



# **Tokyo 2020 Olympic & Paralympic Games Climate Mitigation**

# WARM UP



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# Plan of Presentation

- Principles of warm up
- What factors affect warm up
- Specific warm up challenges for Tokyo 2020



# Why Warm Up?

- Prepares the body for exercise
  - optimise performance
  - reduce the risk of injury
- Physiological and Psychological
- Should take place for any training session



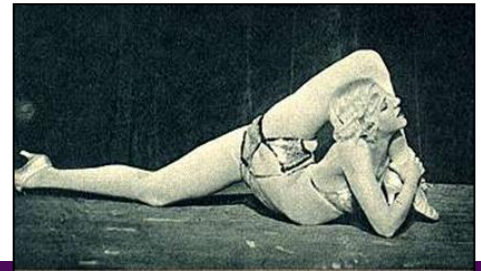
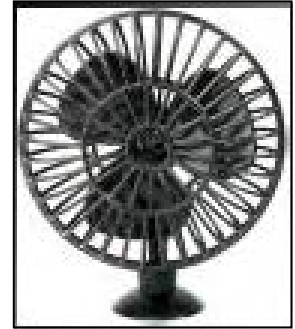
# What do we need for maximal performance?

- Max efficiency muscles
  - easy contraction/stretching
  - rapid supply of energy
  - more efficient energy supply
- Max coordination
  - speed of transfer of information
  - speed of detection



# What does warm up do?

- ↑ body, muscle, blood temperature
- Improve blood flow
- More efficient oxygen transfer and use
- Improve cooling efficiency
- Improve flexibility
- Improve psychomotor skills
- Protects muscle, tendons and ligaments



# Structure of a Warm Up

- **Passive warm up** (rug/warm environment)

- externally increase body temperature



- **General warm up**

- nonspecific movements



- **Specific warm up**



# General Warm Up

- 5-10 mins gentle movement
- Gradual increase in intensity
- 50%  $VO_{2max}$
- Energetic walk, gentle trot, slow canter

↑ stifle ROM after 10 min general warm up.

Northrop et al. 2011





# Specific Warm Up

- Practice specific movements with increasing intensity
- Duration dependent on whether
  - Training session
  - Competition
  - Type of competition



# Preparation for Competition Movements

- Practice specific movements required
  - Proprioceptive conditioning
  - Mental preparation
  - Muscle/tendon conditioning
  - Joint ligament flexibility



# Preparation of movements

- BUT only small amount of each movement – not to fatigue



# Threshold of intensity vs performance

Jumping 1.35m

- ↑ Number jumps
  - ↑ Height of fences
- 
- ↓ competition performance
  - ↑ penalty points

Stachurska et al. 2018

Dressage

- Warm up duration ↑ performance up to threshold
- then ↑ intensity → ↓ competition performance

Murray et al. 2006

# Excessive repetition of individual movements

- Risk of muscle glycogen depletion/fatigue
- Reduced performance
- Potential for injury
- Overheating – particularly of muscles



# Overtraining during Warm Up

- Lack of rider confidence
- Tension/lack of experience
- Insufficient preparation
- Warm up not adapted to conditions
  - Fitness
  - Temperature/Humidity
  - Weather
  - Ground conditions

Muscle  
glycogen  
depletion



# Factors affecting Warm Up

- Individual athlete's capability
  - Physical (age, experience, flexibility)
  - Mental
- Environmental influences
  - Distractions
  - Temperature/humidity
  - Ground conditions



# Warm up in cold

- Muscles colder – weaker, tire earlier
- so
- ↑ Warm-up time
  - ↑ Length of low-intensity General warm-up





# Warm up in heat

- Body temperature increases more rapidly  
→ **reduce warm up time**
- Warm-up in the shade if possible
- Cooling + Drinking
- 3 x 15 min *versus* 45 min



# Ground conditions



# What is usual warm up practice?

- Dressage
  - 34 min (max 1 hour) – reports of 60 mins
- Jumping (12 min +)
  - 1<sup>st</sup> round 18, 22-27, 37 min    12, 13 jumping efforts
  - 2<sup>nd</sup> round approx 32 min    9 jumping efforts
- Approximately 2/3 time spent in trot and canter



Stachurska et al. 2018, Tranquille et al. 2017, Murray et al. 2006, Lindner 2002

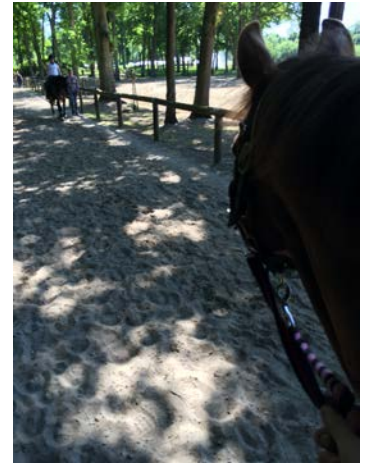
# Tokyo 2020: Factors to take into account

- Climatic conditions
- Distance from stables to warm up
- Warm up to arena
- Time in day for training and warm up
- Surfaces?



