect of voluntary exercise on persistent inflammatory pain and stress

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Exercise Therapy for Chronic Pain

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INTRODUCTION

For people with chronic pain, the prospect of doing exercise may seem like an overwhelming and impossible task. And yet, exercise therapy is frequently prescribed for patients with a wide variety of chronic pain problems. Exercise provides multiple benefits for patients including improvements in strength, flexibility, and endurance; decrease in cardiovascular and metabolic syndrome risk; improved bone health; improved cognition and mood; and often most importantly for the patient, improved pain control (Box 1). It therefore might seem that patients should be eager to participate in an exercise program. However, patients with chronic pain frequently present with significant levels of fear-avoidance behaviors and are often resistant to
Forced running

- Increase anxiety and stress (Leasure & Jones, 2008; Griesbach et al. 2012; Ke et al. 2011; Moraska et al. 2000)

- Endocrine and immune system impairment (Moraska et al. 2000)

- Exacerbate inflammation (Cook et al. 2013)
Wheel running in the wild

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(a) fraction of wheel running explained by species

<table>
<thead>
<tr>
<th>Fraction</th>
<th>mouse</th>
<th>slug</th>
<th>rat</th>
<th>shrew</th>
<th>frog</th>
<th>snail</th>
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<td>0.80</td>
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(b) A photo of a mouse running inside a wheel.

(c) A photo of a slug running inside a wheel.

(d) A photo of a rat running inside a wheel.

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**Methodology**

- Male Long Evans rats (n=6-12 per group)
- CFA-induced persistent inflammation (ankle), sham injection
- Voluntary running = Running wheel, 2hrs/day, 4days/wk, 3wks

**Outcomes**

- Hypersensitivity = Static weight bearing, thermal latency
- Inflammation = Ankle swelling, range of motion
- Stress = Plasma corticosterone

Tested 24h post-exercise
Voluntary running

**Inflamed**

- Distance (m): 0 to 8000
- Week 1, Week 2, Week 3

**Sham**

- Distance (m): 0 to 8000
- Week 1, Week 2, Week 3

**Running (m/wk)**

- Distance (m): 0 to 8000
- Week 1, Week 2, Week 3

**Total distance (3 wks)**

- Inflamed
- Sham

- Distance (m): 0 to 10000
Inflammation

Ankle width

**Inflammation-Sedentary**

**Inflammation-Exercise**

**Sham-Exercise**
Inflammation

Range of Motion

Inflammation-Sedentary
BL ** W1 W2 W3

Inflammation-Exercise
BL W1 W2 W3

Sham-Exercise
BL W1 W2 W3

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Hypersensitivity

Inflammation-Sedentary

Inflammation-Exercise

Sham-Exercise

Weight bearing

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Hypersensitivity

**Thermal latency**

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<td><strong>Inflammation-Exercise</strong></td>
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<td><strong>Sham-Exercise</strong></td>
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Stress

Plasma corticosterone

- Inflammation-Sedentary
- Inflammation-Exercise
- Sham-Exercise
Correlations: Exercise, pain and stress

Access to exercise rather than amount of exercise
Summary

Persistent inflammation is painful and stressful.

Rats exercise voluntarily, even with persistent hind limb pain.

Voluntary exercise does not improve inflammation (swelling).

Voluntary exercise improves nociceptive hypersensitivity and stress.

It’s not amount of exercise, but regular access.
Thank you!

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