

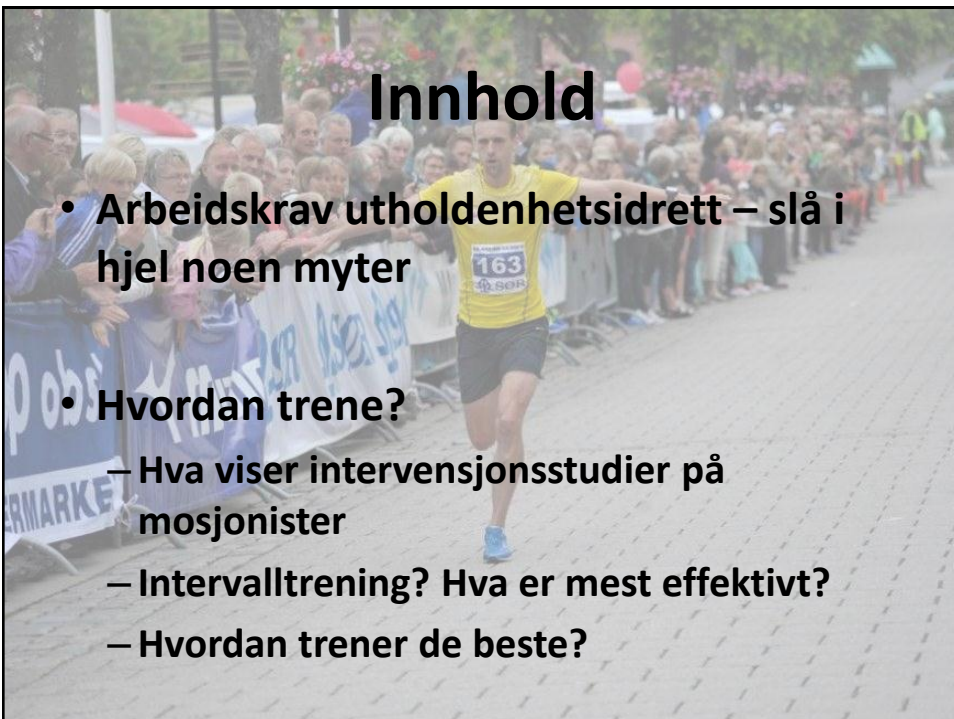
# UTHOLDENHETSTRENING

## BESTE PRAKSIS

Er «No Pain NO Gain»  
mottoet vi skal trene etter?

