

PHYSICAL PREPARATION FITNESS & TESTING OF REFEREES

Prof. Hans Holdhaus
Institute for Sports Medicine and Science

IMSB - Austria



INSTITUT
FOR
SPORTS MEDICINE
& SCIENCE
AUSTRIA

HIGH
PERFORMANCE
CENTER
SÜDSTADT
1982



IMSB - Austria



TASK

**SCIENTIFIC
SUPPORT
TO
SPORTS**

IMSB - Austria



GOAL

**OPTIMIZATION
OF
TRAINING
&
PERFORMANCE**

IMSB - Austria



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IMSB - Austria



SPORTS PHYSICIAN

BIOMECHANICS

NUTRITION SCIENTIST

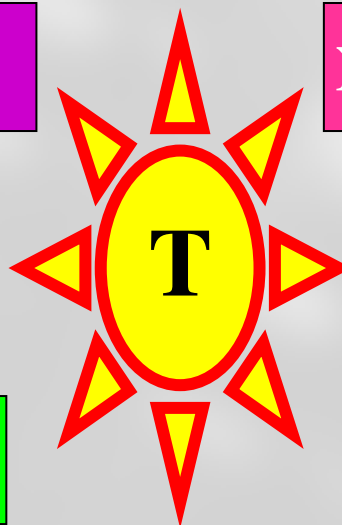
PSYCHOLOGIST

THERAPISTS

ANTHROPOLOGIST

COACHES

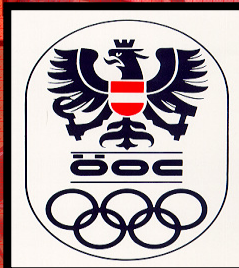
SPORTS SCIENTISTS



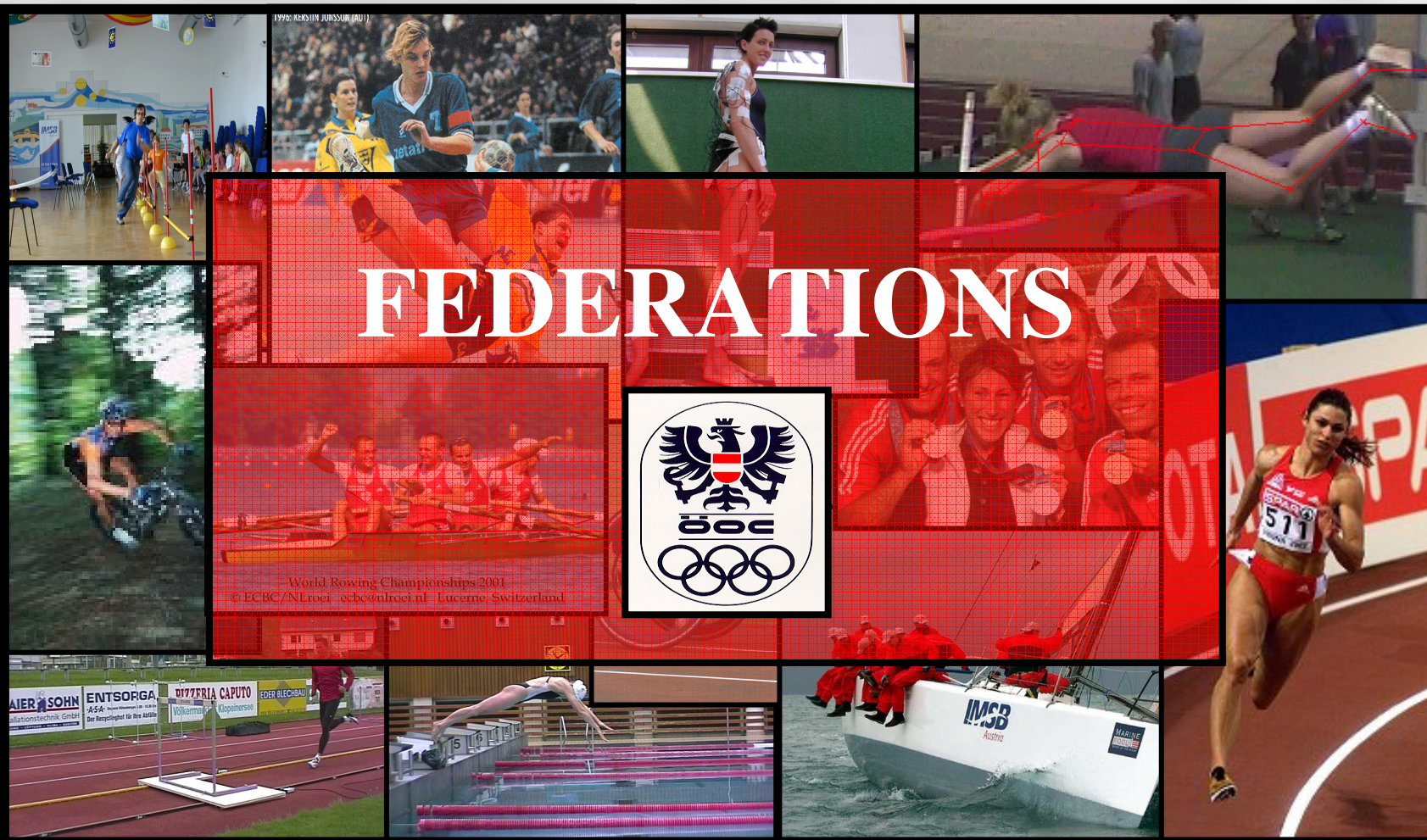
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Austria

FEDERATIONS



World Rowing Championships 2001
© ECBC/NLroei ecbe@nlroei.nl Lucerne, Switzerland



IMSB - Austria



LOS ANGELES
SEOUL
BARCELONA
LILLEHAMMER
ATLANTA
NAGANO
SYDNEY
SALT LAKE CITY
ATHEN
PEKING
VANCOUVER

IMSB - EHF

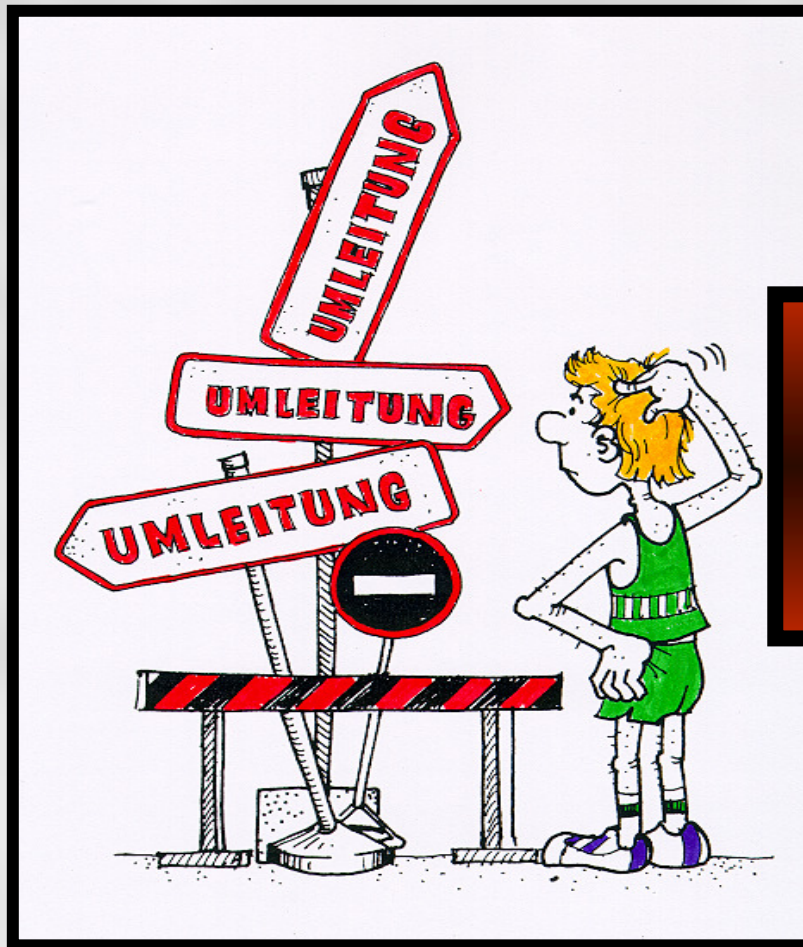


**MEMBER
MEDICAL COMMISSION
since 1992**

**HEAD
IHF – ANTI – DOPING
2005 - 2011**



IMSB - EHF



REFEREE

THE GAME

IMSB
Austria

**HANDBALL
HAS
CHANGED**

ATTRACTIVE



THE GAME

IMSB
Austria

**HANDBALL
HAS
CHANGED**

DYNAMIC



THE GAME

IMSB
Austria

**HANDBALL
HAS
CHANGED**

FASTER



THE GAME

IMSB
Austria

**HANDBALL
HAS
CHANGED**

**STUDY
L. Michalsik
(Univ. Aarhus)**



THE GAME

IMSB
Austria

**HANDBALL
HAS
CHANGED**

~ 4000 m

~ 10% HIR



THE GAME

IMSB
Austria

**HANDBALL
HAS
CHANGED**

~ 2000 AC

~ 70% VO₂



THE GAME

IMSB
Austria

**HANDBALL
HAS
CHANGED**

~ 3 – 10 mm L

~ 1 kg WL



THE GAME

IMSB
Austria

**HANDBALL
IS
PHYSICALLY
EXTREMELY
EXHAUSTING**



THE REFEREE

IMSB
Austria



**GAME
CHANGES**

**REFEREES
HAVE
TO
CHANGE
TOO**

THE REFEREE

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Austria

**HANDBALL
REFEREES
STUDY**

~ 5000 m

~ 1% HIR



THE REFEREE

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**HANDBALL
REFEREES
STUDY**

**LESS
RECOVERY**



THE REFEREE



CONSEQUENCE

**REFEREES
MUST BE PERFECT
PREPARED**

THE REFEREE

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**REFEREE
IS
A
KEY
PLAYER
IN
THE
GAME**

THE REFEREE



PROJECT
„THE *NEW* REFEREE“
GLOBAL
REFEREE TRAINING PROGRAMME

THE REFEREE



PROJECT

„THE *NEW* REFEREE“

GLOBAL REFEREE TRAINING PROGRAMME

? REALISATION ?

THE REFEREE



PROJECT

„THE *NEW* REFEREE“

EUROPEAN REFEREE TRAINING PROGRAMME

THE REFEREE



KNOWLEDGE

TRAINING

SUPPORT



THE REFEREE



THE REFEREE

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„TRAINING“

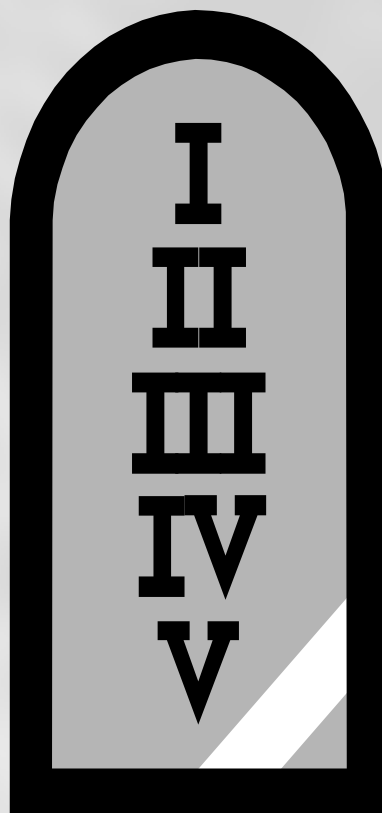
???????

? TRAINING ?



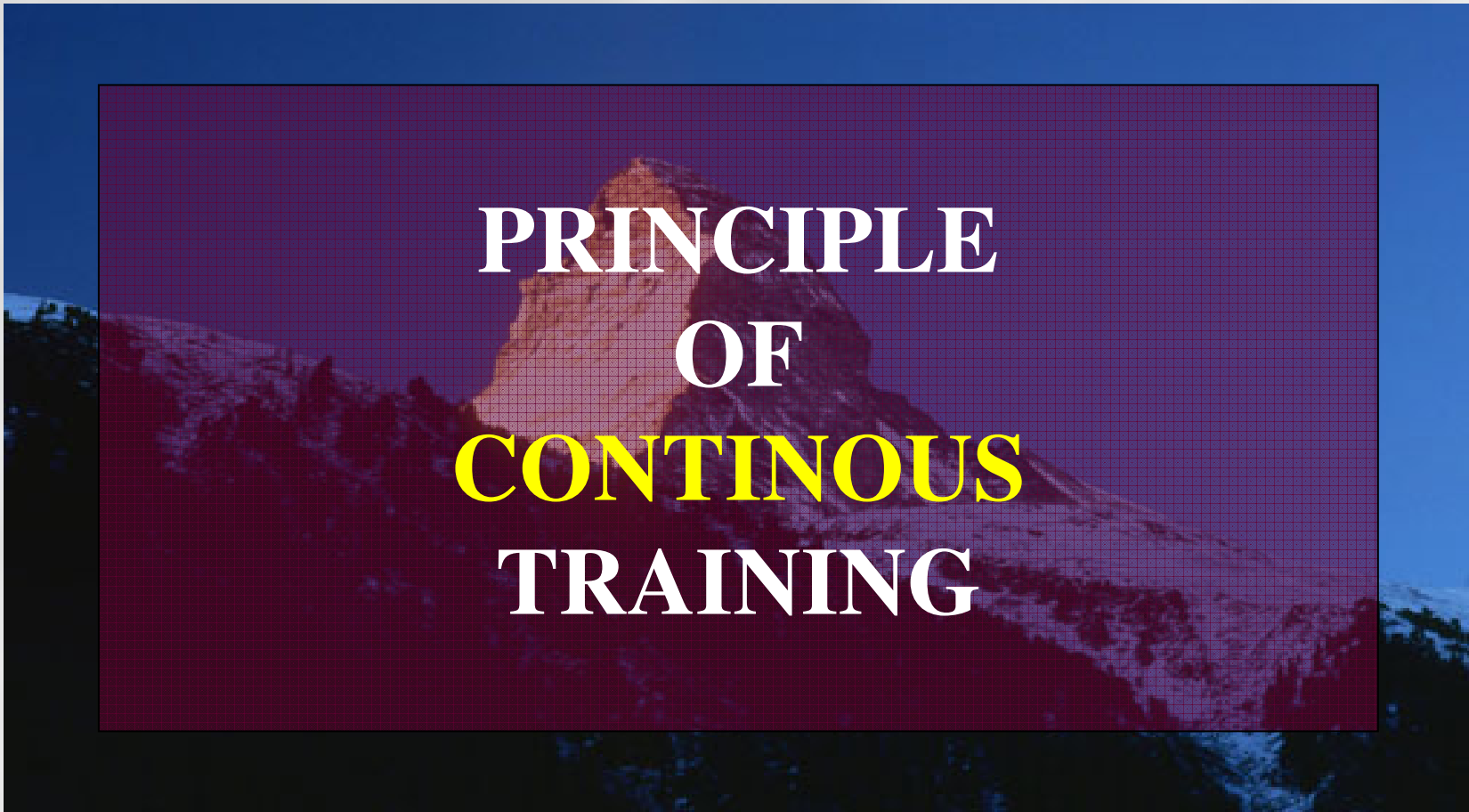
**TRAINING IS A COMPLEX
PROCESS
FOCUSING ON A
PLANNED AND
GOAL-ORIENTED
PERFORMANCE DEVELOPMENT**

TRAINING



BASIC TRAINING PRINCIPLES

PRINCIPLES

A background image of a mountain landscape, likely the Grossglockner in Austria, with a prominent peak and snow-covered slopes under a clear blue sky. The image is framed by a dark blue border.

PRINCIPLE OF CONTINUOUS TRAINING

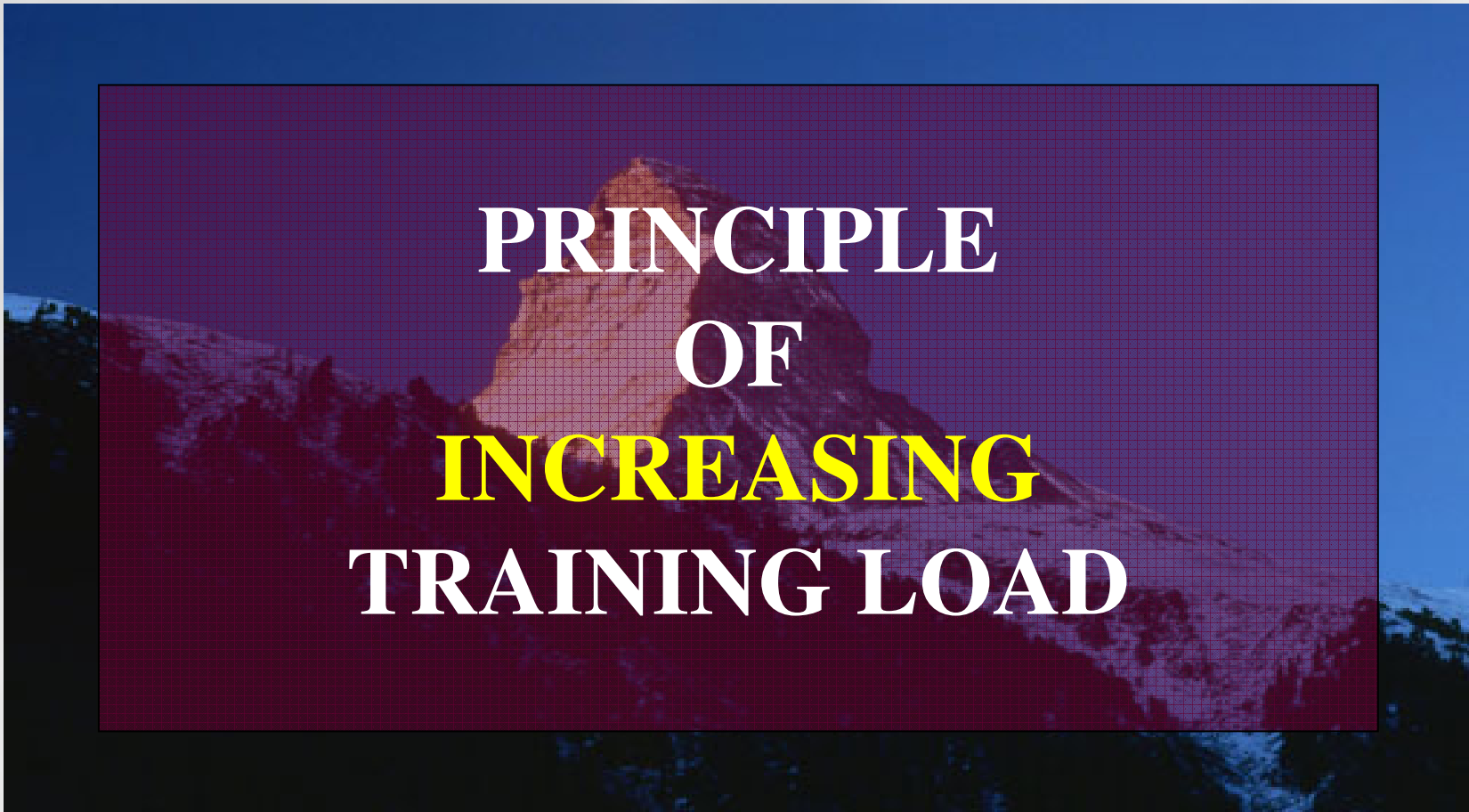
PRINCIPLES

A background image of a mountain peak, likely Mount Everest, with a blue sky and snow-covered slopes. The image is overlaid with a dark blue grid pattern.

REGULARITY

LONG - TERM

PRINCIPLES

A large, dark blue rectangular area containing a faint, grid-like pattern. Overlaid on this is a photograph of a rugged mountain peak, likely Mount Everest, with snow and rocky terrain. The text "PRINCIPLE OF INCREASING TRAINING LOAD" is centered over the image.

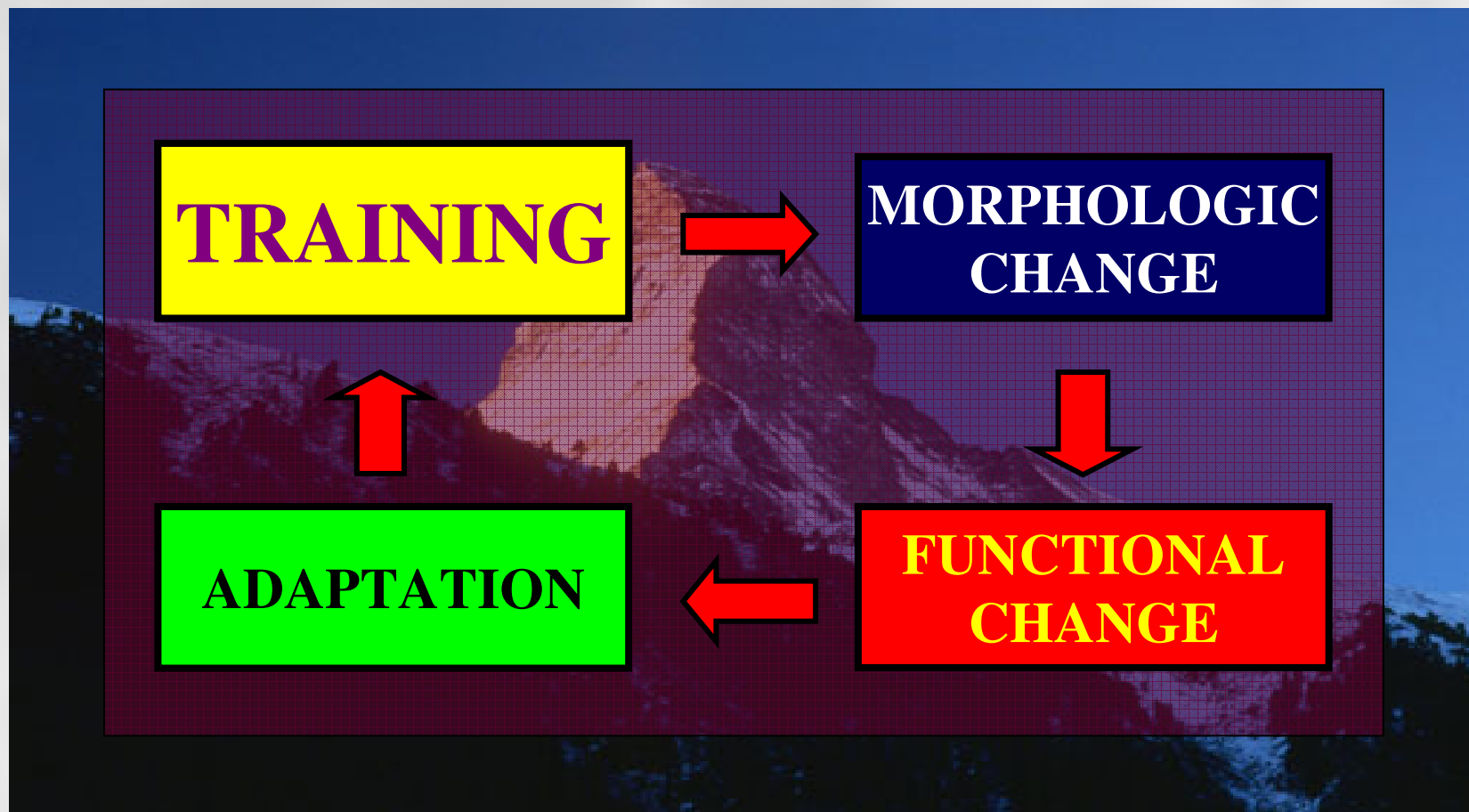
PRINCIPLE OF INCREASING TRAINING LOAD

PRINCIPLES

A background image of a mountain landscape with a prominent rock formation, overlaid with a dark blue grid pattern.

