

ALI BROWN, BSC EXERCISE
AND SPORTS SCIENCE

INTRODUCTION TO S&C FOR SAILING



AIMS OF THE DAY



Confident designing basic programs for different sailing athletes



Confident delivering class-specific warmups



Confident with 'in-gym' delivery



Confident supporting the athlete in the run up to competition



WHAT IS YOUR LEVEL OF
CURRENT UNDERSTANDING?



WHAT WILL TODAY LOOK LIKE?



4 Workshops:



Building basic training programs



Effective warm-up strategies



Practical delivery of S&C for safety and adaptation



Tapering for key events, load management and tracking progress

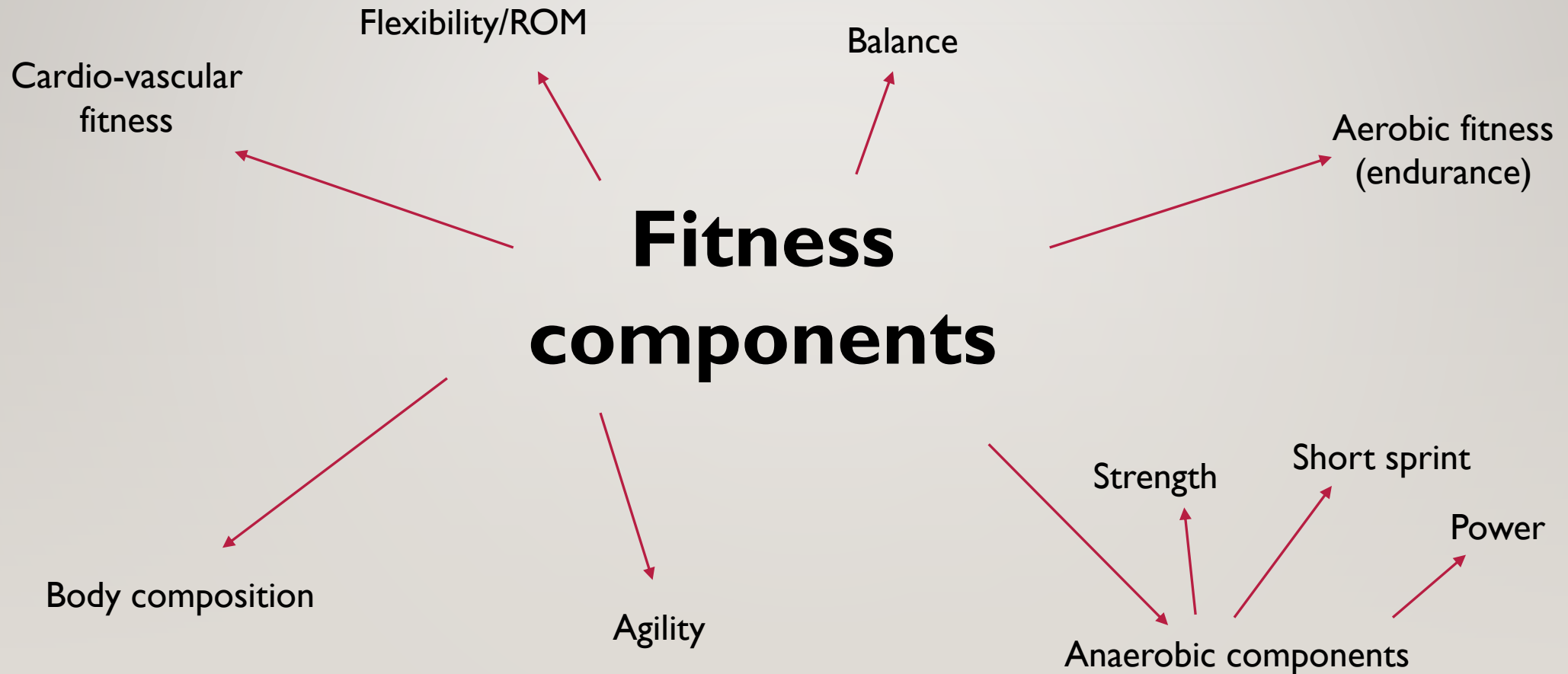


WORKSHOP I: BUILDING BASIC TRAINING PROGRAMS



WHERE DO WE
START?

UNDERSTANDING THE ATHLETE + GOALS



TASK – WHAT'S IMPORTANT TO EACH?

Kitesurfer

Cardiovascular fitness

Balance

Body composition

ILCA sailor

Endurance

Flexibility/ROM

Body composition

49er Crew

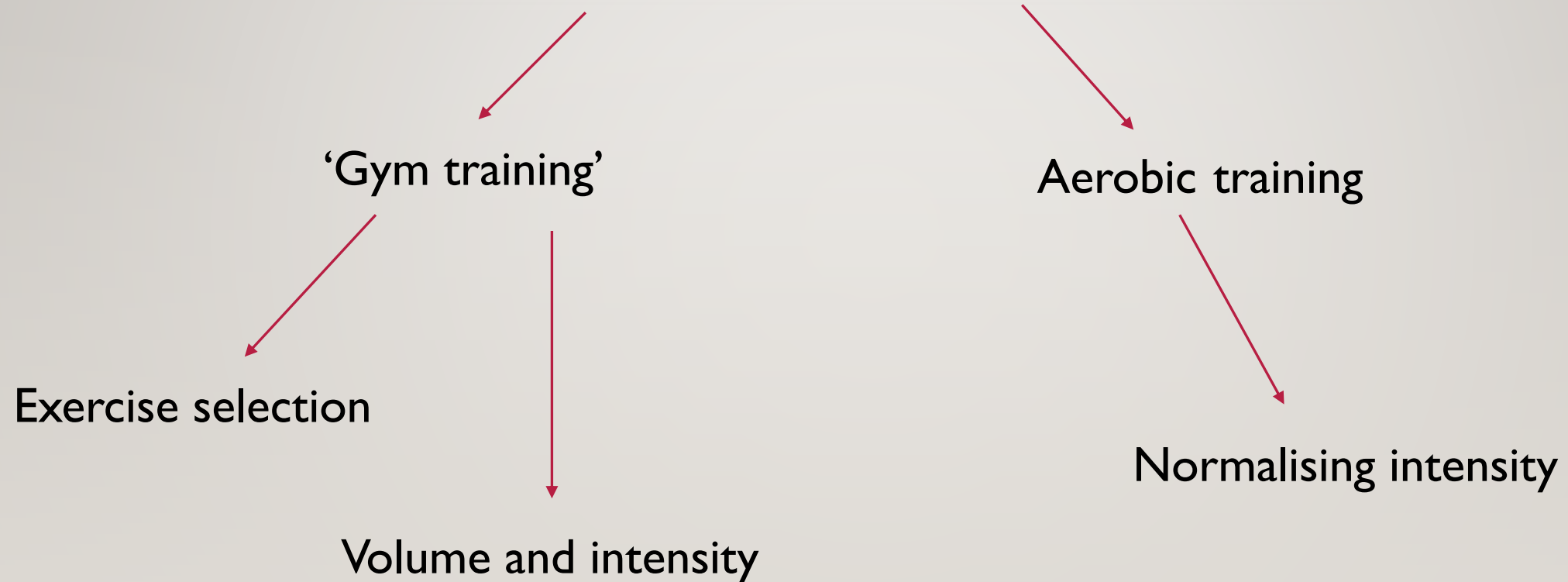
Speed

Agility

Cardiovascular fitness



NEEDS ANALYSIS INFORMS TRAINING PROGRAM



Training goal



Repetition maximum continuum



HOW MANY SETS AND REPS?