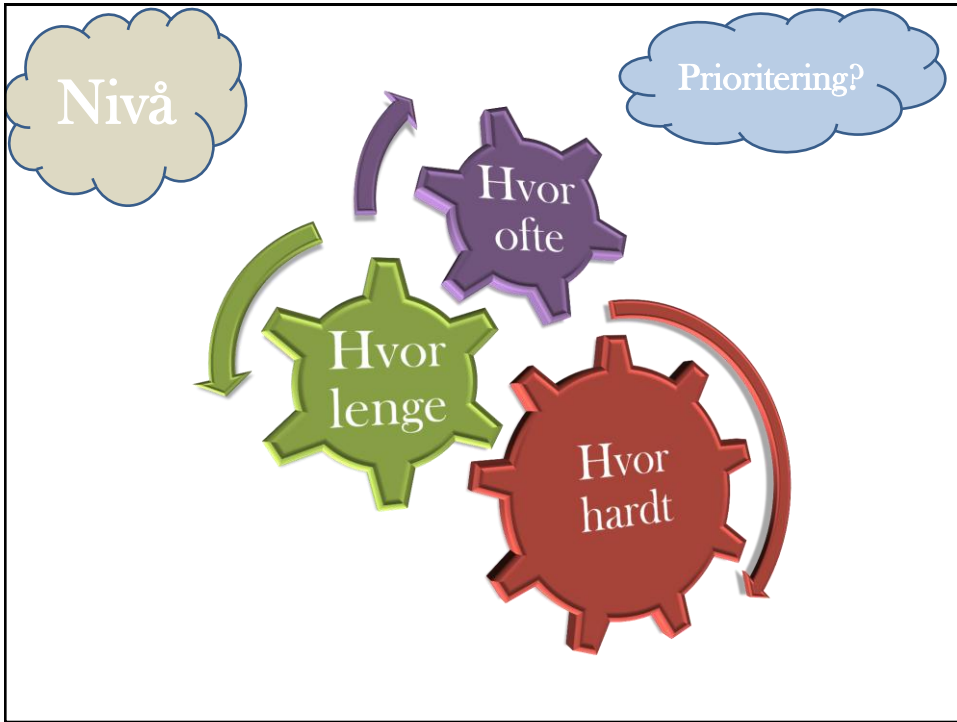
Oslo 10 okt 2013

Stipendiat Øystein Sylta  
Universitetet i Agder/Olympiatoppen



### Innhold

- Arbeidskrav utholdenhetsidrett – slå i hjel noen myter
- Hvordan trene?
  - Hva viser intervensjonsstudier på mosjonister
  - Intervalltrening? Hva er mest effektivt?
  - Hvordan trener de beste?





## Hva kreves for å løpe fort?

*«Jeg løper så seint fordi jeg har så dårlig teknikk...»*

*«Jeg er ikke rask nok til å løpe fort..»*

*«Klarer ikke å presse meg...»*

**Hva ønsker du at IKKE skal skje?**



## Arbeidskrav innen løp



Hastighet uten å bli stiv!

**KONDISJON**



## Maksimalt oksygenopptak Kroppens motor



## Liten bil med stor motor

LITEN BIL – STOR MOTOR



Høyde: 1,74  
Vekt: 66 kg  
L/min: 6  
MI/kg/min: 90

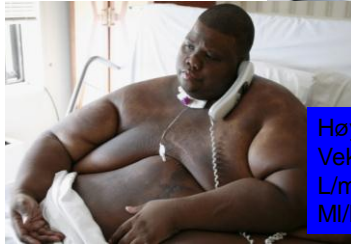
STOR BIL – LITEN MOTOR



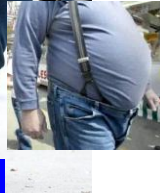
Høyde: 1,80  
Vekt: 80 kg  
L/min: 4,5  
MI/kg/min: 56,25



## LASTEBIL - MOPEDMOTOR



Høyde: 1,80  
Vekt: 130 kg  
L/min: 2  
MI/kg/min: 15



Hvordan trene for å bedre VO<sub>2</sub>maks?

## HVORDAN SKAL VI TRENE?



**LÖPING**

# Trykk på knappen «tren mer»

GRUPO LENA  
Rigor e Solidez  
www.grupolena.p

GRUPO LENA:  
UM UNIVERSO  
DE SOLUÇÃO  
COM RIGOR  
E SOLIDEZ

LINA

30 www.grupolena.p

Forbættelse av utøverne

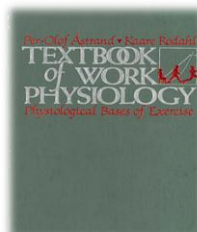
## INTENSITY DISTRIBUTION

Intensity zone	% of HR <sub>max</sub>	Blood lactate (mmol/l)*	Examples of training models
<b>I-zone 5</b>	92-100	6.0-10.0	Interval training with maximal or near maximal exertion, and with recoveries equivalent to 70-90 % of the repetition time.
<b>I-zone 4</b>	87-92	4.0-6.0	High intensity continuous training or intervals with a high level of exertion and recoveries equivalent to approximately 50 % of the repetition time.
<b>I-zone 3</b>	82-87	2.5-4.0	Natural interval training, intensive continuous training, or long intervals with recoveries equivalent to 20-30 % of the repetition time.
<b>I-zone 2</b>	72-82	1.5-2.5	Moderate intensity continuous training.
<b>I-zone 1</b>	55-72	< 1.5	Recovery sessions and low intensity continuous training.