CHANGE TRAINING AFTER SUCCESSFUL ADAPTATION

PRINCIPLES



PRINCIPLES

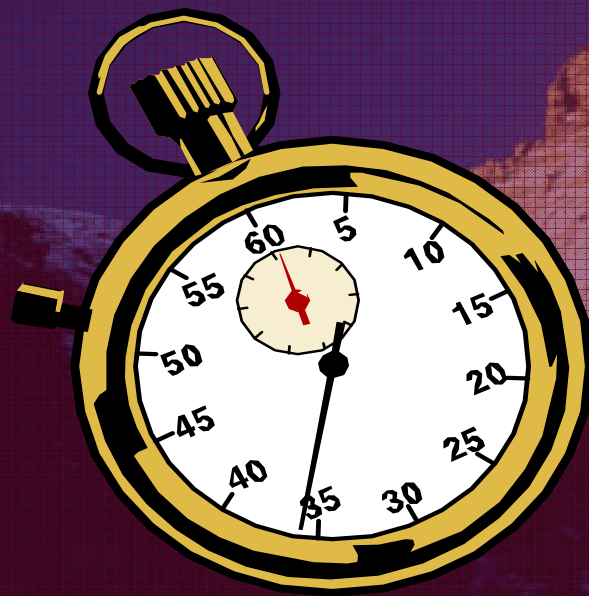


TRAINING SESSIONS

DURATION

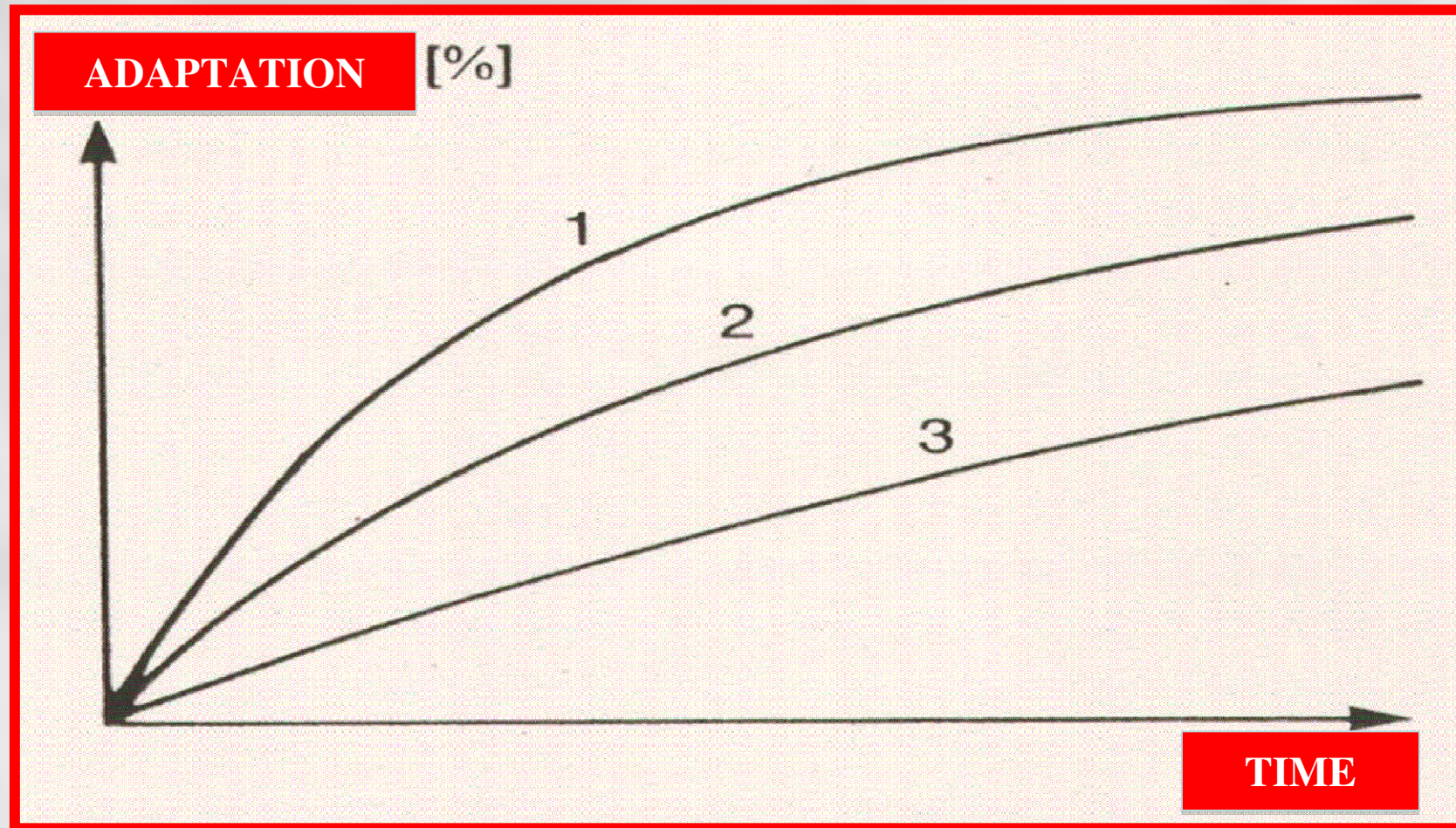
INTENSITY

PRINCIPLES



**HOW LONG
DOES IT TAKE
TO REACH
EFFECTS
??**

PRINCIPLES



PRINCIPLES



ENDURANCE

8 – 12 w

POWER

6 – 8 w

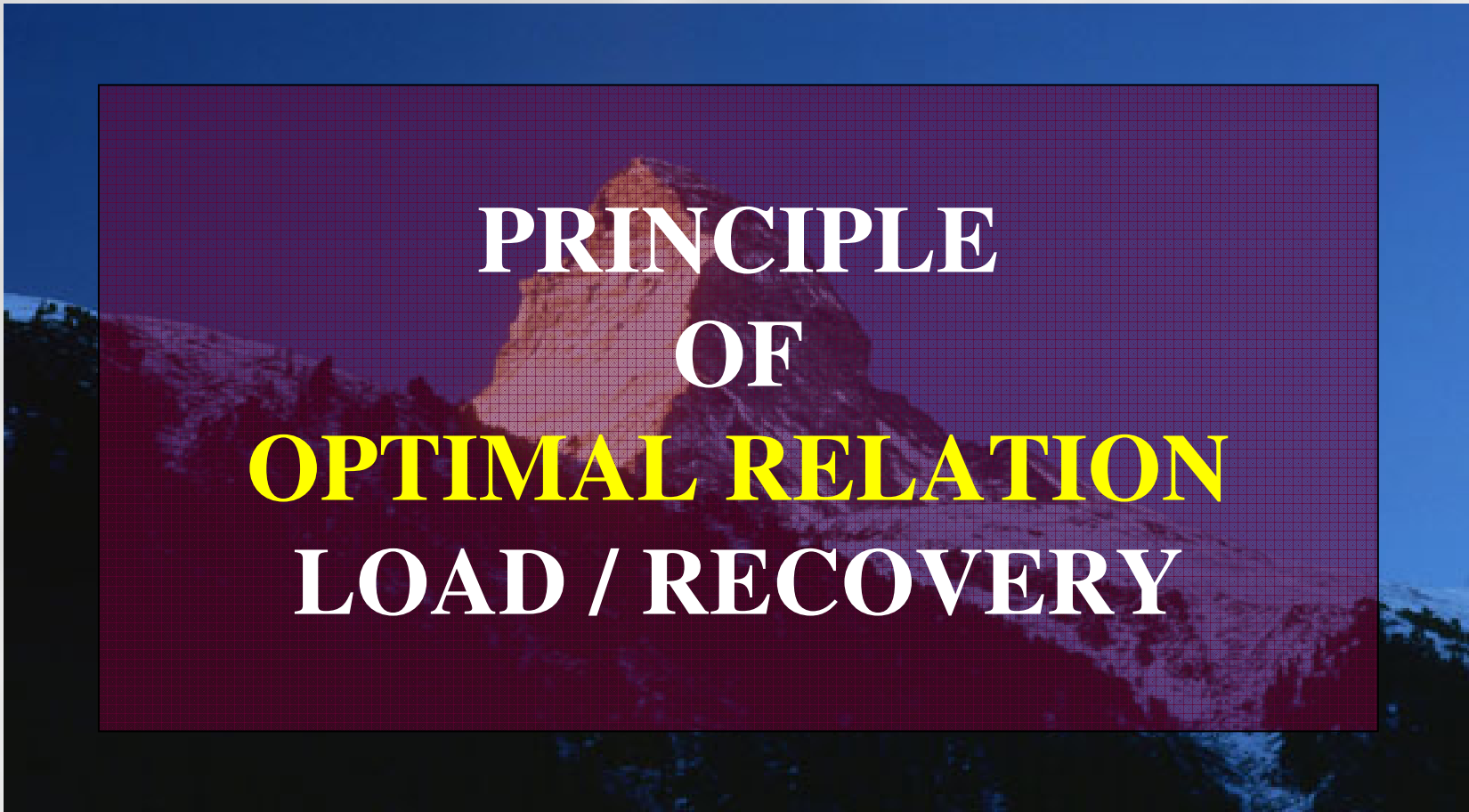
FLEXIBILITY

2 – 4 w

COORDINATION

1 – 2 w

PRINCIPLES

A background image of a mountain peak, likely Mount Everest, with a blue sky and some clouds. The image is overlaid with a dark blue grid pattern.

PRINCIPLE OF OPTIMAL RELATION LOAD / RECOVERY

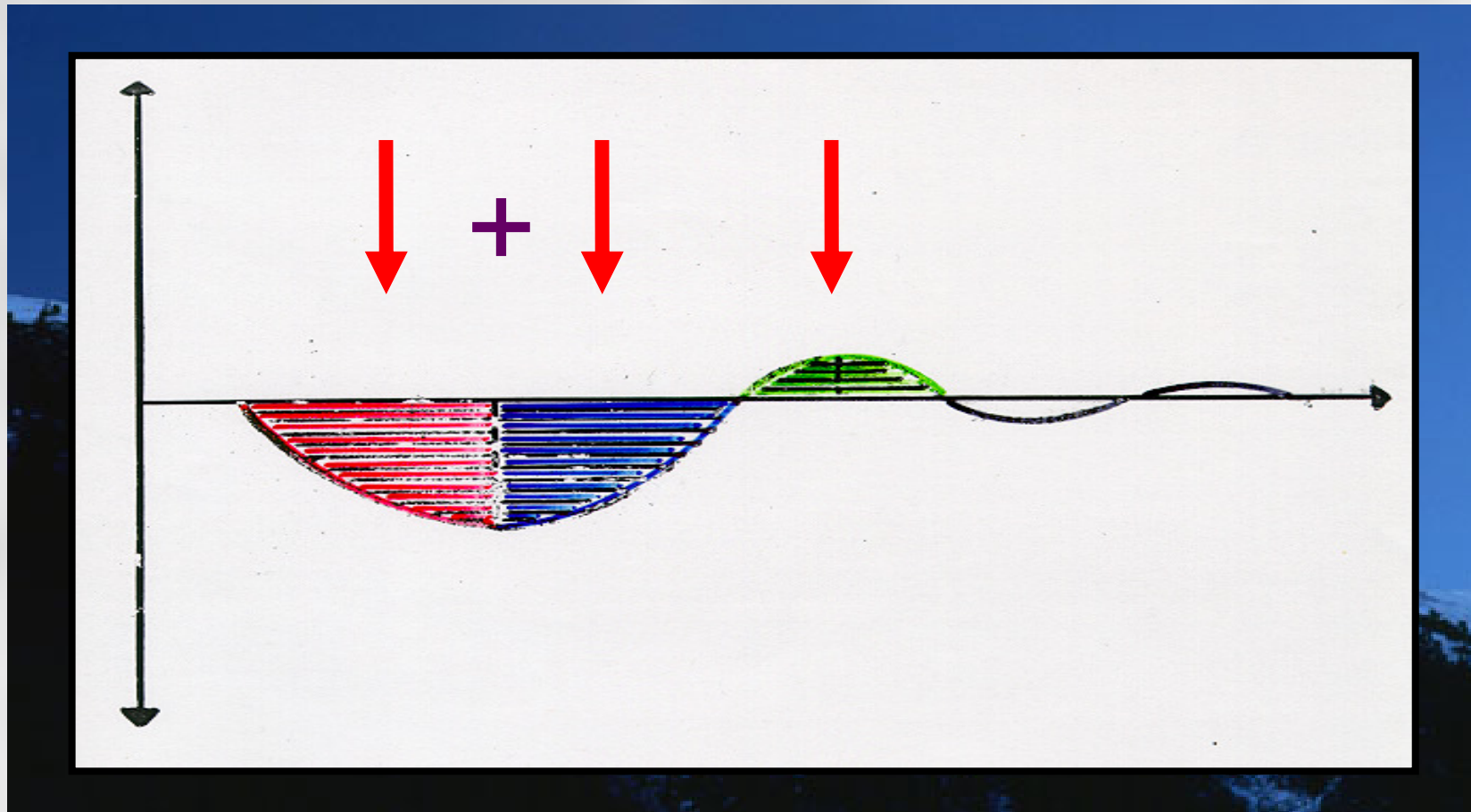
PRINCIPLES



**TRAINING EFFECTS
ARE THE
PRODUCT OF A
SYSTEMATIC CHANGE
OF
TRAINING AND RECOVERY**

PRINCIPLES

IMSB
Austria



PRINCIPLES



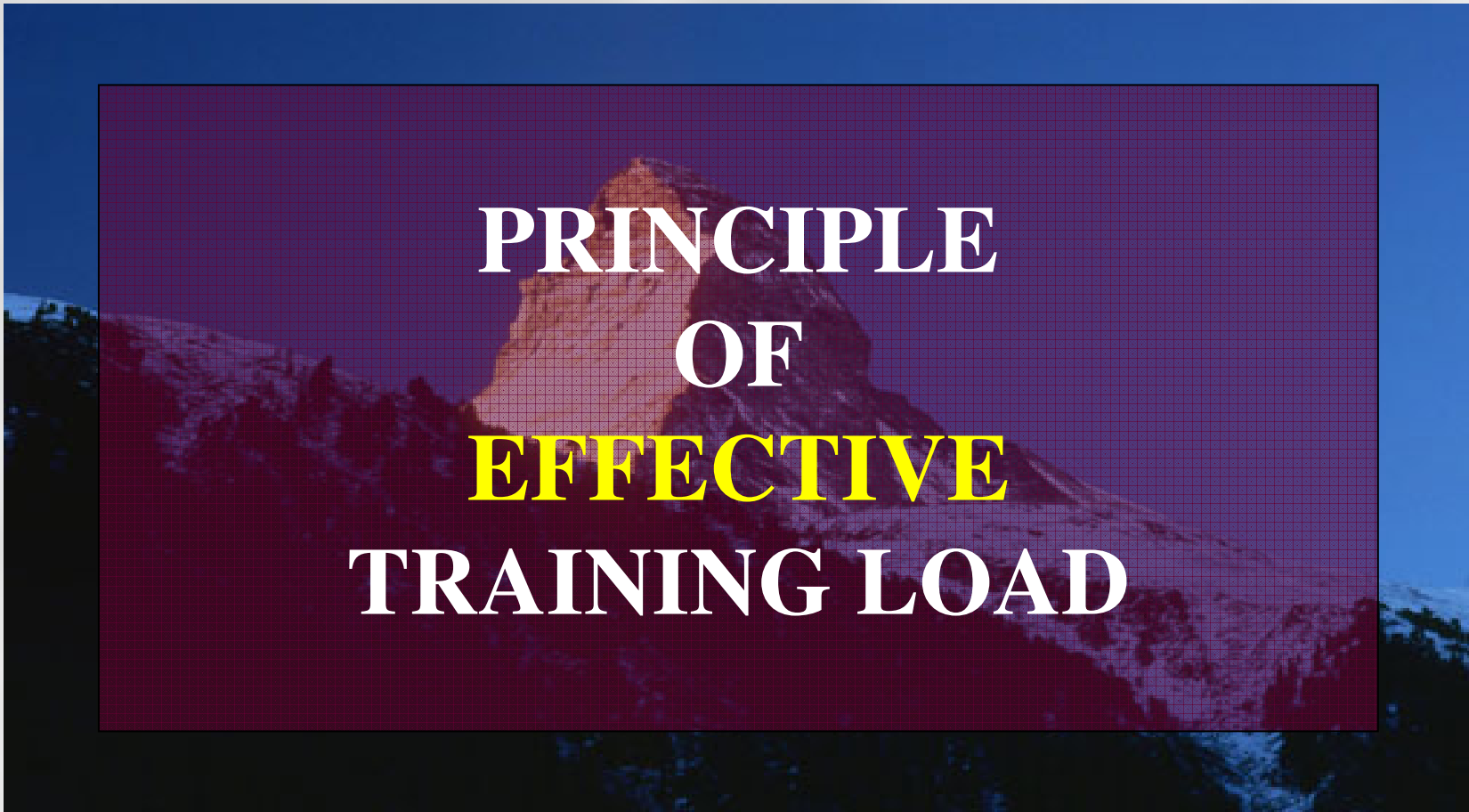
TRAINING

+

RECOVERY

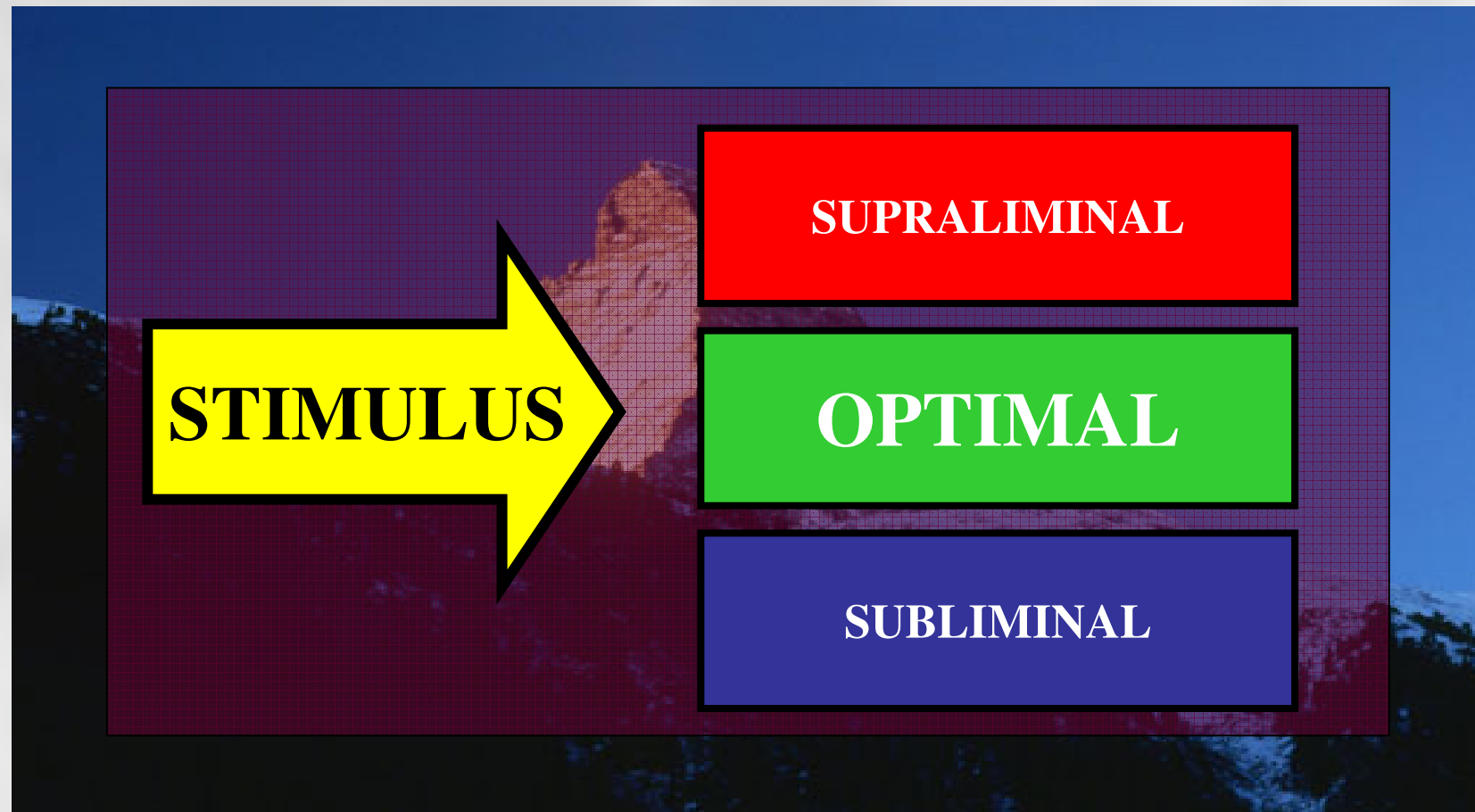
TRAINING UNIT

PRINCIPLES

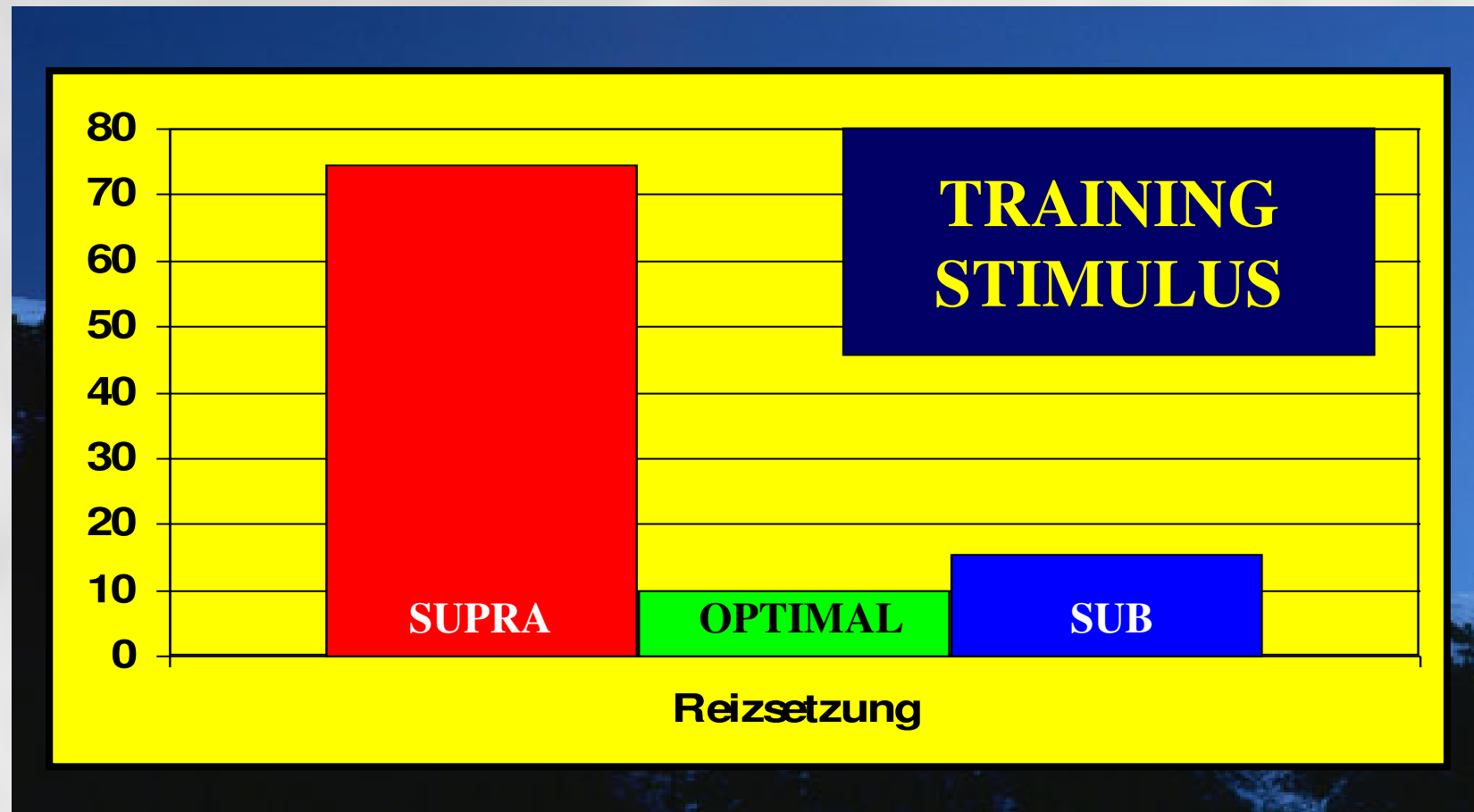
A background image of a snow-capped mountain peak under a clear blue sky, with a dark, textured overlay.

