ECM ELITE COACH MENTORSHIP

STRENGTH & CONDITIONING EDUCATION

The Elite Coach Mentorship

Any Athlete, Any Level, Any Sport, Anywhere….
AND GET ELITE RESULTS…

ECM ELITE COACH MENTORSHIP

STRENGTH & CONDITIONING EDUCATION

Total Immersion Session:

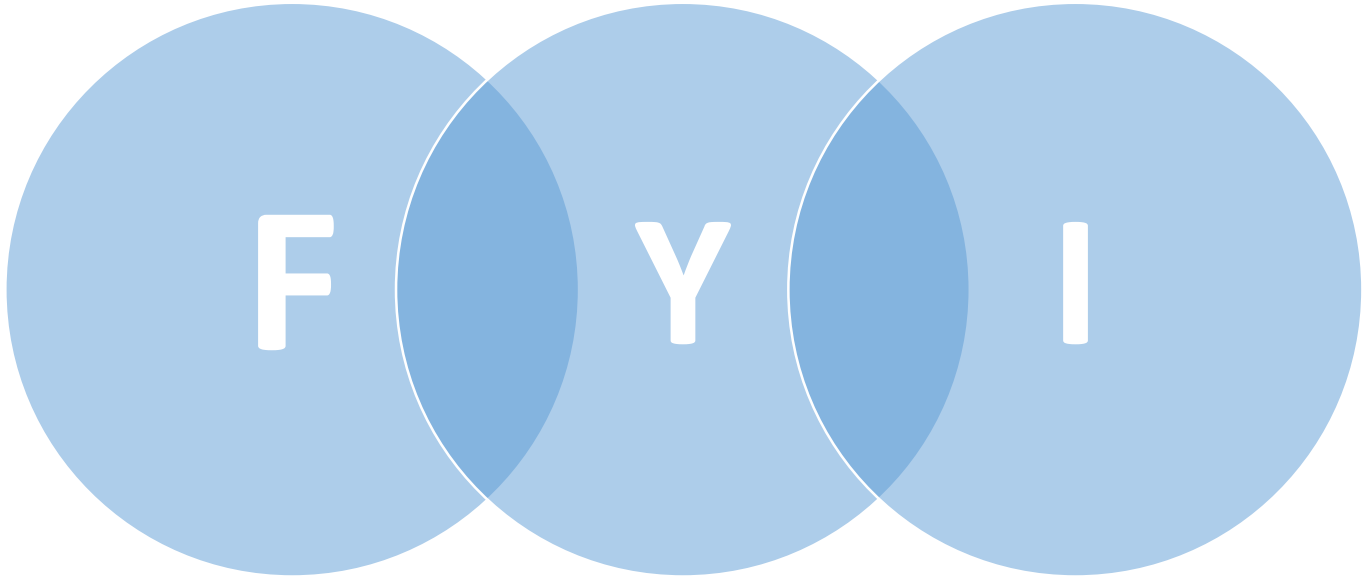
Endurance Sports Series

ECM ELITE COACH MENTORSHIP

STRENGTH & CONDITIONING EDUCATION

This session we will be looking at the disciplines that make up triathlon. Swim, bike and run are the events which are included within this event.

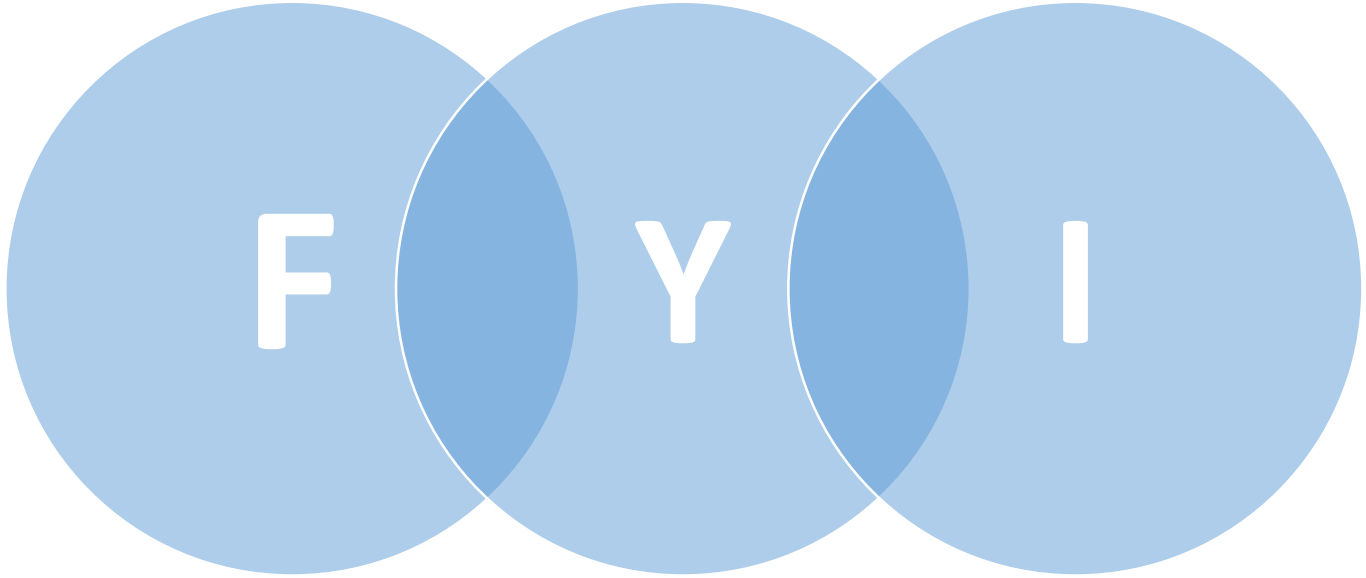
Images: cyclingweekly.com, Harvard university, triathlonweekly.com



Endurance sport is defined as the ability to sustain force and power output.

An endurance sport is any sport in which there is a requirement to sustain an activity level whilst enduring a level of physical stress.

Bazyler, C., Abbott, H., Bellon, C., Taber, C. and Stone, M., 2015. Strength Training for Endurance Athletes. *Strength and Conditioning Journal*, 37(2), pp.1-12, training4endurance.com



Endurance can be split down into Low Intensity Exercise Endurance (LIEE) and High Intensity Exercise Endurance (>2min)

Bazyler, C., Abbott, H., Bellon, C., Taber, C. and Stone, M., 2015. Strength Training for Endurance Athletes. *Strength and Conditioning Journal*, 37(2), pp.1-12, training4endurance.com

Why is this important?