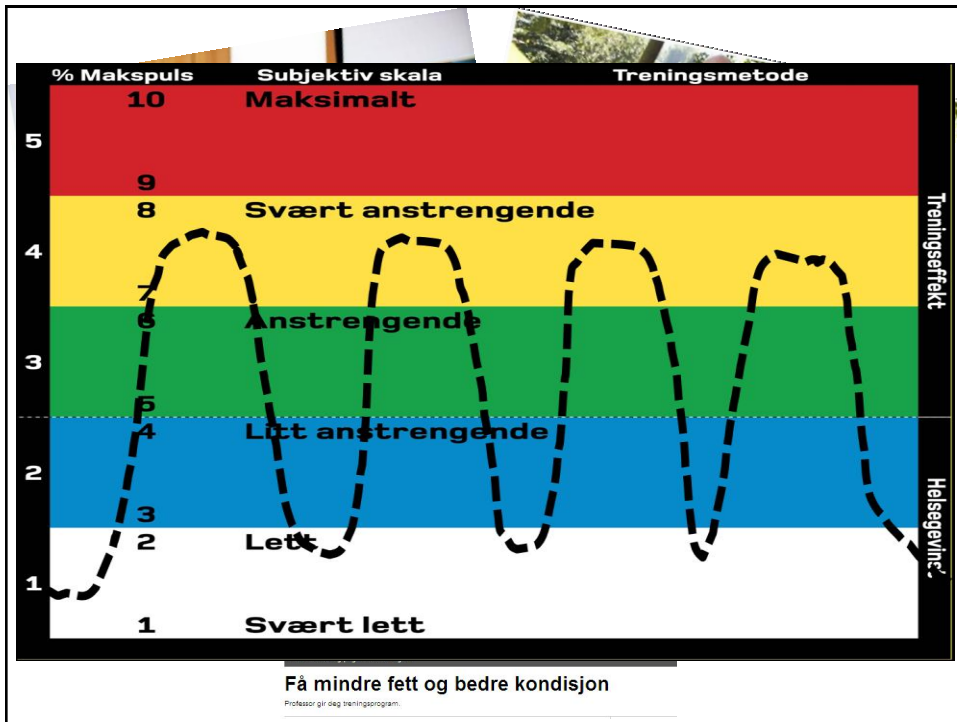


“It is an important but unsolved question which type of training is most effective: to maintain a level representing 90 percent of the maximal oxygen uptake for 40 min, or to tax 100 percent of the oxygen uptake capacity for 16 min”

*(Åstrand & Rodahl, Textbook of Work Physiology, 1970).*







## Aerobic High-Intensity Intervals Improve $VO_{2max}$ More Than Moderate Training

Helgerud et al. 2007

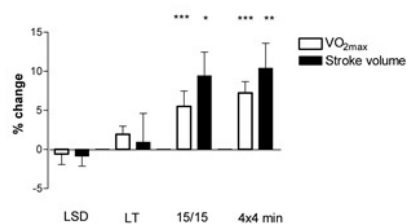
### Metode

3 økter pr uke – 8 uker (n=10 pr gr):

1. Rolig lkj 45min – 70 %  $HR_{max}$
2. Moderat lkj 24 min – 85 %  $HR_{max}$   
Tot 35min
3. 15/15sek intervall x 47rep, 90-95 %  $HR_{max}$ . Tot 35min
4. 4x4min intervall, p=3min, 90-95 %  $HR_{max}$ . Tot 35min

### Resultat

Endring  $VO_{2max}$ :



Gr 1-4: økt arb øk. 7,5-11,7 % \*

Gr 1-4: økt LTV 9,6 % (ca 1km/t) \*

Gr 3-4: økt SV ca 10 % \*

## Effekt av økter med ulik intensitet og varighet. Seiler et al. 2011



## Effekt av økter med ulik intensitet og varighet Seiler et al. 2011

### Metode

**2 int + 2-3 r lkj/uke – 7 uker:**

1. Rolig lkj x 5/uke – Tot. 8,5t
2. 2 økter: 4x16min (88 %  $HR_{max}$ ),  
p=3min + 3 rolig lkj – Tot. 7,6t
- 3. 2 økter: 4x8min (90 %  $HR_{max}$ ),  
p=2min + 3 rolig lkj – Tot. 5,7t**
4. 2 økter: 4x4min (94 %  $HR_{max}$ ),  
p=2min + 3 rolig lkj – Tot. 5,7t

«Hensiktsmessig» intervall-design,  
uavhengig av totalt arbeid.

