

Some cross-training workouts to improve your energy system fitness

In the previous post (<http://www.danbakerstrength.com/free-articles/recent-trends-in-high-intensity-aerobic-training/>), I detailed how you don't need to Long Slow Distance training to improve your energy system fitness. High intensity intervals will greatly improve both your aerobic and anaerobic energy system fitness. In this article I will detail workouts that don't entail running ~ they are suitable for injured athletes who can't run, athletes who don't need to run for their sport (eg. Paddling, rowing), combat athletes and those who just don't like running. Cross training workouts can be extremely challenging and effective in improving your aerobic and anaerobic energy system fitness for both the upper and lower body, something that running alone can never achieve. These workouts will make heavy use of the rower, bike, grinder (if you have one, if not just punch the heavy bag), the heavy bag and if you are playing rugby league/union, MMA or BJJ, you can use a partner for grappling and sparring, if you want. If you have an injury that prevents you from training or competing fully, you can "easily" perform these workouts, or variations of them, with modifications appropriate to your situation.

Determination of 100% Maximal Aerobic Speed (MAS).

The determination of the high-intensity Maximal Aerobic Speed (MAS) is necessary for most of these work-outs. The options for running tests have been described in a previous article (ref.1, <http://www.danbakerstrength.com/free-articles/recent-trends-in-high-intensity-aerobic-training/>). As there is no universally-agreed field test across all training modalities (7), I simply default to a 5-minute all-out effort test in rowing, cycling, arm-grinding, paddling etc, as other researchers have shown that typically across different modes of exercise, the 100% MAS can typically be held for 4 to 6-minutes in well-trained athletes (4, 7). However, often athletes can present with injuries during a session or on short notice (8) and training sets must then be calculated upon the spot. Accordingly, it is necessary to have default scores to use, which are based upon data from the hundreds of athletes I have trained over more than two decades. For example, if the rowing 100% MAS is not directly known, I default to 4.8 m/s for athletes 77-85 kg, 4.9 m/s for 85-93 kg, 5 m/s for 94-99 kg, 5.1 m/s for 100-105 and 5.2 m/s for > 105 kg. What this means is, it is assumed a 94-99 kg male would row 1500 m in 5-minutes ($1500\text{m}/300\text{secs} = 5\text{ m/s}$) in a 5-minute MAS rowing test. Therefore if I didn't know the athletes exact rowing MAS, I would assume it to be 5 m/s (for a 94-99 kg male

athlete) and set the training sets and reps based upon that score. For cycling, 300 watts is an equivalent 100% MAS to 5 m/s, so you can adjust accordingly. Clearly, this all depends on your own specific fitness levels, so you will need to test and measure your own rowing, cycling and grinding MAS.

For acyclical modes of exercise where MAS cannot be calculated, such as grappling and punching/boxing, if necessary heart rate (HR) can be used to determine if the athlete is working to the level of difficulty that we expect. But I make most use of the rower, bike and grinder as the exact measures of distance and time inherent in the use of these ergometer pieces allow for an accountability of performance.

Below is a description and rationale for various cross-training workouts that I like to use with athletes.

Description and rationale for various workouts

“F troop”. Table 1. depicts a simple program that I use in the **General Preparation Phase** athletes or **those new to this type of training**. This “F troop” workout is a classic manifestation of the **100%:70% MAS** interval protocol, except that the intervals are 30 s long, rather than the typical 15 s used when we do the same type of workout when running (1). I have found that when performing rowing and cycling ergometer conditioning, it is sometimes more effective to use these longer 30 s intervals when in earlier stages of the Preparation Period or those new to this type of training. The continuous nature of the 5-minute sets, (albeit as 30 s hard, 30 s easier) with only a 1-minute rest between, greatly affects the basic aerobic qualities, which is the appropriate stimulus for this stage of the training year. The athletes can start on any of the prescribed stations, but rotate through the session in the order as listed. By prescribing cycling (lower body peripheral), grinding/punching (upper body peripheral) and rowing (whole body), I aim to stress not only the central heart/lung cardiovascular adaptations but also the peripheral aerobic adaptations within the musculature. The time spent exercising at > 100% MAS equals 15-minutes, although the HR actually stays elevated above 85% maximum for a much longer period.

“Harden up”. Table 2 depicts the Harden Up workout that is performed in the **Specific Preparation Phase** and can clearly be seen as a progression from the F Troop workout (17:40 mins spent \geq 100% MAS). By this stage of the training year, intensity of efforts becomes an even greater concern. The sets are only 3:40 minutes, with a 1:20 minute recovery, but the working intensity of around 110% MAS for 20 s, even with a passive recovery of 20 s, is much harder to complete. Clearly by exercising above the 100% MAS, the anaerobic system must be called into play to provide additional energy to attain the pacing

demands of 110%. It also contains an element of contact conditioning with boxing sparring or grappling when the athletes are already in a deeply fatigued state ~ the ability to absorb contact with an elevated breathing rate and heart rate at a pace above the 100% MAS as a critical aspect of “hardening up” the body for the realities of rugby type football and MMA/combat sports.