Fitness Requirements

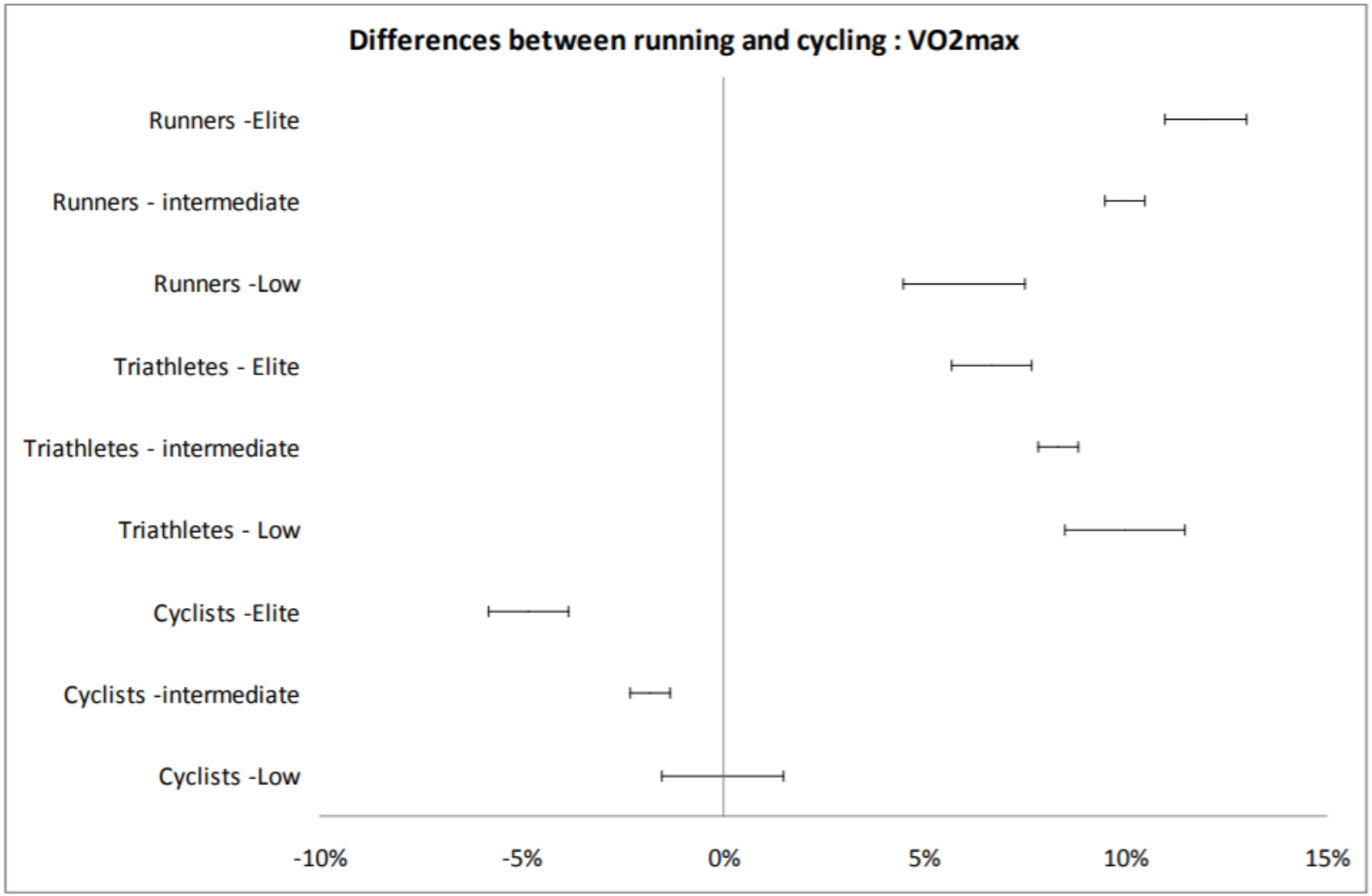
Sport/Discipline	Sex	Competition Level	VO_2max (ml·kg^{-1}·min^{-1})	
			Running	Cycling
Triathlon	Male	French National Team	78.5 ± 3.6	75.9 ± 5.2
		South African Nation Team	74.7 ± 5.3	69.9 ± 4.5
	Female		63.2 ± 3.6	61.3 ± 4.6
Marathon	Male	French & Portuguese Olympic Teams	79.6 ± 6.2	-
	Female		61.2 ± 4.8	-
Road Cycling	Male	Professional Team	-	78.8 ± 3.7

Knechtle, B., Zingg, M., Stiefel, M., Rosemann, T. and Rüst, C., 2015. What predicts performance in ultra-triathlon races? – a comparison between Ironman distance triathlon and ultra-triathlon. Open Access Journal of Sports Medicine, p.149.