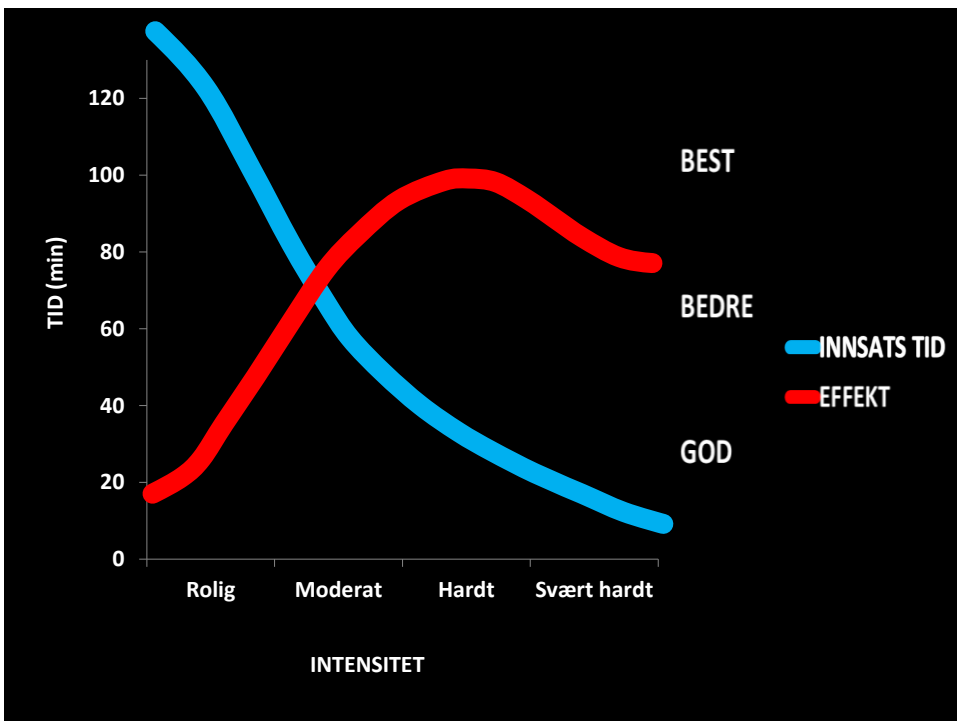
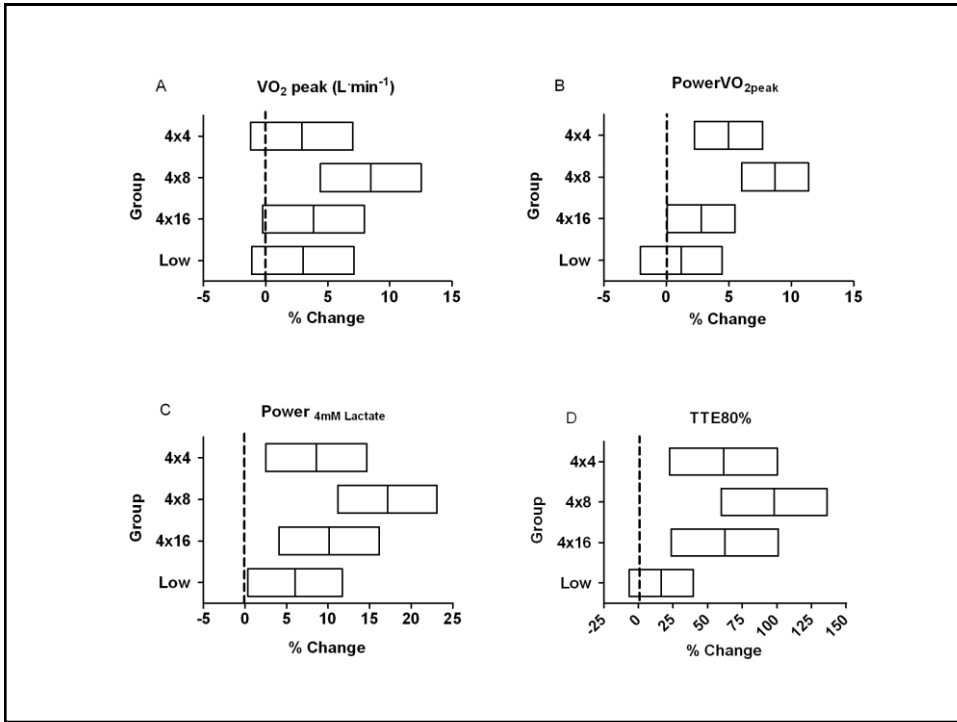
### Resultat

