Return to play guidelines following acute illness

Prof Martin Schwellnus
1. How common is acute illness in Summer Paralympic athletes?
2. What are the common systems affected by acute illness in Paralympic athletes?
3. What are the consequences and possible medical complications of acute illness during exercise?
4. What are the guidelines for return to play (RTP) during (and after) acute illness?
How common is illness at Summer Paralympic Games?

Illness and injury in athletes during the competition period at the London 2012 Paralympic Games: development and implementation of a web-based surveillance system (WEB-ISS) for team medical staff

Wayne Derman, Martin Schwellnus, Esme Jordaan, Cheri A Blauwet, Carolyn Emery, Pia Pit-Grosheide, Norma-Angelica Patino Marques, Oriol Martinez-Ferrer, Jaap Stomphorst, Peter Van de Vliet, Nick Webborn, Stuart E Willick

Factors associated with illness in athletes participating in the London 2012 Paralympic Games: a prospective cohort study involving 49,910 athlete-days

Incidence of illness

14.2% athletes
13.2 per 1000 athlete days
1 per 75 athlete days

<table>
<thead>
<tr>
<th>Team size</th>
<th>New illness frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>One athlete every $3^{rd}$ day</td>
</tr>
<tr>
<td>38</td>
<td>One athlete every $2^{nd}$ day</td>
</tr>
<tr>
<td>75</td>
<td>One athlete every day</td>
</tr>
<tr>
<td>150</td>
<td>Two athletes every day</td>
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</tbody>
</table>

Summer Olympic Games: 7% Illness
Summer Paralympic Games: 14.2% Illness
Illness by system affected (per 1000 player days)

- Respiratory: 3.52
- Skin and subcutaneous: 2.32
- Gastrointestinal: 1.89
- Nervous system: 1.12
- Genitourinary: 0.97
## Effects of acute infections on exercise performance

<table>
<thead>
<tr>
<th>System</th>
<th>Influence</th>
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</table>
| Musculoskeletal| • Muscle wasting (decrease in protein content)  
• Decrease in muscle strength (isometric and isotonic)  
• Decrease in muscle endurance  
• Mitochondrial abnormalities |
| Cardiovascular | • Decrease in aerobic exercise capacity  
• Increase in heart rate at submaximal exercise intensity  
• Decrease in stroke volume → Decrease in cardiac output |
| Neurological   | • Impairs motor coordination  
• Decreased neuromuscular transmission |
| Metabolic      | • Catabolism of muscle protein  
• Increased uptake of amino acids in the liver and other organs  
• Decrease in muscle enzyme activity  
• Decreased levels of serum fatty acids  
• Decreased mobilisation of fatty acids from the fat deports  
• Increase in the proportion of energy arriving from CHO metabolism  
• Higher lactate levels at all stages during a graded exercise test  
• Increase in glucagon, growth hormone and cortisol  
• Hyper-insulinaemia  
• Decrease in oxygen uptake  
• Inability to maintain euglycaemia |
Acute self reported illness negatively affects exercise performance
(Did not finish rate - % athletes started)

Clinical point

1. Athletes with any symptoms of an acute pre-competition illness had a 1.6 X greater chance of not completing the event
2. Athletes with symptoms of an acute systemic pre-competition illness had a 1.9 X greater chance of not completing the event

Physician diagnosed acute systemic illness affects exercise performance
(Did not finish rate - % athletes started)

Clinical point

1. Athletes with diagnosed **systemic illness > 24 hours** before the event had a 5 X greater chance of not completing the event
2. Athletes with diagnosed **systemic illness < 24 hours** before the even had a 7 X greater chance of not completing the event

*: Significantly different from CON group
## Potential medical complications of an acute infective illness during exercise

<table>
<thead>
<tr>
<th>System</th>
<th>Complication</th>
</tr>
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</table>
| Cardiovascular        | Viral myocarditis  
                         | Myopericarditis  
                         | Dysrhythmias  
                         | **Sudden cardiac death** |
| Neuromuscular         | Rhabdomyolysis with or without **acute renal failure**  
                         | Joint, ligament and tendon injuries due to impaired motor coordination, reduced muscle strength and endurance |
| Respiratory system    | Bronchial hyper-reactivity                                                                        |
| Others                | Affects on fluid homeostasis (ADH production reduced in fever, fluid loss with fever)  
                         | Post-viral fatigue syndrome  
                         | Increased duration and severity of symptoms of illness  
                         | **Ruptured spleen (IM)**  
                         | **Heatstroke**  
                         | Disease transmission to other athletes |
Pre-event acute illness increases the risk of medical complications

Clinical point
Athletes with any pre-event acute illness, who chose to start the event, had a 2.3 X greater risk of developing a medical complication during the event

*: Significantly different from control
What are the return to play guidelines for athletes with acute illness?

