



## USING PHYSICAL TESTING RESULTS TO PLAN YOUR CONDITIONING SESSIONS

Created by Dr Stuart Cormack, Dr Emerson Franchini and Dr Clare Humberstone

### 1. Introduction

It is vital for a Judo athlete to develop a high level of aerobic conditioning in order to achieve international competition success. Judo athletes complete several sessions per week on the tatami that contribute to their aerobic conditioning – e.g. uchikomi, randori, circuits. However, another efficient way to create additional improvements in aerobic conditioning is to complete specific “off-mat” conditioning sessions.

This document gives you recommendations about “off-mat” conditioning sessions that you should use to get efficient gains in aerobic fitness and how to make them most effective by using simple information gained from your physical testing results.

These programs are designed around the concept of maximizing the time you spend exercising at or above the speed that achieves maximal aerobic power ( $VO_2\text{max}$ ). This is a powerful stimulus for your body to adapt and improve aerobic conditioning. This approach has been consistently proven to be highly effective in elite athletes and are backed up by modern sports science principles and research. There may be some place for 30-60 minute steady state runs (e.g. weight management, off-season maintenance) but these should not form the basis of your conditioning program.

### General recommendations

- Do not perform an activity if it causes pain. Commence each session with a warm up and finish with some type of recovery activity (e.g. light stretching, wear compression garments, hydrotherapies).
- The following conditioning program examples are based around running because the forms of physical testing you have completed are typically running (e.g. beep test, running time trial or  $VO_2\text{max}$  test on treadmill). But the same principles apply to any form of aerobic exercise that you prefer, such as cycling, rowing or versa-climber. There is a section in the document below that specifically helps you adapt these principles to these other training modes.
- The benefit of using your physical testing results to follow this program is the precision it provides. This works best when you use any form of exercise when you can measure the intensity of your work rate (e.g. running speed, rowing time per 500m, cycling power, versaclimber power or workrate). This allows you to be very specific about the intensity at which you are working. You can also use a general guide of ‘Rating of Perceived Exertion’ (RPE) – i.e. how high the intensity of your exercise feels to you - to guide how hard to work in each of these sessions, so we have given you this information. But it is less precise and may be less efficient for your training.

## 2. Getting Started

The first thing you need to do is choose your method of conditioning and calculate your maximum aerobic speed (MAS) specific to that training method. Here are examples of how you do that:

### RUNNING

#### Method 1: Calculate MAS from Beep Test Score

Level 1 of the Beep test starts at 8km/h and increases by 0.5km/h each level so that by Level 21 the speed is 18.5km/h. Based on this, work out your running speed depending on your beep test score and put it into the equation below to work out your MAS.

$$\text{MAS} = (2.4 \times \text{max shuttle speed in km}\cdot\text{h}) - 14.7$$

For example, if you dropped out at Level 12,2 the running speed is 14km/h. The equation then becomes:

$$\text{MAS} = (2.4 \times 14) - 14.7$$

$$\text{MAS} = 19 \text{ km/h.}$$

For ease of use for outdoors running you can then convert this to speed in m/s. To do this, multiply the speed in km/h by 1000 and divide by 3600 e.g.  $19000/3600 = 5.3 \text{ m/sec}$

#### Method 2: Find MAS on treadmill VO<sub>2</sub>max test report

On the detailed report you were given following your VO<sub>2</sub>max test, find the row that says MAS or it can also be called vVO<sub>2</sub>max (Velocity at VO<sub>2</sub>max). This speed will be in km/h. To convert it to m/s, multiply the speed in km/h by 1000 and divide by 3600 e.g.  $19000/3600 = 5.3 \text{ m/sec}$

**Note:** your MAS is not the speed the treadmill was going on your final stage when you were tested in the laboratory, because this was at a lower speed using an uphill gradient. Instead your MAS has been calculated to be what its equivalent would be on a flat running surface.