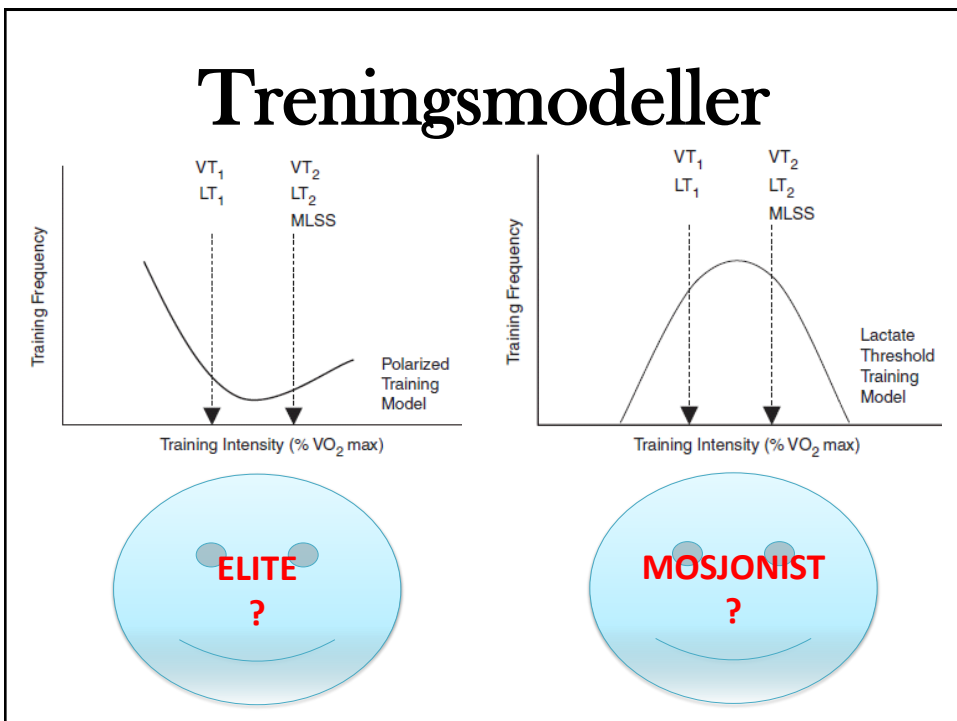
**Endring  $VO_2max$ :**

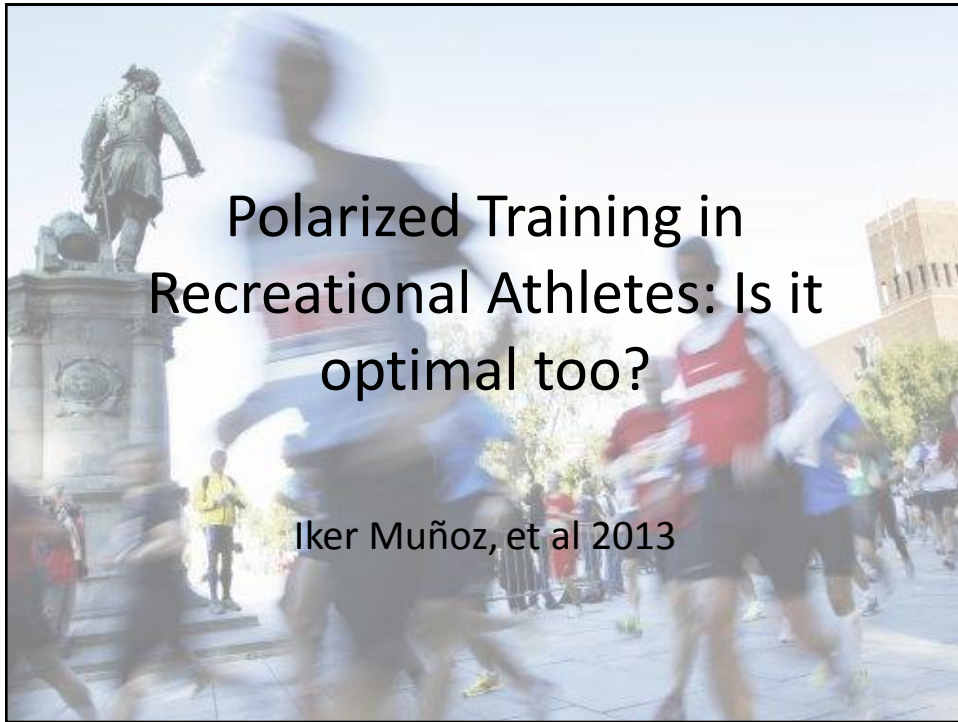
1. 3,4 %
2. 6,5 % \*
- 3. 10,4 % \***
4. 5,6 %

