What happens when you exercise?

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Myositis

- Juvenile Dermatomyositis
- Dermatomyositis
- Polymyositis

- Inclusion Body Myositis
Causes of Muscle Weakness

- Inflammation
  - Acute onset

- De-conditioning
  - Muscles lose strength within 24-48 hours
  - Maximum muscle strength lost in 1st 6 weeks
  - Muscles only recover with use.
Why Weaker Muscles?

- Pain
  - Inflammation
  - Biomechanical
- Reduced movement
- Reduced activity
- General ‘un-wellness’
- Muscle imbalance
- Disease activity - ? cause
- CYTOKINES

Petersen AM J physiol & pharm 2006; Mathur N Med of Inflamm 2008
Biomechanical Changes

- Inflammation is patchy
- Muscle imbalance
  - Strong muscles get stronger
  - Weak muscles get weaker
- Abnormal muscle patterning
- Abnormal forces through joints
- Joint instability
- Fatigue
Why Weaker Muscles?

► Pain
  ► Inflammation
  ► Biomechanical
► Reduced movement
► Reduced activity
► General ‘un-wellness’
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► Disease activity
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Petersen AM J physiol & pharm 2006; Mathur N Med of Inflamm 2008
TNFα

- **Inhibits contractile function**
  - Reduced contractile force
  - Blunts muscle response to calcium activation

- **Causes muscle atrophy**
  - Increases proteolysis
  - Inhibits insulin affect upon muscles
  - Blocks glycogen uptake in muscles

- **Chronic increase:**
  - Inhibits skeletal muscle synthesis
  - Causes skeletal muscle myopathy
TNFα has a normal bi-phasic response in muscle growth

TNFα

Increase in MM cells

Apoptosis of mature cells

Mature MM cells

TNFα
IL-6

- Pro-inflammatory cytokine – Delayed onset muscle pain.
- Normally produced by working muscles

Controlled by:

- **TYPE OF EXERCISE**
  - Eccentric > Concentric
  - Endurance > resistance
- Dependent on effort and time
- Glycogen availability
- Normal response

**Metabolism control**

- Glucose homeostasis
  - Insulin-stimulated glucose disposal
- Lypolysis
  - Fatty acid oxidation

Pederson BK J appl physiol 103; 2007; Winkelmann C; AACN Clinical Issues, 2004
Excessive eccentric, endurance and strenuous exercise causes an increase in cytokine production:

- Local muscle inflammation → Local muscle damage → degrading necrotising mm cells →

Requires ↑Glycogen supplies
Regular and moderately progressive resisted exercise programmes:

► Reduce normal production of:
  › IL-6
  › TNFα

► Improves the bodies homeostasis abilities
  › Efficient use of glycogen and Lipolysis
  › Less muscle inflammation (lower CRP)

(Kasapis C, J of Am Coll Cardiology 45; 2005)

AND THEREFORE ARE ANTI-INFLAMMATORY

Muscle Repair

► Satellite Cells
  › Muscle precursor cells
  › Replace muscle cells
  › Increase number of muscle cells
  › Form new fibres or repair damaged segments

► Stimulated by exercise
  ▶ Daily exercise after damage encourages repair.
  › Finite number
    ▶ Max no. @ birth, start to ↓ from 9 years
Common Pattern of Weakness in Most Conditions

► Hip Abductors
► Hip Extensors
► Inner range Quads
► Plantar flexors

► Muscle imbalance
► Abnormal muscle patterning
Causes of Fatigue

- Inflammation
- Active disease
- Muscle weakness
- Specific muscle fatigue
- Deconditioning
- Reduced Aerobic fitness

- Emotional factors
- Psychological factors
  - Perception of illness
  - Perception of normal fatigue levels
Muscle Patterning

- Abnormal muscle pattern
- Muscle weakness
- Muscle imbalance
- Keep moving anyhow
- Pain and fatigue

Keep moving anyhow...
Your Strength and Recovery

- Maximise what you can
  - Strength
  - Stamina – specific and general
  - Energy levels
  - Pacing

- Doing something is better than nothing!
Simple vs Complex Exercise

- **Simple Exercise (correct biomechanics)**
  - Hip abduction
  - Straight leg raise etc

