TSAC CONFERENCE
TACTICAL STRENGTH AND CONDITIONING
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Individualising conditioning programs for large tactical groups

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Goals of this presentation

• Understand the importance of prescribing individual training intensity during conditioning sessions.
• Be able to prescribe individual training programs for tactical athletes.
• Individualise a group training session to ensure all tactical athletes are training at the same intensity.
Why is this important?

• In large groups especially in Law enforcement, Military, Fire and Rescue there will generally be large differences in fitness levels.
What’s the difference?

Professional sport

Law enforcement
Differences

Professional sport
• Monitoring Programs
• Well being reviews
• GPS
• Heart rate monitoring
• RPE

Law enforcement
• How long is a piece of string?
• Funding
• Every one is different
• Numbers
Differences

Professional sport

Law enforcement
How can we as coaches cater for everyone?

- Age
- Sex
- Different fitness levels
- Yet still ensure that all individuals get the training that they need.
Non individualised programs
Ways to determine your maximal aerobic speed (MAS)

• Distance / Time = MAS in metres a second
• For example, if your running time trial for 2km was 10 minutes, then your MAS = 3.33m/s (2000 m/600 s).
• If your 5 min max rowing time trial was 1500m, then MAS = 5m/s (1500 m/300 s).
• If your 10 min cycling time trial was 6000m, then MAS = 10 m/s (6000 m/ 600 s)
Different MAS speeds for different intervals

• Using our running example test example (3.33 m/s) running intervals at 100, 110, 120 or 130 % MAS would mean the following distances in the specified times.

• Important point MAS above 100% can only be maintained for shorter intervals, but can be repeated a number of times.
## MAS speed for different intervals

<table>
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<tr>
<th>Speed (%)</th>
<th>10 secs</th>
<th>15 secs</th>
<th>20 secs</th>
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<tr>
<td>70%</td>
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<tr>
<td>80%</td>
<td>27 m</td>
<td>40 m</td>
<td>53 m</td>
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<td>160 m</td>
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<tr>
<td>90%</td>
<td>30 m</td>
<td>45 m</td>
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<td>180 m</td>
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<tr>
<td>100%</td>
<td>33 m</td>
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<tr>
<td>110%</td>
<td>37 m</td>
<td>55 m</td>
<td>74 m</td>
<td>110 m</td>
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<tr>
<td>120%</td>
<td>39 m</td>
<td>59 m</td>
<td>78 m</td>
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</tr>
<tr>
<td>130%</td>
<td>43 m</td>
<td>64 m</td>
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</table>
Basic mathematics

• Just to make sure that you understand how we have calculated the distances.
• Speed = Distance/time
• Distance = Speed x Intensity x time
• 59.94m = 3.33 m/s x 1.2 (120%) x 15 sec
Prescription tests

• Tests that produce a termination velocity at or very close to VO$_2$ max are useful when the goal is to design high intensity aerobic training programs for large tactical groups.
What are some of the tests that we can use?

- Beep test (multi stage shuttle run)
- University of Montreal Track Test (MAS)
- 30:15 Intermittent Fitness Test (Buchheit)
Beep Test (multi stage shuttle)

<table>
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<tr>
<th>Beep Shuttle Level</th>
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</table>

Bishop, Sports Coach
Beep test (multi stage shuttle)

- MAS = 2.4 x max shuttle speed – 14.7
- Multi stage shuttle (beep test) results over 10 km.h\(^{-1}\) underestimate MAS and should be adjusted using the formula above.
Maximal Aerobic Speed (MAS) Test

200 metre oval

25 metres

2 metres
Maximal Aerobic Speed (MAS) Test

- Set up a course over 200 or 400 metres
- Place in colour cone (red) 25 metres apart around circumference of marked track
- Place second colour (yellow) 2 metres behind each of the red cones (safety zone)
- Athletes start on red cone
Maximal Aerobic Speed (MAS) Test

- Athletes commence running at 10 km/hr for two minutes
- Must be within coloured cones at audible CD beep
- Test is continuous in nature
- Velocity increases by 1 km/hr every 2 mins
- Test termination – miss cones on 3 consecutive occasions or voluntary exhaustion
MAS can be used to predict VO₂ max

- The following formulae can be used to predict VO₂ max from MAS results:
- \( VO₂ \text{ max (ml.kg}^{-1}. \text{min}^{-1}) = 3.5 \times \text{MAS (in km.h}^{-1}) \)
- Or \( 0.0324 \times (\text{MAS})^2 + 2.143 \times \text{MAS} + 14.49 \)
30:15 Intermittent Fitness Test (IFT)