PRINCIPLE OF EFFECTIVE TRAINING LOAD

PRINCIPLES



PRINCIPLES

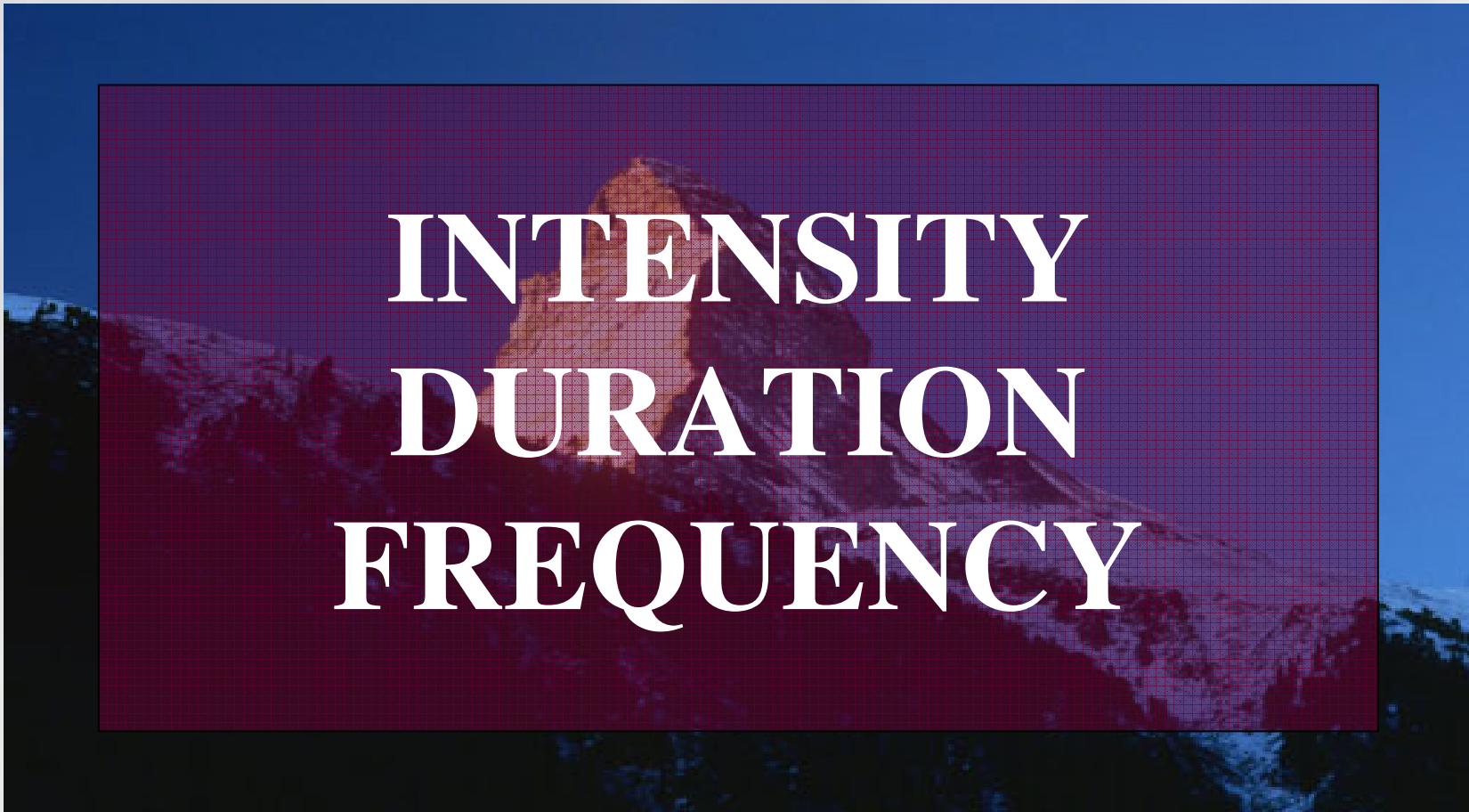


PRINCIPLES

A graphic showing a mountain peak with a red grid overlay. The text "TRAINING STIMULUS" is written in white, serif, all-caps font across the center. Above and below the text are large white question marks.

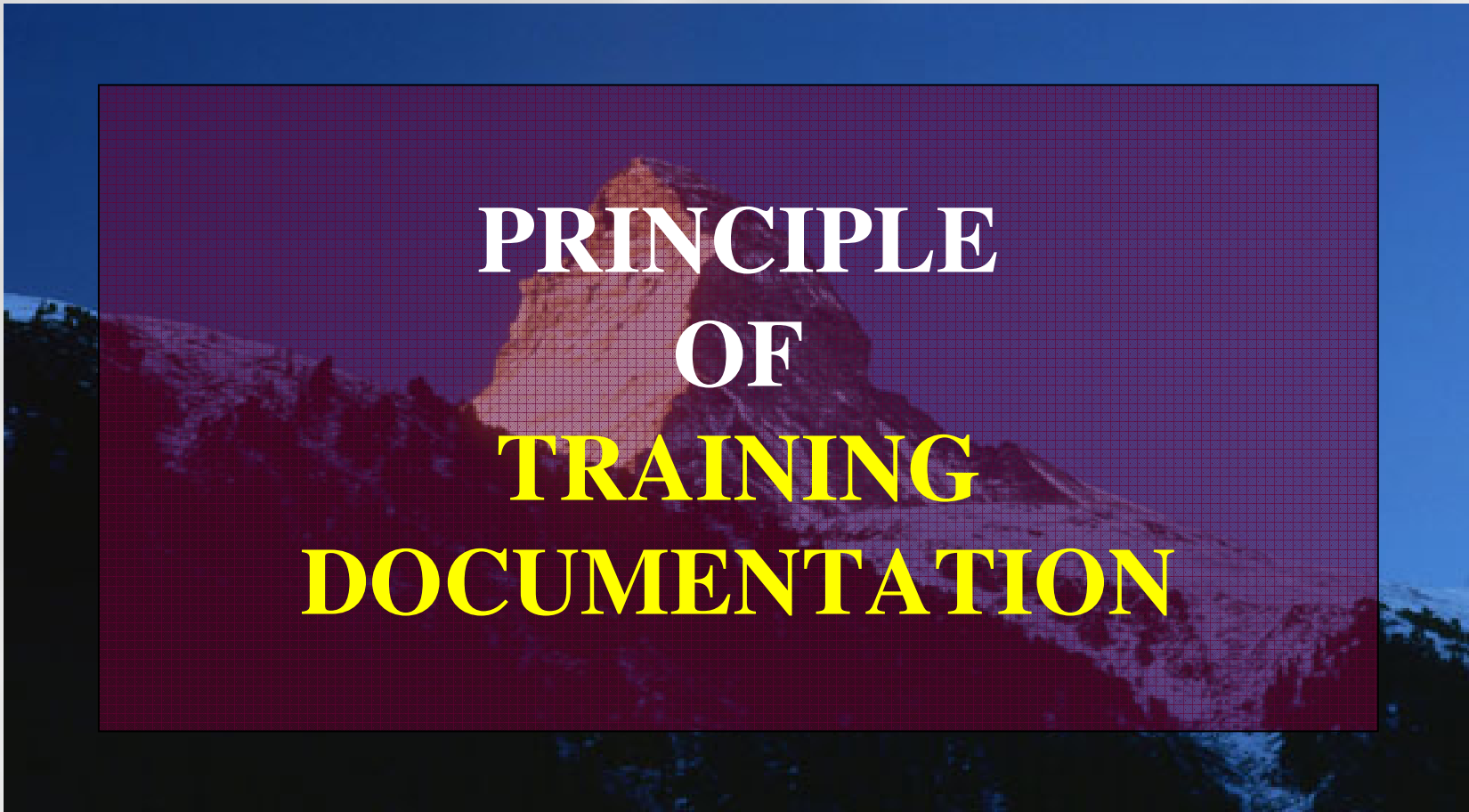
?
TRAINING STIMULUS
?

PRINCIPLES

A large, dark blue rectangular area containing a faint, grid-like pattern. Overlaid on this grid is a photograph of a rugged, snow-capped mountain peak under a clear blue sky. The text "INTENSITY", "DURATION", and "FREQUENCY" is centered over the image in a large, white, serif font, stacked vertically.

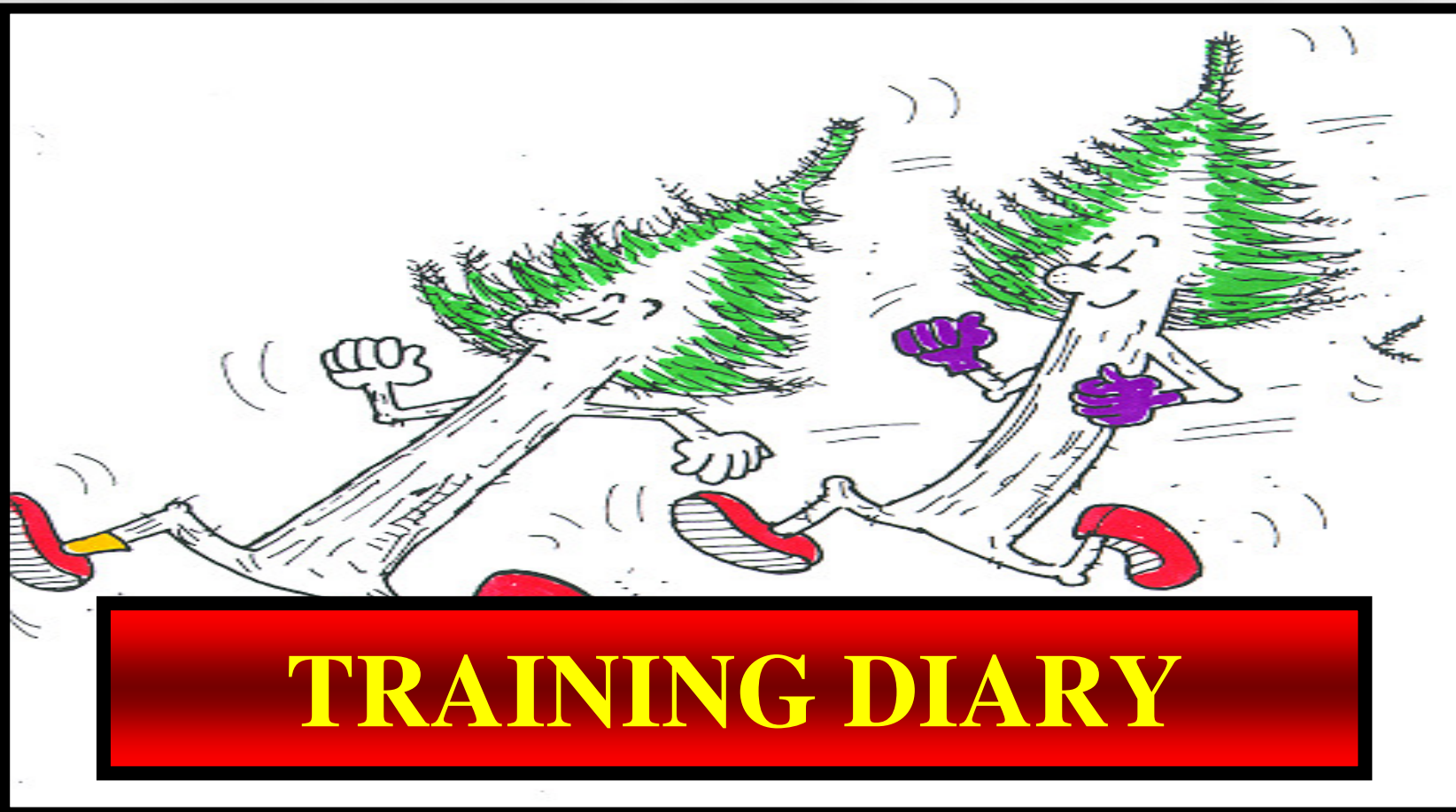
INTENSITY
DURATION
FREQUENCY

PRINCIPLES

A background image of a mountain landscape, likely the Grossglockner in Austria, with a prominent peak and snow-covered slopes under a clear blue sky. The image is overlaid with a dark blue grid pattern.

PRINCIPLE OF TRAINING DOCUMENTATION

PRINCIPLES



PRINCIPLES



web-4-trainer



https://imsb.web4trainer.net/?ex=w/a4e8w4t=v59f5u41bp1nojup3mm741qd0

IMSB Austria

Startseite | Trainingsplan | Tagebuch | Auswertungen

Marietta Sengeis [abmelden]

Trainer
Ansicht / Bearbeitung
--- Gesamtansicht ---
Ausdauer allgemein
Max Mustermann

Speichern

Notiz/Text

Vorlagen
Frei
Vorlage hinzufügen...
...
...Trainingskurs_selbst gestaltet
Kurs_ keine Zeit
Regenerationswoche - Übergangsperiode
Urlaub - Training wird selbst gestaltet
Frei ! oder ganz locker
Frei, Ruhetag
Frei, Stretching und sonstiges

Vorlagen

Juli 2011		August 2011		September 2011	
Woche 29	Woche 30	Woche 31	Woche 32	Woche 33	
Montag 01. Aug					
Art	Trainingsinhalt	A0	A1	A2	A3
Lauf	Fahrtspiel im Gelände 60 min. A1-A3 Variation (hügeliges Gelände)	00:00	00:20	00:20	00:20
Ergometer	...	00:00	00:00	00:00	00:00
Rad	...	00:00	00:00	00:00	00:00
Schwimmen	...	00:00	00:00	00:00	00:00
Kraft (spez)	Krafttraining	siehe Kraft-Detailansicht			0:40
Dienstag 02. Aug					
Art	Trainingsinhalt	A0	A1	A2	A3
Lauf	90 min. reiner A1 Dauerlauf im Anschluss 4 Steigerungsläufe mit 6 sec. und 2 min. Trabepause dazwischen, einbauen.	00:00	01:30	00:00	00:00
Ergometer	...	00:00	00:00	00:00	00:00

web-4-trainer



https://imsb.web4trainer.net/?ex=w/a4e&w4t=v59f5u41bplnoju3mm74lqd0

IMSB Austria

Marietta Sengeis [abmelden...] | Hilfe | Druck

Startseite | **Trainingsplan** | Tagebuch | Auswertungen

Übersicht | Kopierfunktion | Tag | **Woche** | Monat | Periodisierung

zurück 29. Woche 30. Woche **31. Woche** 32. Woche 33. Woche weiter

Montag, 01. Aug

Art	Trainingsinhalt	Gesamt																																																						
Lauf	Fahrtspiel im Gelände 60 min. A1-A3 Variation (hügeliges Gelände)	A1 0:20 A2 0:20 A3 0:20 » 1:00																																																						
Kraft (spez)	Krafttraining 1. Einheit: Warm UP: 6x 30 sec. Schnurspringen, 30 sec. Pause, dann 3 Durchgänge der folgenden Übungen, 2 min. Serienpause, 30 sec. Pause nach Übung, für Stabi Übungen 45 sec.	MA 0:40 » 0:40																																																						
	<table border="1"> <thead> <tr> <th>Nr.</th> <th>Übung</th> <th>WH / Dauer</th> <th>Sätze</th> <th>Serien</th> <th>% max. Gewicht</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>KG Bauch tiefe - Hüftheben</td> <td>12 WH</td> <td>1</td> <td>1</td> <td>100 %</td> </tr> <tr> <td>2.</td> <td>LH Beine Gesäß - Ausfallkniebeugen</td> <td>8 WH</td> <td>1</td> <td>1</td> <td>100 %</td> </tr> <tr> <td>3.</td> <td>KG Stabi - Rücklings</td> <td>00:45:00</td> <td>1</td> <td>1</td> <td>100 %</td> </tr> <tr> <td>4.</td> <td>LH Beine - Reißkniebeuge auf dem Rollbrett</td> <td>8 WH</td> <td>1</td> <td>1</td> <td>100 %</td> </tr> <tr> <td>5.</td> <td>KG Stabi - Vorlings, Arm und Bein abheben</td> <td>00:45:00</td> <td>1</td> <td>1</td> <td>100 %</td> </tr> <tr> <td>6.</td> <td>GB Rücken - Rudern in Bauchlage</td> <td>12 WH</td> <td>1</td> <td>1</td> <td>100 %</td> </tr> <tr> <td>7.</td> <td>GB Rumpf, Brust - Liegestütz, Bein abheben</td> <td>8 WH</td> <td>1</td> <td>1</td> <td>100 %</td> </tr> <tr> <td>8.</td> <td>KG Stabi - Seitlings, Bein anheben</td> <td>00:45:00</td> <td>1</td> <td>1</td> <td>100 %</td> </tr> </tbody> </table>	Nr.	Übung	WH / Dauer	Sätze	Serien	% max. Gewicht	1.	KG Bauch tiefe - Hüftheben	12 WH	1	1	100 %	2.	LH Beine Gesäß - Ausfallkniebeugen	8 WH	1	1	100 %	3.	KG Stabi - Rücklings	00:45:00	1	1	100 %	4.	LH Beine - Reißkniebeuge auf dem Rollbrett	8 WH	1	1	100 %	5.	KG Stabi - Vorlings, Arm und Bein abheben	00:45:00	1	1	100 %	6.	GB Rücken - Rudern in Bauchlage	12 WH	1	1	100 %	7.	GB Rumpf, Brust - Liegestütz, Bein abheben	8 WH	1	1	100 %	8.	KG Stabi - Seitlings, Bein anheben	00:45:00	1	1	100 %	
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	» Übungen ein/ausblenden » Detailsansicht	Gesamt 1:40																																																						

Dienstag, 02. Aug

Art	Trainingsinhalt	Gesamt
Lauf	90 min. reiner A1 Dauerlauf im Anschluss 4 Steigerungsläufe mit 6 sec. und 2 min. Trabepause dazwischen, einbauen.	A1 1:30

Trainer Online (0) Athleten Online (1)

DE 20:17

web-4-trainer



https://imsb.web4trainer.net/?ex=w/tud&date=1312149600&unit=163&user=4057&print=1

IMSB Austria Trainingsplan - Kraft (spez),...

Max Mustermann | Druck

Trainingsplan - Kraft (spez), Montag, 01. Aug 2011

Trainingsinhalt	Gesamt
Krafttraining 1. Einheit: Warm UP: 6x 30 sec. Schnurspringen, 30 sec. Pause, dann 3 Durchgänge der folgenden Übungen, 2 min. Serienpause, 30 sec. Pause nach Übung, für Stabi Übungen 45 sec.	MA 0:40 » 0:40

1. - KG Bauch tiefe - Hüftheben



- Rückenlage
- Beine überkreuzt nach oben gestreckt
- Arme unterstützen den Kopf
- Beine senkrecht nach oben führen
- Hüfte dabei vom Boden abheben
- wieder langsam absenken

	Soll
WH / Dauer	12 WH
Sätze	1
Serien	1
% max.	100 %
Gewicht	

2. - LH Beine Gesäß - Ausfallkniebeugen



- weiter Ausfallschritt
- Rücken gerade
- Blick nach vorne gerichtet
- Langhantel liegt auf den Schultern
- beide Knie beugen bis vorderes Knie rechten Winkel bildet
- hinteres Knie bis knapp über dem Boden abgesenken und
- wieder zurück zur Ausgangsposition
- Seitenwechsel

	Soll
WH / Dauer	8 WH
Sätze	1
Serien	1
% max.	100 %
Gewicht	

THE REFEREE



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THE REFEREE

IMSB
Austria



PCMA

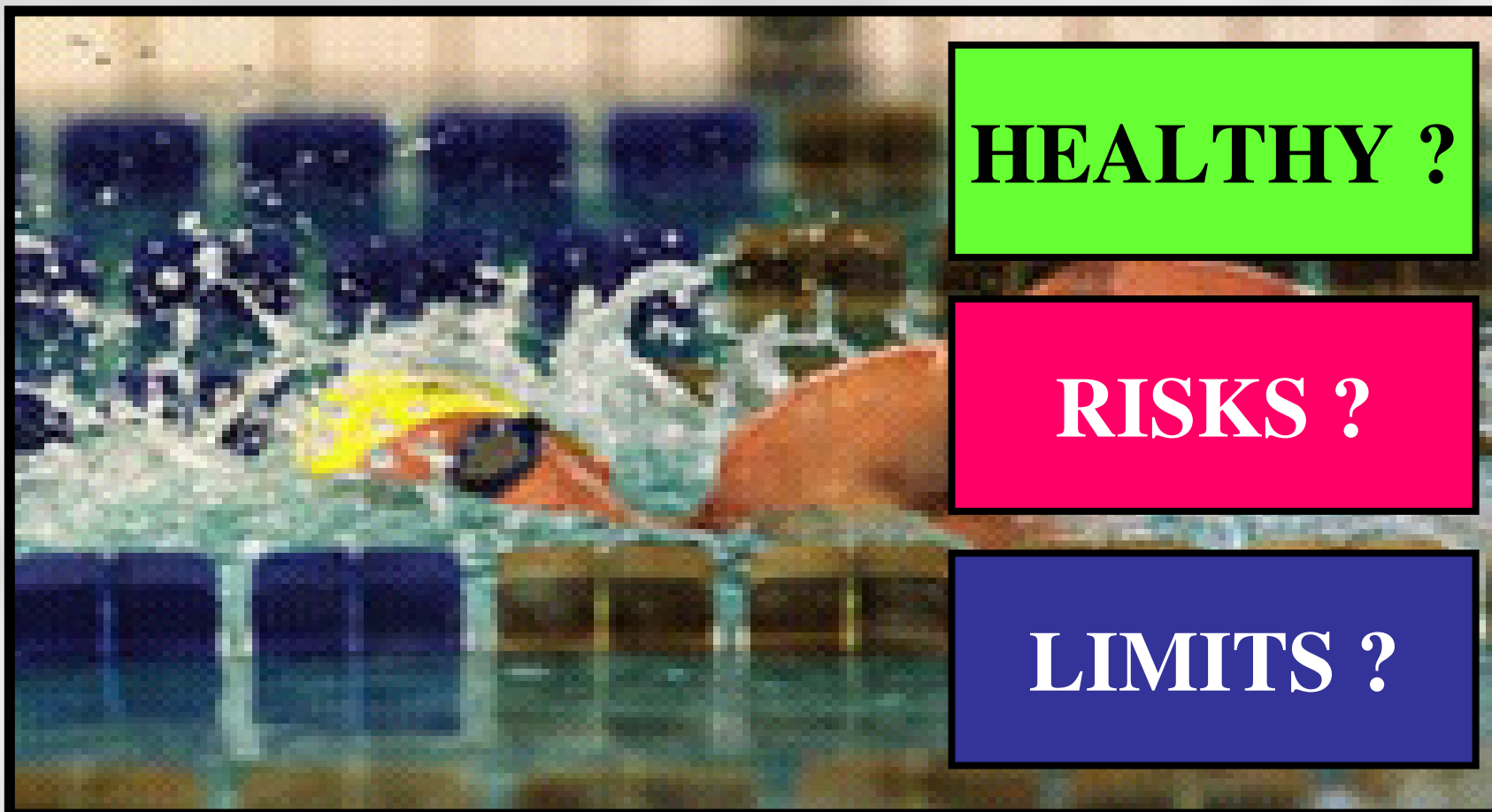
THE REFEREE



PRE COMPETITION MEDICAL ASSESSMENT

INTERNAL STATUS
ORTHOPAEDIC STATUS
LAB (blood, urin)