Gr 1-4: økt LT<sub>w</sub> 5-17 % (20-**40w**) \*

Gr 1-4: økt TTU 80%<sub>max</sub> (ca 20-**100**  
%) \*





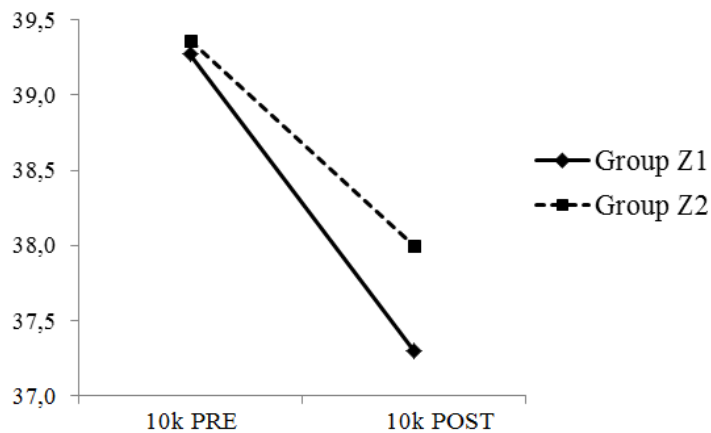


	Group Z1 (n = 15)	Group Z2 (n = 15)
Age (yr)	34 ± 9	34 ± 7
Weight (kg)	71.4 ± 8.9	67.0 ± 10.4
Height (cm)	177 ± 5	173 ± 7
BMI	22.7 ± 2.4	22.2 ± 2.2
VO <sub>2max</sub> (ml·kg <sup>-1</sup> ·min <sup>-1</sup> )	61.0 ± 8.4	64.1 ± 7.3
HR <sub>max</sub> (beats·min <sup>-1</sup> )	182 ± 11	187 ± 8
VT2 (%HRmax)	91 ± 3	91 ± 3
VT1 (%HRmax)	77 ± 3	79 ± 5
Training Experience (yr)	7.0 ± 3.2	5.6 ± 3.5
10L PDE T <sub>lim</sub> (min)	29.2 ± 4.9	29.4 ± 3.9



10 ukers varighet	Group Z1	Group Z2
	(n = 15)	(n = 15)
Total Running Time (hr)	39.1 ± 7.9	36.3 ± 8.1
Total Time in Zone 1 (hr)	28.5 ± 6.3*	16.7 ± 6.2
Total Time in Zone 2 (hr)	5.3 ± 2.7*	13.9 ± 8.8
Total Time in Zone 3 (hr)	5.3 ± 1.7	5.6 ± 1.6
Total Time in Zone 1 (%)	72.9 ± 5.6*	46.8 ± 15.2
Total Time in Zone 2 (%)	13.5 ± 5.6*	37.3 ± 16.1
Total Time in Zone 3 (%)	13.6 ± 4.3	15.8 ± 4.1
Total TRIMPs	3299 ± 670	3691 ± 982
Mean TRIMPS/wk	330 ± 67	370 ± 98