- **Complex exercise (General fitness)**
  - Walking
  - Running
  - Static bike
How to train muscles

- Specific muscles and Aerobic Training
- High repetitions
  - Less than 15 reps is not effective, ideal is 30 reps
- Low weights (0.5 – 5kg)
- Regular
  - 2x week better than 1x week, 4x week is best
- Regular progression
  - Daily/weekly is better than monthly

Faigenbaum AD, Rhea MR, Avery D, Hostler D and American College of Paediatrics
Home Management Programme

- Easy to do at home
- Progressive
- Specific
- Functional?
- Not too long
- Once a day
Core Central Stability

- Strengthening abdominals and back extensors
- Reduce pressure on spine
- Modified positions
- High reps and progress
- Think about each and every step
- Think about standing
Exercises need to be progressed.
It is important that the muscles increase:

STAMINA
STRENGTH

However these are lost after 6 weeks of no exercising! (De-conditioning)

If the strength training is maintained long enough (over 4 months) then the memory of the strength remains and regaining lost strength and stamina is easier.
Aerobic Fitness

- Specific exercises – high reps with weights
- Functional exercises
  - Sitting to standing
  - Stairs
- Sport (care with biomechanics)
  - Reduced WB
    - Cycling / swimming / horse riding / rowing etc
  - Full WB
    - Walking (power) / Running / football / basket ball etc
Sport

- FUN
- Varied
- Any Sport
  - That you also enjoy
- Pain afterwards if common and means you need to do more NOT LESS!

- NEED TO BE FIT FOR THE SPORT
  - Table tennis vs Rugby
Therapy Principals

- Progressive, resisted exercises to regain:
  - muscle balance
  - control of joint biomechanics
- Balance and proprioception education
- Think about the movements
- Functional activities
- Increase generalised stamina
- Increased confidence with own physical abilities:
  - In rehabilitation
  - With family

What happens when you exercise?

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Disposition

- Metabolic milieu in muscle – why do muscles get weak?

- Effects of exercise in IIM
  - Disability and quality of life (QoL)
  - Disease activity and inflammation
  - Molecular effects in muscle tissue
Metabolic milieu in muscle

- Lactate is produced as a product of energy consumption in the muscle (the mitochondria).
- One study showed that individuals with established PM/DM had abnormally high lactate levels in blood following an incremental exercise bout compared to healthy controls indicating lower aerobic capacity locally in the muscle.
- Another study showed that there was no difference in lactate levels locally in muscle after an incremental exercise bout compared to healthy controls, but that the group of patients had markedly lower exercise capacity and whole-body aerobic capacity.
- Other factors contributing to muscle weakness could be: Lower levels of phosphocreatine in rest and during exercise, lower numbers of capillaries, swollen capillaries, expression of pro-inflammatory cytokine interleukin 1.
1. Warm-up
2. Shoulder mobility
3. Grip strength
4. Strength knee extensors
5. Strength shoulders
6. Strength hip extensors
7. Strength neck flexors and trunk
8. Strength hip flexors

- About 10 repetitions / task
- Combine with 20 min brisk walks
  5 days a week
12 weeks home exercise – PM/DM

- Improved muscle strength (if you have pronounced weakness)
- Improve muscle endurance
- Improve aerobic capacity (if you add 20 minutes walks 5 days a week)
- Might reduce fatigue and improve quality of life
- Could reduce CK-levels, no signs of increased inflammation in muscle
- Increase proportion of type I fibers (oxygen dependent, endurance)
Intensive resistance training in low-active adult PM and DM

3 sets of 10 repetitions on 10 voluntary repetition maximum (the weight you can lift 10 times but not 11, 70% of Maximal strength)

Deltoids  Quadriceps  Lat dorsi/biceps

Gastrocnemius  Trunk/neck

- Start on lower intensity
- Adapt to levels of fatigue, pain, corticosteroid dose, risk of osteoporosis

Intensive resistance training

- When exercising on 10 voluntary repetitions maximum 3 days a week for at least 7 weeks:
  - Improved muscle strength
  - Improved muscle endurance
  - Improved function in daily life
  - Reduced disease activity
  - Reduced inflammation in muscle
    - Down-regulation in genes regulating inflammation and fibrosis
Exercise program