Follow this handy guide to build strength and endurance.
Sign-up for training at thegym.academy



STRENGTH

3-6 Sets
1-6 Reps
2-5 Mins rest



HYPERTROPHY

3-6 Sets
6-12 Reps
1-2 Mins rest



ENDURANCE

2-3 Sets
12-20+ Reps
30-75 Sec rest

POWER/PLYOMETRIC TRAINING

Power

- All about intention, creating force rapidly. (often bar speed)

Plyo

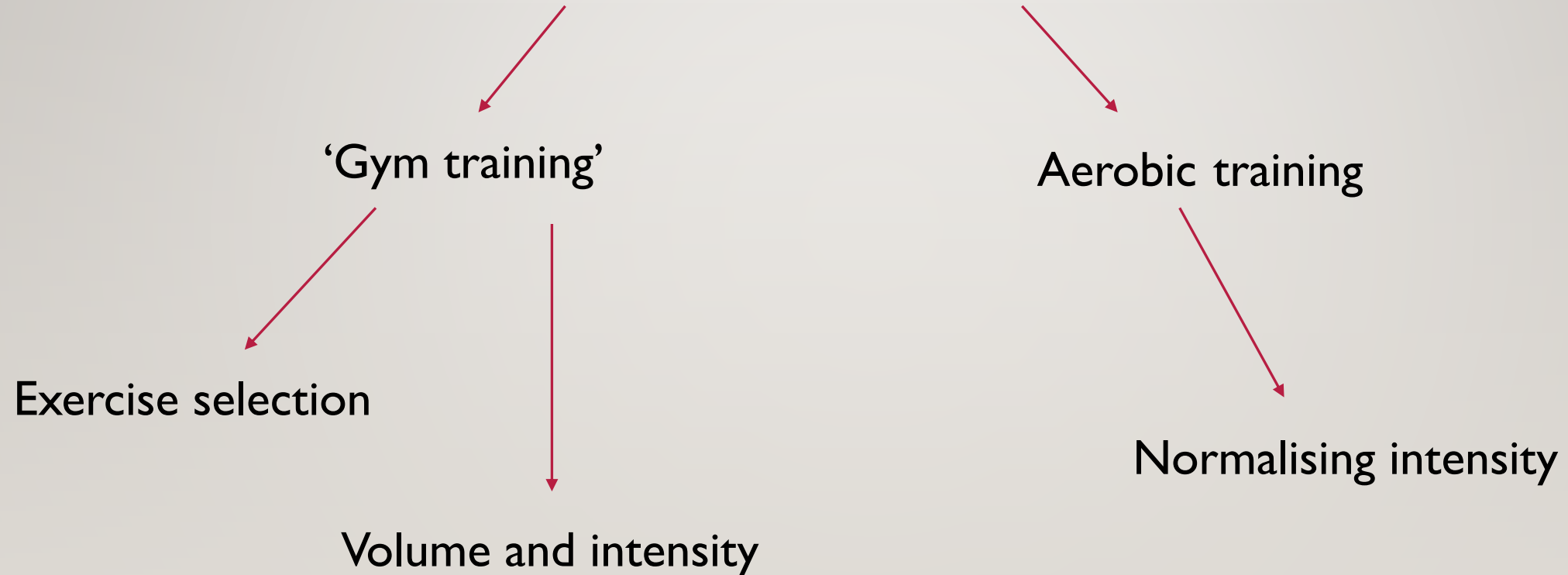
- In some cases, about minimising ground contact time
- 30-50 maximum ground contacts for beginners



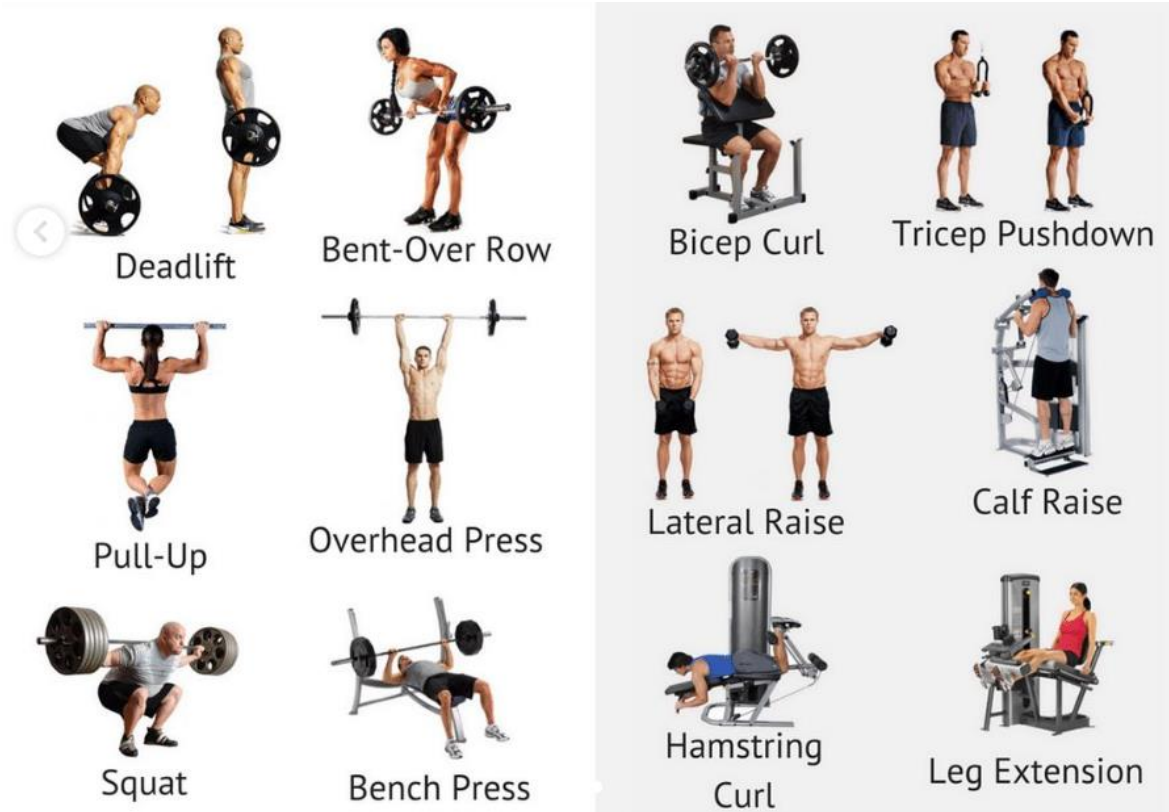
WHAT ABOUT INTENSITY? (WEIGHT)

- %IRM <https://strengthlevel.com/one-rep-max-calculator>
- Bar Speed
- 1-2 RIR

NEEDS ANALYSIS INFORMS TRAINING PROGRAM



COMPOUND VS ISOLATION



SPECIFIC REQUIREMENTS OF DIFFERENT MUSCLE GROUPS

Kitesurfer

- Endurance in a partial squat
- Strong rotational core

ILCA Sailor

- Quad and core dominant
- Sheeting load requires grip and bicep endurance

49ER Crew

- Important to be fast across the boat in manoeuvres
- Power when hoisting the kite

TASK

For a kitesurfer, ILCA sailor or 49er sailor design an S&C session specific to their class

You are balancing:

- Fitness characteristic (strength, power, hypertrophy, endurance, plyo)
- Exercise selection (Lower body, push, pull, core)

It should feature:

- 6-8 exercises
- Sets, reps, rest
- How you're going to measure intensity

EXAMPLE: KITESURFER

Exercise	Sets	Reps	Rest
Pause Squat	3	8-10	2min
Squat Jump	2	6	2min
Single Leg RDL	3	10-12	90s
Pull up	3	8-10	90s
Incline Bench	3	10-12	60s
Pall off press	3	12-14	30s
SS Cable rotation	3	12-14	30s

EXAMPLE: ILCA SAILOR

Exercise	Sets	Reps	Rest
Front Squat	3	10-14	90s
SL Leg Curl	3	8-10	90s
Pull Up	4	6-8	2min
DB Overhead	3	10-12	30s
SS DB Curl	3	12-14	30s
Weighted Sit-up	3	10-12	30s
SS Side-bend	3	10-12	30s

EXAMPLE: 49ER CREW

Exercise	Sets	Reps	Rest
Back Squat	3	10-12	90s
RDL	3	10-12	90s
Lateral Heiden	3	5 each side	90s
Chin Up (power)	4	6	2min
Prone row (power)	4	6	2min
Pall off press	3	12-14	30s
SS Cable rotation	3	12-14	30s

COMMON CHECKS WHEN PROGRAMMING

Compounds
before isolation

How many
sets/week for
muscle group
(10-20)