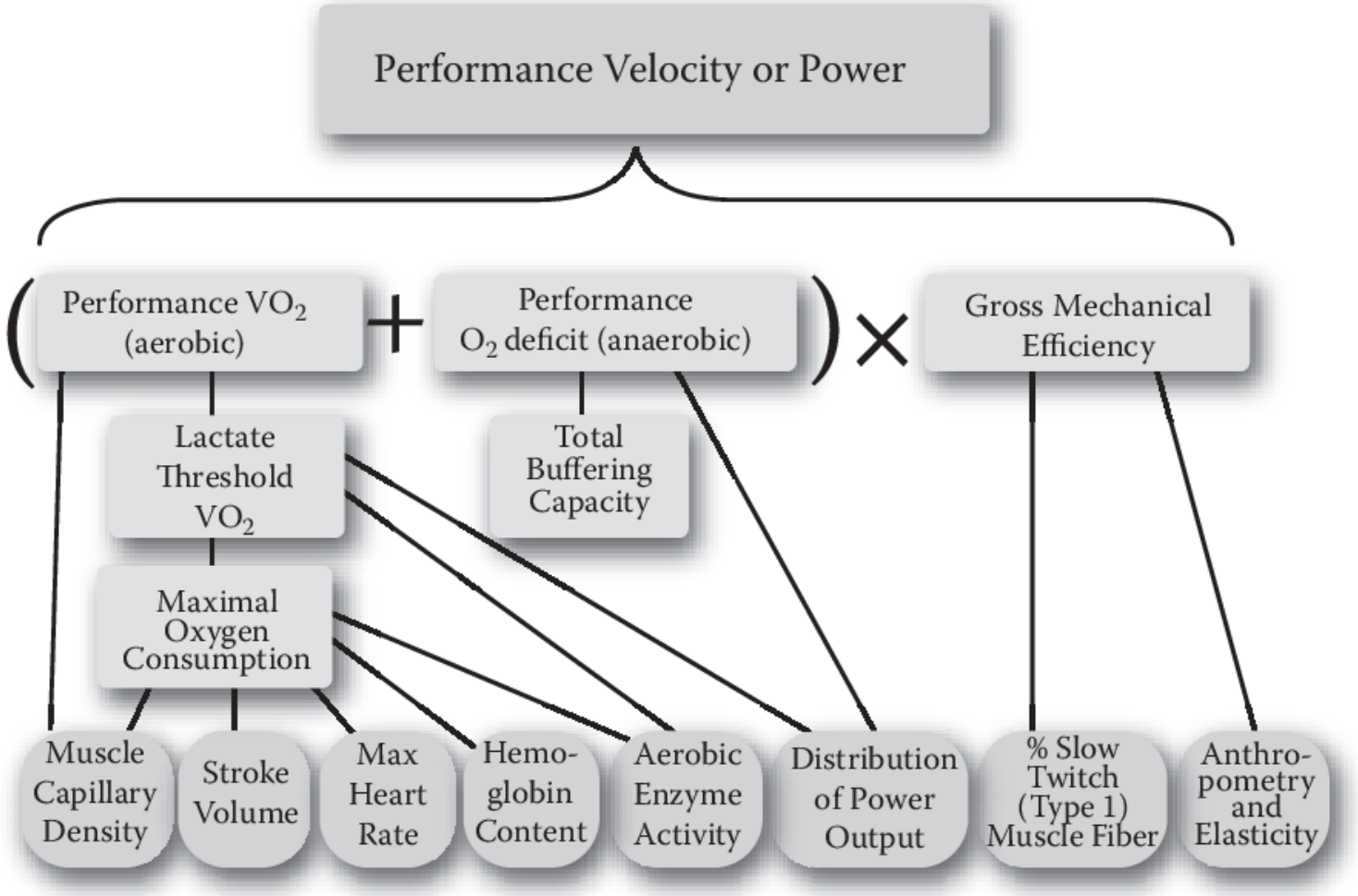
	Trained	Well trained	Elite	World class
Training and race status				
Training frequency	2–3 times a week	3–7 times a week	5–8 times a week	5–8 times a week
Training duration	30–60 min	60–240 min	60–360 min	60–360 min
Training background	1 y	3–5 y	5–15 y	5–30 y
Race days per year	0–10	0–20	50–100	90–110
International Cycling Union (UCI) ranking	–	–	First 2000	First 200
Physiological variables				
Wmax (W)	250–400	300–450	400–600	400–600
Wmax ($W \cdot kg^{-1}$)	4.0–5.0	5.0–6.0	6.0–7.0	6.5–8.0
$\dot{V}O_2max$ ($L \cdot min^{-1}$)	4.5–5.0	5.0–5.3	5.2–6.0	5.4–7.0
$\dot{V}O_2max$ ($mL \cdot kg^{-1} \cdot min^{-1}$)	64–70	70–75	72–80	75–90
Economy ($W \cdot L^{-1} \cdot min^{-1}$)	72–74	74–75	76–77	> 78

Values represent ranges. Adapted from Jeukendrup, Craig, and Hawley (11).

Peiffer, J., Abbiss, C., Chapman, D., Laursen, P. and Parker, D., 2008. Physiological Characteristics of Masters-Level Cyclists. Journal of Strength and Conditioning Research, 22(5), pp.1434-1440.



Millet, G., Vleck, V. and Bentley, D., 2011. Physiological requirements in triathlon. Journal of Human Sport and Exercise, 6(2 (Suppl.), pp.184-204.