THE REFEREE



THE REFEREE



ERGOMETRY

**VITA
max**

ECG

THE REFEREE



ERGOMETRY



**REGULATION ?
PERFORMANCE ?**

THE REFEREE



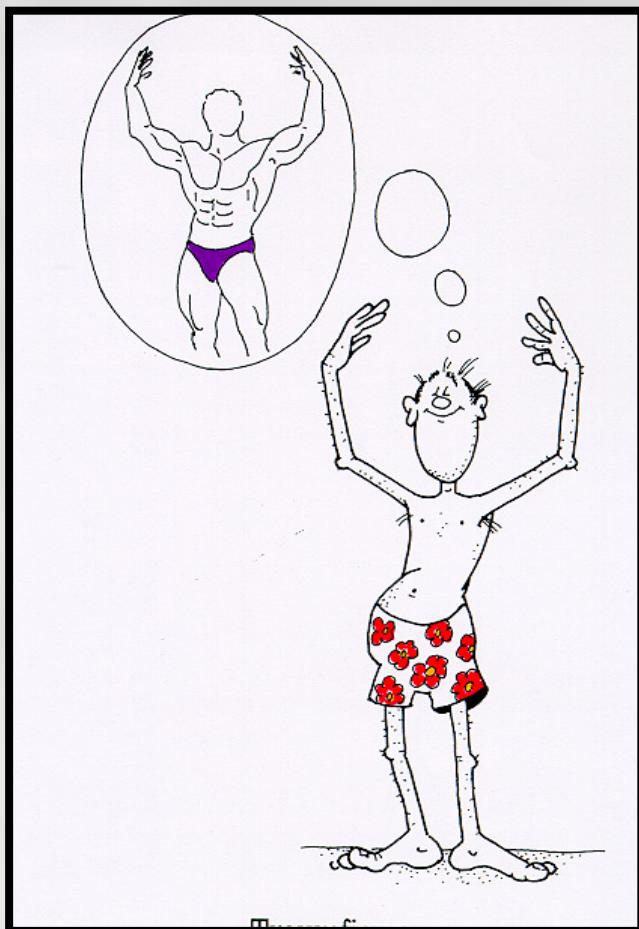
ERGOMETRY



TRAINING ADVICE

THE REFEREE

IMSB
Austria



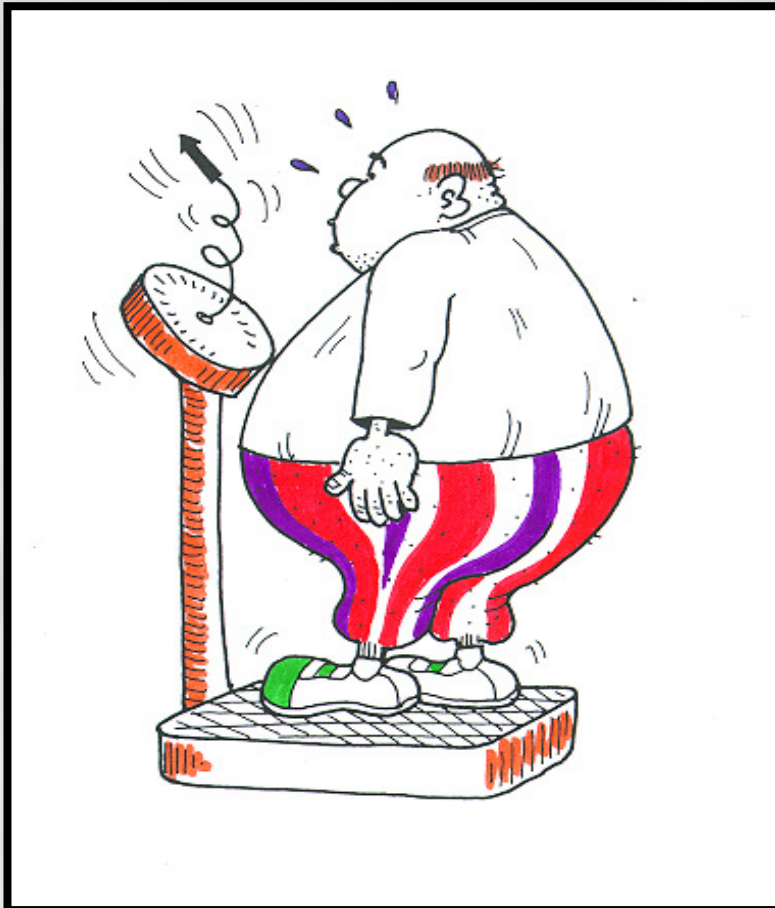
BODY HEIGHT

**BODY
STRUCTURE**

BODY WEIGHT

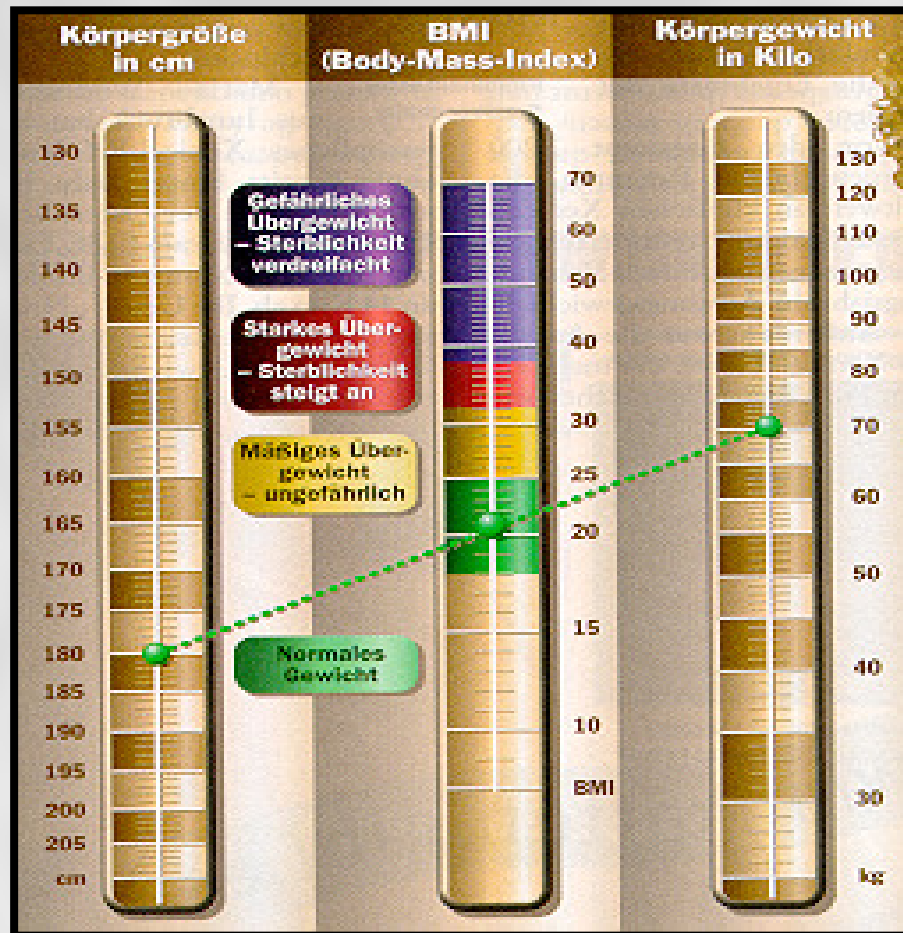
THE REFEREE

IMSB
Austria



BROCA
BMI

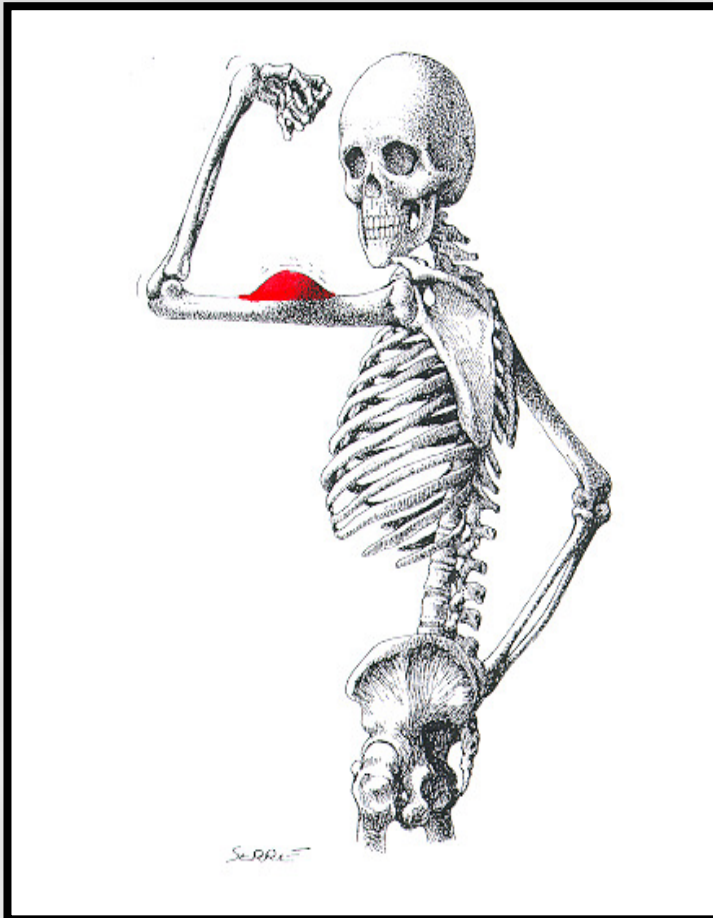
THE REFEREE



BMI

B-WEIGHT
:
B-HEIGHT (m²)

THE REFEREE



BODY- COMPOSITION

**FAT
SKELETON
MUSCLE**

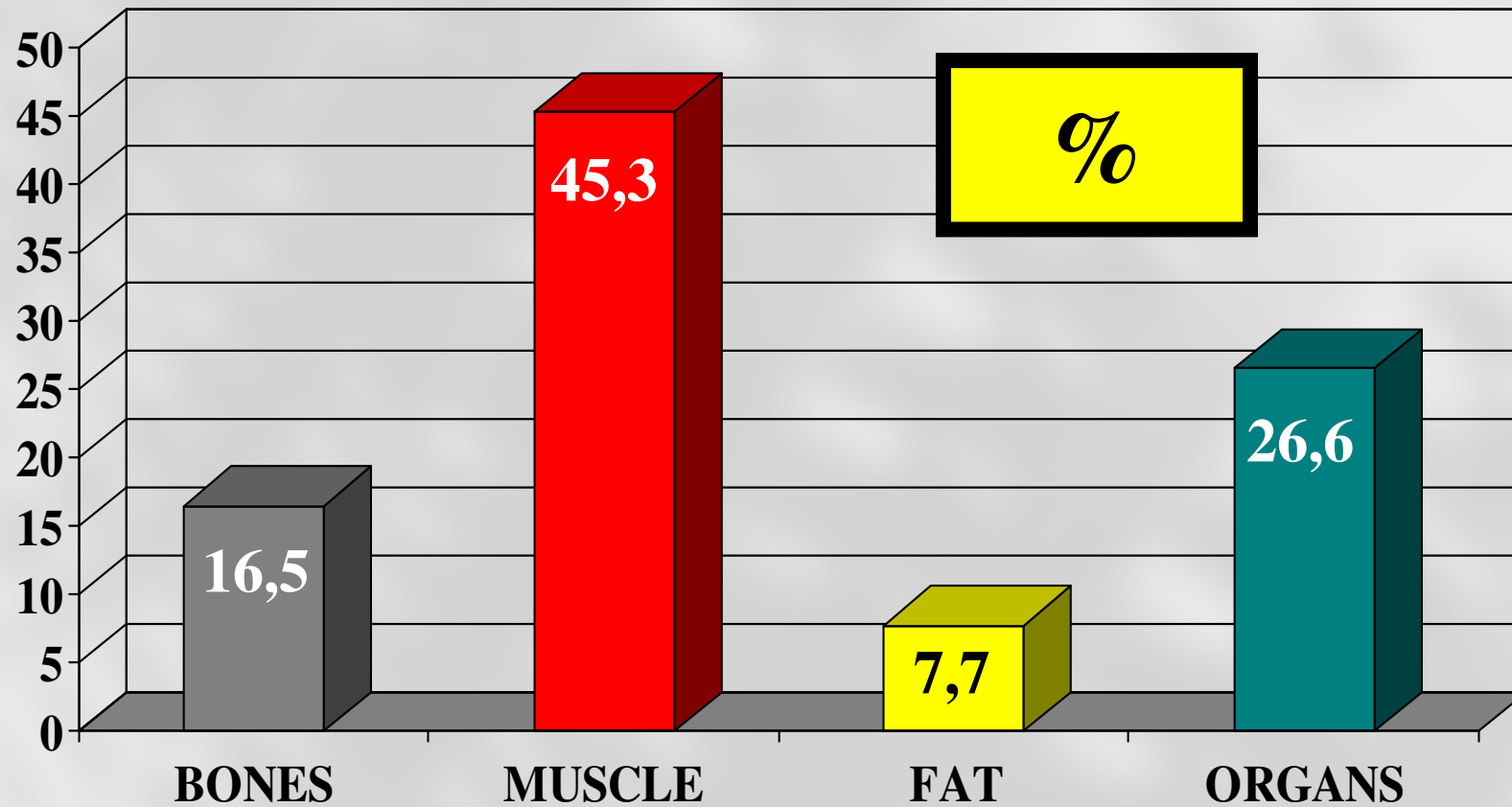
ANTHROPOMETRY



24 J, w
160 cm
65,12 kg

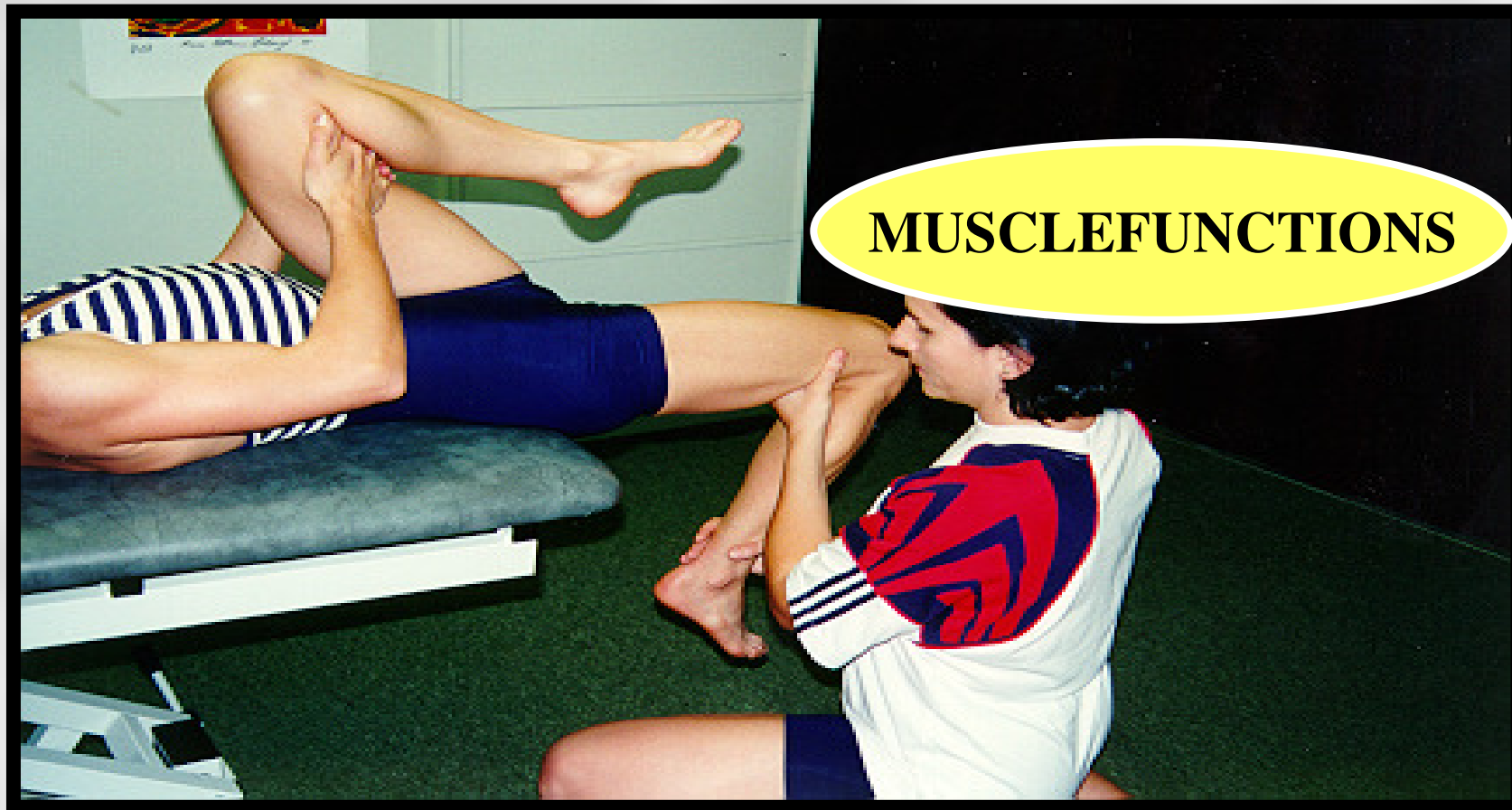
ANTHROPOMETRY

IMSB
Austria



THE REFEREE

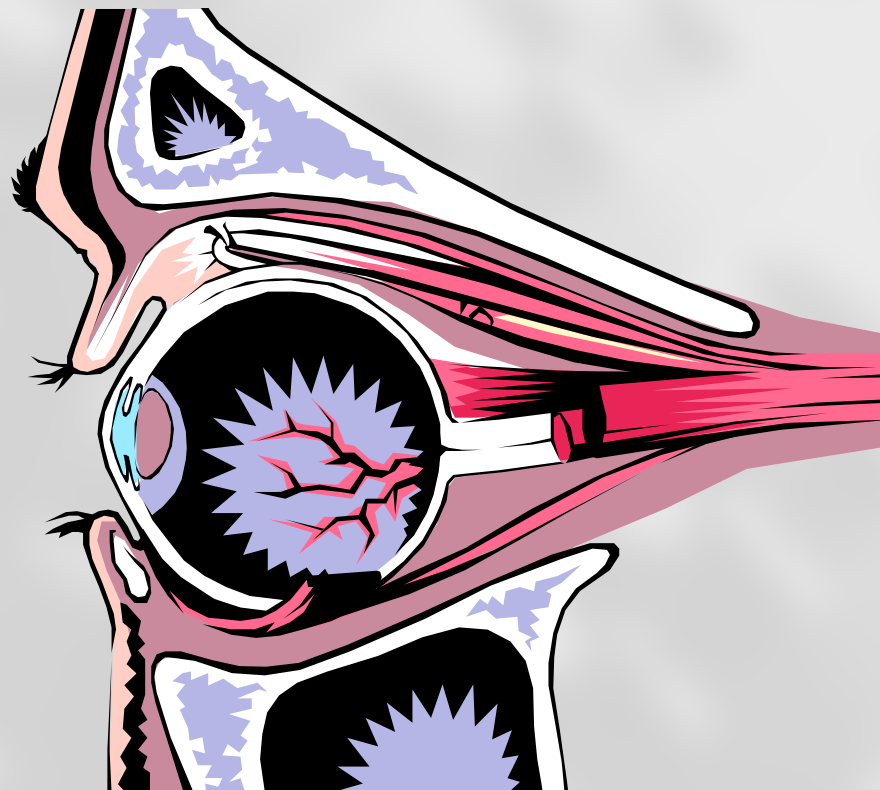
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THE REFEREE

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TOP VISION PROGRAMM



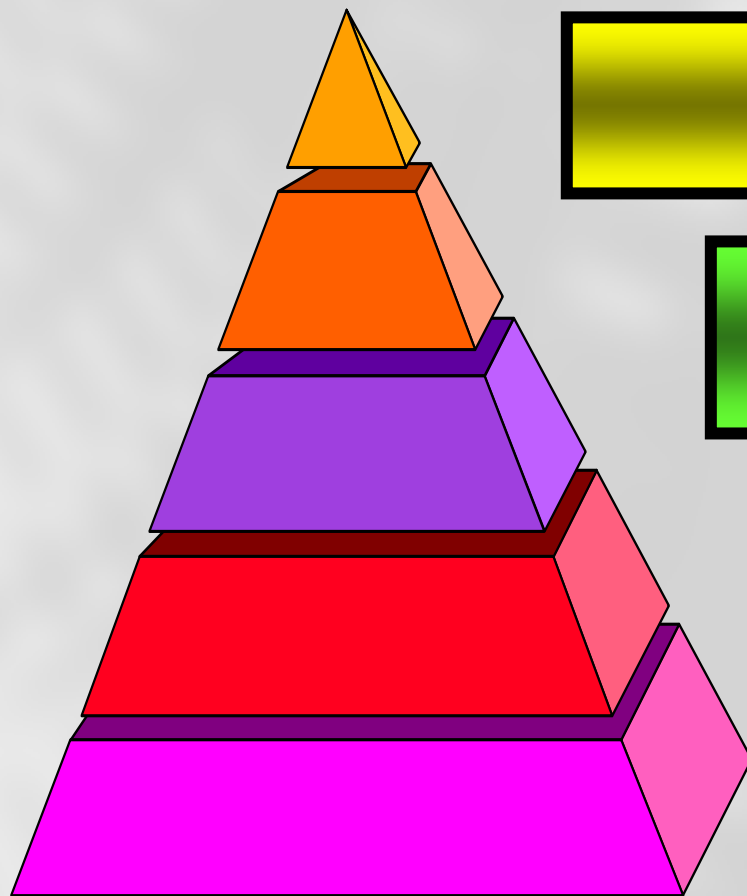
THE REFEREE

IMSB
Austria

TRAINING



THE REFEREE



CONTROLLING

TRAINING

DIAGNOSIS

ANALYSIS

THE REFEREE



PERFORMANCE DETERMINING FACTORS

THE REFEREE



ENDURENCE

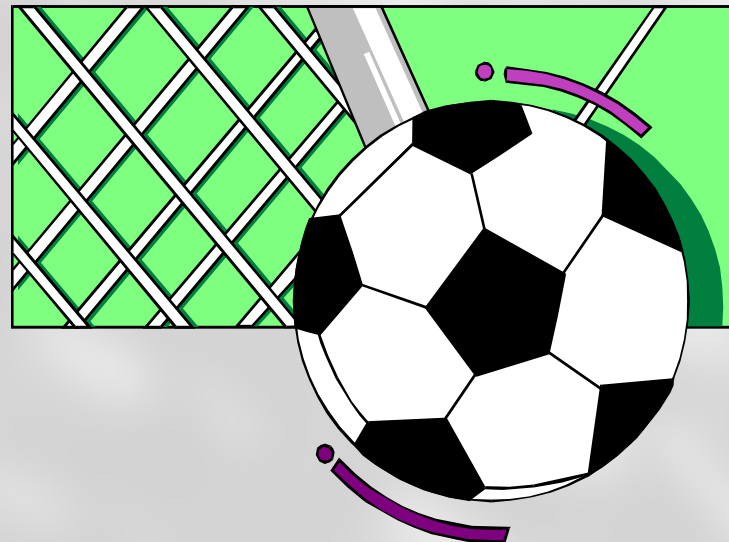
AEROBIC

ANAEROBIC

COORDINATION

REACTIVITY

SPEED

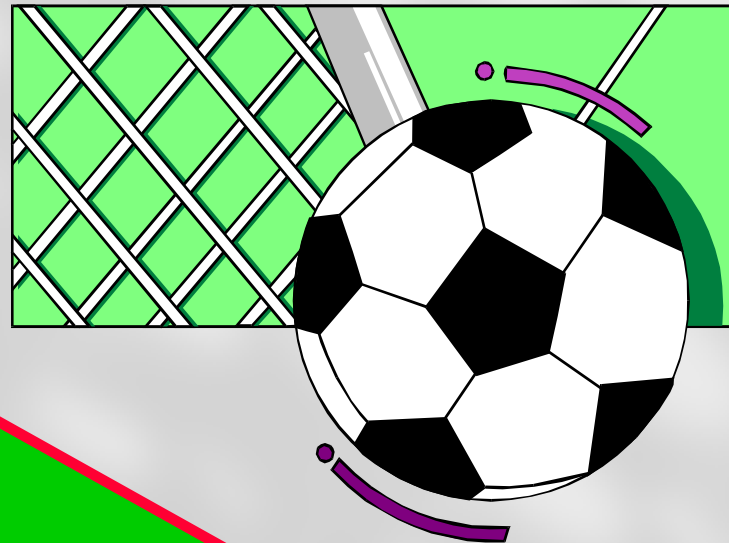


FLEXIBILITY

THE REFEREE



ATTENTION
SELF CONTROL
SELF CONFIDENCE
CONCENTRATION
STRESS RESISTANCE
etc.