- Martin Buchheit

http://www.martin-buchheit.net
30:15 Intermittent Fitness Test (IFT)

A

3m safe zone

20 Metres

B

3m safe zone

20 Metres

C

3m safe zone
30 – 15 Intermittent Fitness Test (IFT)

- An intermittent shuttle run beep test conducted over a 40 metre course
- 30 seconds running – 15 seconds passive recovery (walking to next starting position)
- Velocity progressively increases with each stage
- Starts at 8 km/hr and increases at 0.5 km/hr per stage
30 – 15 Intermittent Fitness Test (IFT)

- Termination criteria – Fail to reach within 3 metre safe zones at time of audio beep on 3 consecutive occasions
- Excellent choice for any intermittent based sports
- Gold standard for tactical athletes (I believe)
- Final velocity (VIFT) can be used to set interval training intensity
30 – 15 Intermittent Fitness Test (IFT)

- The following formulae can be used to predict VO₂ max from IFT results:
  \[ VO₂ \text{ max} (\text{ml.kg}^{-1}. \text{min}^{-1}) = 28.3 - 2.15 G - 0.741 A - 0.0357 W + 0.0586 A \times V_{IFT} + 1.03 V_{IFT} \]
- Where G stands for gender (female = 2, male = 1)
- A stands for Age, and W stands for weight
30 – 15 Intermittent Fitness Test (IFT)

• Why do I prefer this test?

1. Can determine a similar training load for tactical athletes.
2. Levels the field between endurance athletes and anaerobic athletes.
3. More specific to the tactical athlete.
4. Takes into account acceleration/deceleration and change
5. Room needed to conduct the test.
Compare the UMTT and 30:15 IFT

UMTT

30 : 15 IFT

Buchheit M, JSCR 2008
Valid and reliable

Buchheit M, JSCR 2010
Important to note

• That the $V_{IFT}$ is much faster than the $vVO_2max$ and the anaerobic contribution is much higher during the 30-15 IFT than during a continuous straight line running test.

• Generally 2 – 5 km/hr faster.
Training intensities

UMTT

15-15 at 110% $V_{LB}$

30 – 15 IFT

15-15 at 95% $V_{IFT}$

Buchheit M, JSCR 2008
UMTT (MAS)

Dupont et al, EJAP 2003
Distance is important

Dupont et al 2003
30 – 15 IFT

• While high intensity intermittent shuttle runs are generally performed above $\text{vVO}_2\text{max}$.
• $V_{\text{IFT}}$ constitute the upper limit for these exercises (with the exception of all out repeated sprints sequences)
Changes in elite professional athletes

- Prep Phase
- Comp Phase
- End of Comp Phase

Bar chart showing changes in $V_{IFT} (km.h^{-1})$ across different phases.
Designing the training program
Rest v active recovery?
### VIFT Spreadsheet

| Name | Age | Gender | Bodyweight (kg) | VIFT (m/s) | VO2 Max (ml/kg.min) | VIFT 50% 10s | VIFT 60% 15s | VIFT 70% 15s | VIFT 80% 15s | VIFT 90% 15s | VIFT 95% 15s | VIFT 100% 15s | VIFT 105% 15s | VIFT 110% 15s | VIFT 115% 15s | VIFT 120% 15s |
|------|-----|--------|----------------|------------|---------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| M    | 20  | 90     | 20.5           | 5.69       | 56.9                | 28           | 48           | 34           | 51           | 40           | 60           | 46           | 68           | 51           | 77           |
| F    | 30  | 90     | 19.5           | 5.42       | 52.4                | 27           | 41           | 33           | 49           | 38           | 57           | 43           | 65           | 49           | 73           |
| M    | 25  | 85     | 19.5           | 5.42       | 62.6                | 27           | 41           | 33           | 49           | 38           | 57           | 43           | 65           | 49           | 73           |
| M    | 25  | 85     | 19.5           | 5.28       | 61.1                | 26           | 40           | 32           | 48           | 37           | 55           | 42           | 63           | 40           | 71           |
| M    | 25  | 85     | 19.5           | 5.28       | 61.1                | 26           | 40           | 32           | 48           | 37           | 55           | 42           | 63           | 40           | 71           |
| M    | 25  | 85     | 19.5           | 5.14       | 59.6                | 26           | 39           | 31           | 46           | 36           | 54           | 41           | 62           | 46           | 69           |
| F    | 30  | 90     | 18.5           | 5.14       | 65.4                | 26           | 39           | 31           | 46           | 36           | 54           | 41           | 62           | 46           | 69           |
| M    | 34  | 90     | 18.5           | 5.14       | 72.4                | 26           | 39           | 31           | 46           | 36           | 54           | 41           | 62           | 46           | 69           |
| M    | 27  | 90     | 18.0           | 5.00       | 60.7                | 25           | 38           | 30           | 45           | 35           | 53           | 40           | 60           | 45           | 68           |
| M    | 34  | 90     | 18.0           | 5.00       | 70.8                | 25           | 38           | 30           | 45           | 35           | 53           | 40           | 60           | 45           | 68           |
| M    | 25  | 90     | 17.5           | 4.86       | 56.5                | 24           | 36           | 29           | 44           | 34           | 51           | 39           | 58           | 44           | 66           |
| F    | 35  | 90     | 17.5           | 4.86       | 68.1                | 24           | 36           | 29           | 44           | 34           | 51           | 39           | 58           | 44           | 66           |
## MAS Spreadsheet

