

VO2max Maintenance for Team Sports: Experience with Cross Training

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We all know how important the VO2max development for team sports in general and rugby in particular is. Rugby is becoming a much faster game with the ELVs and through its natural evolution. The ball remains in game longer (up to 48% average in the southern hemisphere), hence asking for an increased stamina on the part of the players. Here is a report on an experiment which has been conducted by myself on well trained rugby and football players concerning the potentiality to maintain an acquired VO2max and velocity at VO2max (thereafter referred as vVO2max) during the competition season through cross training without specifically running at vVO2max in order to minimize the impacts and concentrate of farther speed development.

The results presented here are not the results of an official scientific research as the panel of players and athletes was too small, but it certainly could throw some base for further studies in this particular area of VO2max development and maintenance. There are indeed some interesting issues resulting from this experiment which sport scientists could eventually use to set a definite research.

First I shall address the protocol of VO2max development used, then why I thought it was important to try cross solutions for its maintenance during the competition phase of the training program. Finally, we shall look at how this was done and the results it gave.

I- VO2max Training:

VO2max (also known as maximum oxygen uptake) is the foundation of most physical activities and even power sports athletes should develop a fair VO2max in order to facilitate recovery between bouts and efforts. Team sports in general, due to the time frame they are played on and their actual physiological demand (ergogenesis), are activities where the higher the VO2max, the better it will be for the players' stamina during the games and moreover their recovery between action bouts, games and training sessions. VO2max is a personal physiological asset which is developed through time with training. An athlete's VO2max is a measure independent of his/her sport although connected. The way an athlete develops his/her VO2max will depend on the specificity of the sport. It is the way vVO2max is developed hence increasing VO2max which is important. For example rugby and football players will develop it through running, while swimmers, bikers, triathletes and rowers will develop it through the specifics of their sport. Nonetheless, VO2max maintenance could be achieved by any meaning as long as training is done in the VO2max speed zone.

Rugby ergogenesis: 60% aerobic, 30% anaerobic lactic, 10% anaerobic alactic

The best way to develop VO2max in team sports is through running intervals using the speed individual players are able to run at VO2max. Briefly, one train VO2max by running (or biking, or swimming or rowing) at speed triggering VO2max also known as vVO2max (please

refer to articles on this website for more details on this). This should be trained during the Preparatory Phase of the Periodized Plan under general and specific aerobic endurance. I personally used for myself and players an interval training protocol scientifically developed and tested by Professor Veronique Billat of the University of Evry sur Seine in France (see articles on this website). This training protocol involves the knowledge of each player's vVO₂max through a 6 minutes running test on a track. Once individual vVO₂max are established, players will have programs to develop twice a week their vVO₂max through gradual sessions of 30-30, 60-60 seconds running and then with a protocol of 5 x 3min at vVO₂max. All resting times being active resting times at 50% of each individual vVO₂max.

Within 6 to 8 weeks of training (2 sessions a week with retest every 2 weeks), the players will develop a sufficient VO₂max to sustain and recover quicker from high intensity workouts. It is usually established that team sports players should have a VO₂max around 55 to 60 ml/kg/min although of course the higher the VO₂max the better. These figures should be the goal to attain with of course some differences in rugby according to position specifics. The training protocol will also develop a lactate tolerance phase as the long intervals will result with the players' blood lactate to rise in the zone of 9 to 10 mmol/L throughout the last bouts at vVO₂max. This is of course a desirable second effect in training for team sports in general.

Once players develop a strong aerobic base in increasing their vVO₂max, the periodized plan addresses specificity with speed and agility development. During this pre-competition phase, the aerobic endurance should be maintained to effective level to avoid detraining. This is also true for the competition phase of course. It is often difficult to find time for players to train at vVO₂max in running intervals twice a week. My hypothesis was that we might be able to maintain running vVO₂max to its best condition by mixing training protocols to get the players minimize the leg impacts generated in running and by training for VO₂max maintenance through biking at vVO₂max while the players will be in the speed development phase. This also is of great use for players recovering from injury as the bike vVO₂max work outs have zero impact and is great for joints injured players helping them in minimizing fitness loss. I implemented on myself and some willing younger amateur rugby and football (soccer) players the following protocol.

II- Cross-training Maintenance:

Biking vVO₂max interval training once a week on ergometer (which also suppose to determine individual vVO₂max on bike for each participant prior starting the cross-training segment) combined with general and then specific field speed training (twice a week). To simulate better the running legs action, the revolution for the vVO₂max bike training was set to 110-115 rpm. Also in respect of standardized recovery procedures, these training were not conducted on a same day. All activities were planned according to the rule of the alternation of the energy system to optimize recovery.

Because the players (and myself) saved the energy loss of a higher impact training protocol (the vVO₂max interval running session), we found ourselves fresher for the speed development training. Moreover, subsequent running tests showed a 100% running vVO₂max

maintenance after 8 weeks of this regimen without any running vVO2max training sessions. I personally underwent an extended period of this protocol for 7 months. I didn't train whatsoever at running vVO2max, did one bike vVO2max session per week, one field sprint session and one bike sprint sessions per week (combining 10 short 12 seconds sprints with maximum recovery between bouts and 3 x 1,000m sprint all in the same session). I retested for running vVO2max 7 months later to find out that my new running vVO2max was 96% of my former vVO2max, which represents a minimal loss without any specific running for aerobic and lactate tolerance development.

III- Conclusion:

The results of this diminutive experience are of course not conclusive of anything without scientific validity. The panel of persons used was too small and the experimental protocol certainly lacked the rigor of a qualified scientific research. Nonetheless, I believe it has shown some interesting facts maybe deserving more in-depth research by field experts and scientists.

We found out that the successful maintenance of an achieved good running vVO2max so necessary for team sports and rugby, could be done in this case, through biking vVO2max sessions combined with general and specific speed development for the sport, providing the bike training is done in the range of 110-115 rpm (slower protocols should be tested to assert this decision which was made by logical analysis rather than proven data collection) as it mimics best the running cadence at higher speed. This benefits the players because they limit the impact on their leg muscles and are fresher for speed and agility sessions, while keeping maintaining their VO2max through efficient cross-training. Injured players, specifically with joints injuries could also benefit from such a protocol as it provides a zero impact training scheme of course providing that the joints can function with a close to normal range of motion throughout.

Protocol used: Table for aerobic development and maintenance

	vVO2max Development	Maintenance
Preparatory Phase	Billat running sessions twice a week: -60-60 (vVO2max and recovery 50% vVO2max -5x3min vVO2max with recovery: 3min @ 50% vVO2max	Maintenance started after 8 weeks of vVO2max running development when players were beginning general and specific speed and agility development
Specific Prep + Competition	Maintenance →	Bike vVO2max session: 1/week -5x3min @ vVO2max (110-115 rpm) with Rest intervals: 3min @ 50% vVO2max -Field general and specific speed sessions, twice a week

References:

On this website at <http://frederickclaro.com/rugbytraining.htm> :

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- "Anaerobic Training for Rugby" (2006)
- "Speed Training for Rugby" (2008)

Books:

- "Periodization in Rugby". Bompas, Claro, 2008 (<http://periodizationinrugby.com>)
- "Periodization, Theory & Methodology of Training", Tudor Bompa, 1988
- "Physiologie et Methodologie de l'Entrainement", Veronique Billat, 2003