THE REFEREE

IMSB
Austria



THE REFEREE



TESTRESULTS

**BASEMENT
FOR
BETTER
& EFFICIENT
TRAINING**

THE REFEREE



SPEED

COORDINATION

POWER

ENDURANCE

FLEXIBILITY

THE REFEREE



TESTS

LAB

FIELD



THE REFEREE



GENERAL TESTS

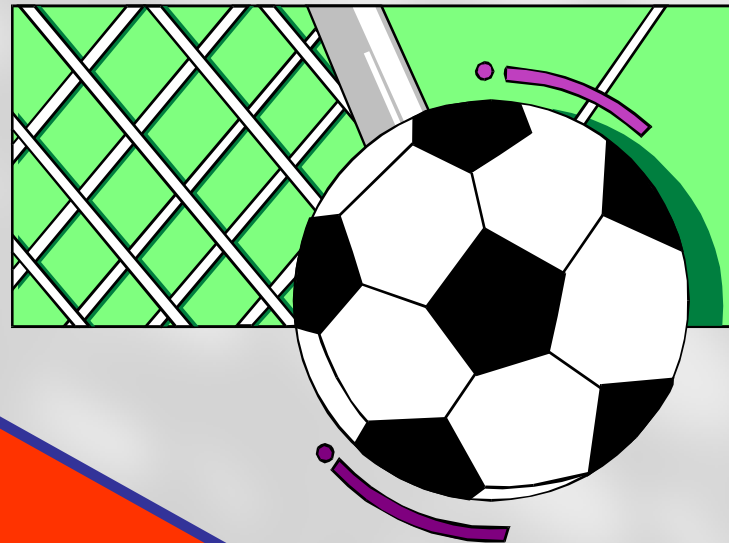
SEMI SPECIFIC TESTS

SPORT SPECIFIC TESTS

THE REFEREE



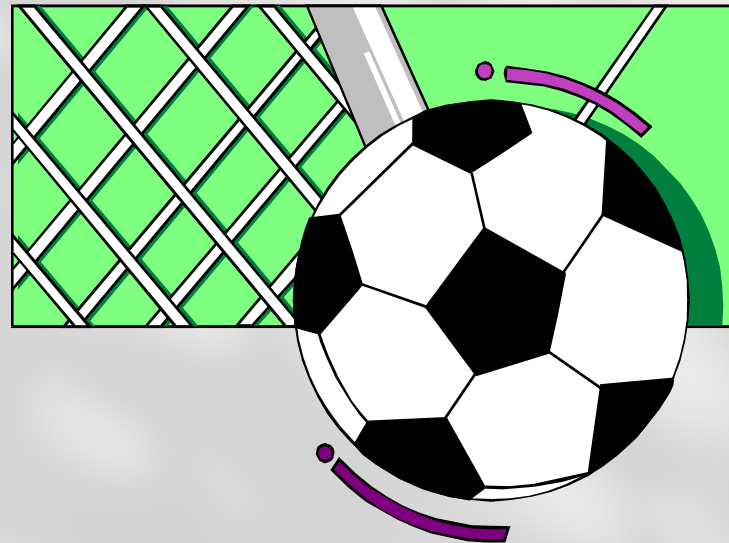
ENDURANCE



THE REFEREE



COOPER TEST



12 min RUN



DISTANCE

THE REFEREE



over 3.000

excellent

2.700 – 3.000

good

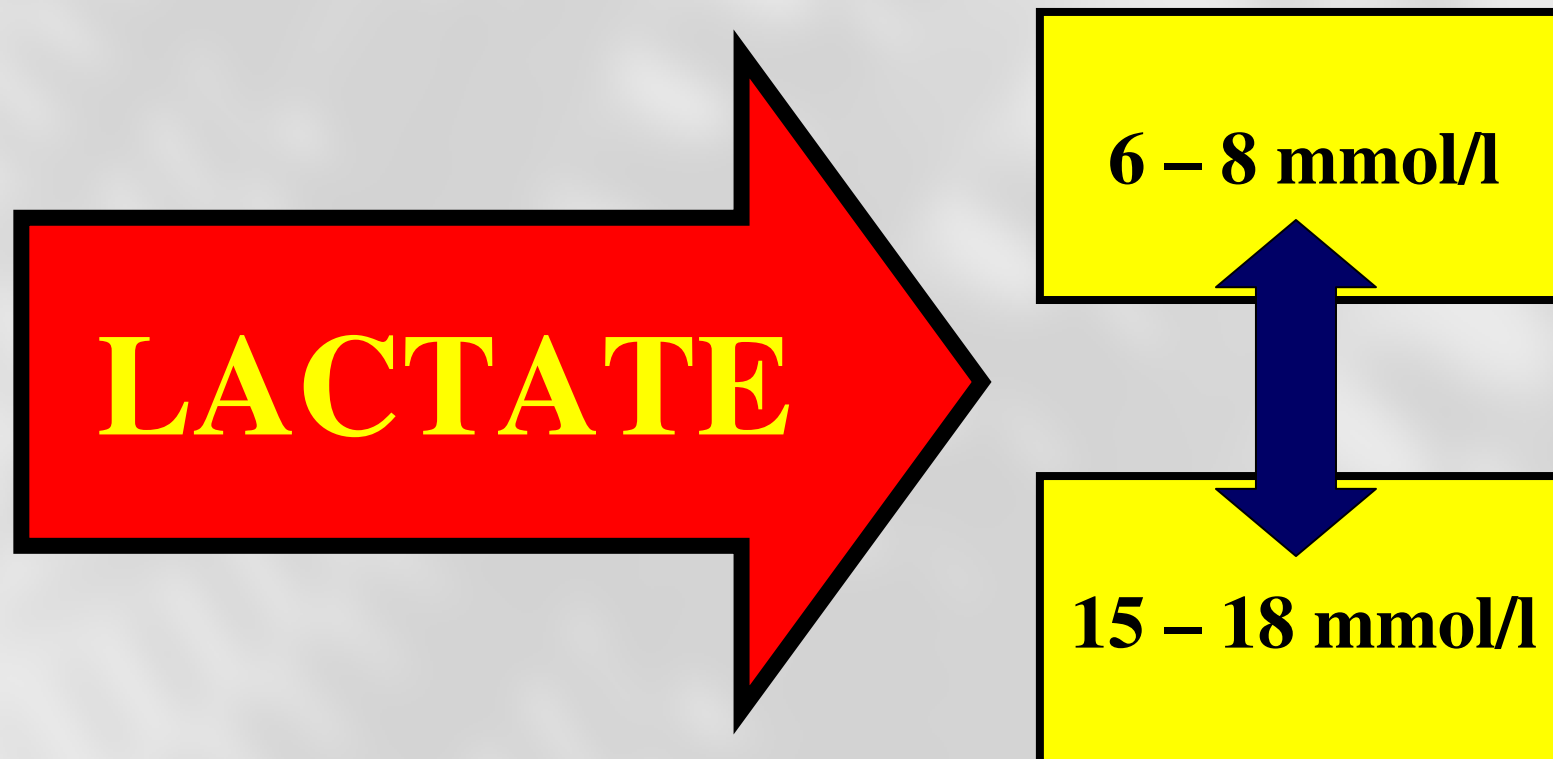
2.400 – 2.700

medium

under 2.400

poor

THE REFEREE

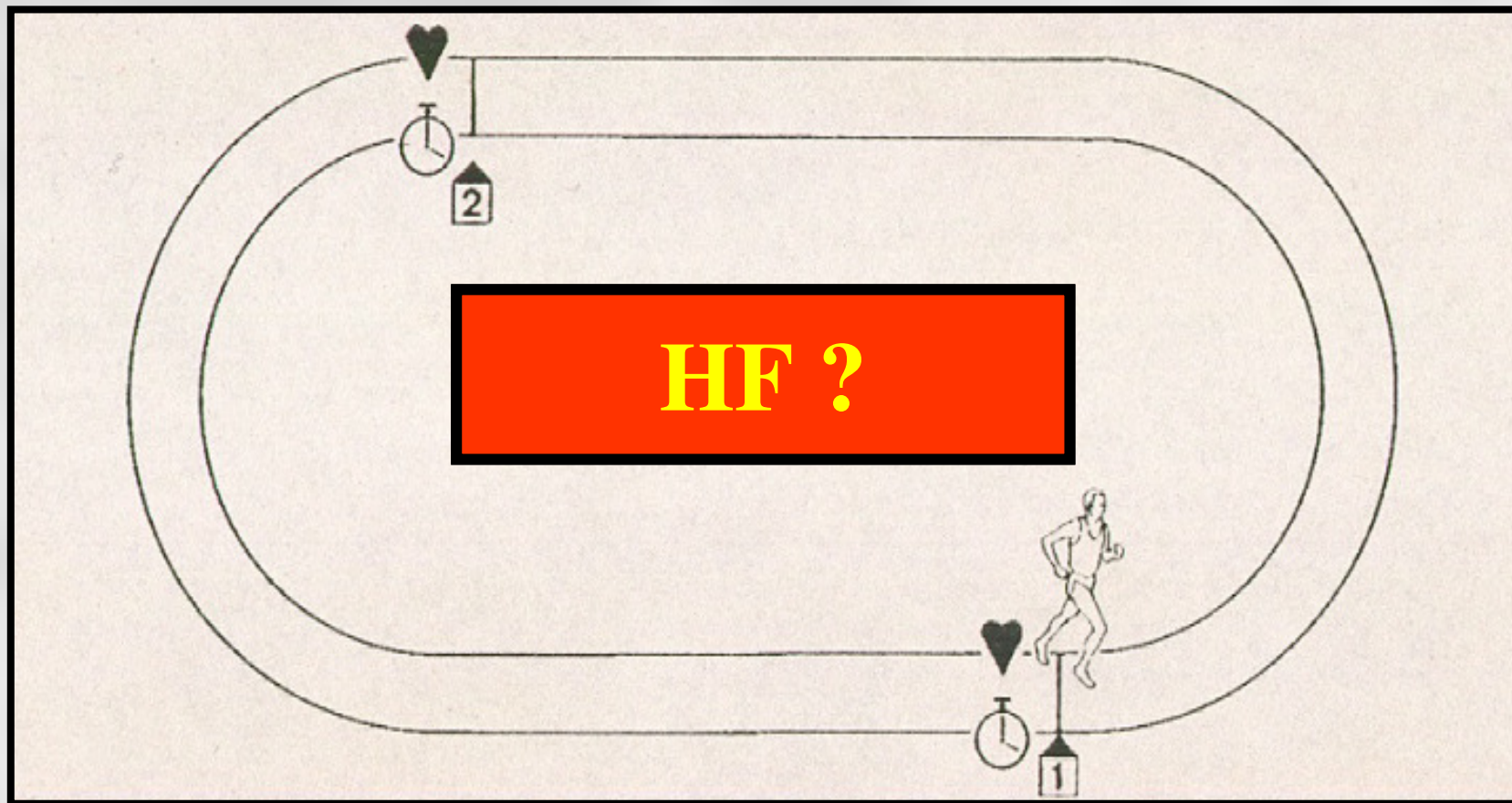


THE REFEREE

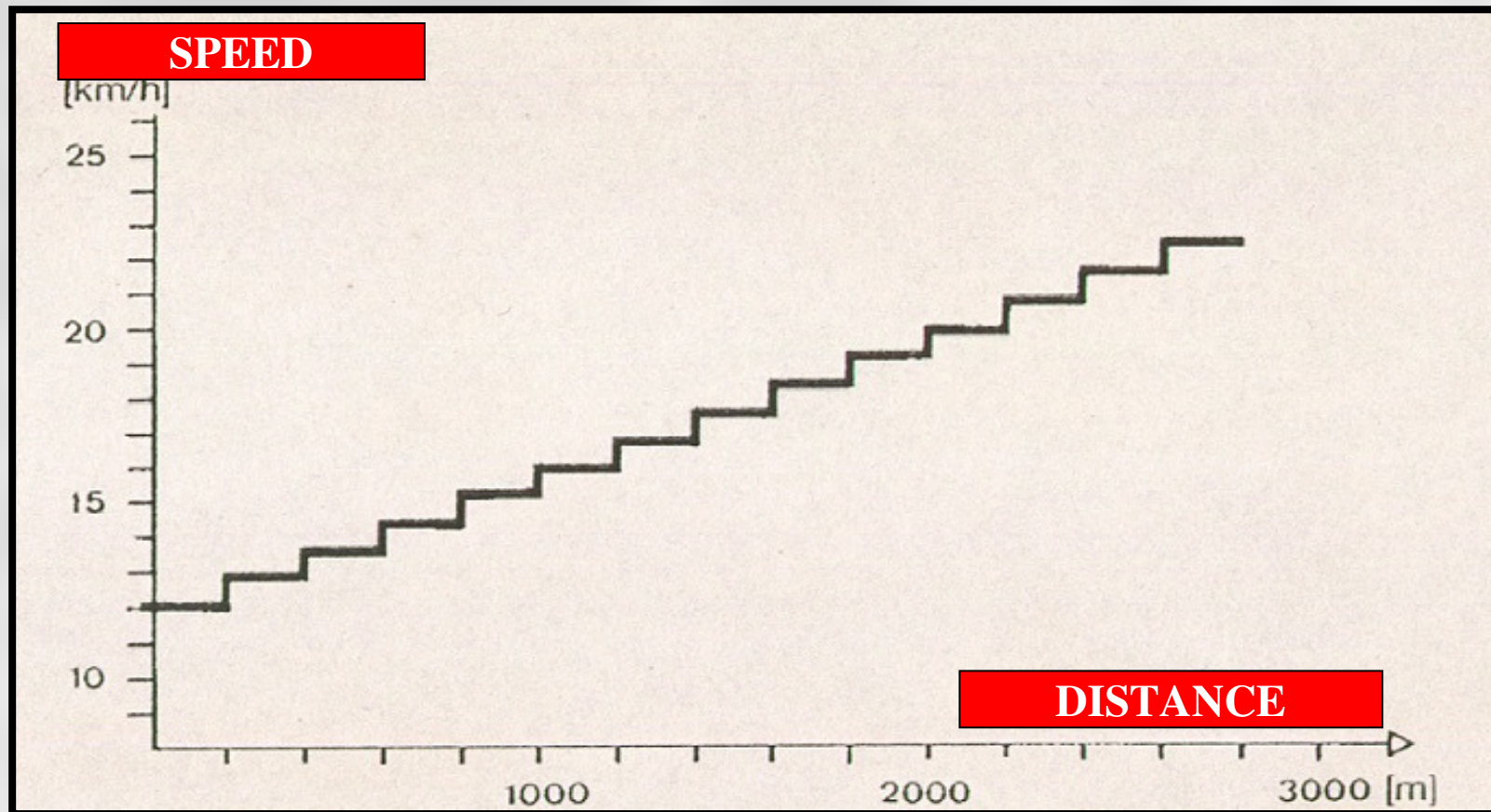


CONCONI TEST

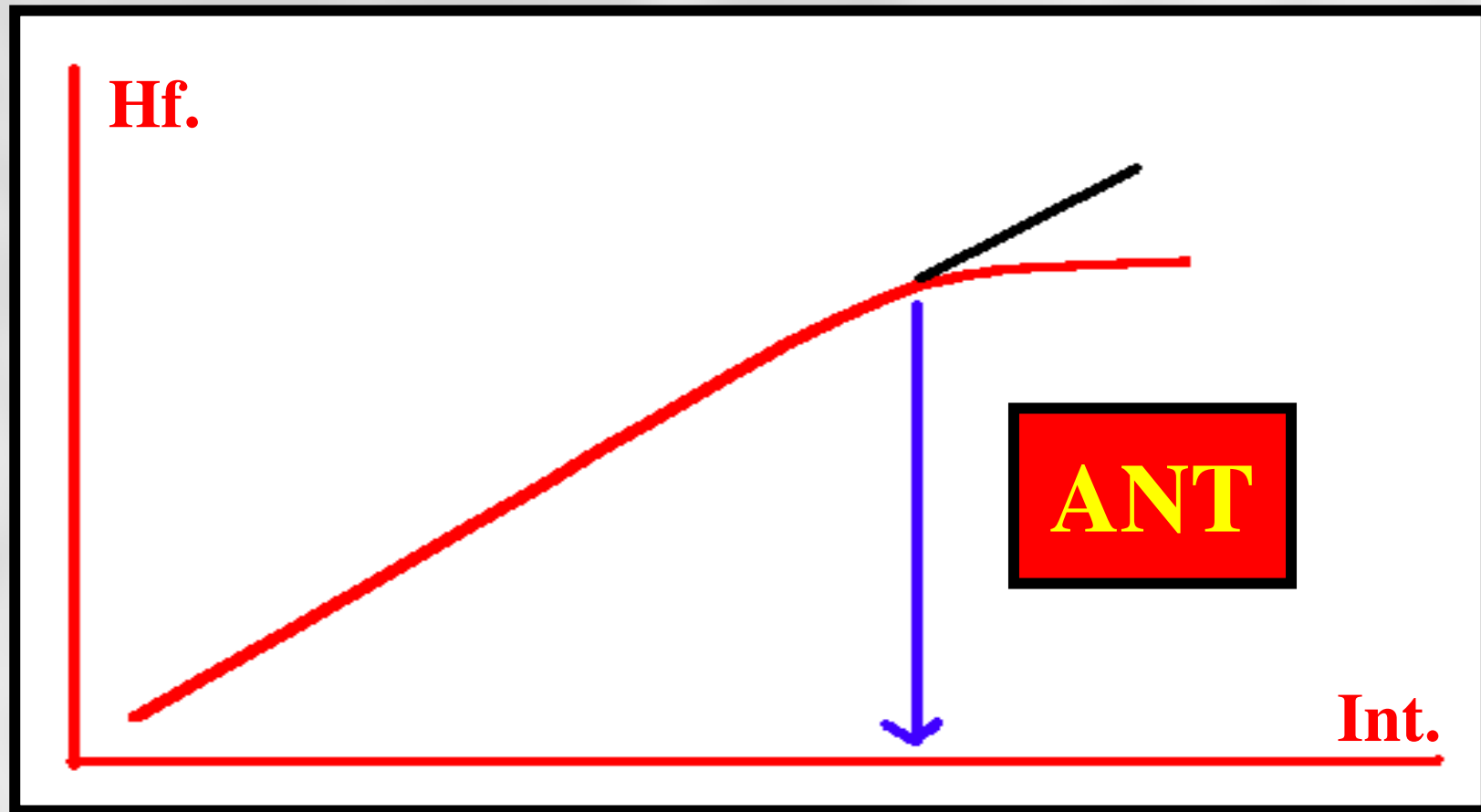
THE REFEREE



THE REFEREE



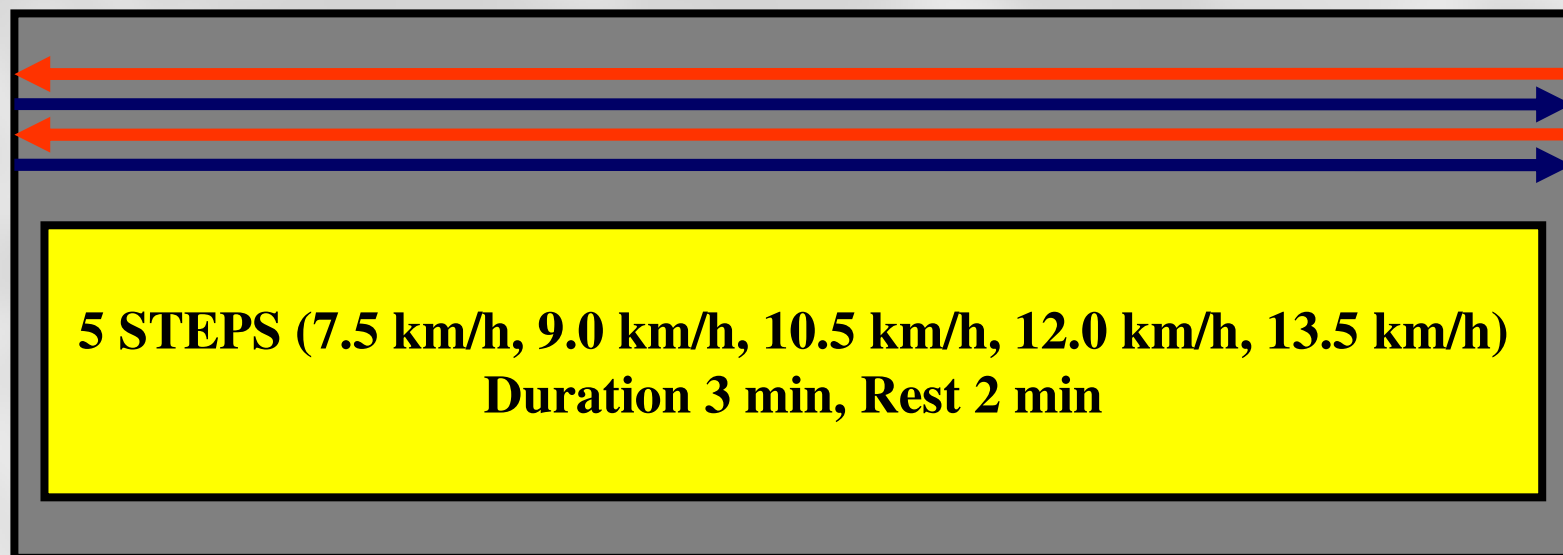
THE REFEREE



THE REFEREE



SHUTTLE-RUN



THE REFEREE

IMSB
Austria



LACTATE

THE REFEREE



TRESHHOLD

ANAEROBIC

AEROBIC

THE REFEREE



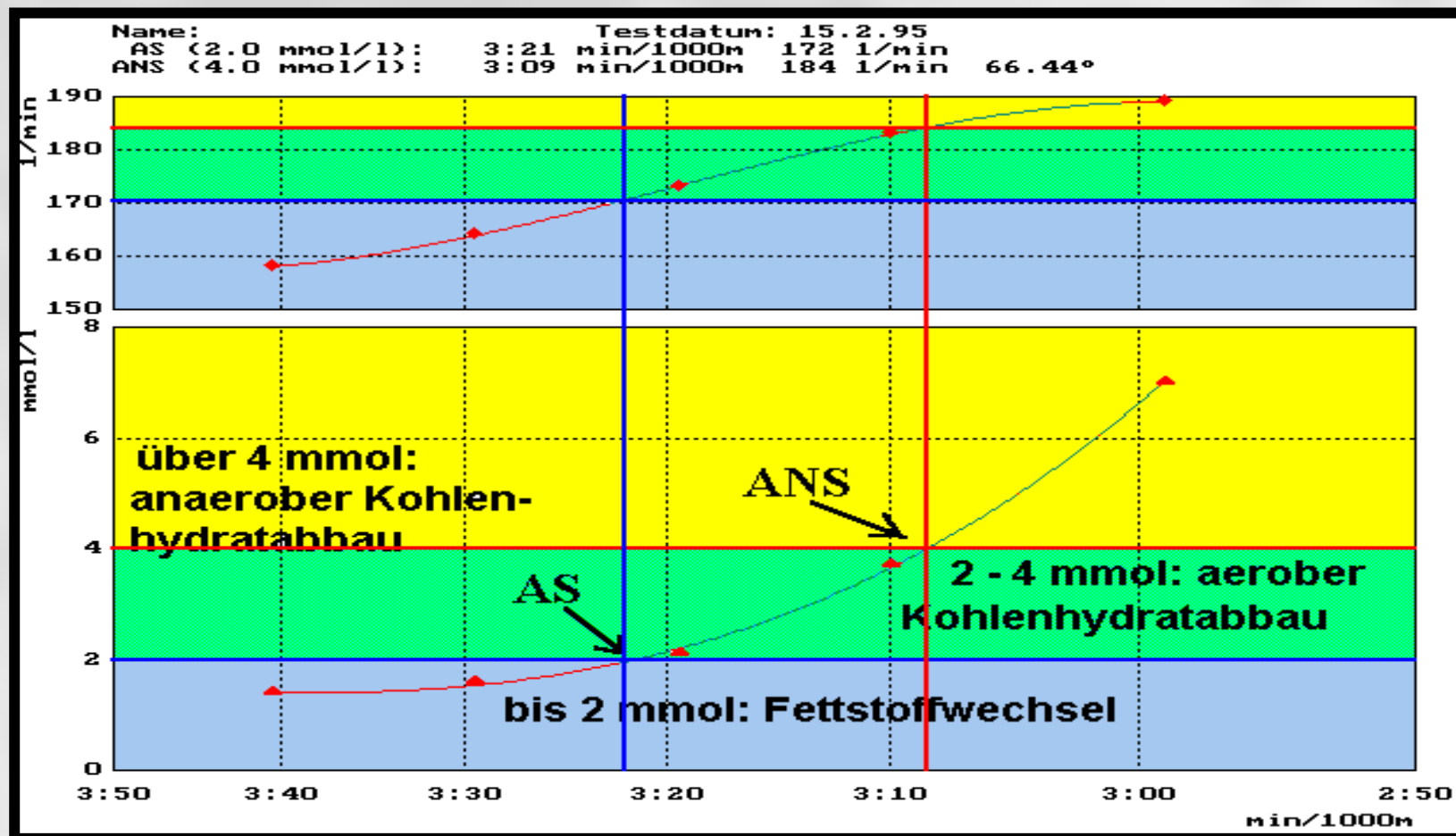
PHOSPHATE

ANAEROBIC GLYKOLYSIS

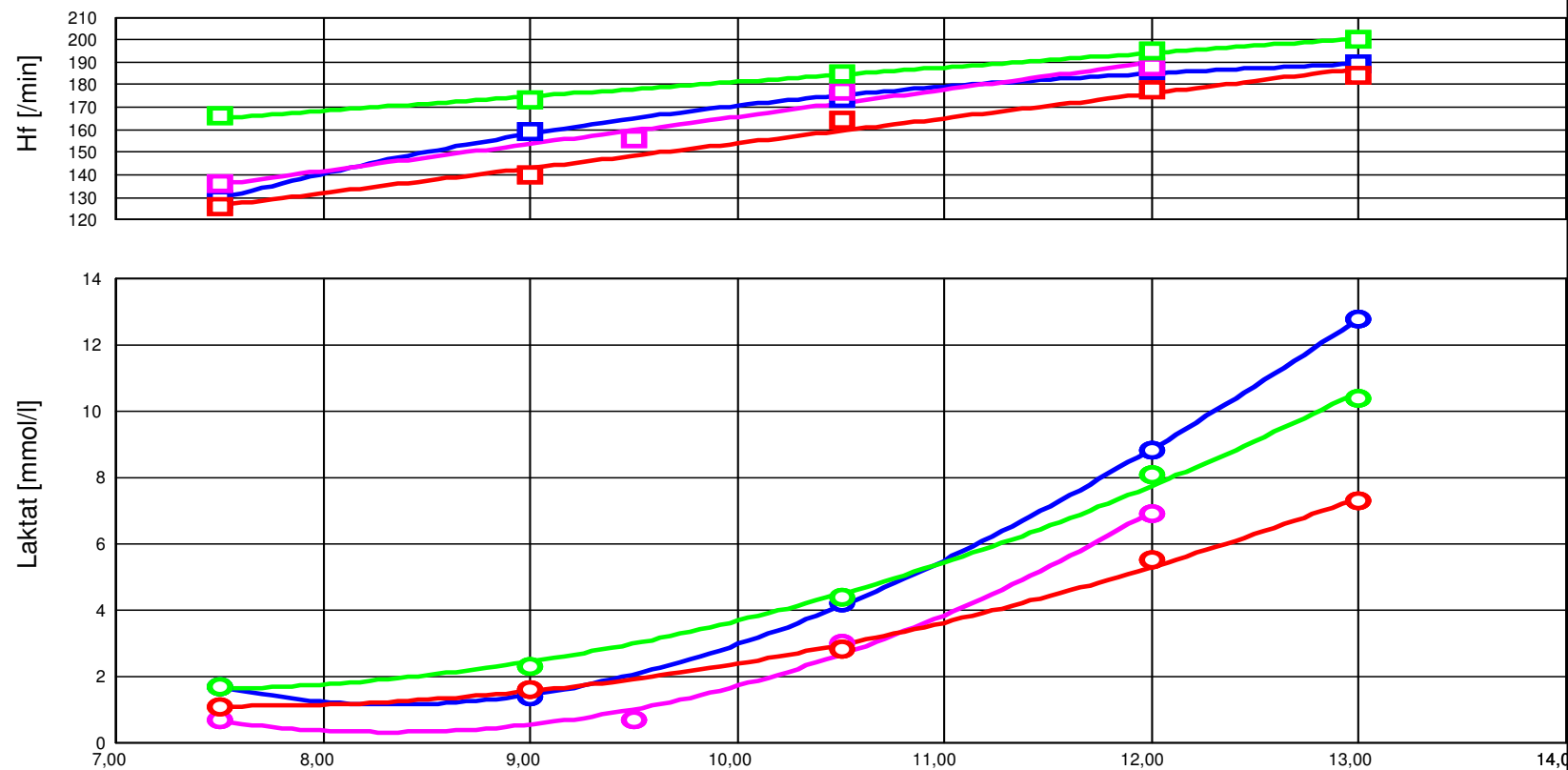
AEROBIC CARBOHYDRAT

AEROBIC FATTY ACIDS

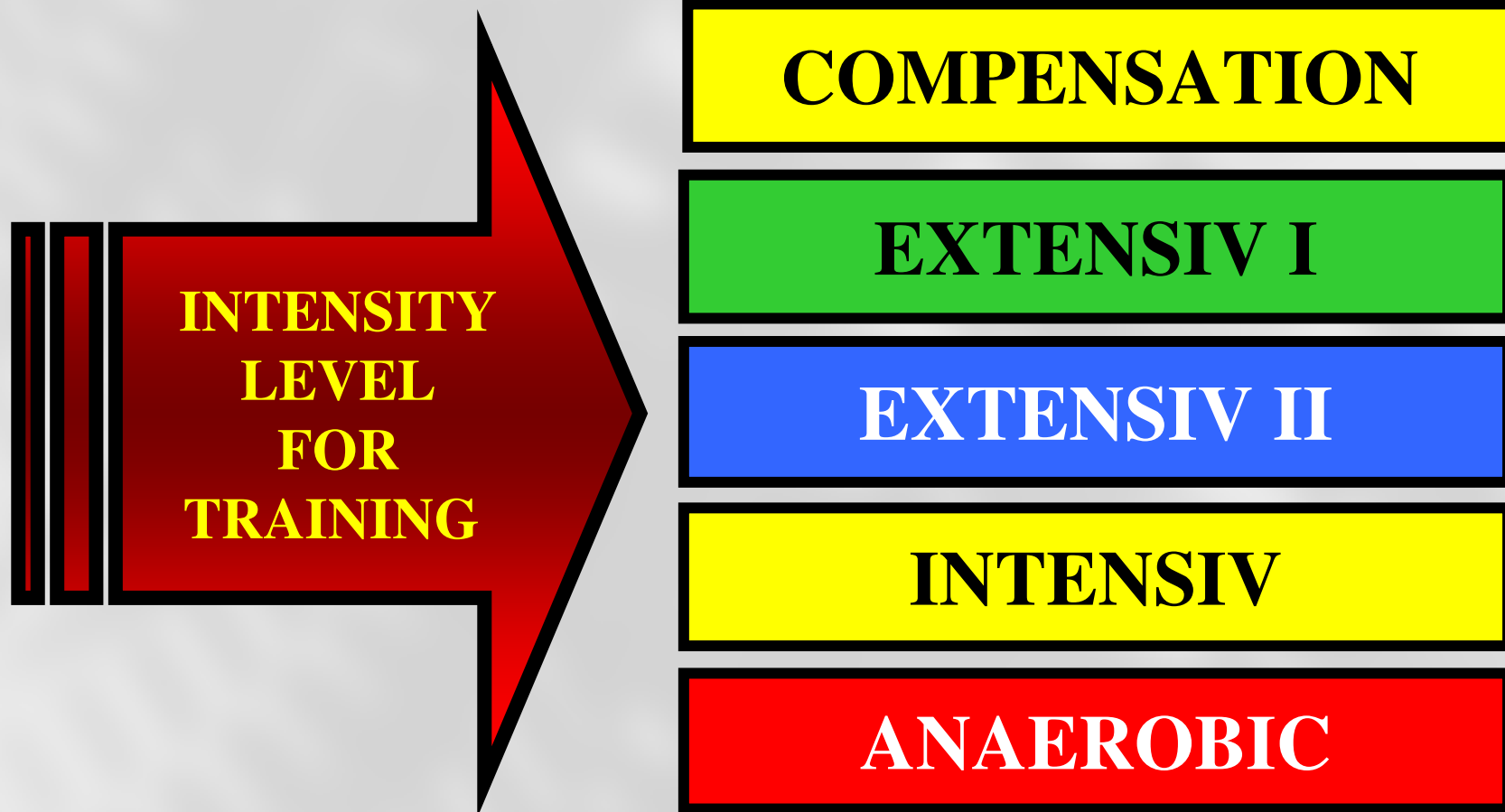
THE REFEREE



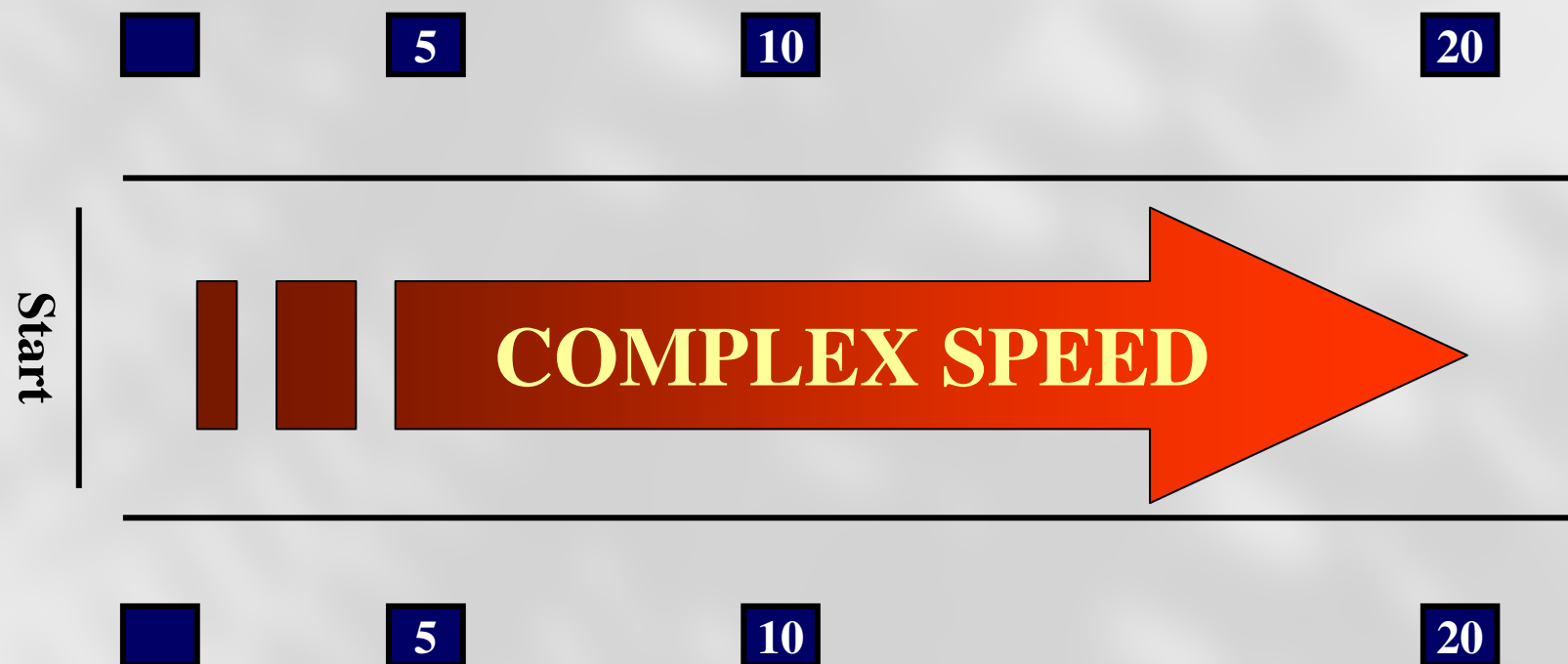
THE REFEREE



THE REFEREE



THE REFEREE



THE REFEREE

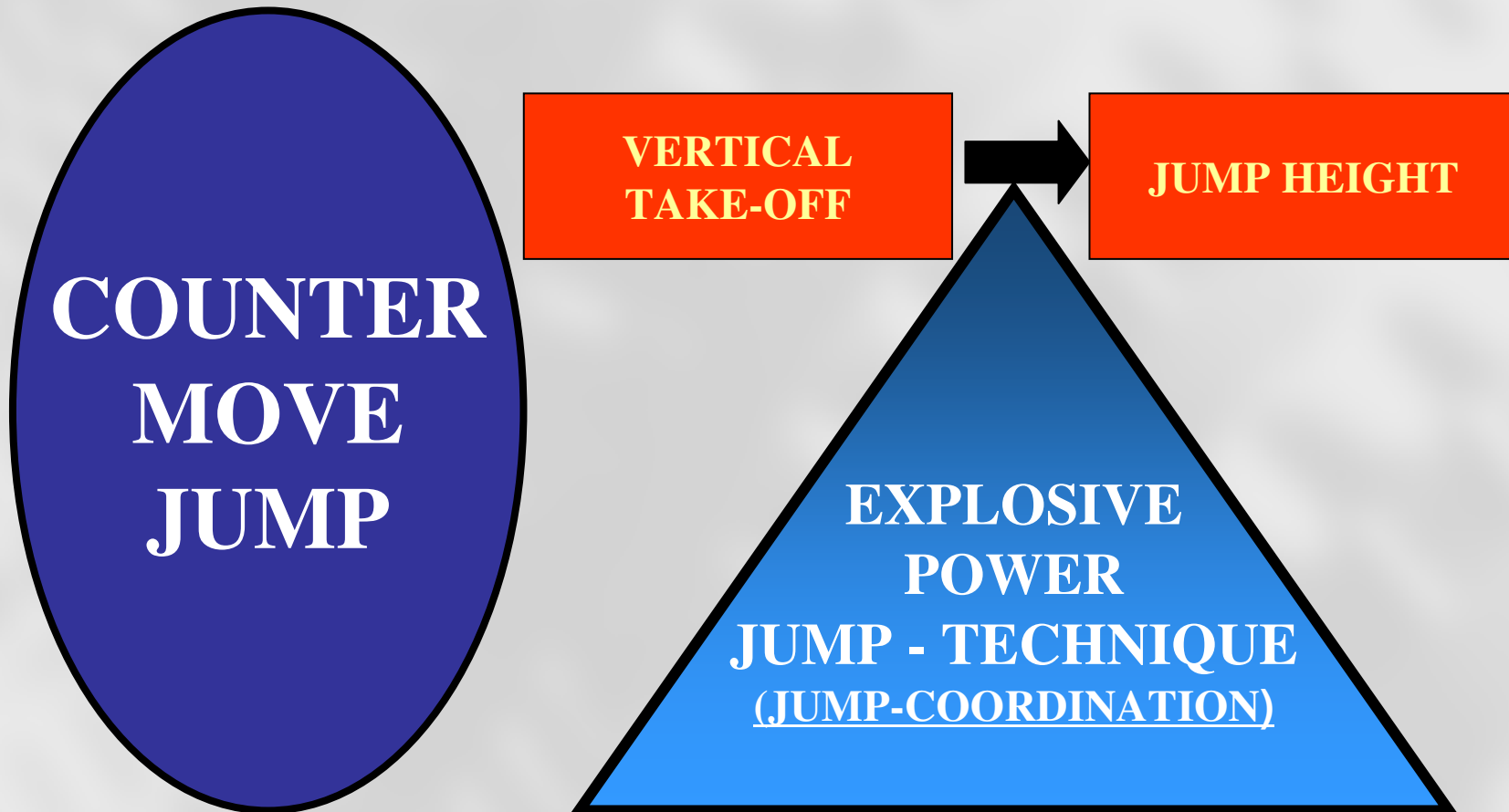


AJAX SPRINT

**SPEZIFIC
SPEED PERFORMANCE**