- 3 times/ w, 12 weeks
- 30 min cycling (load of 70 % of VO₂ max)
- 20 min muscle endurance (30-40 % of 1 VRM)
This program can:

- Improve whole-body aerobic capacity
- Reduce lactate levels in muscle and improve mitochondria function and increase numbers of capillaries in muscle
- Improve muscle strength and endurance
- Improve ability to perform daily activities
Creatine supplementation AND exercise in myositis

- Phosphocreatine (Pcr) is an important part of the muscle glycolytic (anaerob) metabolism
- Individuals with DM are reported to have low levels of Pcr
- Pcr is most important in the muscle energy system during the first seconds of exercise, but is still used to continue muscle contractions up to 2 minutes
- Five months creatine supplements combined with regular exercise (like home exercise) is more effective than exercise alone in established PM/DM.
- Talk to your rheumatologist before starting

01/09/2016 Helene Alexanderson
Creatine dose

- Introduce creatine in addition to 2-3 days a week exercise
  - Could be any kind of resistance training alone or combined resistance and aerobic exercise
- Loading dose of 8 grams / day for 3 days
- Continue with a maintenance dose of 3 grams / day for 3 months
- Take a 4-week break from creatine and continue to exercise
- Start again with the maintenance dose for another 3 months and continue this cycle
- Creatine supplements can ONLY have positive effects on muscle function in combination with exercise
- If you don’t exercise regularly – DON’T take creatine supplementation!
Exercised performed twice a day for 16 weeks


<table>
<thead>
<tr>
<th>Exercises</th>
<th>Preintervention</th>
<th>Postintervention</th>
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</thead>
<tbody>
<tr>
<td>1. Whole body</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sitting to standing</td>
<td>3 sets of 6/day</td>
<td>3 sets of 10/day</td>
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<tr>
<td>(from standard height chair with arms)</td>
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<tr>
<td>2. Upper limbs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biceps curls*</td>
<td>2 sets of 10/arm/day</td>
<td>2 sets of 10/arm/day</td>
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<tr>
<td>Shoulder presses*</td>
<td></td>
<td></td>
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<tr>
<td>Seated rowing (Thera-Band)</td>
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<tr>
<td>Wrist flexion/extension*</td>
<td></td>
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<tr>
<td>3. Lower limbs</td>
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<td></td>
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<tr>
<td>Calf raises (on tiptoe)</td>
<td>1 minute 2/day</td>
<td></td>
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<tr>
<td>Calf stretches (against wall)</td>
<td>15–20 seconds 3/day</td>
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<tr>
<td>Vastus medialis (isometric)</td>
<td></td>
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<tr>
<td>Ankle dorsiflexion</td>
<td>2 sets of 20/day</td>
<td></td>
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</tbody>
</table>

*Holding a 375-g can of food in each hand.*
This program can improve

- Muscle strength
- Ability to stand up from sitting
- Walking ability
Results: muscle strength

Mean percentage change in patients (n = 7) muscle strength following the exercise intervention when compared to pre-intervention strength levels normalized to 100%.

*P > 0.05

12-week submaximal resistance training under vascular occlusion: All adult myositis

- Air cuffs placed over inguinal fold and pressure of 70% of pulse elimination pressure
- Patients exercised 2 d/week in a leg-press on 30% of 1 RM in 3 sets
  - Improved strength
  - Could lead to muscle hypertrophy
  - Safe: no increased CK

Health benefits from regular physical activity

- Strong association between aerobic capacity and health! Both in healthy and in myositis
- Regular physical activity and exercise can:
  - Improve quality of life
  - Reduce risk of type II diabetes, osteoporosis and cardiovascular disease
  - Reduce high blood pressure
- Important as individuals with inflammatory rheumatic diseases are at higher risk of developing cardio-vascular disease
Take home message

- Exercise should be designed individually and adapted to disease activity and disability with regular follow-up during active disease

- Active progressive exercise should be recommended to patients in all stages of disease – better to do something rather than nothing

- Exercise should be able to be incorporated in your daily life

- Regular physical activity
Thank you for listening!

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