Strength and Conditioning in MSK Physiotherapy

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Advanced Practice Physiotherapist
What is “Strength”
What is “conditioning”
Where are you on the continuum?

**Purist S+C approach**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Phase 1: Hypertrophy</th>
<th>Phase 2: Strength/Power</th>
<th>Phase 3: Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reps</td>
<td>High</td>
<td>Moderate</td>
<td>Low</td>
</tr>
<tr>
<td>Sets</td>
<td>High</td>
<td>Moderate</td>
<td>Low</td>
</tr>
<tr>
<td>Rest</td>
<td>Short</td>
<td>Moderate</td>
<td>Low</td>
</tr>
<tr>
<td>Load</td>
<td>Low</td>
<td>Moderate</td>
<td>Very</td>
</tr>
<tr>
<td>Volume</td>
<td>High</td>
<td>Moderate</td>
<td>Low</td>
</tr>
<tr>
<td>Training sessions per week</td>
<td>3-6</td>
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<td></td>
</tr>
</tbody>
</table>

**Loose advice and guidance approach**

- **Max Effort Activity**: Feels almost impossible to keep going. Completely out of breath, unable to talk. Cannot maintain for more than a very short time.
- **Very Hard Activity**: Very difficult to maintain exercise intensity. Can barely breathe and talk.
- **Vigorous Activity**: Borderline uncomfortable. Short of breath, can speak a sentence.
- **Moderate Activity**: Breathe a bit more heavily, can hold short conversation. Still somewhat comfortable, but becoming noticeably more challenging.
- **Light Activity**: Feels like you can maintain for hours. Easy to breathe and carry a conversation.
- **Very Light Activity**: Hardly any exertion, but more than sleeping, watching TV, etc.

**Start where you are. Use what you have. Do what you can.**

*Arthur Ashe*
Response to the word “Exercise”

Expectation

Reality

Is this actually more representative of how we think the session will go down? Is this the problem?
Needs analysis

• Who’s needs?
• How do you gather this information?
  • When do you gather it?
  • Can YOU meet those needs?

#WhatsYourPatter

“If you didn't have this problem, what would be the 1st thing you’d do?”
Exercise prescription is not about the addition of exercise, but the appropriate dosage.
Needs analysis

Potential barriers?
- Time.
- Pain.
- Readiness to change.
- You??

Demands of MT?
- Physical.
- Psychological.
- Metabolic.
- Environmental.

Exercise experience?
- Novice – expert
- Task dependent scale.
Principals of S+C

• Overload.
• Specificity – Needs analysis.
• Progression, regression and Periodisation.
• Reversibility – Anything gained by prolonged loading, can be lost by prolonged de-loading.
Variable Manipulation

• How….
  • Many – Volume = Reps x sets x load.
  • Often – Frequency.
  • Hard – Perceived exertion / load.
  • Fast - Time under tension / Power / RFD
  • Long – Endurance / recovery.
Resistance training – Fashion or Function?
Muscle Thickness and training type

Strength training (7 sets x 3RM w 3 mins rest) vs Hypertrophy training (3 sets x 10RM w 90 seconds rest).
Equal muscle thickness changes after 8 weeks, but greater strength gains with strength training.
N=17
Muscle thickness and load volume

Low Load training (25-35 reps to failure) vs High load training (8-12 reps to failure).
3 sets of 7 types of exercise across all major muscle groups. 3 times per week for 8 weeks.
Similar muscle thickness in UL and LL, with no significant differences.
Strength gains significantly greater in heavy load training vs low load (19.6% vs 8.8%) in squat 1RM and 6.5% vs 2% in bench 1RM.
N= 18
Strength and Hypertrophy

- 21 studies included.
- 1RM gains were significantly greater in HL training vs LL training.
- Hypertrophy measurements were similar across all load spectrums.
Hypertrophy and frequency of training

- 2 times per week training of a major muscle group is superior to once per week.
- There is no clear evidence to suggest 3 times is better than 2 times.
Does S+C influence…

Pain:

Injury risk reduction:

Lauersen (2014) SR in BJSM - demonstrates the greatest risk reduction is with Strength training (~33%).
Can you exercise into pain?