#### Method 3: Calculate MAS from Time Trial

Perform a maximal running 2km time trial around an athletics track.

$$\text{MAS} = \text{time trial distance in metres, divided by, time to complete trial in seconds}$$

For example, if you ran a 2km TT in 8mins your MAS would be:

$$2000/480 = 4 \text{ m/sec}$$

### **UCHI-KOMI (hikidashi, basic entrance repetition or your tokuy-waza)**

If using Hikidashi, start with 20 rep/min (i.e., 1 rep each 3 s) and add 3 rep each min, until fatigue. The speed at your last stage is your maximum hikidashi uchi-komi aerobic speed.

If you did not complete a stage, use the equation below to determine your maximal aerobic speed:

Maximal aerobic speed (rep/min) = speed at the penultimate stage + (3\* time (in seconds) of last stage/60 s)

Failure to maintain the rhythm or to perform a proper technique execution determine the end of the test.



Photo credit: Shiroma, S.A. (2017)

### **ROWING**

Perform a maximal 5 minute time trial on a rowing ergometer and record the distance covered (or alternatively power in Watts you produced).

MAS in m/s = total distance/time:

For example, if you rowed 1500m in 5min your MAS would be:

$$1500/300 = 5\text{m/s}$$

MAS in Watts = the average power (Watts) you generated across the duration of the time trial. The rowing ergometer should tell you this as an option if you select the right units on the computer.

### **CYCLING**

Perform a maximal 5 minute time trial on a stationary bicycle and record the distance covered.

‘Spin bikes’ that have no computer (or only a very basic one) on them to show you what speed or power you are generating are not suitable for this method.

MAS = time trial distance in metres/time to complete trial in seconds

For example, if you cycled a 2km TT in 8mins your MAS would be:

$$2000/480 = 4 \text{ m/sec}$$

Convert this speed to km/h if those are the units you can monitor your training with on the bicycle. To do this, multiply the speed in m/s by 3600 and divide by 1000 e.g.  $4 \times 3600 = 14400$ ,  $14400/1000 = 14.4$  km/hr.

Alternatively, some bicycle ergometers will tell you what the average speed was for your time trial in km/h or average power for the duration (in Watts). You can use either of these as your MAS and do the program using these speed/power indicators measures.

### **VERSACLIMBER/STEPPER etc.**

Use the methods above for cycling or rowing to calculate m/s or watts/s depending on the output available on the specific machine.

### **ANY OTHER METHOD THAT YOU CAN'T QUANTIFY EASILY (i.e. running not on treadmill or track, cycling without power-meter or speedometer, exercising outside on variable gradient)**

If you want to use another method of conditioning that does not allow you to measure work-rate (i.e. speed, power, time to complete a distance) you should complete the programs below using the Rating of Perceived Exertion (RPE) indicators below as guides for intensity of each interval.

1 - 10 Borg Rating of Perceived Exertion Scale	
0	Rest
1	Really Easy
2	Easy
3	Moderate
4	Sort of Hard
5	Hard
6	
7	Really Hard
8	
9	Really, Really, Hard
10	Maximal: Just like my hardest race

### 3. Using MAS to determine program

The next step is to use your MAS to guide your training using the session examples below. For example if you have an MAS of 15 km/h and the program requires you to run at 100% of your MAS for 1 minute then you can do this accurately using a treadmill or GPS device. When you have to train at a speed other than 100% of your MAS you need to multiply your MAS (e.g. 15 km/h) by the appropriate amount. E.g. 110% of 15 km/h = 15 multiplied by 1.10. This is 16.5 km/h.

If you want to work out what distance you should be cover (e.g. running, cycling, rowing, etc.) for a time interval do the following:

1. Determine MAS in m/s or watts/s from a time trial or other test as described above.

If you have an MAS in km/h you can convert it to m/s using the following equation:

$$\text{MAS in m/s} = (\text{MAS in km/h} \times 1000) / 3600$$

e.g. MAS of 15km/h =  $15000 / 3600$  = MAS of 4.16 m/s

If you are working at 100% of your MAS, simply multiply your MAS by the duration of the interval (e.g. MAS of 5 m/s for 15s = 75m).

2. If you are working above or below 100% of your MAS, multiply your MAS in m/s or watts/s by the % of MAS you should be working at.