**Figure 1. Performance Results (10k PRE vs. 10k POST in Group Z1 and Group Z2)**

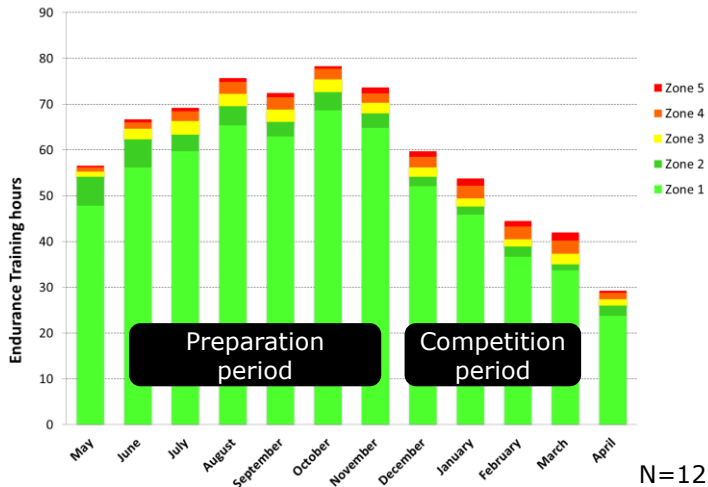


# DESKRIPTIVE STUDIER

## HVORDAN TRENER ELITEUTØVERE?



# ENDURANCE TRAINING

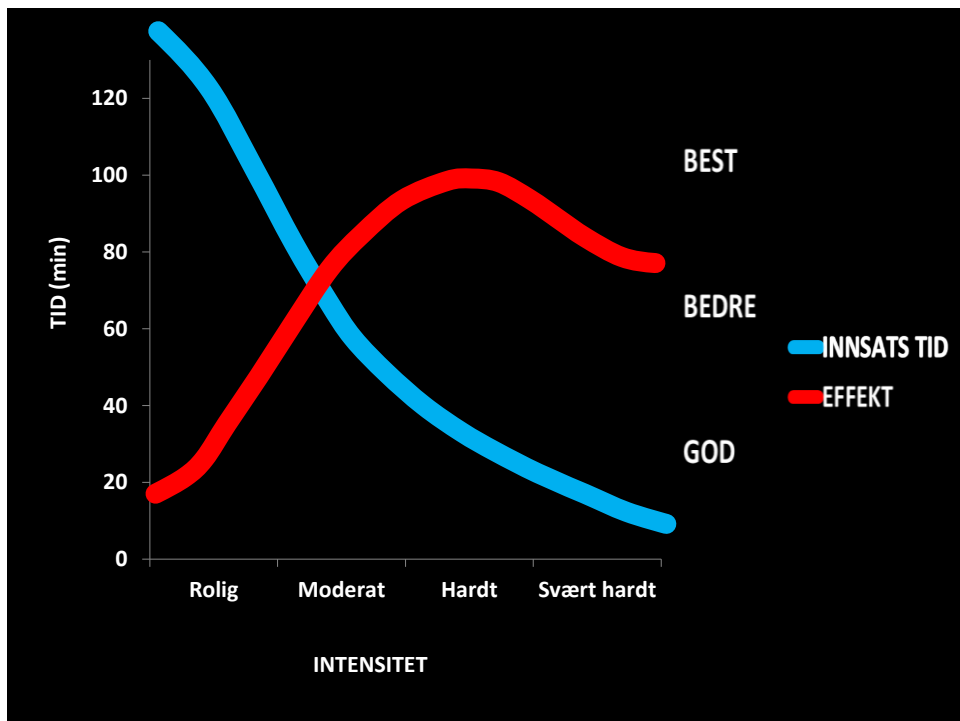
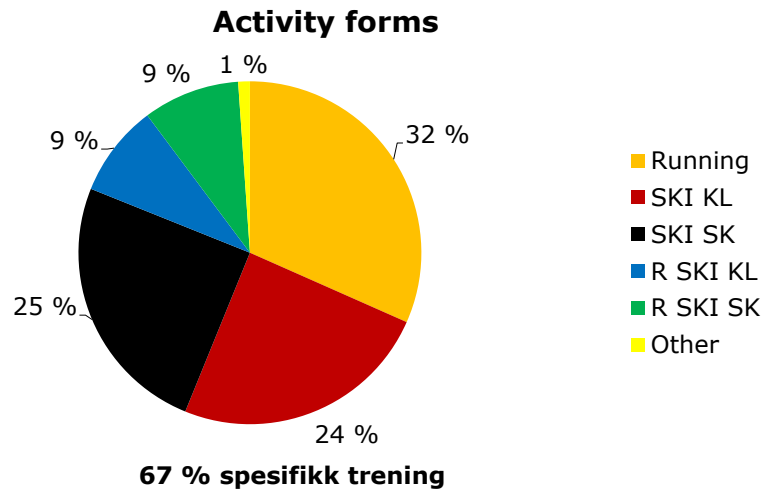