THE REFEREE



THE REFEREE



**AGILITY
TESTS**

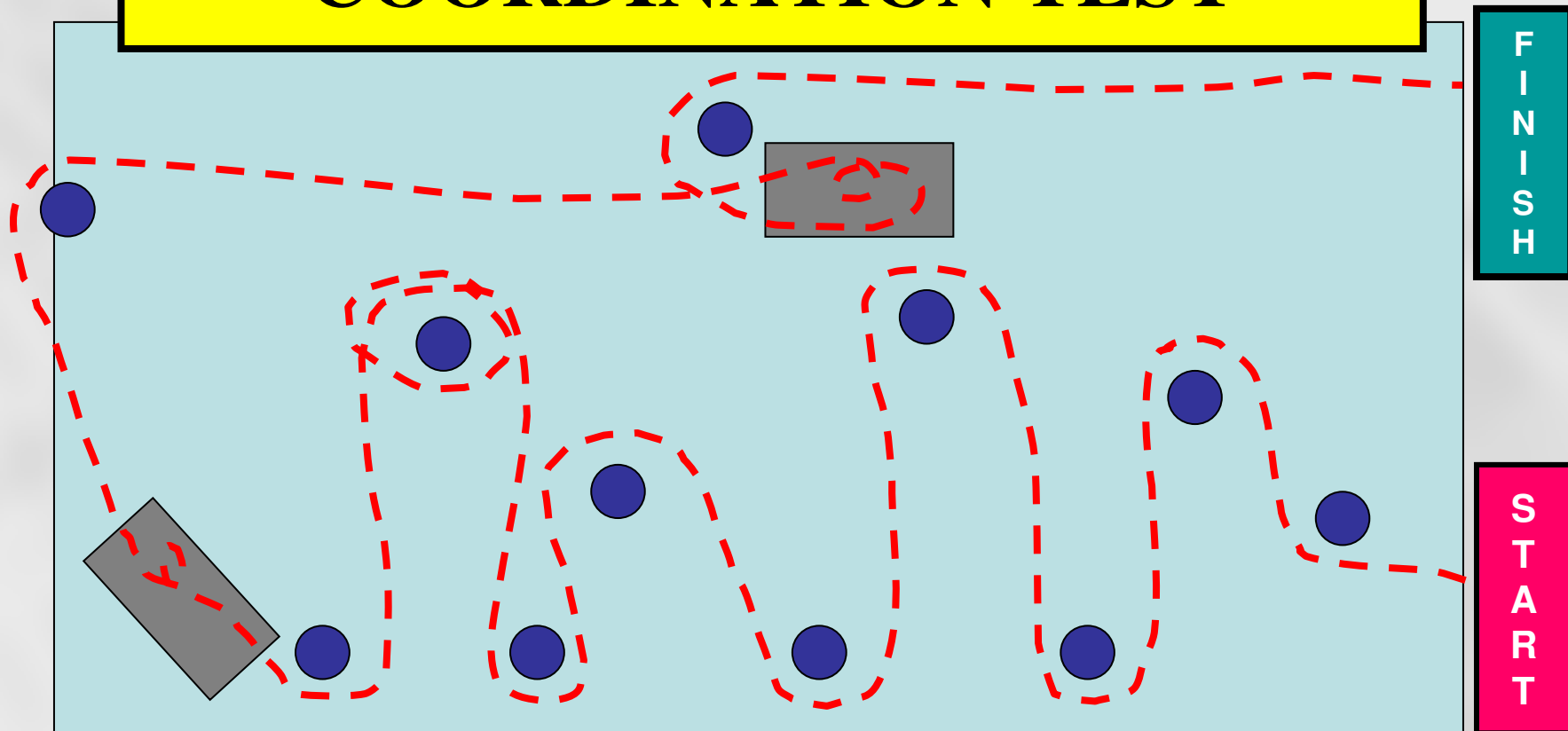
**REACTION
TESTS**

**COORDINATION
TESTS**

THE REFEREE



COORDINATION TEST



THE REFEREE

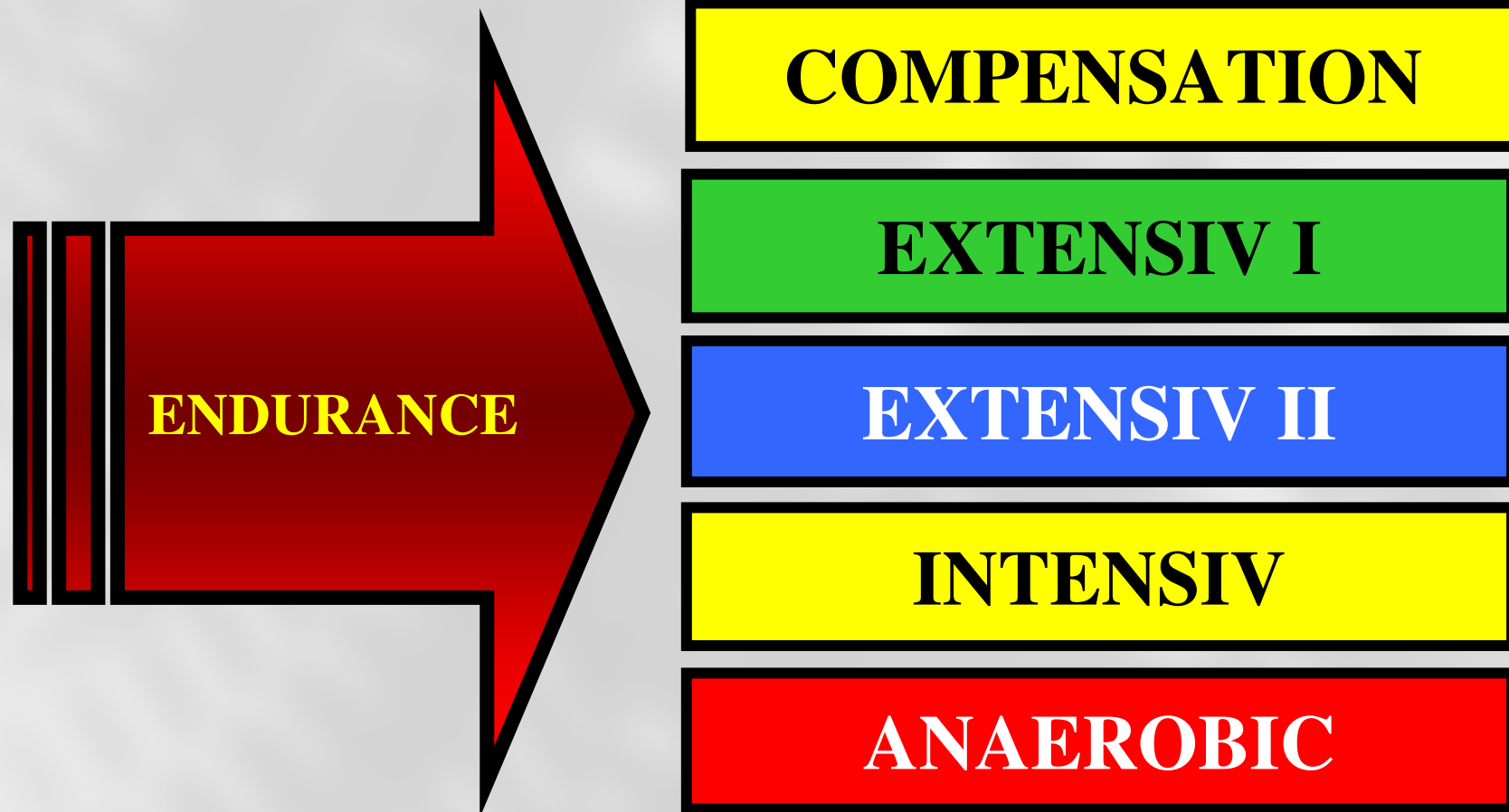


WHEN ?

WHAT ?

HOW ?

THE REFEREE



ENDURANCE



COMPENSATION

RECOVERY COMPENSATION WARMING UP & COOLING DOWN

ENDURANCE



EXTENSIVE

EXTENSIVE I (AD-1)

EXTENSIVE II (AD-2)

ENDURANCE



EXTENSIVE

**BASIC ENDURANCE
FAT or CH METABOLISM
ECONOMIZING**

ENDURANCE



INTENSIVE

ENDURANCE CH - METABOLISM TRESHHOLD TRAINING

ENDURANCE



ANAEROBIC

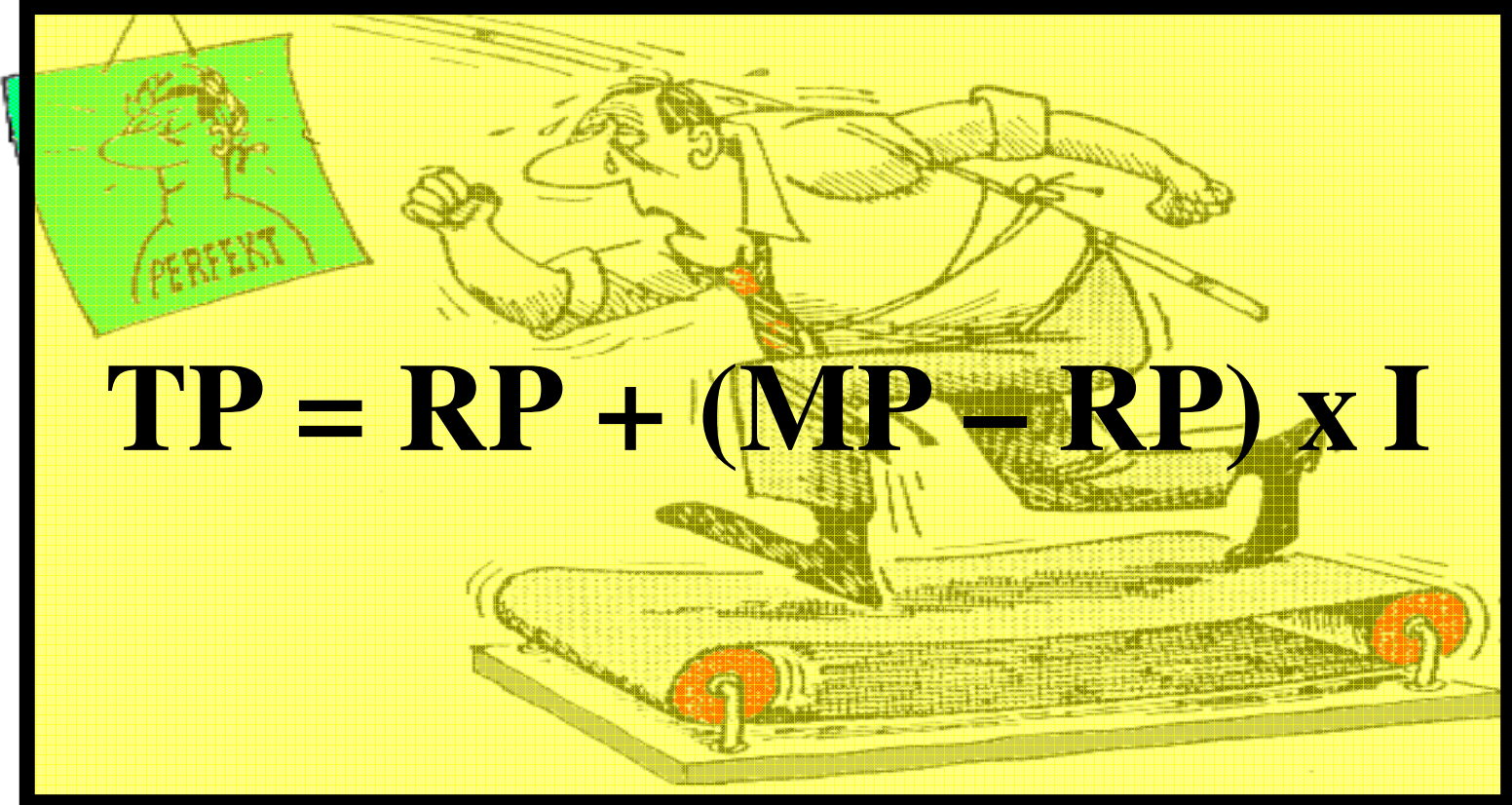
LACTATE TOLERANCE
CH - METABOLISM
TRESHHOLD TRAINING

ENDURANCE



I N T E N S I T Y	COMPENS.	F	A 0	50-60%
	EXTENSIV I	F	A 1	60-70%
	EXTENSIV II	F/CH	A 2	70-80%
	INTENSIVE	CH	A 3	80-90%
	ANAEROBIC	CH	A 4	90-100%

ENDURANCE

A cartoon illustration of a man running on a treadmill. He is looking towards a green sign on the wall that says 'PERFECT'. The treadmill has two orange wheels at the front and back. The entire scene is set against a yellow background.
$$TP = RP + (MP - RP) \times I$$

ENDURANCE



BASIC ENDURANCE

$RP = 50, MP = 190, TI = 1$

$TP = 134/\text{min}$

ENDURANCE



D U R A T I O N	COMPENS.	F	A 0	15 - 30 min
	EXTENSIV I	F	A 1	90 - 120 min
	EXTENSIV II	F/CH	A 2	60 - 90 min
	INTENSIVE	CH	A 3	30 - 60 min