“Total annihilation”. This workout, depicted in Table 3, is one of my **Competitive Period** (in-season) variations, all with a familiar theme. Typically this is the main conditioning workout of the week. Whereas the previous two workouts were typified by a **1:1 work:rest or work:active recovery ratio**, this workout entails varying work:rest ratios and varying work lengths. The punching sections are maintained at 1:1 for 15 s intervals of work:rest (the rest period is actually holding the heavy bag for the partner), however the rowing sets of 6-minutes are much more difficult. The first rowing set is at 20:20, the second at 30:15 and the third at 45:15 ~ **the ratio of work:rest increases from 1:1 to 2:1 to 3:1**. While the prescribed intensity for the final 45:15 set is 93-100%, I want the athlete to be at 100%, however I have to accept that sometimes cumulative fatigue prevent them from attaining their “non-fatigued state 100% MAS”. Nonetheless 93% MAS is the lowest I will accept without prescribing penalty reps. The motto I like to use is “Do the intensity or do extras”. Accordingly, this workout with >17:30 mins \geq 100% MAS is deemed “Total annihilation”.

“Complete towel up”. This workout (Table 4) is another variation used in the **Competitive in-season period**. It uses a little more variety in that grappling and cycling are also utilized, but other than that it is essentially the same in method and difficulty as the previous one.

There are a number of variations of these two in-season favourites, but the one constant I maintain are the three 6-minute rowing sets with the increasing work:rest ratios to induce a high level of energy system fatigue and stress. What is manipulated is whether the other sets include grappling, boxing, battling ropes, sport specific drills and so on, which itself is based upon the individuals sport, injury status or other objectives. Obviously a combat athlete can replace cycling sets with grappling, punching or calisthenics (eg. sprawls, hip heists, wall walks etc) set if so desired.

“3-way Energy system”. As the name suggests, this work-out stresses all three energy systems in a methodical order and can be performed rowing or cycling (Table 5). It is typically performed by athletes with long-term injuries (eg. ACL rehab) on an irregular basis during the Competitive Period and each of the three portions is performed immediately after

the other, with no rest. The first 10-minute set stresses the **anaerobic ATP-PC system** with five 10-s intervals with a complete active recovery (110-s) before morphing into the **anaerobic lactic system** workout. The lactic workout can be 20-s with 100-s active recovery (1:5) or even 30-s with 90-s active recovery (1:3). This is an extremely difficult portion of the workout. Following this, the **aerobic portion** is similar to many workouts listed above, with 30-s at 100% MAS alternated with 30-s of 70% MAS.

Rowing Max aerobic power. This simple workout (Table 6) is typically used when I need to give an athlete just a short burst or to stress their energy system conditioning “off their feet” (not running) to reduce impact load in a session. Thus it may be performed at any stage of the training year, as it is a set that is used in conjunction with other training. The two versions are essentially the same ~ one variant is to row for a **prescribed time of 20 s** (1:1) for 16 repetitions (11-minutes) and add up the total meters attained. The other variant is to prescribe a **set distance of 110 m** (which takes most players between 18-21 s) and add the total time taken to row the 16 intervals with a set 20s rest between each interval.

Circuits. Generally I am not a big fan of circuits, as I believe that for very strong athletes, they induce high levels of lactic acid and fatigue that will wear that athlete down with prolonged exposure. But athletes with long-term injuries need some variety in their total training stimulus if they are performing multiple training sessions each week. So provided they are still performing their prescribed strength/power program and performing 1-2 of the conditioning workouts already listed each week, then about once every 2 or so weeks, an upper body circuit can be used. Typically it will consist of 6-9 exercises with an order of upper body pushing, upper body pulling, torso/abdominal exercise throughout the circuit. There are a few different methods to increase the difficulty of circuits, but I prefer to use an exactly prescribed order of exercises, resistance and reps (eg. 20) and monitor how long it takes for the athlete to finish the circuit. After a prescribed rest period they would repeat the circuit and possibly one more repeat (if they can handle it). Add up the total time it took to complete the two or three circuits as a gauge of performance. When the athlete repeats the circuit workout in two weeks time, they would have to improve their total time. My advice is to use a given combination of exercises, resistances and reps only three times and then alter it, as circuits are neutrally boring. The “Shock-Adaptation-Maximization” process inherent in the concept of block periodization takes only the three workouts with circuit training. By this I mean the first time a circuit is performed it is a Shock, the second time you are already Adapting to it and improving and the third time, you should be Maximizing your performance at that particular workout. Less improvement in performance will occur from the third to a

fifth workout as compared to the first to third. So change the workout after three sessions and keep the improvements happening.

My other piece of advice is don't overdo circuits as a conditioning method (or a "strength" training method) and remember that the bigger and stronger the athlete, the harder it is for them to recover from a difficult circuit workout.

Conclusion.

High-intensity energy system conditioning can be performed on a number of indoor ergometers. This makes it useful for implementing into the training of MMA/combat athletes as well as for rugby athletes who may be injured or need to reduce running volume.

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Table 1. Standard “F Troop” Saturday morning workout = 36-min.