Posterior chain
loading

Body balance:
unilateral/bilateral,
push/pull

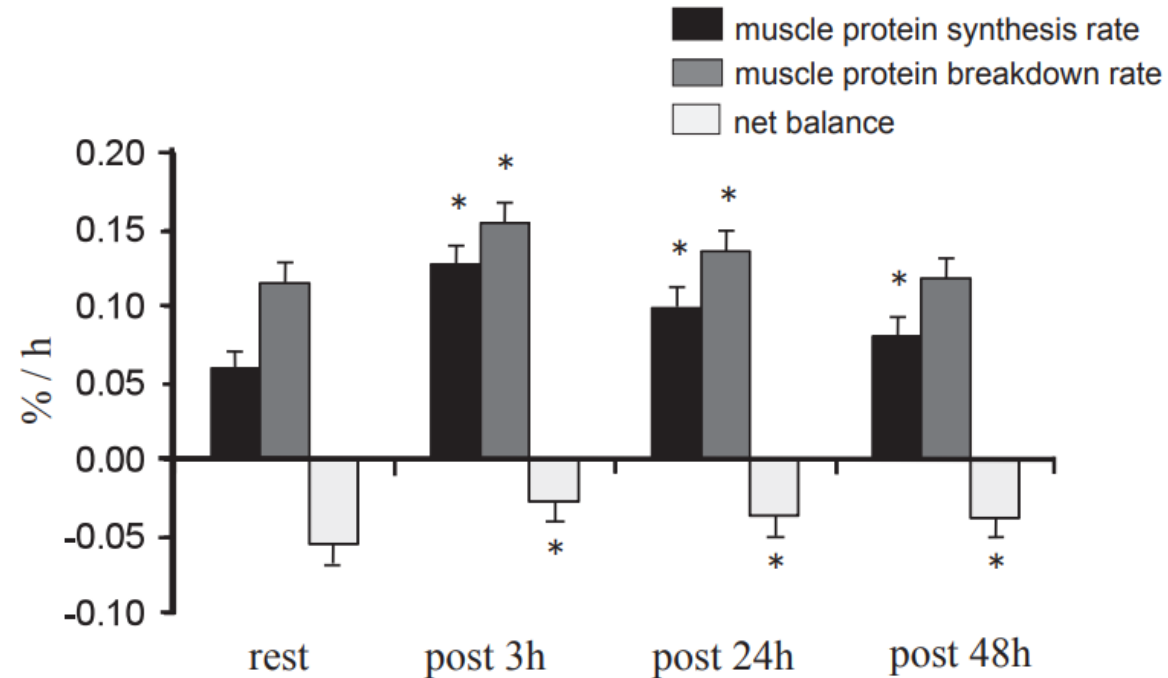
Supersets

Sessions per
week/splits



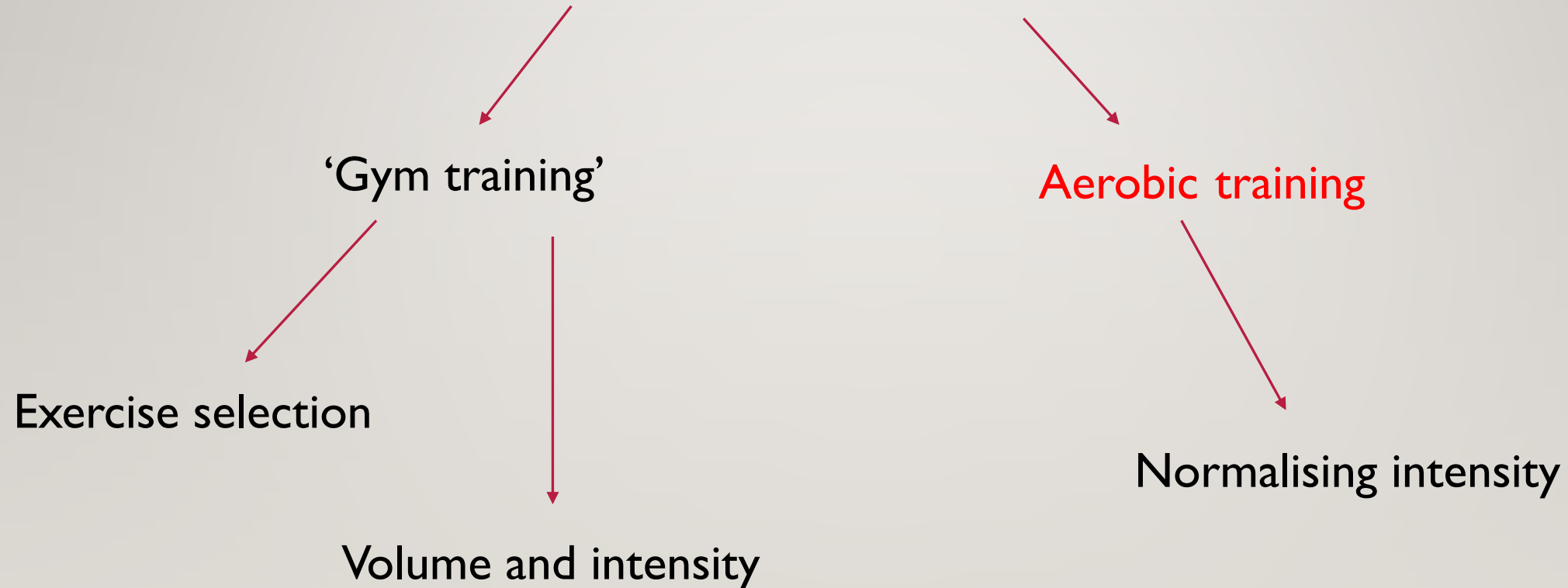
ANYTHING YOU WOULD
CHANGE?

GYM TRAINING (ADAPTATION) (SESSIONS/WEEK)



- Need to train a muscle group 2 times a week (1-3 for adaptation)

NEEDS ANALYSIS INFORMS TRAINING PROGRAM

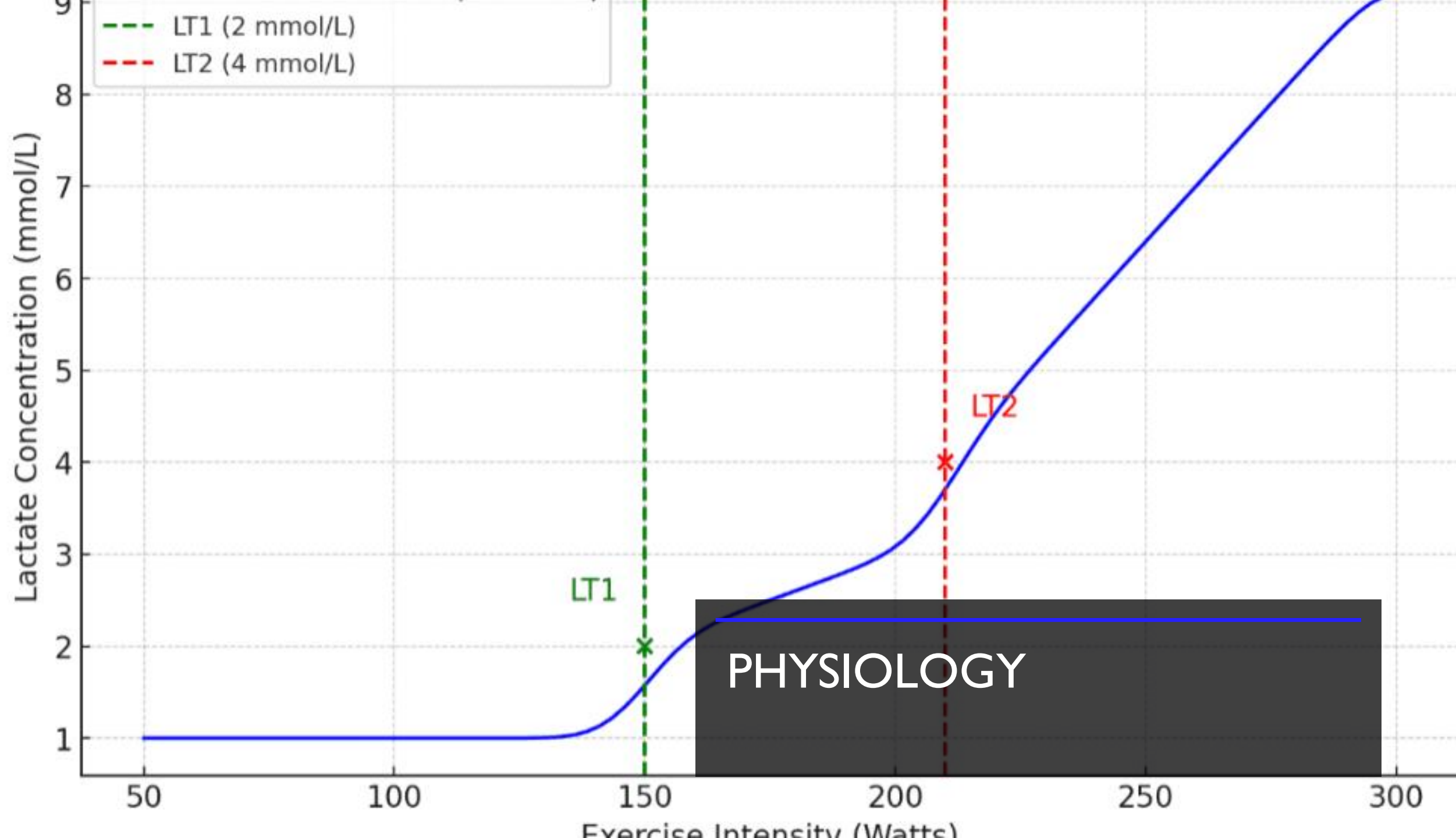


‘GO AND CYCLE AT 26KM/H FOR 2 HOURS’

Why is this flawed as a way to program ‘aerobic training’?