<table>
<thead>
<tr>
<th>Name</th>
<th>MAS RESULTS</th>
<th>VO2 Max ( \text{ml} \cdot \text{kg}^{-1} \cdot \text{min}^{-1} )</th>
<th>Cone Color</th>
<th>Active Recovery</th>
<th>Work</th>
<th>Passive Rest</th>
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<tr>
<td></td>
<td>km/h ( \text{m/s} )</td>
<td>10 s</td>
<td>15 s</td>
<td>10 s</td>
<td>15 s</td>
<td>10 s</td>
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<td>63.6</td>
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<td>30</td>
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30-15 VIFT Training Session

20 km/h at 100% for 15secs = 83m
19 km/h at 100% for 15secs = 79m
18 km/h at 100% for 15secs = 75m
17 km/h at 100% for 15secs = 77m
16 km/h at 100% for 15secs = 67m
15 km/h at 100% for 15secs = 62m
14 km/h at 100% for 15secs = 58m

Work 15 secs : Passive rest 15 secs
MAS – MRS Grids
Long side = 100 %
Short side = 70 %

MAS (VO₂) Grids

Work 15 secs : Active Recovery 15 secs
Sample $V_{IFT}$ traditional periodised running program

<table>
<thead>
<tr>
<th></th>
<th>Week 1</th>
<th>Week 2</th>
<th>Week 3</th>
<th>Week 4</th>
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<td>Intensity</td>
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<td>95%</td>
<td>97.5%</td>
<td>100%</td>
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<td>Work:Rest</td>
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<td>10:10</td>
<td>10:10</td>
<td>10:10</td>
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<td>6 mins</td>
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<td>6 mins</td>
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<tr>
<td>Rest</td>
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<td>3 mins</td>
<td>3 mins</td>
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<td>2</td>
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<td>15 mins</td>
<td>15 mins</td>
<td>15 mins</td>
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Sample $V_{IFT}$ undulating periodised running program

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<tr>
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<th>Week 3</th>
<th>Week 4</th>
<th>Week 5</th>
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<td>Basic</td>
<td>Shock</td>
<td>Shock</td>
<td>Unload</td>
<td>Basic</td>
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<tr>
<td>Intensity</td>
<td>92.5%</td>
<td>100%</td>
<td>102.5%</td>
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<tr>
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<td>15:15</td>
<td>15:15</td>
<td>15:15</td>
<td>15:15</td>
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<td>6 mins</td>
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<tr>
<td>Rest</td>
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<td>2 mins</td>
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### Undulating weekly schedule

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Aerobic power and capacity

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<th>CAPACITY</th>
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<td>100%:70%</td>
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<tr>
<td>Total time</td>
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</table>
Aerobic power and capacity

- **POWER**: The absolute power of performance measure for that energy system in a one of maximal effort.
- **CAPACITY**: The ability to repeat or sustain high power levels during the use of that energy system.
30-15 as a predictor of injury

Orr, R., Stierli, M. & Hinton, B.
30-15 and the 20m PSRT

Almost Perfect Linear Correlation

Orr, R., Stierli, M. & Hinton, B.
30-15 Training - ABT

• No Difference between 30-15 training program and traditional recruit training program with regards to performance.
• 30-15 training program had less volume and training time then traditional recruit training.

Orr, R., Stierli, M. & Hinton, B.
Things to consider

- Shift rotations
  - When last on shift?
  - When next on shift?
  - Recovery
Appreciation

• National Strength and Conditioning Association (TSAC)
• Dr Mike Newton, Edith Cowan University
• Martin Buchheit
Contact Details

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References

References