For example 110% of MAS of 5 m/s can be calculated as  $5 \times 1.1 = 5.5$  m/s. Multiply this new speed by the duration of the interval (e.g.  $5.5 \text{ m/s} \times 15 \text{ s}$ ) to determine the distance you should cover (e.g.  $5.5 \text{ m/s} \times 15 \text{ s} = 82.5 \text{ m}$ ).

If you have a longer interval session (e.g. 5min at 100% MAS) you can work out how far you should run in total and then how long it should take you to run around parts of a 400m track so you can keep on time. In this case, if your MAS is 5m/s you should run 300m in 1 minute (150m every 30sec which equals 100m in 20sec) and 1500m in 5mins.

If you are using a rowing or cycling ergometer, exercise for the interval duration making sure you are keeping your power/speed at the desired percentage of your MAS throughout the duration of the interval.

#### 4. Conditioning session examples

- Commence each session with an appropriate sub-maximal warm up using the same exercise modality as you will perform the session in.
- If you are performing a high intensity interval training session, ensure you do some progressively higher intensity intervals before you commence the session.
- The relevance of each session is dependent on your individual needs (fitness level, injury status etc.) and it may need modification from the sets, reps and speeds below in order to meet your requirements. There are countless combinations of sets, reps and rest periods possible.

**Sessions 1-4 are general aerobic conditioning programs that may suit a general preparation phase of training.**

##### **Session 1**

5 x 3 min at 90% MAS with 1.5 min jogging between efforts (RPE 5-6)

##### **Session 2**

4 x 5min @ 100% MAS with 3min rest between efforts (RPE 5)

##### **Session 3**

3 x 5min @ 100% MAS with 3min rest between efforts (RPE 5)

2 x 3min @ 110% MAS with 2min rest between efforts (RPE 6)

##### **Session 3**

1 x 5min @ 100% MAS with 3min rest between efforts (RPE 5)

2 x 3min @ 110% MAS with 1min jog & 1min rest between efforts (RPE 6)

2 x 2min @ 110% MAS with 90sec jog between efforts (RPE 6)

##### **Session 4**

3 x 1min @ 110% MAS with 60sec jog between efforts (RPE 6)

6 x 30sec @ 110% MAS with 30sec walk between efforts. Rest for 60s after set of 6 (RPE 7)

8 x 15sec @ 115% MAS with 15sec rest between efforts (RPE 7)



**Sessions 5 & 6 are relatively higher intensity and suitable once you have a base of conditioning**

**All sessions can be made more intense by performing an active recovery (e.g. jog) during the rest periods.**

#### **Session 5**

4 x 30sec @ 110% MAS with 30sec walk between efforts. Rest for 60s after set of 4 (RPE 7)

6 x 15sec @ 115% MAS with 15sec rest between efforts. Rest for 90s after set of 4 (RPE 7)

8 x 10sec @ 120% MAS with 10sec rest between efforts (RPE 8)

#### **Session 6**

6 x 15sec @ 115% MAS with 15sec rest between efforts. Rest for 90s after set of 6 (RPE 7)

2 x (8 x 10sec @ 120% MAS with 10sec rest between efforts) with 90s between sets of 8 (RPE 8)

**Sessions 7 – 9 are very high intensity repeated effort sessions. The volume of these sessions is low but the very high intensity will result in rapid gains in aerobic fitness. All sessions can be made more intense by performing an active recovery (e.g. jog) during the rest periods.**

#### **Session 7**

4 x (6 x 10sec @ 120% MAS with 10sec rest between efforts) with 90s rest between sets of 4 (RPE 9)

#### **Session 8**

6 x 10sec @ 130% MAS with 10sec rest between efforts. Rest for 2min after set of 6 (RPE 9)

2 x (6 x 10sec @ 120% MAS with 10sec rest between efforts) with 90s between sets of 6 (RPE 9)

#### **Session 9**

Sets until failure (ideally 30-40 bouts) of 15s at 100% MAS with 15s of jogging at 70% MAS between efforts (RPE 9)