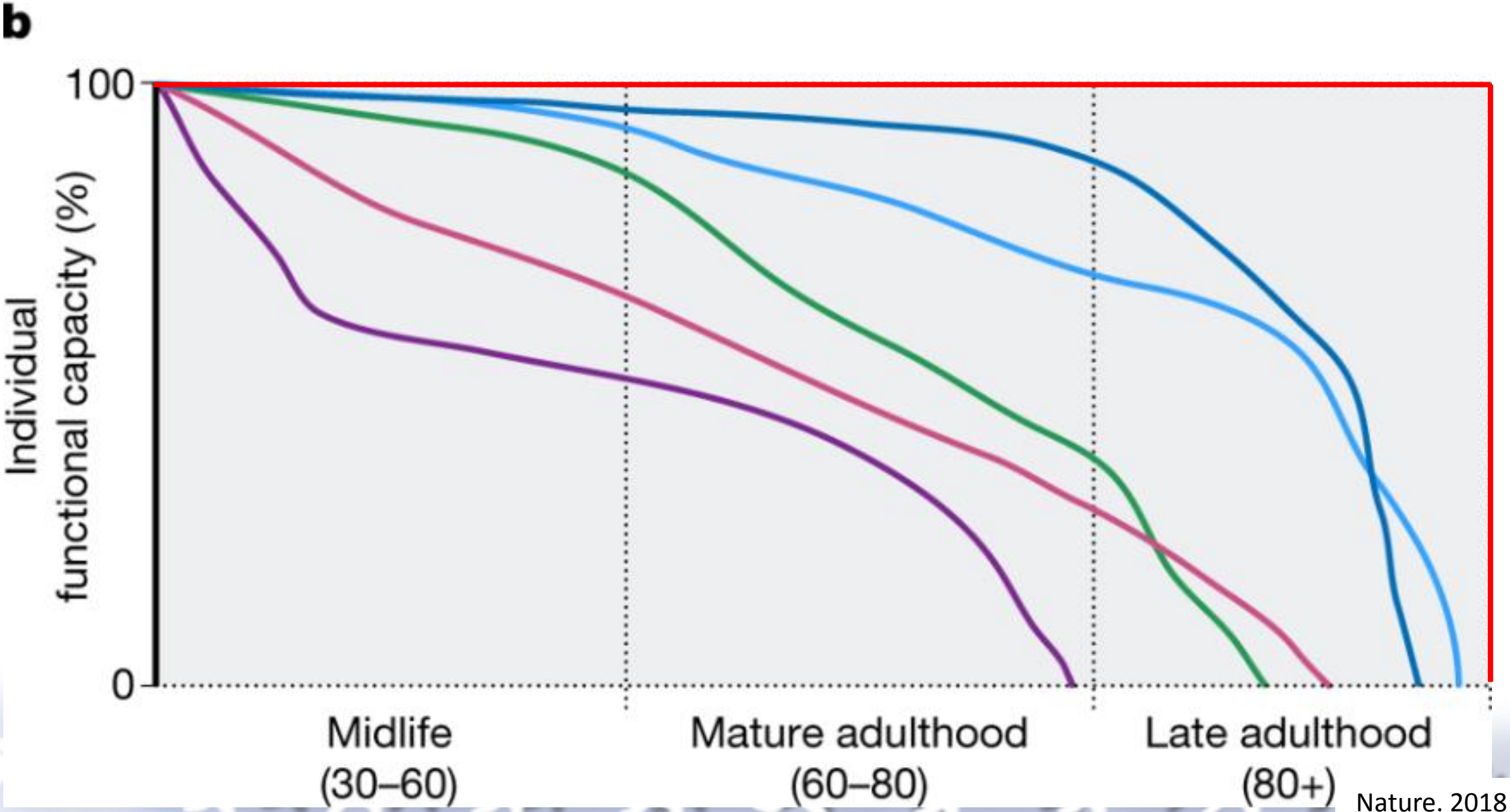
Cvičte rozumně,
budete žít věčně,
ale hlavně si při tom nesmíte ublížit

doc. MUDr. Vladimír Tuka, Ph.D.
Centrum kardiovaskulární rehabilitace VFN
Komplexní kardiovaskulární centrum VFN a 1. Lékařská fakulta UK, Praha