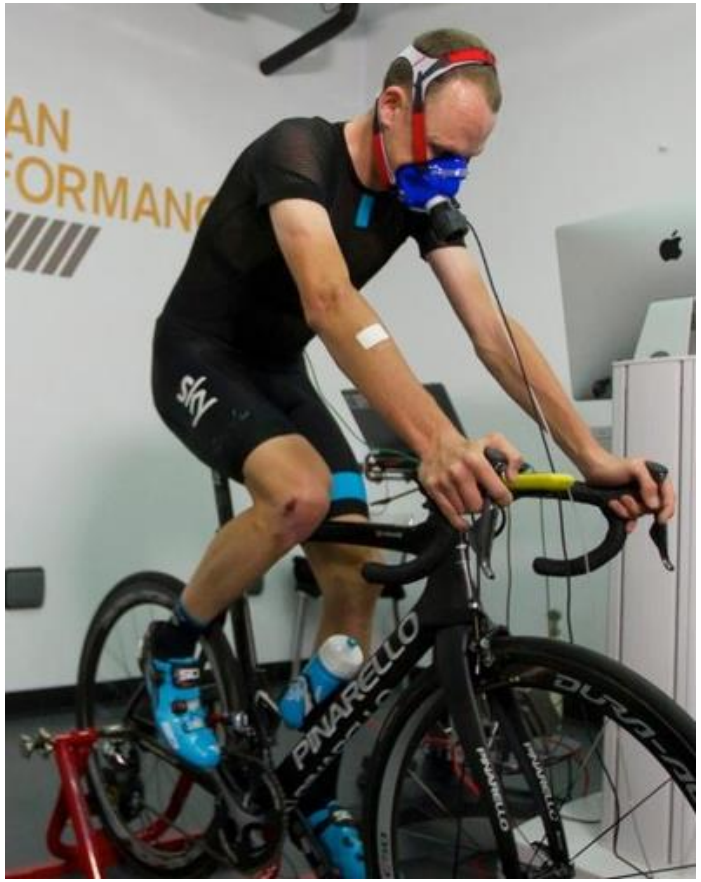
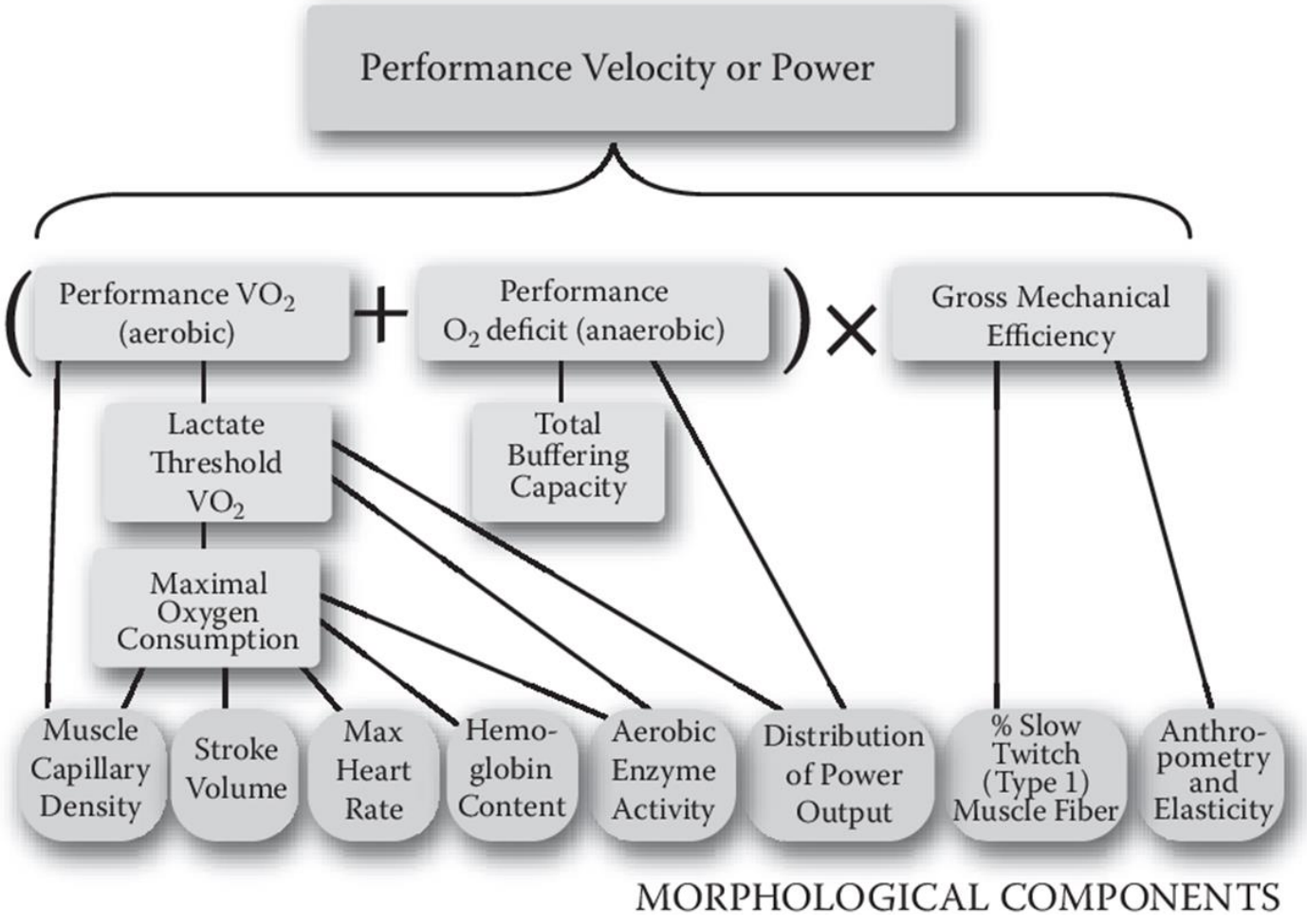


Image: bikeradar.com

Joyner, M. and Coyle, E., 2008. Endurance exercise performance: the physiology of champions. The Journal of Physiology, 586(1), pp.35-44.



Maximal Strength Training Improves:

- Running Economy
  - vVo2 Max
  - wVo2 Max

(Bazyler et al., 2015)

Joyner, M. and Coyle, E., 2008. Endurance exercise performance: the physiology of champions. The Journal of Physiology, 586(1), pp.35-44.

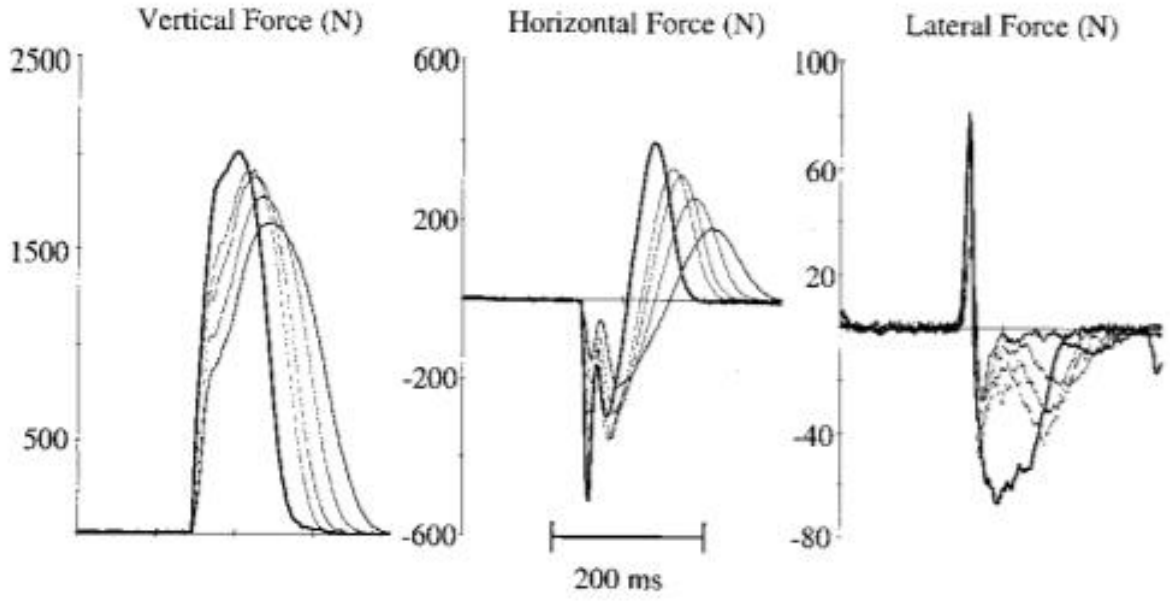


FIGURE 2—Mean curves of vertical, horizontal, and lateral ground reaction forces from the slowest speed of 3.25 m·s^{-1} (*thin solid line*; mean of 170 contacts) up to the maximal speed (*thick solid line*; mean of 34 contacts). The *dashed lines* indicate the respective ground reaction forces at the three medium speeds (5.00, 6.00, and 7.00 m·s^{-1}). In the phase, the shortening contact time implies increases in the running speed.