- External influence (wind, hills, fatigue)
- Gives no indication of what is happening at physiological level
- Will not ‘feel the same’ to different athletes





HOW TO PROGRAM AEROBIC TRAINING?

It is important we normalise intensity

How?

- RPE
- %Max HR/HRR
- %VO₂max
- %FTP/2k time

Which depends on...

- Athletes experience
- Intensity of training programmed
- Facilities/time available

RATING OF PERCEIVED EXERTION

RPE SCALE	RATE OF PERCEIVED EXERTION
10 /	MAX EFFORT ACTIVITY Feels almost impossible to keep going. Completely out of breath, unable to talk. Cannot maintain for more than a very short time
9 /	VERY HARD ACTIVITY Very difficult to maintain exercise intensity. Can barely breathe and speak only a few words
7-8 /	VIGOROUS ACTIVITY Borderline uncomfortable. Short of breath, can speak a sentence
4-6 /	MODERATE ACTIVITY Breathing heavily, can hold a short conversation. Still somewhat comfortable, but becoming noticeably more challenging
2-3 /	LIGHT ACTIVITY Feels like you can maintain for hours. Easy to breathe and carry a conversation
1 /	VERY LIGHT ACTIVITY Hardly any exertion, but more than sleeping, watching TV, etc

Also a 6 – 20 scale supposed to coincide with HR

Pro

Cons

No equipment

Risk of bias

Adjusts with fatigue

Little physiological input

% OF MAX HR/HRR

HRR reserve = Max HR – resting

- You would then add x% of HRR to resting HR to get zone

Pro

Gives objectivity

Less bias and
measurable for
athlete

Cons

Requires kit

Accurate appraisal
of Max/resting HR

HR will be lower
for same zone
when fatigued

Individual sub-max
zones vary as %
HR/HRR

Zone	Type of Exercise	Heart Rate	RPE
<i>1</i>	<i>Active Recovery</i>	<i>55-70% Max</i>	<i><4</i>
<i>2</i>	<i>Aerobic Endurance</i>	<i>65-80% Max</i>	<i>4 to 6</i>
<i>3</i>	<i>Tempo</i>	<i>77-87% Max</i>	<i>6 to 7</i>
<i>4</i>	<i>Threshold</i>	<i>84-94% Max</i>	<i>7 to 8</i>
<i>5</i>	<i>VO2max</i>	<i>> 90% Max</i>	<i>> 8</i>
<i>6</i>	<i>High Intensity Sprints</i>	<i>Variable</i>	<i>> 8</i>
<i>7</i>	<i>Anaerobic Capacity</i>	<i>Variable</i>	<i>> 8</i>
<i>8</i>	<i>Strength Training</i>	<i>Variable</i>	<i>Variable</i>

%FTP/2KM TIME

Would first test

- **FTP** - either 60min all out or 20min max effort power x 0.95
- **2km** – 2km all out distance
- **Then prescribe intensity** as % of these power values

Pro

Shows progress

Objective

Cons

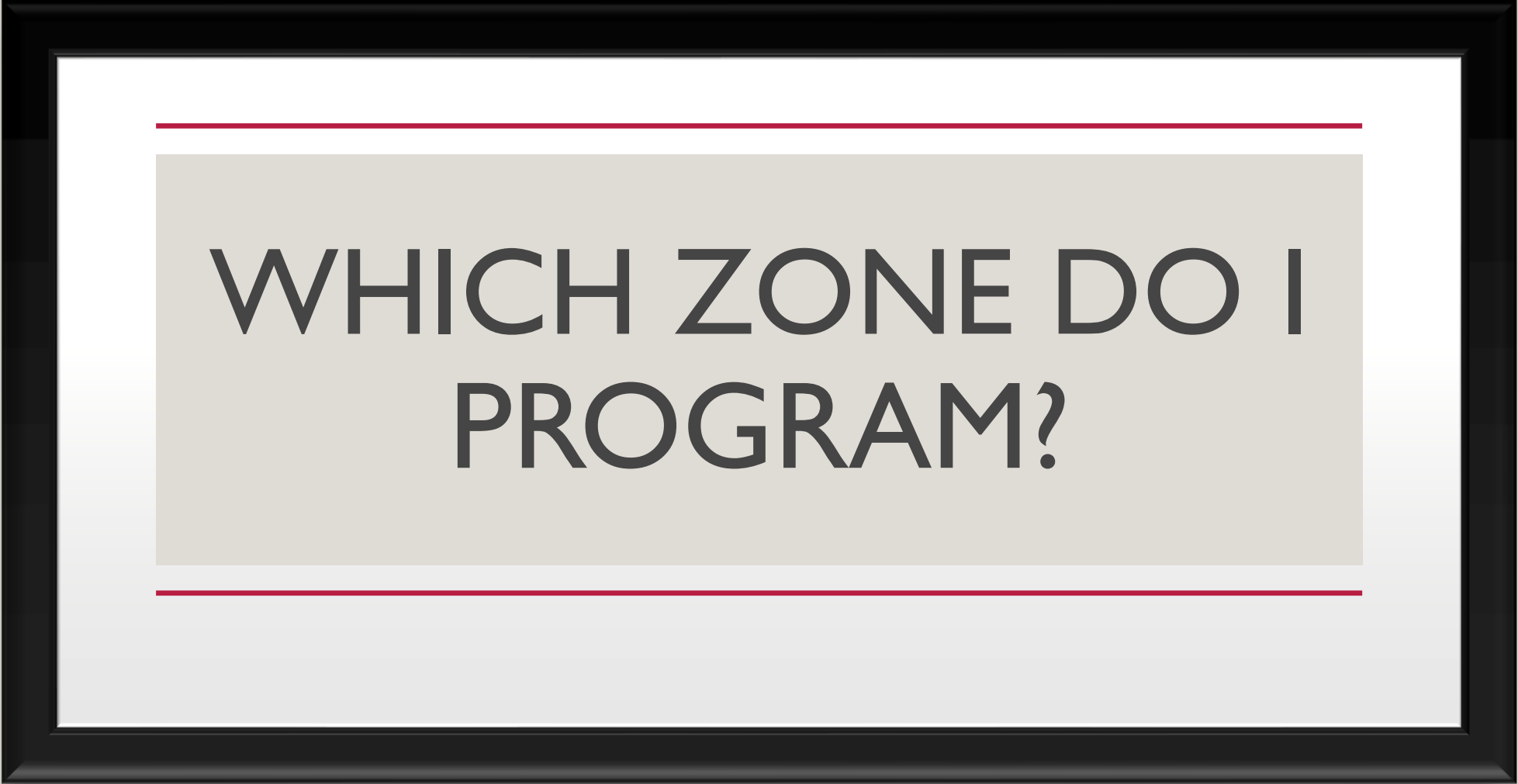
Requires a means to measure power

Doesn't adjust automatically with fatigue

Individuals' zones may vary within %power

HOW DO THEY ALL INTERACT?

Upper bound	Exercise Intensity Domain	Bike Zones	% FTP (BIKE ONLY)	Rowing Zones	%2k (watts) (ROWER ONLY)	RPE
LT1	Moderate (LIT)	Zone 1	0-55%	UT3	<60%	1: Very, very easy
		Zone 2	55-75%	UT2		2: Easy
						3: Moderate
LT2	Heavy (MIT)	Zone 3	75-90%	UT1	60-70%	4: Somewhat hard
		Zone 4	90-105%	AT	70-80%	5: Hard
						6
Highest intensity VO2max is reached	Severe (HIT)	Zone 5	105-120%	TR	80-105%	8
				AC		
Max power output	Extreme	Zone 6	120-150%	AP	>105%	9: Extremely hard
		Zone 7	>150%			10: Maximal



WHICH ZONE DO I
PROGRAM?

HOW IS THIS RELEVANT TO THE SAILOR?