	ANAEROBIC	CH	A 4	15 - 30 min

ENDURANCE



METHODES

NON STOP METHODE

INTERVAL METHODE

REPETITION METHODE

ENDURANCE



NON STOP METHODE

CONSTANT SPEED

CHANGING SPEED

FARTLEK

ENDURANCE



INTERVAL METHODE

EXTENSIVE INTERVAL

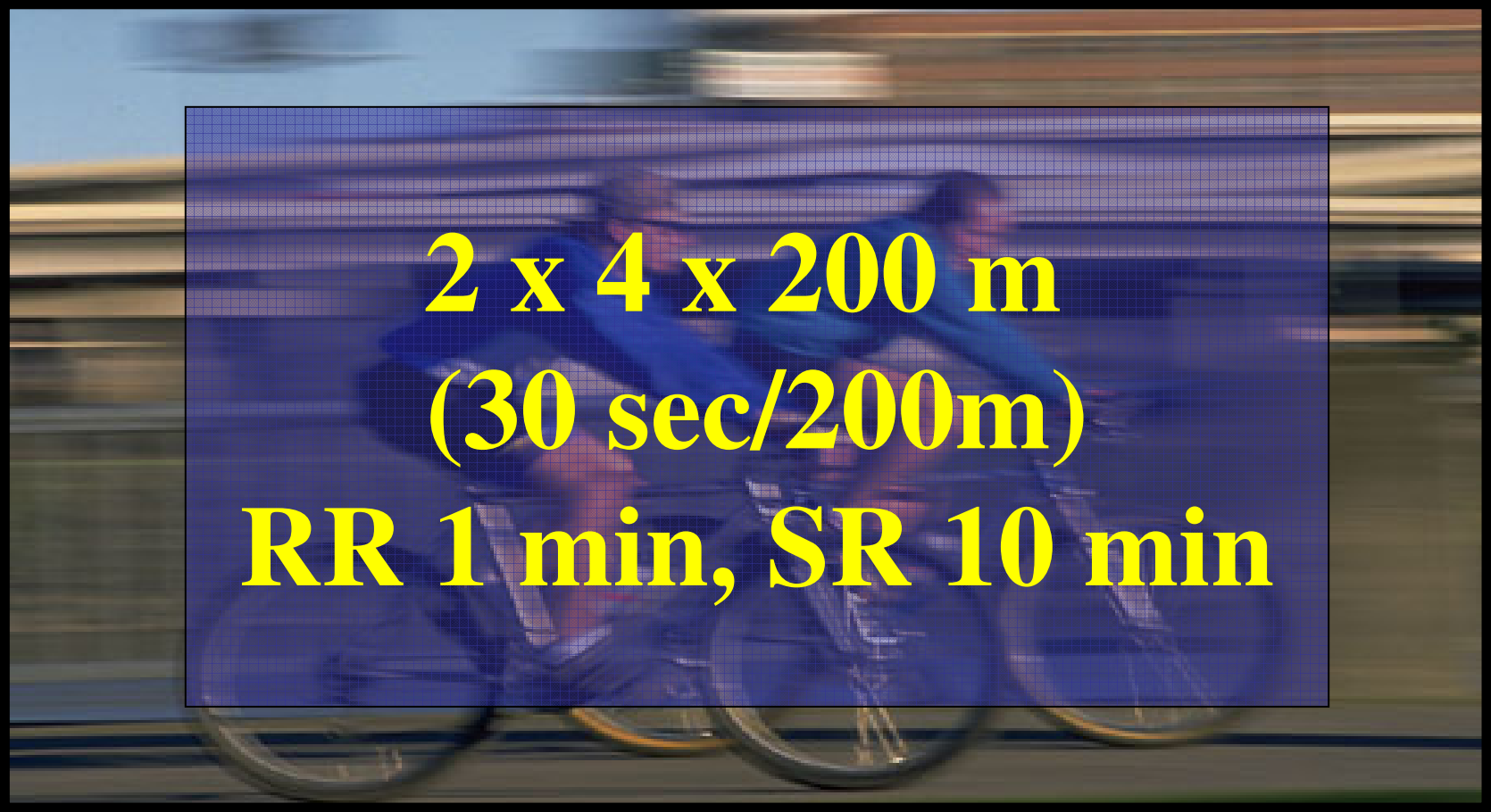
INTENSIVE INTERVAL

ENDURANCE

A background image showing a cyclist in motion, blurred to indicate speed. The cyclist is wearing a blue long-sleeved shirt and dark shorts, riding a road bike. The background is a blurred landscape with green fields and a blue sky.

10 x 400 m
(120 sec/400m)
REST: 2 min

ENDURANCE

A background image showing two cyclists in blue jerseys riding on a track, with a blurred background suggesting motion. A semi-transparent blue grid overlay is positioned in the center of the image.

2 x 4 x 200 m
(30 sec/200m)
RR 1 min, SR 10 min

ENDURANCE



FREQUENCY

3 - 7 TS / WE

ENDURANCE



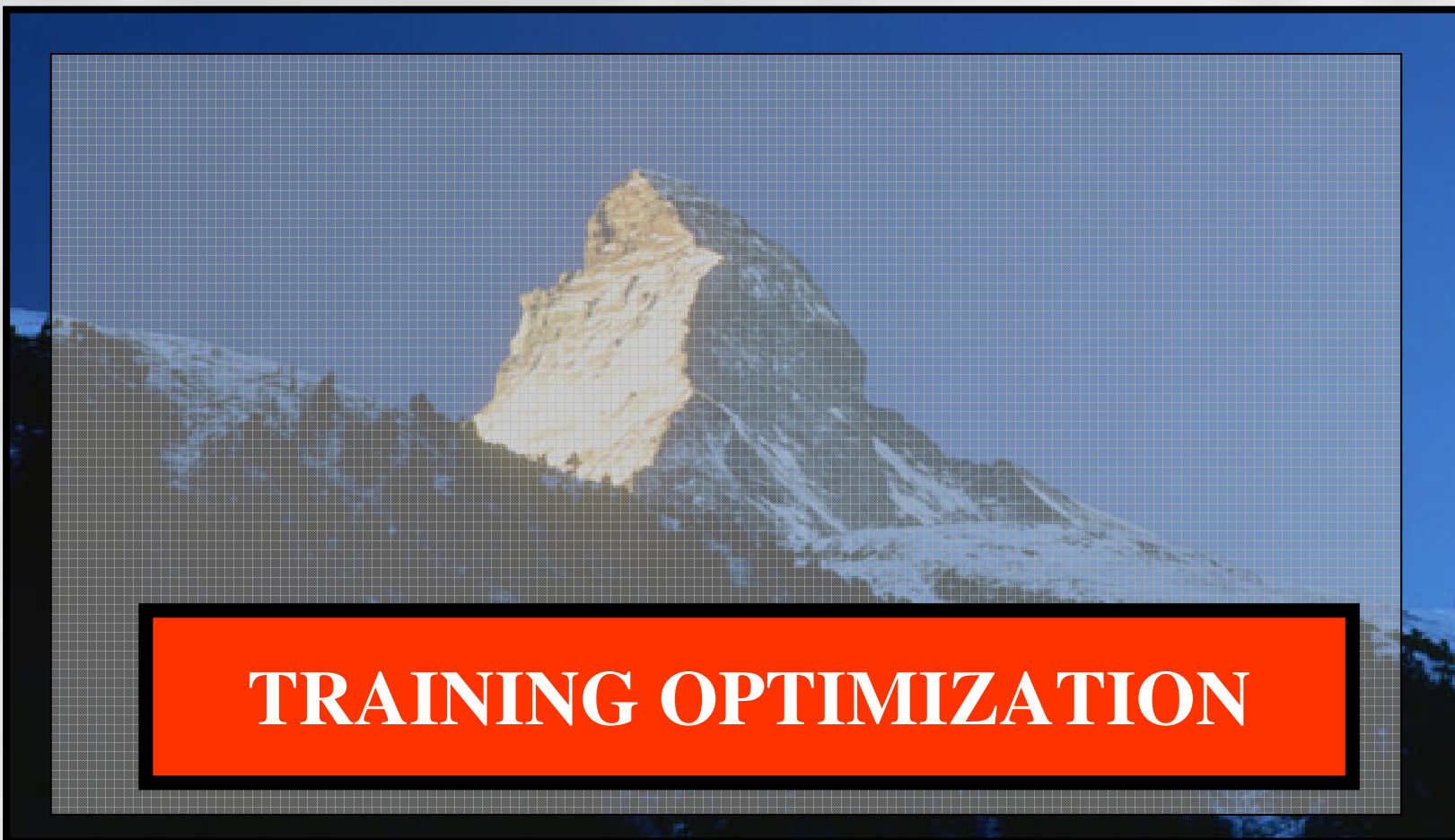
SWIMMING

RUNNING

WALKING

CYCLING

THE REFEREE



TRAINING OPTIMIZATION

THE REFEREE



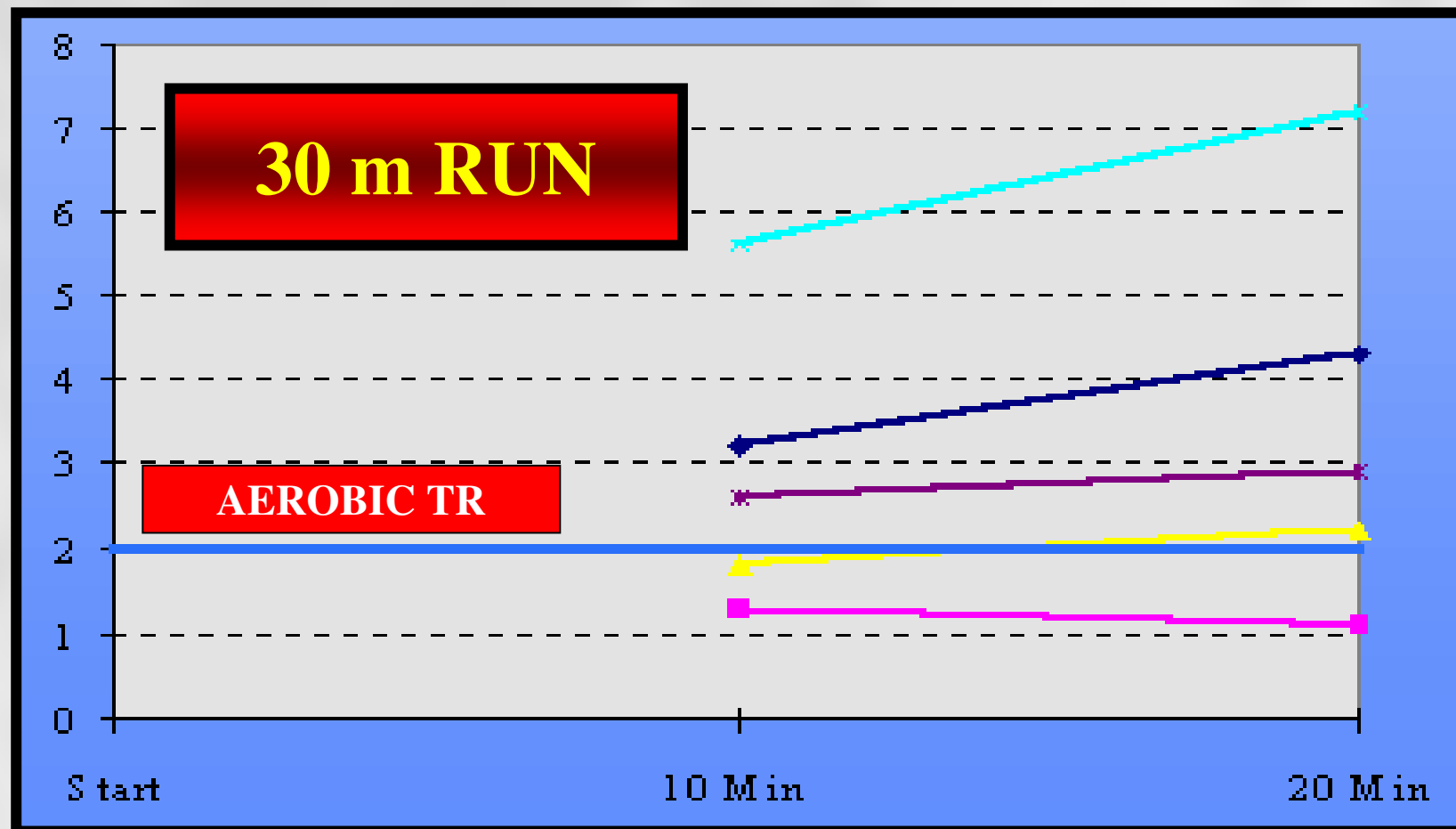
EFFECT

EFFICIENCY

ADAPTATION



ENDURANCE



THE REFEREE



RECOVERY



REGENERATION



RECOVERY

ACTIVE

PASSIVE

REGENERATION



ACTIVE
RECOVERY
IS AN **ESSENTIAL**
PART OF A
TRAININGSESSION

REGENERATION

IMSB
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**SLOW RUN
GYMNASTIC
STRETCHING**