*'However, the present study revealed the role of the **powerful force production during the ground contact**. Especially important in this regard is the activation of the leg extensors during the preactivity and braking phases, and their coordination with longer lasting activation of the hamstring muscles. **It may also be suggested that proper coactivations of the muscles around the knee and ankle joints are needed to increase the joint stiffness to match the requirement for increase in running speed.** The action of the hip extensors becomes then beneficial during the ground contact.'*

KYR??L??INEN, H., BELLI, A. and KOMI, P., 2001. Biomechanical factors affecting running economy. Medicine and Science in Sports and Exercise, 33(8), pp.1330-1337.

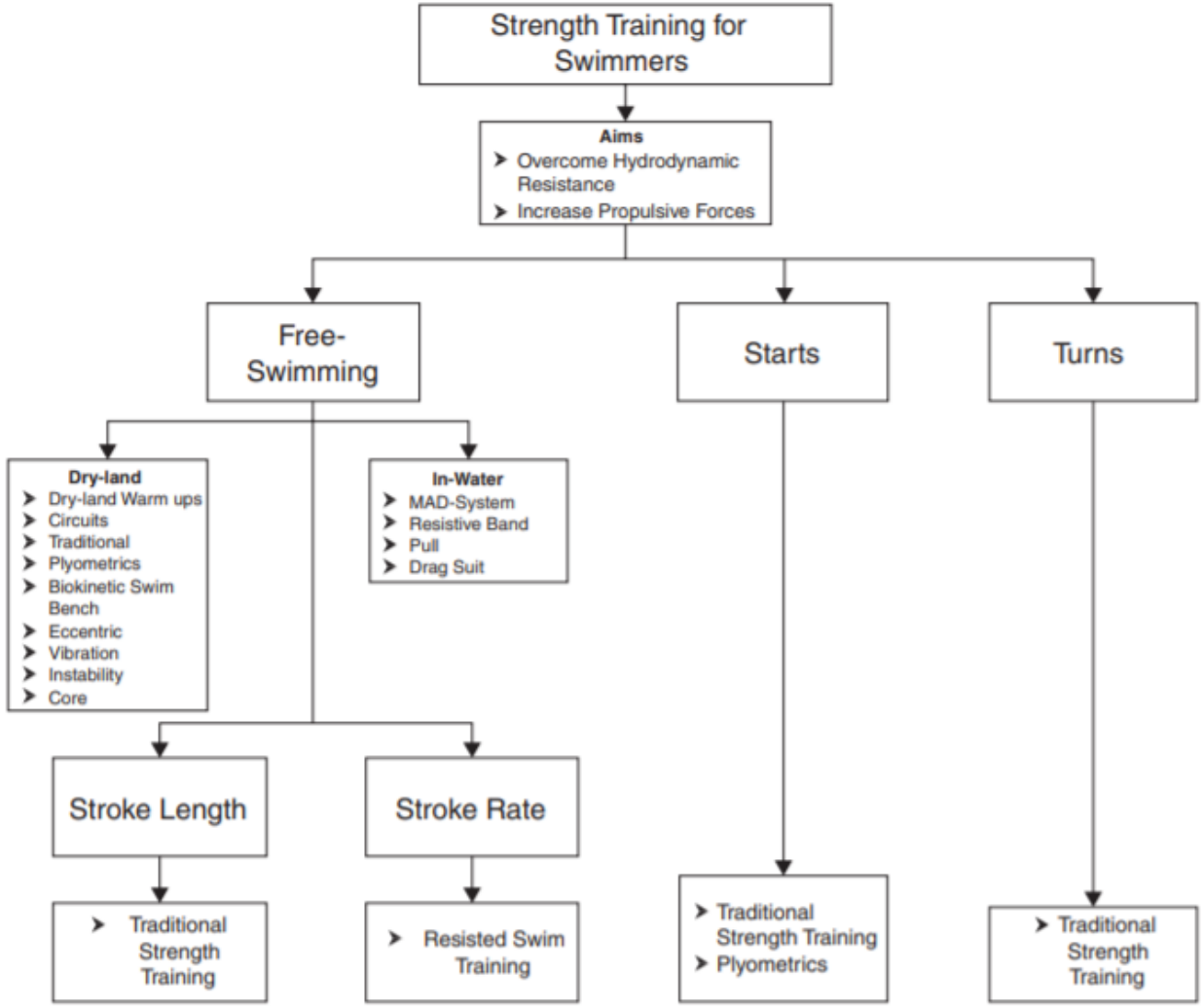
Table 1
Effects of concurrent HFLV strength training and endurance training on HIEE and LIEE

Study	Athletes	$\dot{V}O_2max$ ($mL \cdot kg^{-1} \cdot min^{-1}$)	Strength training	HIEE	LIEE
HFLV ST					
Støren et al. (82)	17 M and F well-trained runners	59.9	4 × 4RM, 3×'s/wk for 8 wk	—	21.3% increase in TE at MAS
Jackson et al. (39)	23 M and F cyclists with >0.5 y competing	52	4 × 4RM, 3×'s/wk for 10 wk	NS for $v\dot{V}O_2max$	NS for 30-km TT
Levin et al. (45)	14 M cyclists with >1 y competing	62.8	4 × 5RM, 3×'s/wk for 6 wk (HFLV)	Control > ST for PP during last 1-km sprint	NS for 30-km TT
Rønnestad et al. (66)	20 M and F well-trained cyclists	66.4	4–10RM, 2×'s/wk for 12 wk	4.2% increase in W_{max}	7% increase in MP during final 5 min of 185 min TT
Rønnestad et al. (64)	20 M and F national level cyclists	66.4	4–10RM, 2×'s/wk for 12 wk	9.4% increase wingate PP, 4.3% increase in W_{max}	6% increase in MP during 40-min TT
Rønnestad et al. (65)	12 M and F national level cyclists	66.3	4–10RM, 2×'s/wk for 25 wk	8% increase in W_{max}, increase wingate PP	—
Rønnestad et al. (68)	17 M national/ international cross-country skiers	66.2	3–5 × 4–8, 4–5 × 3–5RM, 2×'s/wk for 12 wk	—	NS in 7.5-km rollerski TT
Rønnestad et al. (67)	16 M national/ international cyclists	75.5	4–10RM, 2×'s/wk for 10 wk, 1×/wk for 15 wk	3% increase in W_{max}, earlier peak torque in pedal stroke	6.5% increase in MP during 40 min TT
Sunde et al. (83)	13 M and F competitive cyclists	61.1	4 × 4RM, 3×'s/wk for 8 wk	—	17.2% increase TE at MAP