Historical approach

1. “Neck check”: First described in 1993 (Eichner)
2. Clinical tool: Based on an abbreviated medical history and findings of a clinical examination
3. Main criteria
   - Symptoms above the ‘neck’:
     Limited return to sport (submaximal exercise and re-evaluate)
   - Symptoms below the neck or systemic symptoms:
     No sport and re-evaluate
4. Never been systematically studied or validated
2016 Modified StARRT Framework for RTP Following Acute Illness (Modified from Shrier I, BJSM 2015)

Step 1 and 2
Assessment of Health Risk

Accurate diagnosis and General Athlete Health Risk

Risk Assessment Process

Step 3
Assessment of Activity Risk

Organ System Stresses

Step 4
Assessment of Risk Tolerance

Return-to-Play Decision
Step 1: Make an accurate diagnosis!!!

What is the causes of the acute respiratory tract illness (RTI) in athletes?

a. Infective (viral, bacterial, fungal, other)
b. Allergies
c. Physical factors related to increased air movement during exercise (cold, dry air, increased air turbulence, mouth-breathing, and inhaled physical or chemical irritants)
d. Other diseases

Schwellnus M, et al; Current Allergy & Clinical Immunology, June 2010; 23 (2)
Blood markers for inflammation/infection

Electrocardiogram / ultrasound imaging

Submaximal exercise test (HR, ? ECG, respiratory, thermoregulatory, fluid balance, ???)

Return to play after infectious disease?

History

Physical examination
- heart, lungs, abdomen
- throat, ears
- lymph nodes
- body temperature

Venous blood sample
- inflammatory markers
- other blood parameters

Additional examinations
- e.g. ECG, ultrasound imaging

Follow-up or further examinations

normal & asymptomatic

Return to play

Follow-up or further examinations

abnormal

 Venous blood sample
- inflammatory markers
- other blood parameters

Additional examinations
- e.g. ECG, ultrasound imaging

abnormal

Follow-up or further examinations

Return to play after infectious disease?
### Step 2: Assessment of Health Risk

Risk of medical complications of an acute infective illness during exercise – depends on accurate diagnosis!

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Van Tonder, A: MPhil Sport and Exercise Medicine dissertation 2015
Step 2: Assessment of Health Risk (Diagnosed acute illness)

- Patient Demographics (e.g. age, sex)
- Symptoms (e.g. systemic, fever, myalgia, Arthralgia, cough, tachycardia, sweating)
- Personal Medical History (e.g. recurrent illness, systemic history, underlying chronic disease e.g. diabetes, medication use)
- Signs (Physical Exam) (e.g. pyrexia, HR, cardiovascular, respiratory, other systems)
- Lab Tests (e.g. Activity markers e.g. CRP, cultures, serology, Troponins)
- Special Tests (e.g. normal resting ECG, Others)

Risk Assessment Process

Step 1 and 2: Assessment of Health Risk

Diagnosis and General Athlete Health Risk

Step 2: Assessment of Activity Risk

Step 3: Assessment of Risk Tolerance

Return-to-Play Decision
Step 2: Assessment of Activity Risk on Organ Systems (depends on the diagnosis of the acute illness)

- Step 1 and 2: Assessment of Health Risk
  - Type of Sport (e.g. intensity, duration, single player vs. team player, contact vs. non-contact)
  - Environmental conditions (e.g. temp, humidity, altitude, pollution, allergens)
  - Competitive Level (e.g. recreational, professional)
  - Ability to Withdraw / Replace (e.g. development of symptoms)

- Step 3: Assessment of Activity Risk Stresses
  - Functional Tests (e.g. normal submax exercise test (HR, thermoregulation), normal muscle strength / endurance)

- Step 4: Assessment of Risk Tolerance
  - Psychological Readiness

Return-to-Play Decision
1. How common is illness? (vs. injury) – As common as injury
2. Type of illness and causes? Respiratory > 50%, mostly infections and allergies
3. Potential complications during exercise:
   – Effects on performance – Reduced (number of mechanisms)
   – Medical complications – Higher rate / potentially life threatening (myocarditis, heat stroke, renal)
4. Return to play
   □ Step 1: Accurate diagnosis
   □ Step 2: Determine athlete health risk (NB systemic signs and symptoms, activity markers, ECG) (need more science)
   □ Step 3: Determine activity risk (organ systems at risk during activity) (suggest gradual return by using special performance tests) (need more science)
   □ Step 4: Determine risk tolerance
Thank you for your attention