REGENERATION



LOW INTENSITY
HF app. 100 – 120 b/min

STRETCHING

app. 10 - 30 min

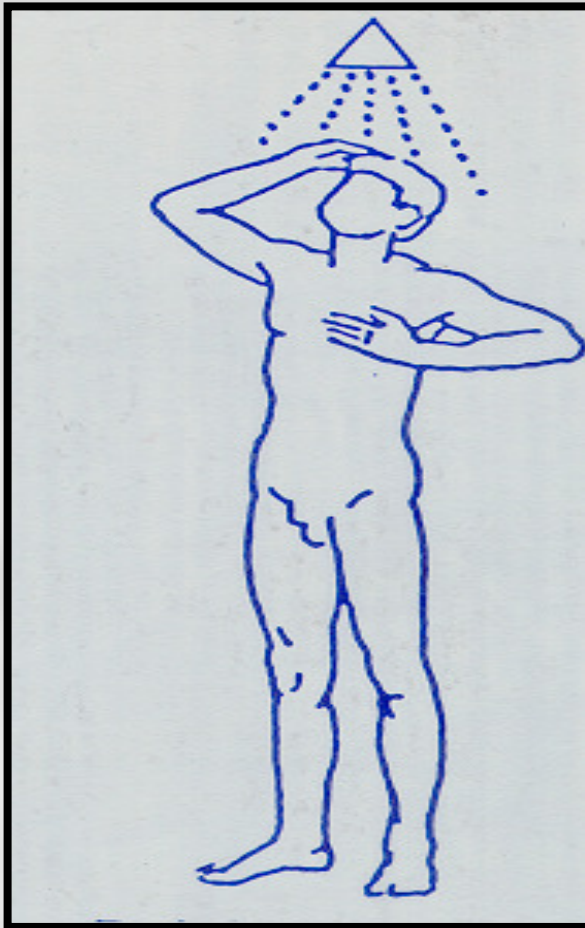
REGENERATION

IMSB
Austria



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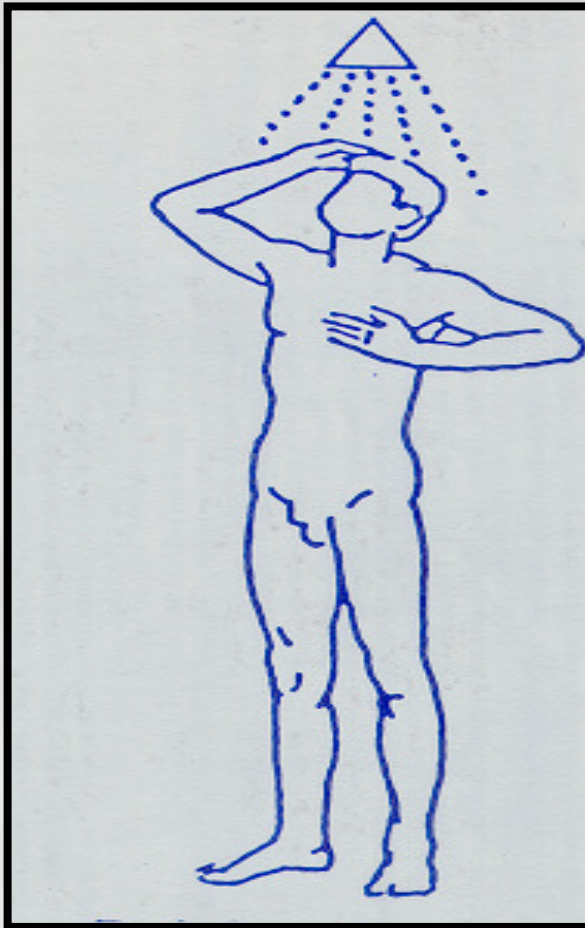
REGENERATION



SHOWER

5-10 min
warm

REGENERATION



SHOWER

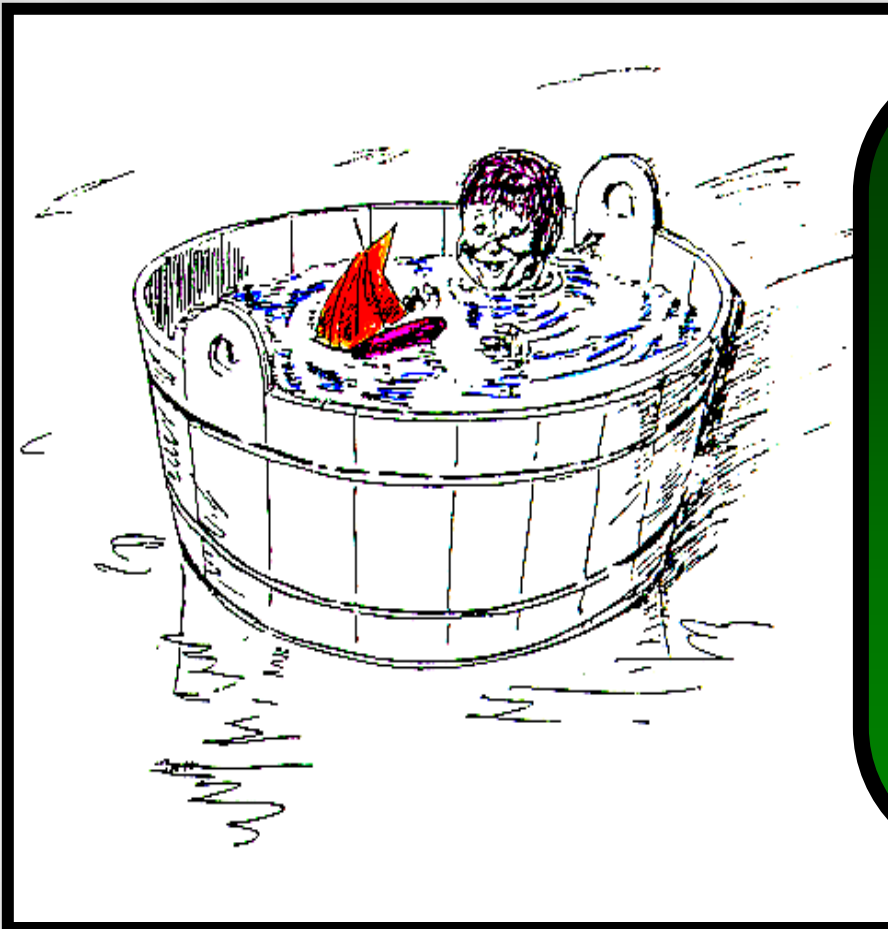
1-2 min warm

10-30 sec cold

3-4 x

REGENERATION

IMSB
Austria



BATH

15-20 min
38-39°

REGENERATION

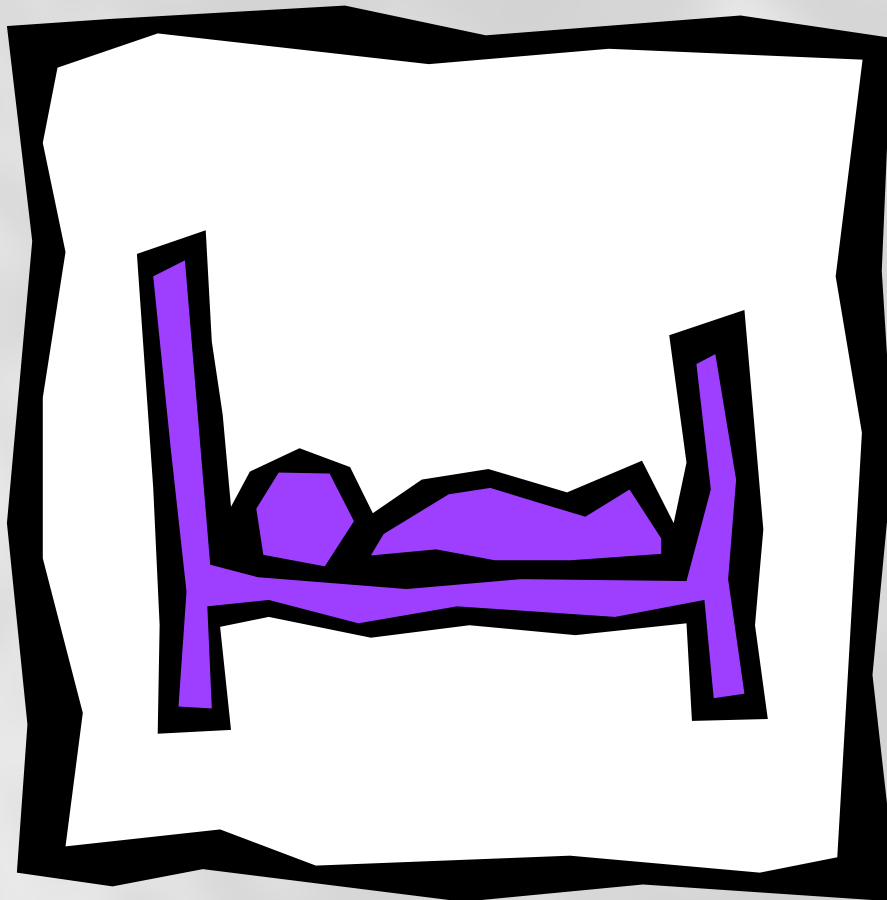


SAUNA

**< 70°
dry**

**leave when you
start sweating**

REGENERATION



SLEEP

POWER NAP

REGENERATION

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REGENERATION

A background image for the 'RELAXING METHODS' section. It shows a tropical beach scene at dusk or dawn, with palm trees silhouetted against a blue and orange sky. A hammock is strung between two palm trees, and the ocean is visible in the foreground. The entire image is overlaid with a dark blue grid pattern.

RELAXING METHODS

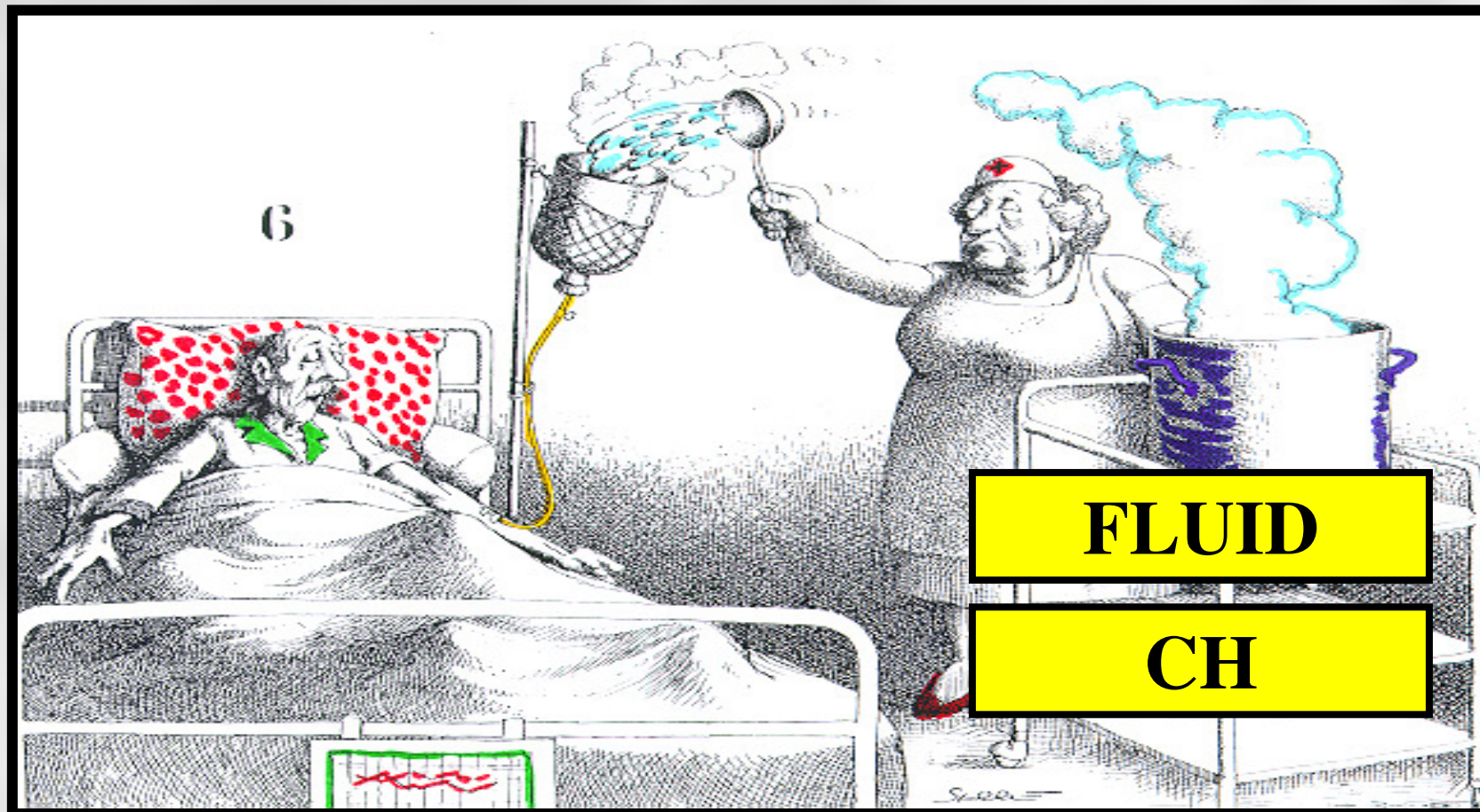
REGENERATION



NUTRITION

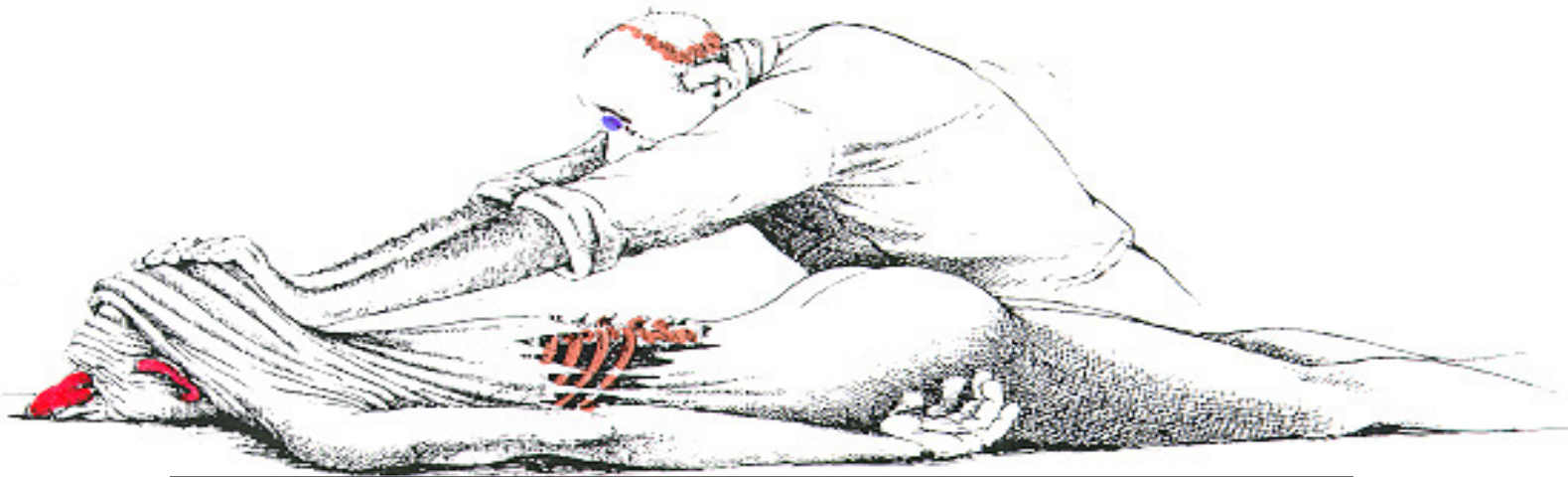
REGENERATION

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REGENERATION

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PHYSIOTHERAPY

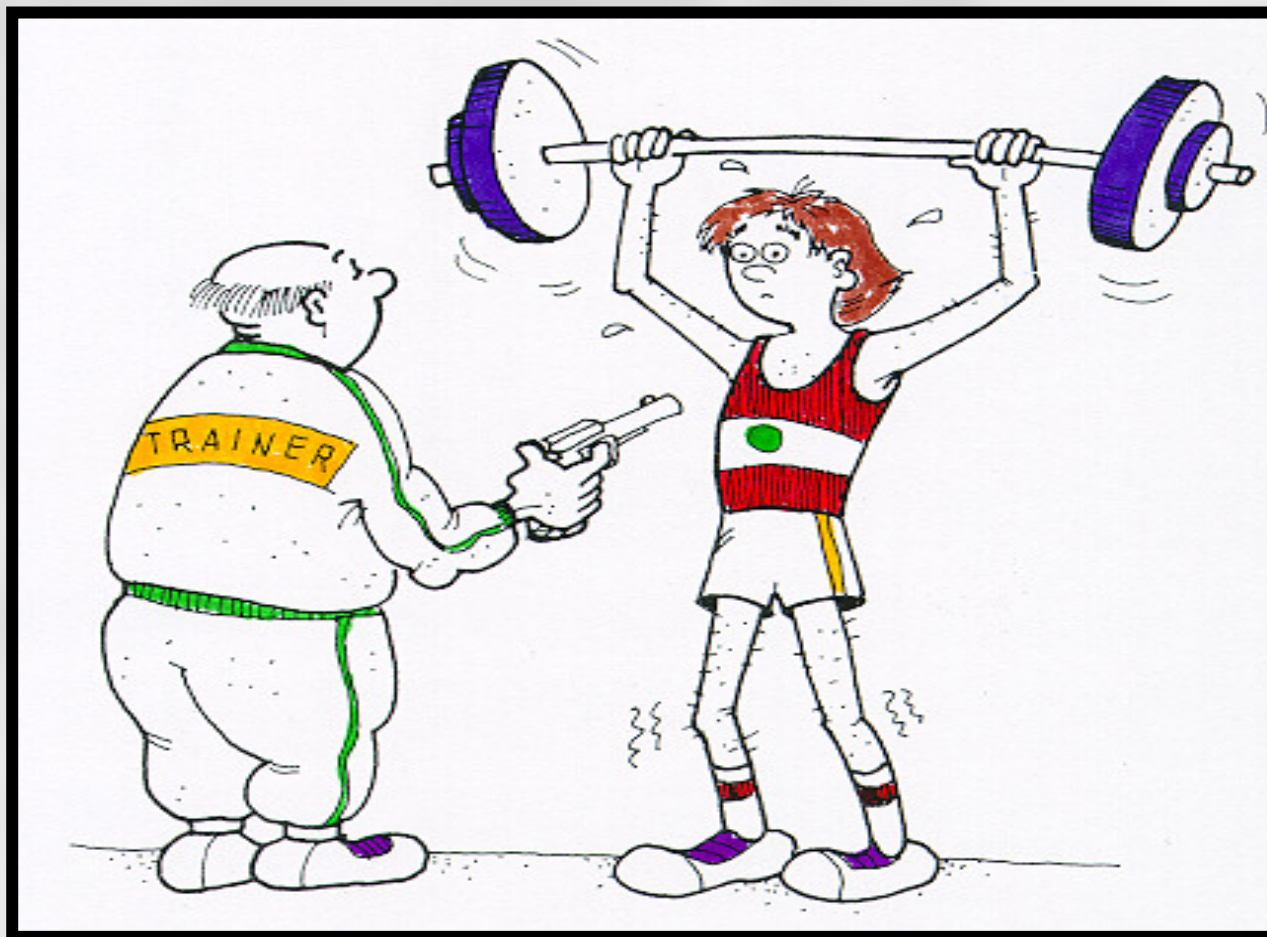
REGENERATION



**FIND OUT YOUR
INDIVIDUAL
REGENERATION
PROGRAM**

THE REFEREE

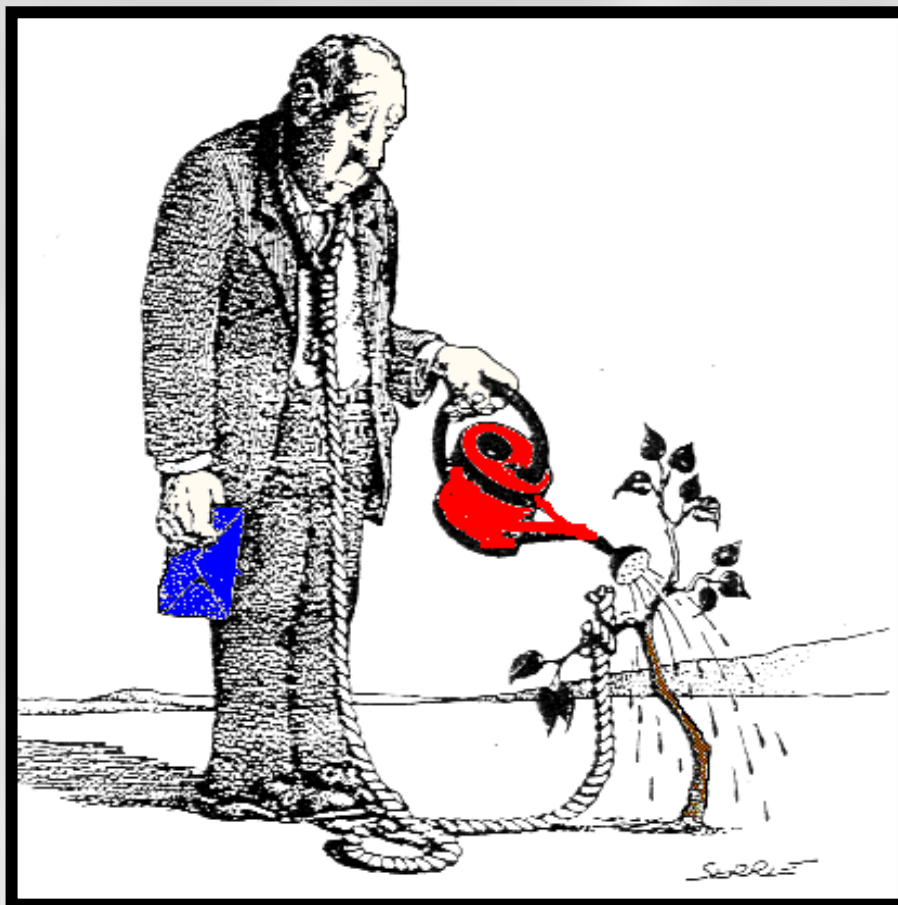
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THE REFEREE

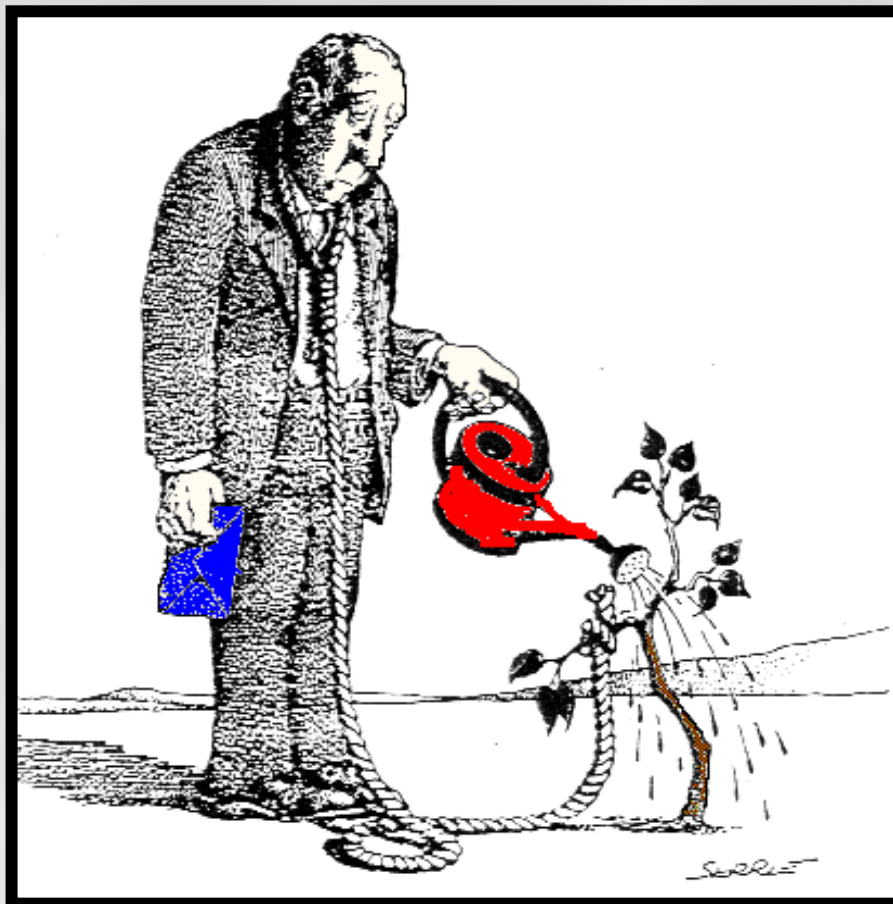
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Austria



**DON'T
WORRY**

THE REFEREE

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Austria



**YOUR
TIME
WILL
COME**

IMSB - Austria



**THANK
YOU**