Table 1 (continued)

Losnegard et al. (46)	19 M and F national level cross-country skiers	64.7	3 × 6–10, 3 × 5–8, 4 × 8, 3 × 4–6RM, 1–2×'s/wk for 12 wk	NS in 20, 40, 60, 80, and 100 m velocity during sprint roller skiing	7% increase in 1.1-km double poling TT, increase in W/kg during 5-min double poling
Millet et al. (51)	15 elite/international level triathletes	68.7	3 × 5, 4 × 5, 5 × 5RM, 2×'s/wk for 14 wk	2.6% increase in $v\dot{V}O_2max$	—
Hausswirth et al. (31)	14 M regional/national level triathletes	69.2	3–5 × 3–5RM, 3×'s/wk for 5 wk	—	Maintenance of FCC during last hour of 2-h cycling test
Sedano et al. (73)	18 M national level runners	69.5	Leg exercises 3 × 7 at 70% 1RM, 2×'s/wk for 12 wk (HFLV group)	increase in $v\dot{V}O_2max$ (ES: 0.87)	HFLV > LFHV > control for 3 km TT ($P < 0.05$)
Guglielmo et al. (26)	16 M regional/national level runners	61.9	3–4 × 6RM, 2×'s/wk for 4 wk (HFLV group)	6.7% increase in vOBLA	—
Barnes et al. (7)	42 M and F collegiate cross-country runners	63.8	2–4 × 6–15, 4 × 5–10, 4 × 4–8, 2 × 3–6RM, 2×'s/wk for 7/10 wk (HFLV group)	10% increase in PF during 5-jump test, 1.6% increase in $v\dot{V}O_2max$	Mean 5k times were worse than control for men, but better than control for women

ES = effect size; F = female; FCC = freely chosen cycling cadence; HFLV = high force low velocity; HIEE = high-intensity exercise endurance; LFHV = low force high velocity; LIEE = low-intensity exercise endurance; M = male; MAP = maximal aerobic power; MAS = maximal aerobic speed; ME = movement economy; MP = mean power; NS = no statistical change; OBLA = onset of blood lactate accumulation; PF = peak force; PP = peak power; TE = time to exhaustion; TT = time trial performance; V_{MART} = maximal velocity in maximal anaerobic running test; $\dot{V}O_2max$ = maximal oxygen uptake; W_{max} = peak power at $\dot{V}O_2max$.



Moral of the story?

Get your athletes strong!!!

Performance Measures for Endurance Athletes

- Maximal Strength tests (Squat, Deadlift, Bench Press)
- Countermovement Jump (RSI, EUR)
- Squat Jump
- Trunk Endurance Tests (Plank, side plank, extensor)
- RHR (used in conjuction with load management and health questionnaire)
- Movement Assessment (SCE, FMS, Movement Dynamics)

Image: menshealth.com

Common Injuries in Triathlon

Table 3 Studies investigating the percentage of triathlon injuries according to different body regions

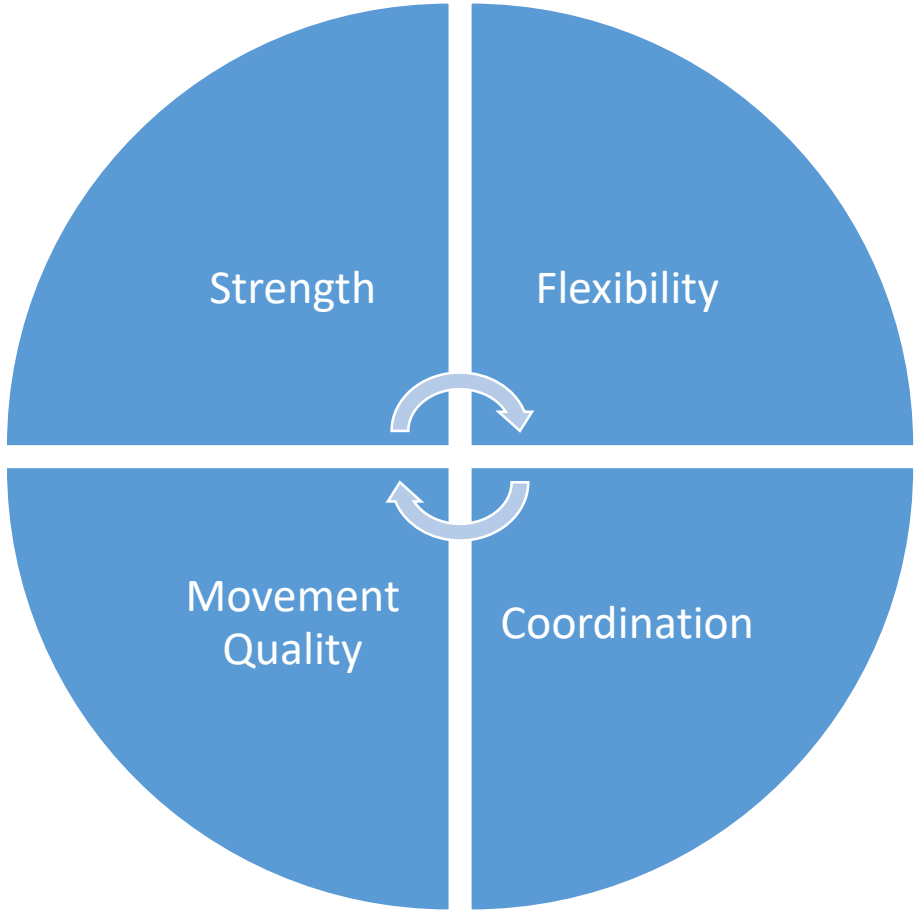
Anatomical region	Shoulder (%)	Low back (%)	Knee (%)	Lower leg (%)	Foot/ankle (%)	Neck (%)
Author						
Massimino et al.[10]		10	22	4	21	
Collins et al.[5]	13.80	4.20	25	17.36	12.57	
Korkia et al.[1]						
8 week diary		14	19	16	27	
Past year			32	22	38	
Manninen and Kallinen[12]	9	28	33	12	13.40	4
Vleck and Garbutt[4]						
Elite		17.90	14.20	Achilles, 14.3		16.70
Development	14.20		17.90	Achilles, 17.9		
Club		15.80	21.90	Achilles, 10.3		
Wilk et al.[2]						
O'Toole et al.[3]		72	63		61	
Clements et al.[6]			Run 72 Cycle 22			
Cipriani et al.[9]	7	8	25	12	24	
Egermann et al.[7]	19	31.20	42.70	27.40	22.40	
Burns et al.[11]						
Pre-season		13	15	19	14 and 16	
Competition		15	17	17	23 and 12	
Shaw et al.[8]			32			