Kitesurfer

ILCA sailor

49er Crew

Cardiovascular fitness

Balance

Body composition

Endurance

Flexibility/ROM

Body composition

Hypoxia

Speed

Agility

Cardiovascular fitness

TRAINING ZONE		AEROBIC ADAPTATIONS						ANAEROBIC ADAPTATIONS			
CODE	NAME	Increased blood volume	Increased aerobic enzyme activity	Increased use of fatty acids as a fuel source	Improved muscle capillarisation	Increased maximum cardiac output	Increased maximum ventilatory capacity	Improved ability to use lactate as a fuel	Increased maximal rate of glycogen use	Improved muscle and blood buffering capacity	Race specific neuro-muscular adaptations
UT3	Fuel Utilisation	●●●●	●●●●	●●●●	●●●●	●●	●	●●			●
UT2	Basic Oxygen Utilisation	●●●●	●●●●	●●●	●●●●	●●	●●	●●	●	●	●
UT1	Oxygen Utilisation	●●●	●●●●	●●	●●●	●●●	●●	●●●	●●	●●	●●
AT	Anaerobic Threshold	●●	●●●	●	●●●	●●●	●●●	●●●●	●●●	●●●	●●
TR	Oxygen Transport	●	●●		●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●
AC	Anaerobic Capacity		●		●●	●●	●●●●	●●	●●●●	●●●●	●●●●
AP	Anaerobic Power										●●●●



Cardiovascular fitness

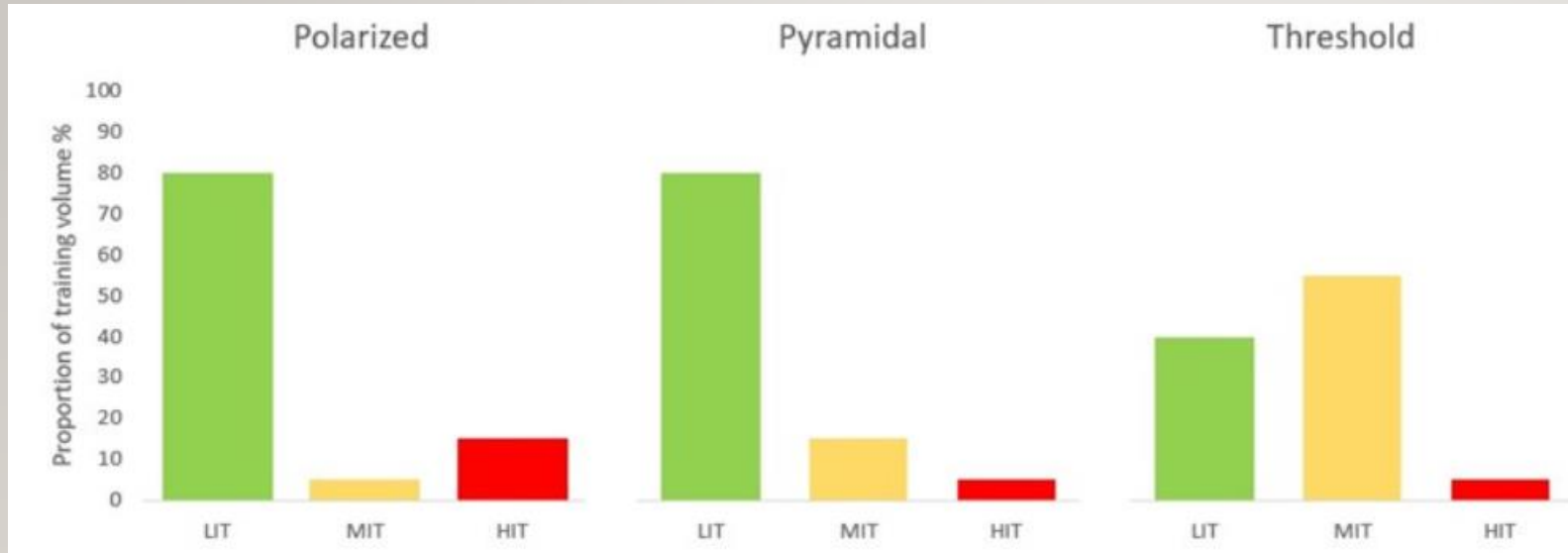
Endurance

Hypoxia

Speed

[illegible]

HOW DO I PROGRAM?



Easiest way is just to do by number of sessions

Choice is influenced by:

- Fitness characteristics required
- Time in the season
- Other training (Z2 is less fatiguing)
- Weight demands

WHAT DOES A ZONE X SESSION LOOK LIKE?

Zone 2

- Min 60 (really 90) minutes at Z2 intensity

Above Z2?

- <https://whatsonzwift.com/search>
- https://plus.britishrowing.org/wp-content/uploads/2023/01/GBRowingTeam_TrainingMatrix.pdf

MEASURING PROGRESS?

When in heavy training blocks FTP/2km should be retested every 4-8 weeks



In a perfect world you would test in a way specific to the fitness characteristic you are trying to better

EXAMPLE OF HOW ALL OF THIS MIGHT LOOK

	Monday	22-Sep	WK4: FB3 + FB4 1 x Zone 3/4 1 Zone 5							
	Tuesday	23-Sep		BB	FB3	Back Squat	Weight	Sets	Reps	Notes
	Wednesday	24-Sep		DB		Bulgarian Split Squat		3	8-10	With s
	Thursday	25-Sep		MC		Hamstring Curl		3	10-12	contro
Q. Spain	Friday	26-Sep		BB		Bench Press		4	8	
Q. Spain	Saturday	27-Sep				Pull Ups		3	6-8	Brace c
Q. Spain	Sunday	28-Sep		MC		Seated Row		3	10-12	
						Pall Off Press		3	10-12	Contro
						Cable rotations		3	10-12	Contro

AIMS OF THE DAY



**Confident designing
basic programs for
different sailing athletes**



Confident delivering class-specific warmups



Confident with 'in-gym'
delivery



Confident supporting the
athlete in the run up to
competition



WORKSHOP 2: EFFECTIVE WARM-UP STRATEGIES

WHAT ARE WE TRYING TO ACHIEVE?

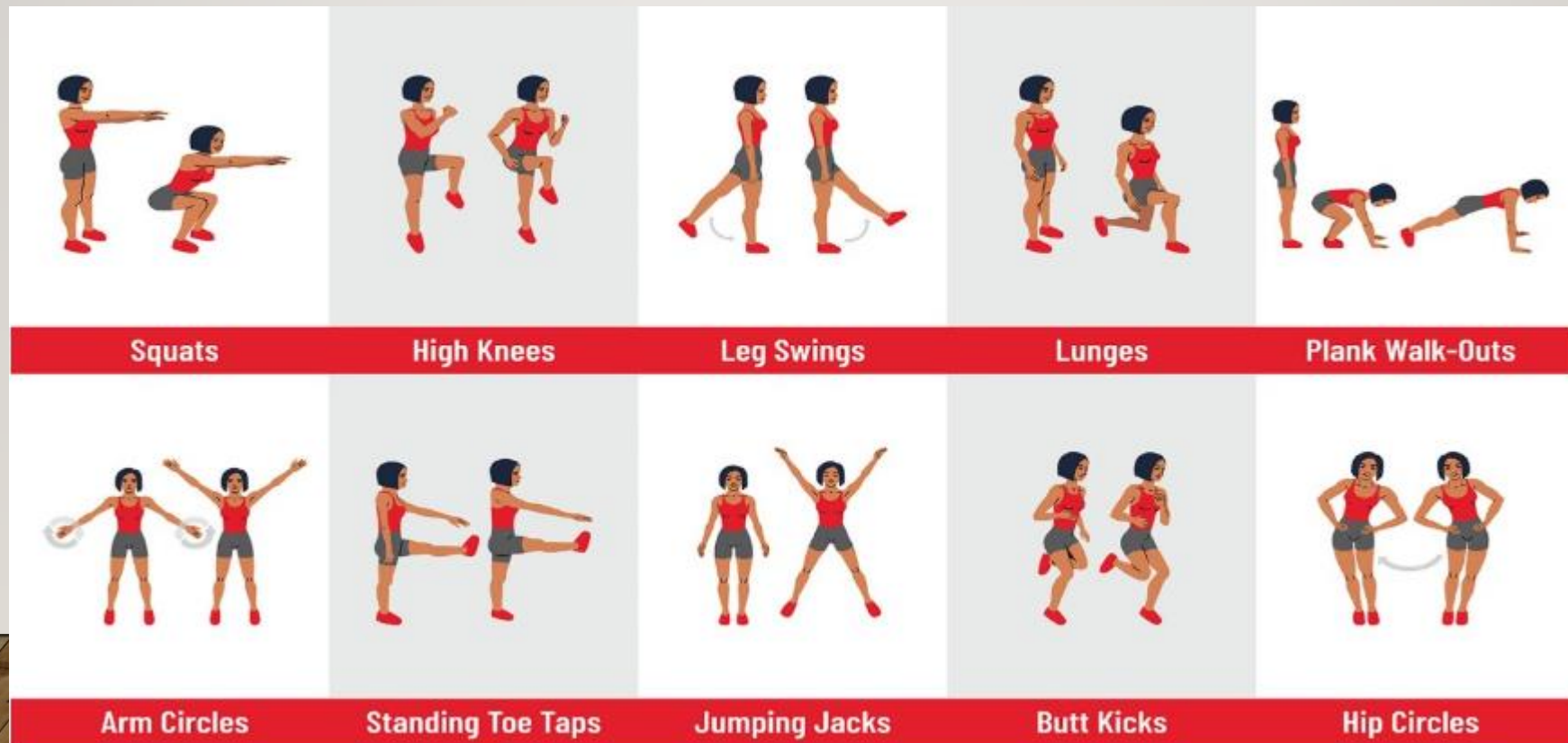
Warmups can be used to:

- Increase mobility
- Elevate HR/prime oxygen delivery
- Increase power
- Focus the brain

And thus, increase performance through these mechanisms

HOW DO I CREATE A WARM-UP THAT INCREASES MOBILITY?

