

Anaerobic Training for Rugby

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During ball in play time, players will mainly use the anaerobic pathway of muscular energy production to fulfill the physiological demand of the game. Both pathways (alactic and lactic) will be used. Surveys and researches have shown that there will be a difference between forwards and backs in the origin of energy production.

A research made in France among Elite B rugby players (Doutreloux, 2004) has shown the following results for lactic acid and heart rates correlation buildup during games:

	Forwards	Backs
Average Acid Lactic	7.02 mmol/L	2.6 mmol/L
Average Heart Rate	170 bpm	150 bpm

Figure 1 Average LA & HR in French Elite B players (adapted Doutreloux, 2004)

Therefore, forwards will use more the glycolytic or lactic acid pathway, as the backs will use more the alactic or phospho-creatine (P-Cr) pathway. Forwards in general are getting involved in more high intensity phases of the game than backs, with less recovery time between bouts, necessitating a higher production of lactic acid, whereas the backs tend to recover for longer period of time during the game, but run at higher intensities, and are reaching maximum speed or close to maximum speed more often than the forwards necessitating a stronger involvement of the alactic anaerobic system. Figure 2 resumes the energy demand for both forwards and backs during action time when players are directly involved in the ball contest, be it as the ball users or as the opposition.

	Forwards	Backs
Alactic pathway	40%	70%
Lactic pathway	60%	30%

Figure 2 Game action time ergo-genesis for players surrounding ball area

For both units power and power endurance are fundamental to enhance game plan and performances. Independently of the tasks to be performed by the different units, all players must be powerful (recruiting a maximum of muscle fast twitch fibers in the shorter amount of time as possible), and do it repetitively during 80 minutes, hence developing endurance to perform powerfully.

We can therefore confidently say that rugby players need to develop the following anaerobic abilities:

- Strength (as Maximum Strength or MxS)
- Power and power endurance (MxS conversion often neglected or not done in a proper way)
- Speed (directly dependent on strength and power development)

- Agility or the faculty to change quickly and powerfully direction without losing much speed (also a factor of strength and power development)
- Lactic Acid endurance (for all players, bur specifically the forwards)
- Technical skills (short and longer to alternate energy pathways training)
- Tactical skills (short and longer, idem as above)

Figure 3 classifies the activities:

Anaerobic Alactic	Anaerobic Lactic
-Strength -Power + power endurance (short) -Speed -Agility -Technical/tactical skills (short duration) → less than 20 seconds Long Rest Intervals > 3 minutes	-Power endurance (long) -Lactic acid endurance -Technical/tactical skills (lactic acid tolerance development) → 30 to 90 seconds Short Rest Intervals < 20/90 seconds (depending on exercise performed)

Figure 3 Training and game activities classification

Alactic activities are intense and in high demand for the Central Nervous System (CNS) which as a result will adapt to the training loads and trigger a faster recruitment of FT fibers. For full benefit, players in training for alactic activities should allow for full recovery of ATP prior reproducing another intense short burst of effort. This is not the desired effect for lactic acid training where players need to increase their tolerance to workloads under high level of LA in the muscles and blood.

In that instance, the rest intervals are of paramount importance and should be optimally planned according to the pathway trained:

- Alactic pathway: 3 to 5 minutes rest between efforts to fully replenish ATP prior the next bout
- Lactic acid pathway: shorter recovery time to allow for LA build up and work under condition of fatigue. This should also involve the aerobic system to increase the O₂ debt repayment during rest intervals.

The principle of the alternation of the energy pathways' training should also prevail to avoid over-reaching and overtraining on the long term and ensure a proper recovery / super-compensation phase during and after training sessions and games.

Figure 4 shows sample of training drills for both pathways:

Anaerobic Alactic	Anaerobic Lactic
-Strength development → Anatomical Adaptation → MxS → Power → Power endurance	-Power endurance → Longer repetition at 60-70% 1RM -Lactic Acid tolerance drills → shuttle

<p>-Speed: 10m/15m-20m for forwards and 10m up to 40m for backs -Agility: Acceleration/deceleration → Quick change of direction -Technical/tactical drills: general play + specific forwards and backs units</p> <p>Drills duration: 10 to 15 seconds Intensity: maximal or close to max Rest Intervals → Long: 3 to 5 minutes</p>	<p>runs, jingle-jangles, sprint sets at 80-85% maximum speed -Technical/tactical drills: general play + specific forwards and back units</p> <p>Drills duration: 30 to 120 seconds Intensity: sub-maximal: 80-85% Rest Intervals → Short: according to average game recovery time or 20 to 60 seconds</p>
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Figure 4 Sample exercises for anaerobic pathways

A position specific training development according to the demand of the game is highly desirable and once a strong aerobic (VO_{2max} development via *vVO_{2max} interval training*, not long slow running...) and technical/tactical base is reached, players should develop the physiological specific aspect of the position and unit they are involved in.

Players can be categorized as follows for the similarities of work type produced in the game:

- 1, 3, 4, 5 (dominant glycolytic)
- 2, 6, 7, 8, 9 (dominant glycolytic)
- 10, 12 (dominant P-Cr)
- 13, 11, 14, 15 (dominant P-Cr)

Note: hooker and half-back positions are two positions where excelling in both pathways is of paramount importance in the modern game as they both cover a lot of ground, are also both expected to be powerful ball carriers to tear through defense lines. These positions are in specific need to maximize the development of all 3 energy pathways.

To optimize performances, the three energy systems should be trained among the segments of a periodized plan, where general aerobic and anaerobic workouts will precede rugby specific aerobic and anaerobic training at the end of the preparatory phase of the plan.

Reference: Doutreloux J.P, CRESS Conference, 2004