Common Causes

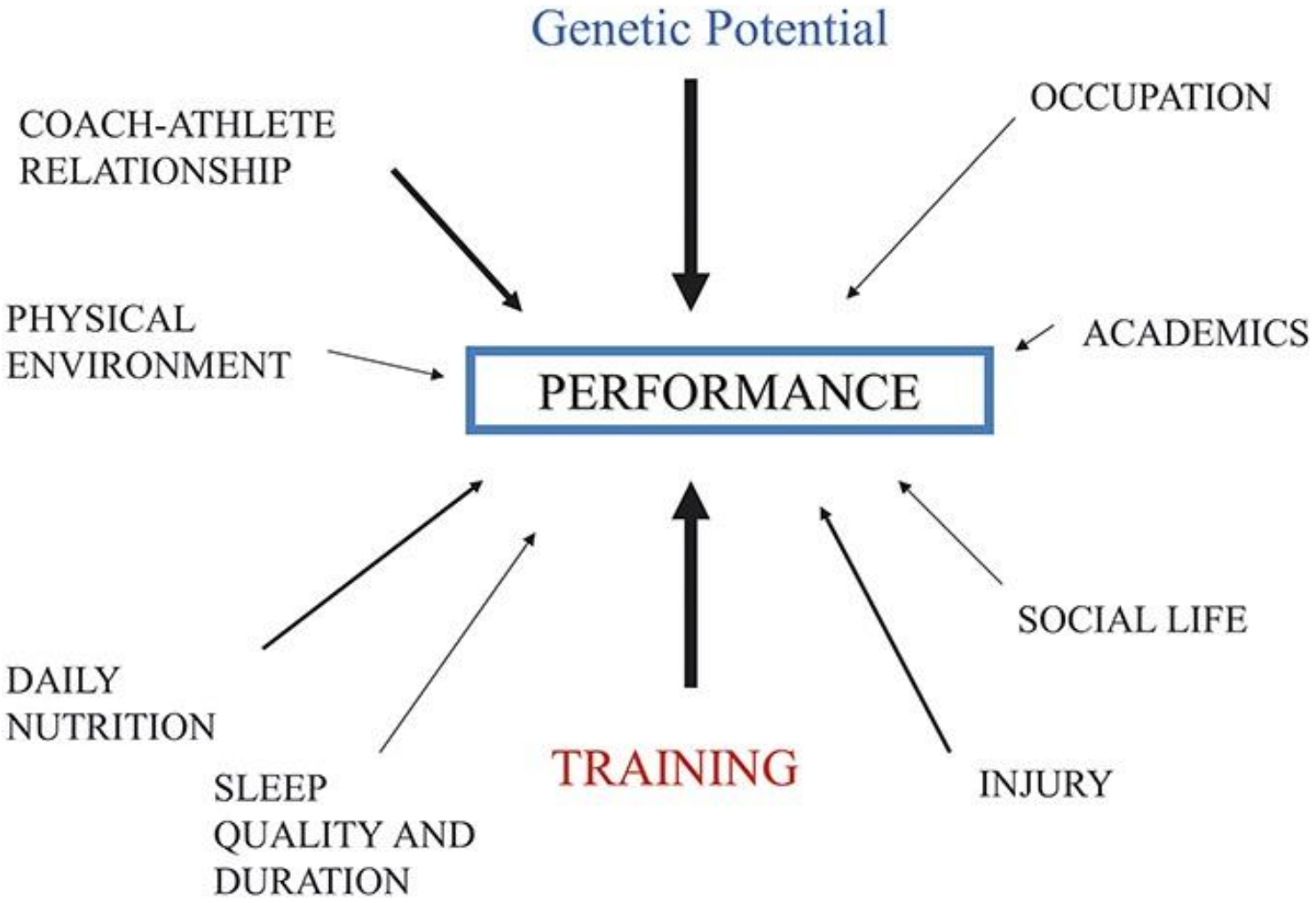
- Overuse/Overload or Underload
- Strength
- Dysfunction
- Previous Injury
- Resting Muscle Length
- Acute Injuries

Clinical Chiropractic, 2006. Triathlon Injuries: A review of the literature and discussion of potential injury mechanisms. 9(3), pp.129-138.

Which of these can you have a positive impact on?



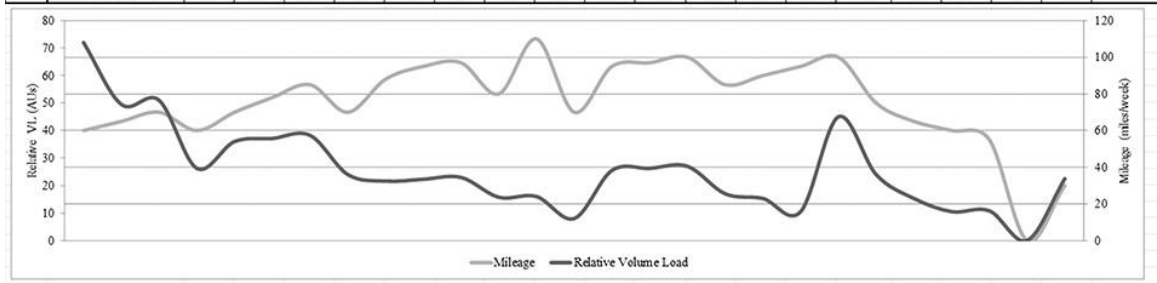
With a well planned/thought out performance plan, you can help an athlete avoid injury. You can't 100% prevent them but you can certainly help develop resilient athletes who can tolerate excessive loads that are placed on them during competition .