- Include dynamic stretches to increase mobility through full range of motion

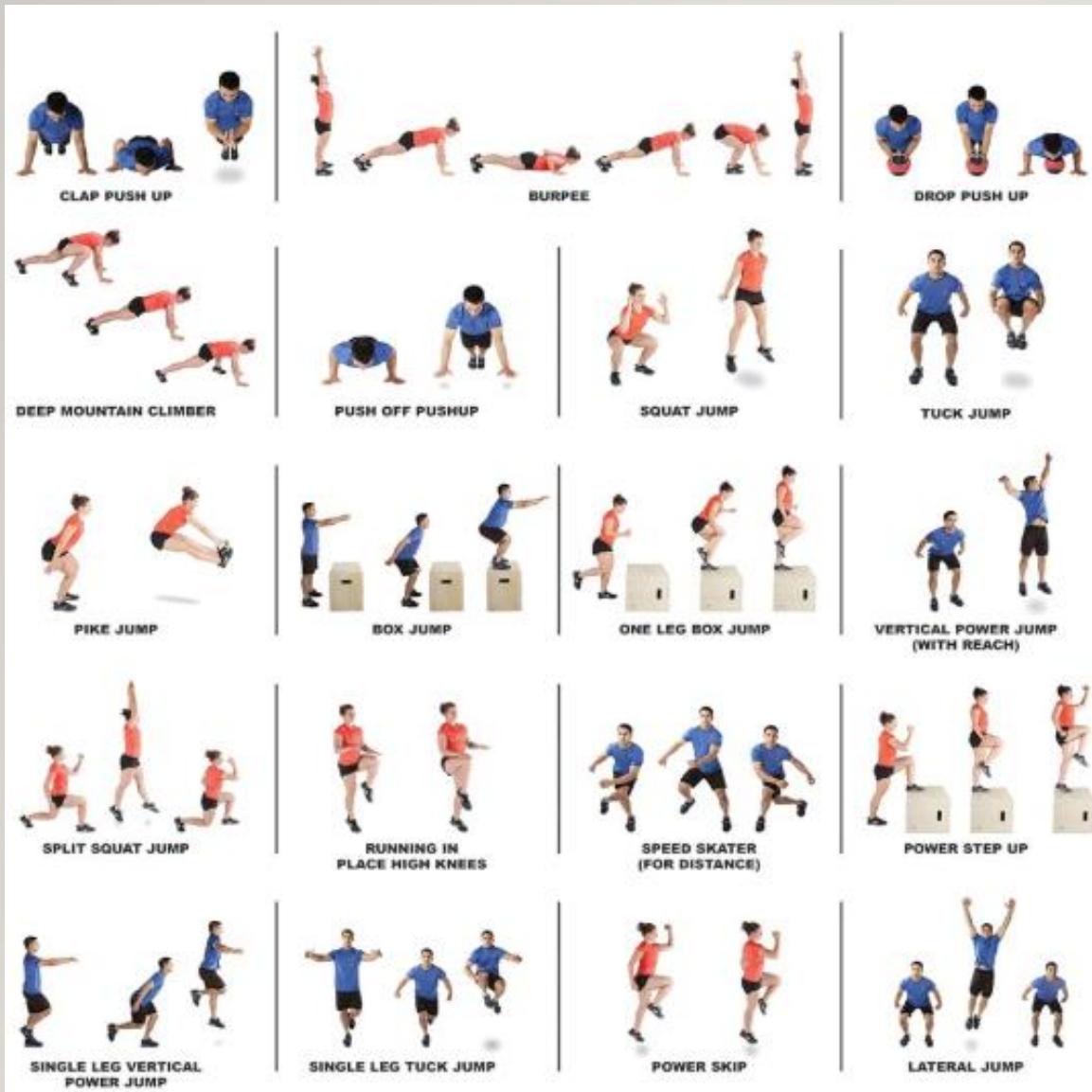


HOW DO I CREATE A WARM-UP THAT 'PRIMES' THE AEROBIC SYSTEMS?

- Start slower and still include mobility exercise, will just have a higher 'top-end' intensity

As far as improving research-backed performance outcomes – intensity is most effective when priming at severe intensities (Zone 5).

^ influence of intensity on water?



HOW DO I CREATE A WARM-UP THAT INCREASES POWER?

- Again, starts with some level of dynamic movement and elevation of HR
- Then some explosive movements (Plyometrics)

TASK

Design a warm-up session specific to your sailor

Your warm-up should be:

- On-land session
- 5-10 minutes in length
- Specific to your athlete's fitness characteristics

Kitesurfer

**Cardiovascular
fitness**

Balance

Body composition

ILCA sailor

Endurance

Flexibility/ROM

Body composition

Brain

49er Crew

Speed

Agility

**Cardiovascular
fitness**

EXAMPLE: KITESURFER

- Lunge, alt hand
- Lunge twist
- Squat
- Duck walks
- 2x 1-minute rounds of knee game

EXAMPLE: ILCA SAILOR

- Lunge, alt hand
- Lunge twist
- Squat
- Duck walks
- Simon doesn't say

EXAMPLE: 49ER CREW

- Lunge, alt hand
- Lunge twist
- Squat
- Duck walks
- Faerie jumps
- Mountain climbers
- Power push ups
- Burpees

AIMS OF THE DAY



**Confident designing
basic programs for
different sailing athletes**



**Confident delivering
class-specific warmups**



Confident with 'in-gym'
delivery



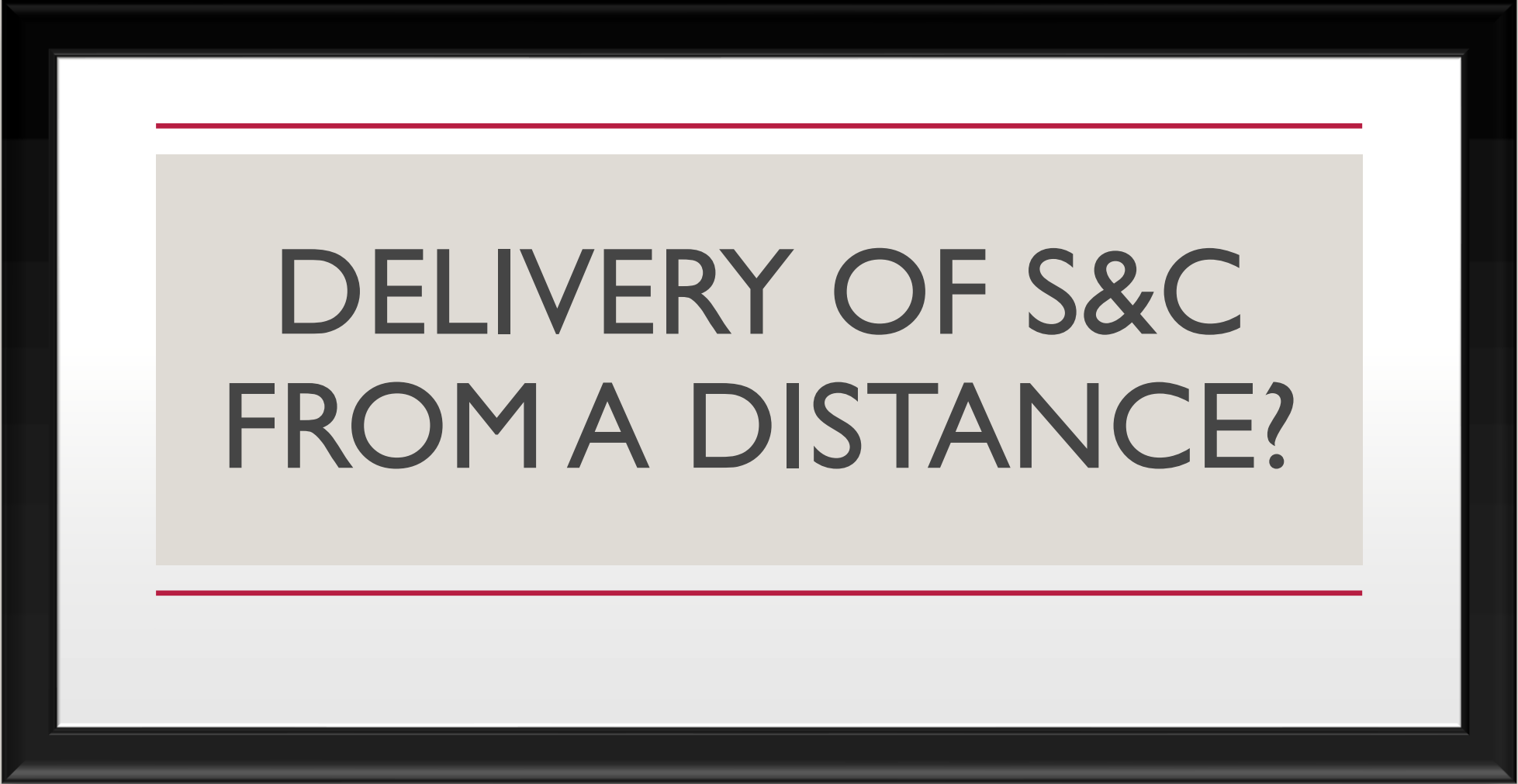
Confident supporting the
athlete in the run up to
competition