# Recommendations

- In shade/cool before warm up
- Precooling?
- Rest periods in shade



# Recommendations

- Shorter total warm up time
  - No passive warm up required
    - Consider pre-cooling
  - ↓ General warm up duration
  - ↓ Specific warm up duration
- 
- For excited horse – use earlier session + shorter competition warm up?



# Recommendations

- General warm up reduced
- Specific warm up reduced
  - ↓ number jumping efforts
  - ↓ time in high intensity movements



# Recommendations

- Split warm up into approx 15 min periods
  - Rest in shade
  - Assessment
  - Cooling if necessary



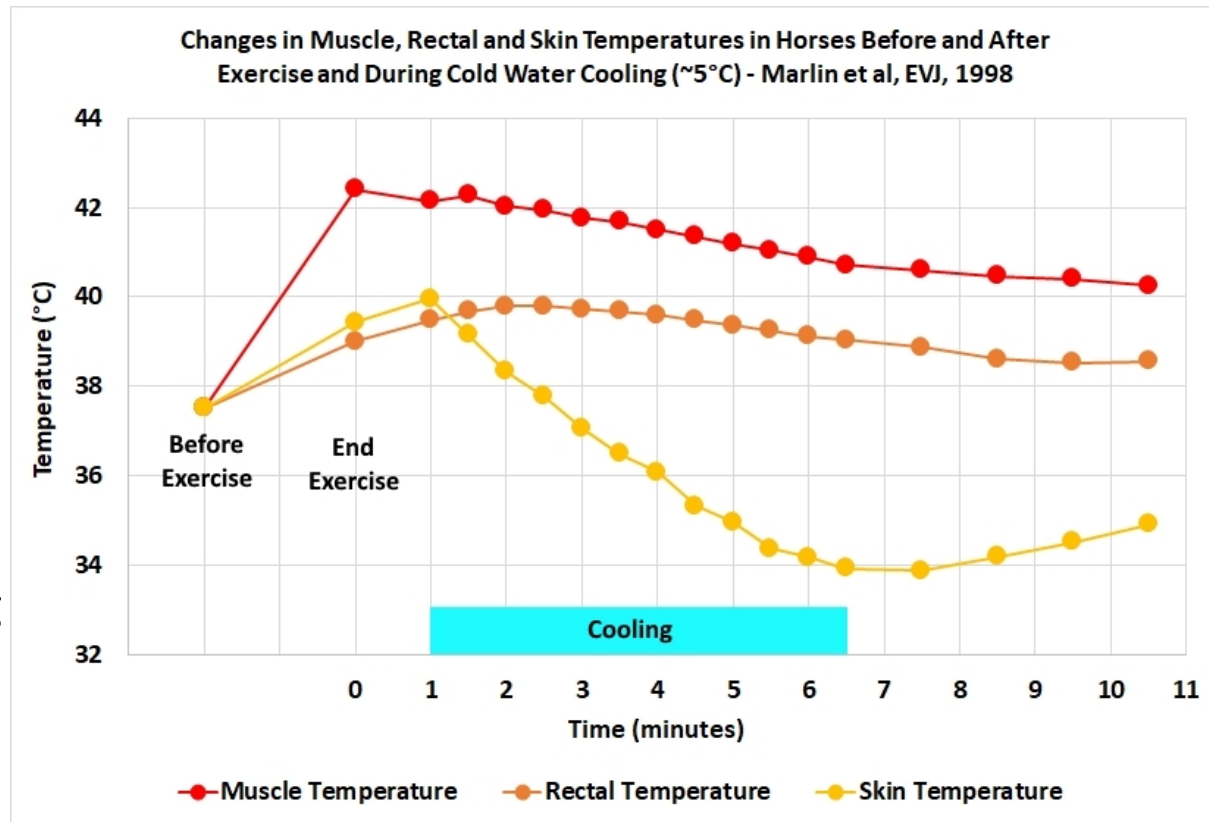


# Feasibility of cooling in the warm up

- Muscle gets the hottest
- Skin cools the quickest
- Rectal continues to  $\uparrow$  after exercise even with cooling
  - takes time for heat to transfer from muscle to blood to rectum
- After 6 min cooling, muscle and rectal still above resting



POTENTIAL FOR COOLING IN  
WARM UP



# Recommendations

- Monitoring
  - Fatigue: how does the horse feel?
  - Respiratory features
    - Respiratory rate at rest stop
    - Regularity of breathing pattern
    - Depth of breathing
  - Sweating
    - Type and distribution



# Warm up on consecutive days

- Cumulative fatigue?
- Too much warm up day 1 - ↓ performance day 3



# Clothing



# Warm up: Take home messages

*Take into account the climatic conditions*

- Reduce Duration and intensity
  - General warm up
  - Specific warm up
- Break warm up into smaller sections
  - Rest
  - Cooling
  - Monitoring