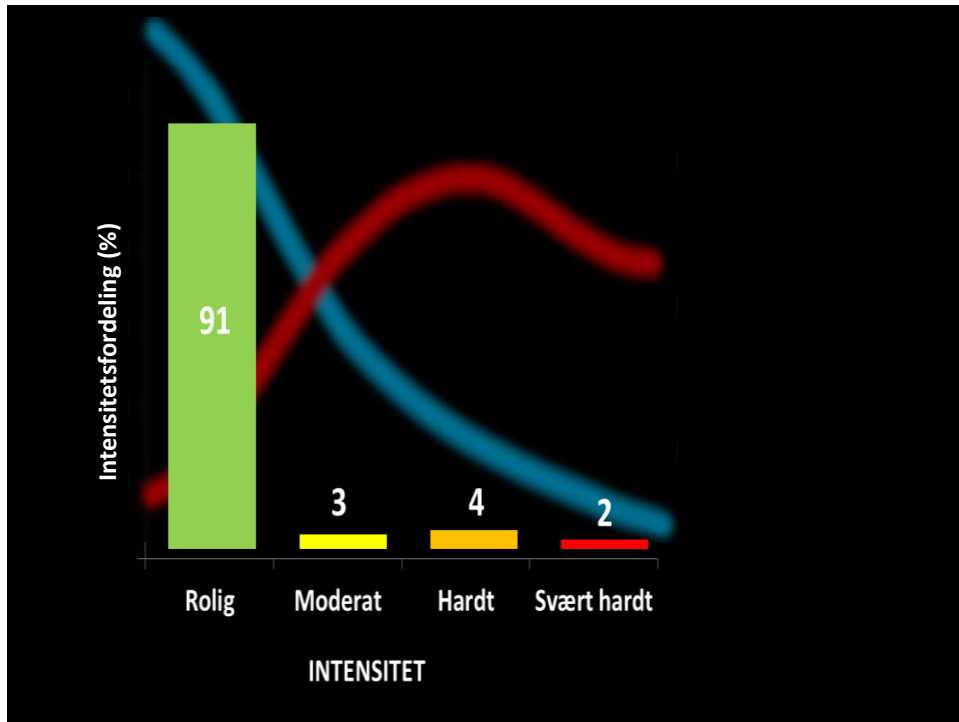
PHD student Øystein Sylta

Unpublished data Tønnessen et al, 2013



## Aktivitetsform





UNIVERSITY OF AGDER

## EXAMPLE WEEK IN ALTITUDE

Day:	AM session:	PM session:
Monday	SKI KL: 2.15-2.30h easy + 6x10sek poling.	<b>R SKI F: Interval, 5x8min, 3min rec, z3 (~3,5mM)</b>
Tuesday	<b>SKI F/KL: 3.30h easy</b>	Rest
Wednesday	SKI F: 2.15-2.45h easy	RUN: 1h easy + 5xstrides + jumps and 30 min max strenght (upper body)
Thursday	SKI F: 2.15-2.30h easy	<b>R SKI KL: Interval, 5x8min, 3min rec, z3 (~3,5mM)</b>
Friday	Rest	Rest
Saturday	SKI KL: 2.15-2.45h easy + 6x10sek poling.	<b>RUN: lactate profile test</b>
Sunday	<b>SKI F: Interval, 5x8min, 3min rec, z2/3 (~2mM)</b>	RUN: 1,30h easy Unpublished data Sylta et al, 2013



## EXAMPLE WEEK IN ALTITUDE

Day:	AM session:	PM session:
Monday	SKI KL: 2.15-2.30h easy + <b>6x10sek poling.</b>	<b>R SKI F: Interval, 5x8min, 3min rec, z3 (~3,5mM)</b>
Tuesday	<b>SKI F/KL: 3.30h easy</b>	Rest
Wednesday	SKI F: 2.15-2.45h easy	RUN: 1h easy + <b>5xstrides + jumps and 30 min max strenght (upper body)</b>
Thursday	SKI F: 2.15-2.30h easy	<b>R SKI KL: Interval, 5x8min, 3min rec, z3 (~3,5mM)</b>
Friday	Rest	Rest
Saturday	SKI KL: 2.15-2.45h easy + <b>6x10sek poling.</b>	<b>RUN: lactate profile test</b>
Sunday	<b>SKI F: Interval, 5x8min, 3min rec, z3 (~2mM)</b>	RUN: 1.30h easy <small>Unpublished data Sylta et al, 2013</small>

## SUM UP

### *Successful Norwegian XC-skiers*

- **~800 h/year**
- **~92 % endurance training**
  - **~91 % LIT, ~9 % HIT**
- **> 500 h specific ski-training**
- **Dramatic volume reduction during competition period**



EM SØLV 2006  
179km/uke  
(2005)



NR 2/3/5000m  
175-  
210km/uke

Tjelta, 2010



EM GULL U23  
2011  
160-180 km/uke

EM GULL U23  
2011  
180-200 km/uke

Div. EM GULL junior  
180-190 km/uke

 UNIVERSITY OF AGDER



EM GULL 2012  
150km/uke

Tjelta, 2012

NR 800m, 4.02-  
1500m  
Ca 130-140km/uke

# Lessons learned...

- MER
- VARIÈR
- POLARISERT
- HØY INTENSITET