**TASK: DELIVER ONE
OF THE WARM-UPS**

WORKSHOP 3:
PRACTICAL DELIVERY
OF S&C FOR SAFETY
AND ADAPTATION



TASK



**DELIVERY OF S&C
FROM A DISTANCE?**

AIMS OF THE DAY



**Confident designing
basic programs for
different sailing athletes**



**Confident delivering
class-specific warmups**



**Confident with 'in-gym'
delivery**

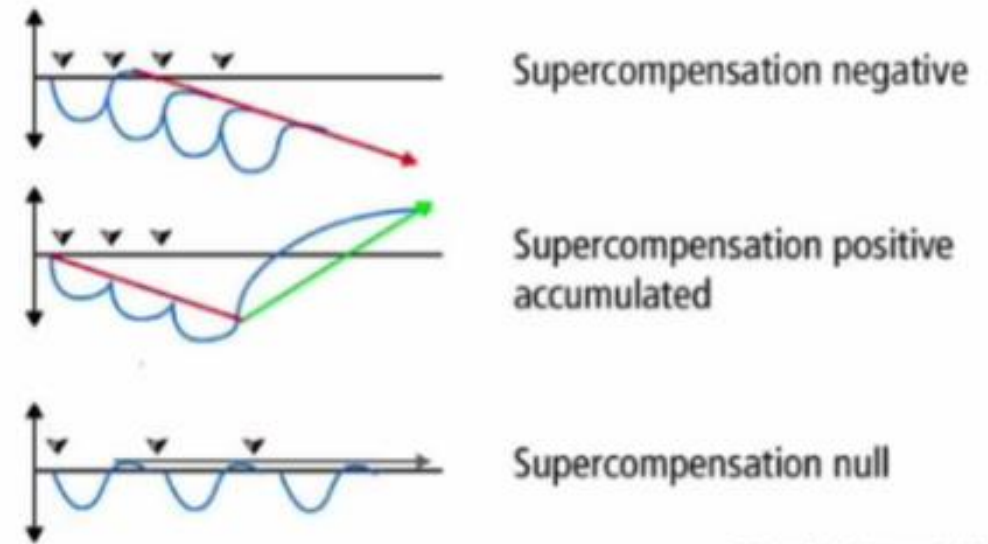


Confident supporting the
athlete in the run up to
competition

WORKSHOP 4:
TAPERING FOR KEY
EVENTS, LOAD
MANAGEMENT AND
OTHER SAILING
SPECIFICS

LOAD MANAGEMENT

- Important to program load effectively
- **Too much:** injury, burnout, poor adaptation
- **Too little:** poor adaptation, decreased motivation



Zatonsky & Kraemer, 2006

CAN WE 'MEASURE' LOAD?



Calories burnt? - doesn't quantify gym well



Time spent training – doesn't account for the intensity



HR – doesn't quantify gym well or some sailing classes



Whoop/HRV – doesn't help you program in advance

GUIDANCE FOR SAILORS?

- RPE x time
- Other 'wellness criteria'

Sailing		Land training				Total load	7 day average
		Gym/ <i>Cardio 2</i>		<i>Cardio</i>			
Duration	RPE	Duration	RPE	Duration	RPE		
		70	5			350	
		90	5	90	5	900	
		25	8	120	4	680	
		150	6			900	
				120	5	600	
150	6			30	8	1140	
180	5					900	781

Recovery markers 1-10						Recovery score (5 - 50)
Scale value 1-10 (1 is bad)						
RHR	Sleep q/h	Energy	Willingness to train	Muscle soreness	Illness	
	5	8	9	10	3	35
	7	8	8	7	2	32

PERIODISATION

- Varying training volume/intensity over time
- Challenging in sailing when multiple important events within a year
- Linear, block, undulating
- We will look most like block periodisation
- Essentially just varying training, for low training level this can be a very basic level

[illegible]

TAPER

Reduction in training volume prior to event to reduce accumulated fatigue

- Reduce 40-60% of normal training volume (rep, set, frequency)
- Linear, exponential, step
- Maintain intensity!
- 0.5 – 3% performance increase
- Duration: improvements seen ranging from min 7 to 28 days, most common 2 weeks
- Un- taper: important manage return to training

S&C AND WEIGHT?

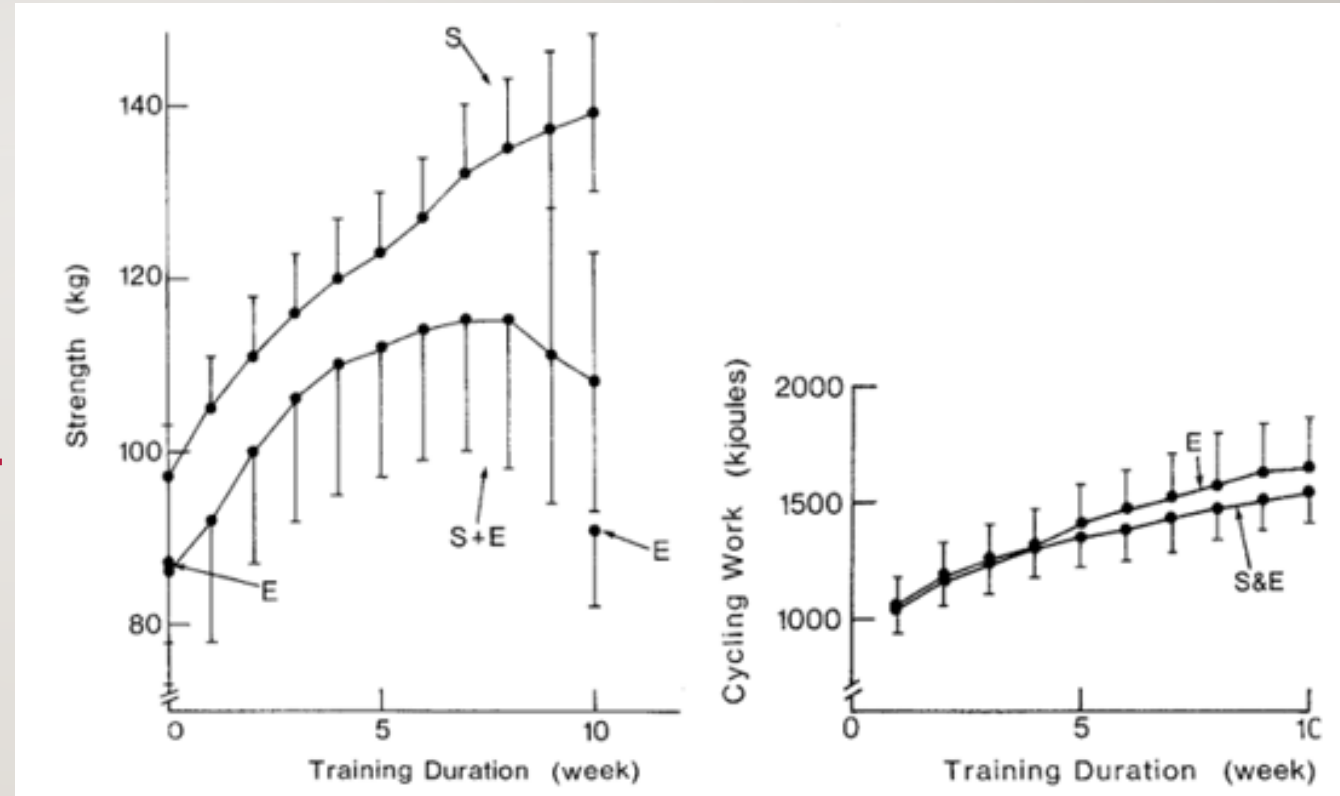
- These under near 'perfect conditions'
- Genetic dependent
- Highly dependant on effective nutrition
- Hypertrophy rep range is most effective (6-12)