ECM ELITE COACH MENTORSHIP

STRENGTH & CONDITIONING EDUCATION

Competition and Annual Plan	Annual Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
	Starting Monday Date	3-Jun	10-Jun	17-Jun	24-Jun	1-Jul	8-Jul	15-Jul	22-Jul	29-Jul	5-Aug	12-Aug	19-Aug	26-Aug	2-Sep	9-Sep	16-Sep	23-Sep	30-Sep	7-Oct	14-Oct	21-Oct	28-Oct	4-Nov	11-Nov	18-Nov	25-Nov	2-Dec
	Competitions	Summer Break														8/14 Vanderbilt Invite 5k/8k	8/20 Hokie Invite 6k/8k @ Va. Tech		10/5 Greater Louisville Classic 5k/8k @ Louisville		10/18 Blue Ridge Open 5k/8k @ App State		11/2 Conference Championship 5k/8k @ Lipscomb		NCAA South Regional 6k/10k @ Alabama	NCAA Championships 6k/10k @ Indiana State		
	Importance															7	6		5		4		3		1	2		
	Laboratory Testing	X														X											X	
Running Training	Training Phase	General Preparation								Specific Preparation									Competition								Transition 1	
	Mesocycle	General Endurance/Speed				Aerobic/Anaerobic Support				Aerobic/Anaerobic Support				CL	Active Rest	Direct Endurance/Speed Support			Specific				Taper				Active Rest	
	Sessions	6	6	6	6	7	8	8	8	8	9	9	9	9	6	8	8	8	8	8	8	9	7	7	6	6	0	4
	Mileage	60	65	70	60	70	78	85	70	88	95	80	80	110	70	95	97	100	85	90	95	100	75	65	60	55	0	30
	Workouts	distance runs, long runs, fartlek, ext. tempo, strides				distance runs, long distance runs, fartlek, ext. tempo, hill accelerations				distance runs, long distance runs, fartlek, ext. tempo, hill running, accelerations				distance, long distance, progression, fartlek		distance, long distance, LT, RP Intervals, strides			distance, long distance, RP Intervals, fast intervals, race modeling				distance, long distance, progression, RP, fast intervals, strides					
Strength Training	Mesocycle	Strength Endurance				Strength				Strength/Power				Active Rest		Strength			Power			CL	Taper				Active Rest	
	Sessions per week	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	0	2
	Sets x Reps	3x10	3x10	3x10	2x10	3x5	3x5	3x5	2x5	3x3	3x3	3x3	3x2	2x5	1x5	3x5	3x5	3x5	2x5	3x3	3x2	5x5	3x5	3x3	3x2	3x2		3x5
	Day 1	Clean tech, BS, WL, OHP				Snatch Tech, BS, SU, PP				PS, HS (BS wu), SUJ, PJ				FS, OHP	FS, OHP	PS+OHS, BS, OHP			PSK, JS (BS wu), PP			MTSP, BS, OHP	Snatch, BS, PP		PSK, JS, PJ			MTSP, BS, WPU
	Day 2	Snatch Tech, SP, MTSP, BOR				Clean Tech, CP, MTCP, CU				PC, CPK, CU, HE				MTSP, DBR	MTSP, DBR	PC+FS, SP, PO, HE			PCK, MTSP, SUJ			MTCP,CGSS, CU	Clean, CP, CU		PCK, MTCP, CSR			MTCP, CP, DBR
	Day 3	Clean Tech, FS, MTCP, WPU				Snatch Tech, FS, SS, WPU				PS, OHS, PU (expl)																		
	Avg Weekly Intensity	80.0%	82.5%	85.0%	87.5%	80.0%	82.5%	85.0%	80.0%	80.0%	82.5%	85.0%	87.5%	80.0%	80.0%	85.0%	87.5%	90.0%	85.0%	85.0%	87.5%	90.0%	80.0%	85.0%	87.5%	90.0%	0.0%	75.0%
	Sets	3	2	2	1	3	3	3	2	3	3	3	3	2	1	3	3	3	2	3	3	5	3	3	3	3	0	3
	Reps	10	10	10	10	5	5	5	5	3	3	3	2	5	5	5	5	5	5	3	2	5	5	3	2	2	0	5
Monitoring	Relative Volume Load	72	49.5	51	26.25	36	37.125	38.25	24	21.6	22.275	22.95	15.75	16	8	25.5	26.25	27	17	15.3	10.5	45	24	15.3	10.5	10.8	0	22.5
	Mileage	60	65	70	60	70	78	85	70	88	95	97	80	110	70	95	97	100	85	90	95	100	75	65	60	55	0	30
	Avg CMJ Height (cm)	31	32	32	33	33	31	30	29	30	28	26	28	28	24	29	25	25	24	28	25	25	23	27	29	31	29	30



Strength Training Abbreviations

BOR	Bent over row	OHS	Overhead squat
BS	Back squat	PC	Power clean
CGSS	Clean grip shoulder shrugg	PCK	Power clean from knee
CP	Clean pull	PJ	Power jerk
CPK	Clean pull from knee	PO	Pullover
CSR	chest supported row	PP	Push press
CU	Chin-up	PS	Power snatch
DBR	Dumbbell row	PSK	Power snatch from knee
FS	Front squat	PU	Pull-up
HE	Hyperextension	SP	Snatch pull
HS	Half squat	SS	Split squat
JS	Jump squat	SU	Step-up
MTCP	Mid-thigh clean pull	SUJ	Step-up jump
MTSP	Mid-thigh snatch pull	WL	Walking lunge
OHP	Overhead press	WPU	Weighted push-up

- Where is your training going?
- What's the purpose?
- Is it sequential?

ECM ELITE COACH MENTORSHIP

STRENGTH & CONDITIONING EDUCATION

Elite Coach Checklist

Key Questions	Yes/No	Notes
Can your athlete hit the required kinematics of the sport?		
Are they at risk of injury?		
Have you analysed the environment?		
Do you understand the terminology?		
Does your plan suit the part of the season?		
Does the plan fit the structure and the athlete?		
Are the sessions adaptable?