Mode of Exercise	Set length	Work Intervals	Recovery	Work : recovery	# of hard reps	Rest
Rowing	5 mins.	30 s @ 100% MAS	30 s @ 60-70% MAS	1:1 Active recovery	5	1 min.
Grinder	5 mins.	30 s @ 100% MAS	30 s @ 60-70% MAS	1:1 Active recovery	5	1 min.
Cycling	5 mins.	30 s @ 100% MAS	30 s @ 60-70% MAS	1:1 Active recovery	5	1min.
Rowing	5 mins.	30 s @ 100% MAS	30 s @ 60-70% MAS	1:1 Active recovery	5	1 min.
Heavy bag Punching or Focus mitts	5 mins.	30 s hard punching	30 s tempo punching	1:1 Active recovery	5	1 min.
Cycling	5 mins.	30 s @ 100% MAS	30 s @ 60-70% MAS	1:1 Active recovery	5	1min.

Table 2. Saturday morning HARDEN UP workout = 40-min.

Mode of Exercise	Set length	Work Intervals	Rest or Recovery	Work : rest	# of reps	Rest
Cycling	3:40 mins.	20 s @ 105-110% MAS x 6	20 s Rest x 5	1:1 Passive rest	6	1:20 mins.
Rowing	3:40 mins.	20 s @ 105-110% MAS x 6	20 s Rest x 5	1:1 Passive rest	6	1:20 mins.
Rowing	3:40 mins.	20 s @ 105-110% MAS x 6	20 s Rest x 5	1:1 Passive rest	6	1:20 mins.
Cycling	3:40 mins	20 s @ 105-110% MAS x 6	20 s Rest x 5	1:1 Passive rest	6	1:20 mins.
Rowing	3:40 mins.	20 s @ 105-110% MAS x 6	20 s Rest x 5	1:1 Passive rest	6	1:20 mins.
Rowing	3:40 mins.	20 s @ 105-110% MAS x 6	20 s Rest x 5	1:1 Passive rest	6	1:20 mins.
Heavy bag punching	3:40 mins	20 s hard punching x 6	20 s Rest x 5	1:1 Passive rest	6	1:20 mins.
Boxing sparring	3:40 mins	Full contact sparring, but only ~ 50% force to head	No rest during the set	NA	6	1:20 mins.

Table 3. Total annihilation workout = 40-mins.

Mode of Exercise	Set length	Work Intervals	Rest or Recovery	Work : rest	# of reps	Rest
Rowing	6 mins.	20 s @ 105-110% MAS	20 s Rest	1:1 Passive rest	9	2 mins.
Heavy bag punching	4 mins.	15 s hard punching	15 s Rest	1:1 Passive rest	4	2 mins
Rowing	6 mins.	30 s @ 100% MAS	15 s Rest	2:1 Passive rest	8	2 mins.
Heavy bag punching	4 mins.	15 s hard punching	15 s rest	1:1 Passive rest	4	2 mins
Rowing	6 mins.	45 s @ 93-100% MAS	15 s Rest	3:1 Passive rest	6	2 mins.
Heavy bag punching	4 mins.	15 s hard punching	15 s rest	1:1 Passive rest	4	2 mins

Table 4. Complete Towel up workout = 40-mins.

Mode of Exercise	Set length	Work Intervals	Rest or Recovery	Work : rest	# of reps	Rest
Rowing	6 mins.	20 s @ 105-110% MAS	20 s Rest	1:1 Passive rest	9	2 mins.
Grappling – Side control or escape	4 mins.	20 s, top must pin, bottom must escape	10 s rest to alternate top & bottom	2:1 Passive rest	8	2 mins
Rowing	6 mins.	30 s @ 100% MAS	15 s Rest	2:1 Passive rest	8	2 mins.
Heavy bag punching	4 mins.	15 s hard punching	15 s rest	1:1 Passive rest	4	2 mins
Rowing	6 mins.	45 s @ 93-100% MAS	15 s Rest	3:1 Passive rest	8	2 mins.
Cycling	4 mins.	30 s @ 100% MAS	30 s @ 70% MAS	1:1 Active recovery	4	2 mins

Table 5. 3-Energy System continuous workout

Mode of Exercise	Energy System	Portion length	Work Intervals	Recovery	Work : recovery	# of reps
Rowing or cycling	ATP-PC	10 mins	10 s @ >95%	110 s @ 40-60% MAS	1:11	5
Rowing or cycling	Lactic	10 mins	20 s @ >90%	100 s @ 40-60% MAS	1:5	5
Rowing or cycling	Aerobic	10 mins	30 s @ 100% MAS	30 s @ 70% MAS	1:1	10

Table 6. Maximum Aerobic Power & Capacity Rowing workout (versions 1 & 2).

Mode of Exercise	Set length	Work Intervals	Recovery	Work : recovery	# of reps	Rest
Rowing version #1	11 mins	20 s @ 105% MAS	20 s	1:1 passive rest	16	4 mins
Rowing version #2	11-12 mins	110 meters – add the time for all 16 reps for total	20 s	~1:1 passive rest	16	4 mins

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