Lyle McDonald- Theoretical Rates of Muscle Gain (natural)				
Category	Rate of Muscle Gain (Men) <i>% of total bodyweight per month</i>	Rate of Muscle Gain (women) <i>% of total bodyweight per month</i>	65kg male (could gain approximately Kg per month)	65kg female (could gain approximately Kg per month)
Beginner	1-1.5%	0.5-0.75%	0.7 to 1.0	0.3 to 0.5
Intermediate	0.5-1%	0.25-0.5%	0.3 to 0.7	0.2 to 0.5
Advanced	0.25-0.5%	0.125-0.25%	0.2 to 0.3	0.1 to 0.2

Categories defined as- Beginner is someone training and eating effectively for their first year of training, intermediate might be the next 2 years and advanced is anything past that.

THE INTERACTION EFFECT

HICKSON 1980



HOW TO MINIMISE ITS EFFECT?

- HIIT cycling
- Replenish glycogen between sessions (fuelling)
- Endurance exercise can reduce force production for up to 8 hours
- (Maximise the gap)
- Which before? – training goals

S&C WITH THE YOUNGER ATHLETE

TABLE 2 | Conceptual model for the implementation of resistance training (RT) programs during the stages of long-term athlete development (LTDA) to enhance muscular fitness and athletic performance.

Early childhood	Late childhood	Adolescents	Adulthood
CHRONOLOGICAL AGE			
Female: 6–8 years Male: 6–9 years	Female: 9–11 years Male: 10–13 years	Female: 12–18 years Male: 14–18 years	Female: >18 years Male: >18 years
BIOLOGICAL AGE			
Tanner stage I	Tanner stage I–II	Tanner stage III–IV	Tanner stage V
MATURITY			
Pre-pubertal (pre PHV)	Pre-pubertal (pre PHV)	Pubertal (mid PHV)	Post-pubertal (post PHV)
STAGE OF LONG-TERM ATHLETE DEVELOPMENT			
FUNDamentals	Learning to train	Training to train	Training to compete
LONG-TERM DEVELOPMENT OF MUSCULAR FITNESS (STRENGTH, POWER, ENDURANCE)			
low resistance training skill competency high			
- Coordination training - Agility training - Balance training - Muscular endurance training with own body mass/training tools (e.g., medicine ball) with a focus on exercise technique	- Balance training - Plyometric training as part of deliberate play (e.g., rope skipping) with a focus on correct jumping and landing mechanics - Core strength training - Muscular endurance training with own body mass/training tools (e.g., medicine ball) - Free weight training with a focus on exercise technique	- Balance training - Plyometric training (depth jumps from low drop heights) - Core strength training - Free weight training at light to moderate loads - Heavy resistance strength training (hypertrophy) - Eccentric resistance training - Sport-specific resistance training	- Balance training - Plyometric training (depth jumps from moderate drop heights) - Core strength training - Free weight training at moderate to high loads - Heavy resistance strength training (neuromuscular activation + hypertrophy) - Sport-specific resistance training
TRAINING-INDUCED ADAPTATIONS			
Neuronal adaptations		Hormonal/Neuronal/Muscular/Tendinous adaptations	

RT programs were allocated to LTAD stages based on expert opinion and according to Lesinski et al. (2016), Falgaireau et al. (2016), Lloyd et al. (2011, 2015), Balyi et al. (2013), as well as Kraemer and Fleck (2005).
Legend: PHV: peak height velocity

RISKS

S&C WITH THE YOUNGER ATHLETE

- Focus on technique
- Low loads
- Hyperextension is most risky (particularly overhead pressing)
- Supervised
- Creating good habits

SALTER-HARRIS FRACTURES

INJURY TO GROWTH PLATE



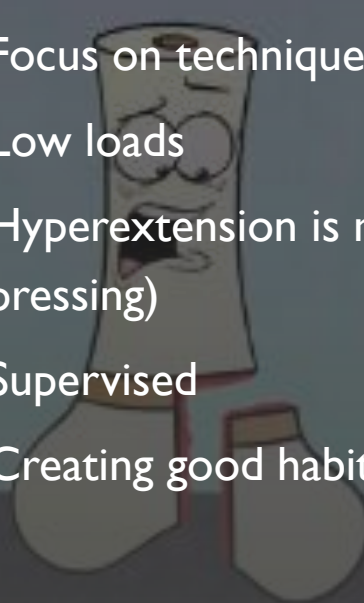
TYPE 1

THROUGH
GROWTH PLATE



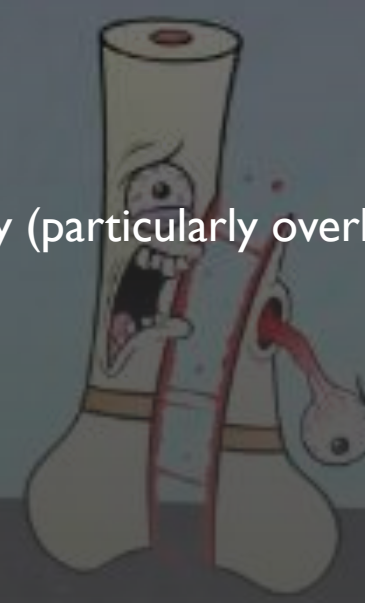
TYPE 2

THROUGH GROWTH
PLATE AND METAPHYSIS



TYPE 3

THROUGH GROWTH
PLATE AND EPIPHYSIS



TYPE 4

THROUGH ALL
THREE ELEMENTS



TYPE 5

CRUSH INJURY OF
GROWTH PLATE

S&C IN VENUE/AT CAMPS

- Largely just creating habits over adaptation
- Emphasising need for training

1			2			3														
Two teams time constraint (6mins)						As one group cross bleep test (6min)						Team runners								
Time constraint: Round the block OR shuttle runs						Running from end to end doing exercises on min and						High HR stim (6min)								
Counting the number of times someone runs in your team						have remainder of minute to run 10,8,6,4,4,2,2						People running from opposite sides								
Round 1			Round 2			Exercises same as 1 basically						Exercises								
Faerie jumps			Plank									Faerie jump								
Squat Jump			Side plank									Squat jump								
Pause			other side									Burpee								
4						5						6								
Core ft. McGill big 3 (7mins x2)						Runners from each end converging						Cross training games						Warm Up		
Side plank						While they're running the others are doing						Netball cross rugby with restriction						Freestyle run		
Side plank						Faerie jumps						Football						Lunge rotate		
Bird dog						Squat jumps						Touch Rugby						Lunge reach up		
Starfish						Bird dog						Capture the flag						Chicken soup		
Leg raise						Mountain climbers						Etc						Knee hug		
High to low plank						(Until get to first runner again)												Knee Game		
Mountain climbers																				

AIMS OF THE DAY



**Confident designing
basic programs for
different sailing athletes**



**Confident delivering
class-specific warmups**



**Confident with 'in-gym'
delivery**



**Confident supporting
the athlete in the run
up to competition**

USEFUL LINKS

British Rowing designing an elite rowing program:

- <https://plus.britishrowing.org/2023/01/16/designing-an-elite-rowing-training-programme-overview/>

Rowing sessions:

- https://plus.britishrowing.org/wp-content/uploads/2023/01/GBRowingTeam_TrainingMatrix.pdf

Bike sessions:

- <https://whatsonzwift.com/search>

A rectangular sign with a black frame is mounted on a light gray wall. The sign has a white background with a central light gray rectangle. The text "THANK YOU!" is written in a bold, dark gray, sans-serif font within the gray rectangle. Two thin red horizontal lines are positioned above and below the gray rectangle. The bottom of the image shows a wooden floor with vertical planks.

THANK YOU!