Review

Should exercises be painful in the management of chronic musculoskeletal pain? A systematic review and meta-analysis

Benjamin E Smith¹,², Paul Hendrick³, Toby O Smith⁴, Marcus Bateman¹, Fiona Moffatt³, Michael S Rathleff⁵,⁶, James Selfe⁷, Pip Logan²

Painful exercise offers a small, but significant benefit to people with MSK conditions in the short term, but no superiority in the moderate to long term.
Effects of exercise on pain

- It varies, exercise has been demonstrated to both improve and also have no impact on measures of pain sensitivity (PPT, QST).
- Those completing weekly sport, had a 2-fold chance of reporting pain, this increased in a linear fashion with each additional hour.
- Exercise increases release of IL-6 which is, via secondary mechanisms, inhibitory of TNF.
- Aerobic training (12/52) = improved UL pain tolerance, not LL.
- Resistance training (12/52) = no sig dif in pain tolerance in UL or LL.
- Combined training (12/52) = Suggested the aerobic arm caused similar UL effects on pain.
- 3/52  of either Aerobic or resistance training also have no impact on measures of pain sensitivity (PPT, QST).
- Both groups improved pain in a linear fashion with each additional hour.
- ** Aerobic arm better constructed compared to the resistance training arm. Don’t take into account for new physiological adaptation to new stim.
So should we engage in S&C in physio??
# Efficacy

Effective treatment options for musculoskeletal pain in primary care: A systematic overview of current evidence

Opeyemi O. Babatunde*, Joanne L. Jordan*, Danielle A. Van der Windt*, Jonathan C. Hill†, Nadine E. Foster†, Joanne Protheroe‡

<table>
<thead>
<tr>
<th>4 guidelines, 3 policy documents, 32 reviews, 1 RCT.</th>
<th>Back, neck, shoulder, knee &amp; multi-site pain.</th>
<th>Pain Function Quality of life Work-related outcomes.</th>
<th>Medium to large summary effects sizes (e.g. SMD 0.65, 95% CI: -0.09 to 1.39 for multi-site pain, Busch et al 2007, &amp; RR 7.74, 95% CI: 1.97 to 30.32 for shoulder pain, Green et al 2003) Beneficial effects in the short &amp; long-term for all five pain presentations.</th>
<th><strong>Strong evidence</strong></th>
</tr>
</thead>
</table>

*Corresponding author.
†School of Health Science, University of Ulster, United Kingdom.
‡Hampshire and Isle of Wight Hospitals Trust, United Kingdom.
What are the mechanisms?

Is it Truly “Strength gains” or distraction?

Is it modification of lifestyle factors?

Is it Self Efficacy?

Is it Graded Exposure?

Is it Expectancy Violation?

Is it all/non of the above?

(he said, absolutely)
Take home messages

Exercise is a HUGE part of physio, and we should ensure we’re “good” at ExRx. Validate the person’s pain experience and offer guidance through a SDM model. Construct a program which addresses a meaningful task, in a graduated method, with avenues for progression/regression – considering individual factors. Try to be a decent human being – engage in conversation about their rehabilitation and use your skills based on the person in front of you.
CLINICAL COMMENTARY
INTEGRATION OF STRENGTH AND CONDITIONING PRINCIPLES INTO A REHABILITATION PROGRAM
Michael P. Reiman, PT, DPT, OCS, SCS, ATC, FAAOMPT, CSCS¹
Daniel S. Lorenz, DPT, PT, ATC/L, CSCS²

REVIEW ARTICLE
The Importance of Muscular Strength: Training Considerations
Timothy J. Suchomel¹ · Sophia Nimphius² · Christopher R. Bellon³ ·
Michael H. Stone⁴

Evidence-Based Guidelines for Strength and Conditioning in Mixed Martial Arts
Tack, Chris BSc (Hons)
I would rather have questions that can't be answered than answers that can't be questioned.

— Richard P. Feynman —