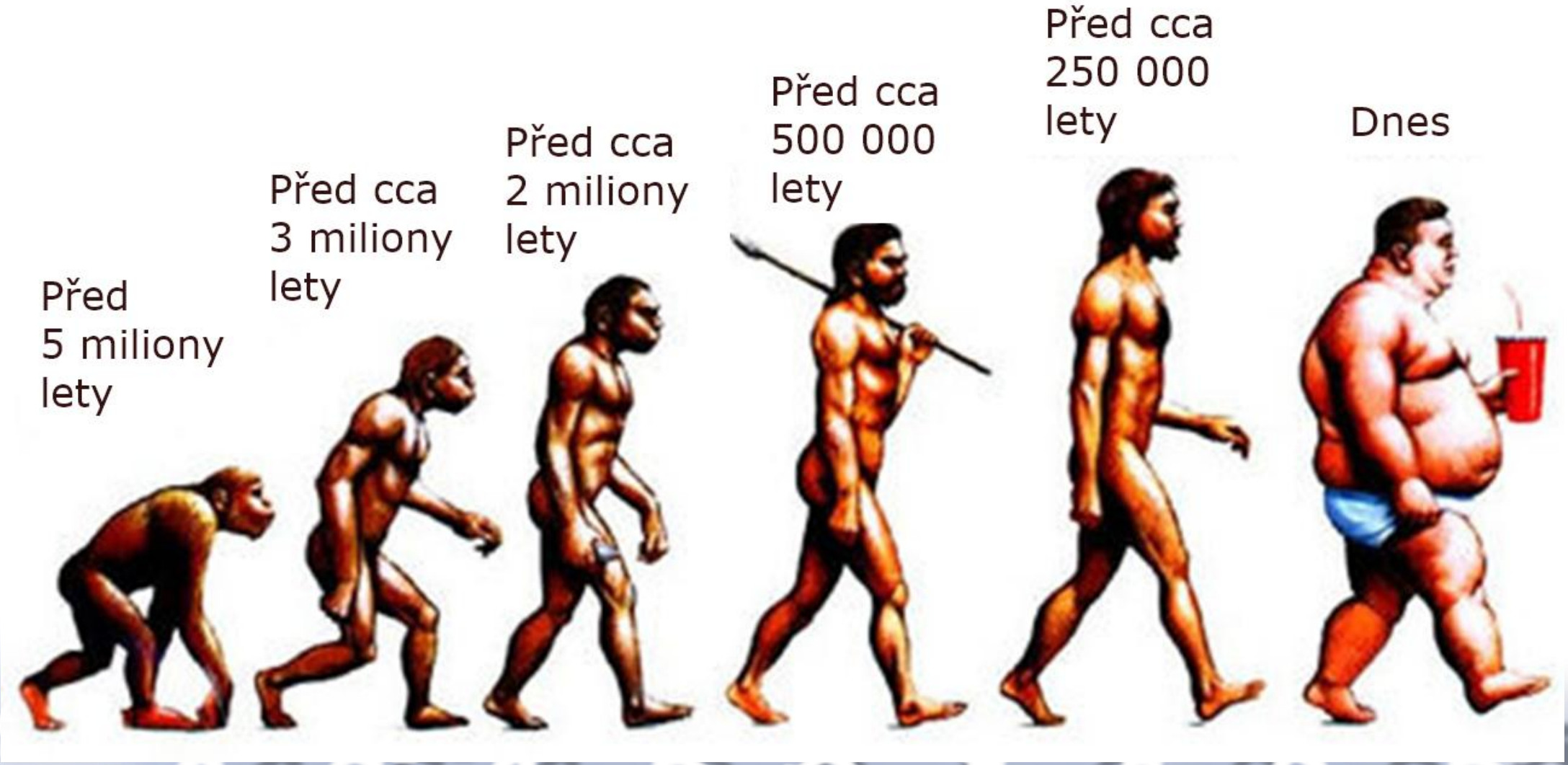
Život věčný – můžeme věřit, doufat, …

„Kvadratura života“



Nature. 2018 Vol 561

Evoluce

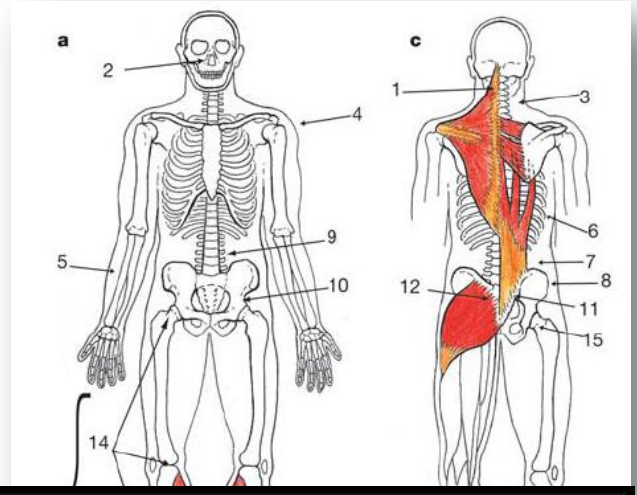

Před
5 miliony
lety
Před cca
3 miliony
lety
Před cca
2 miliony
lety
Před cca
500 000
lety
Před cca
250 000
lety
Dnes

Endurance running and the evolution of *Homo*

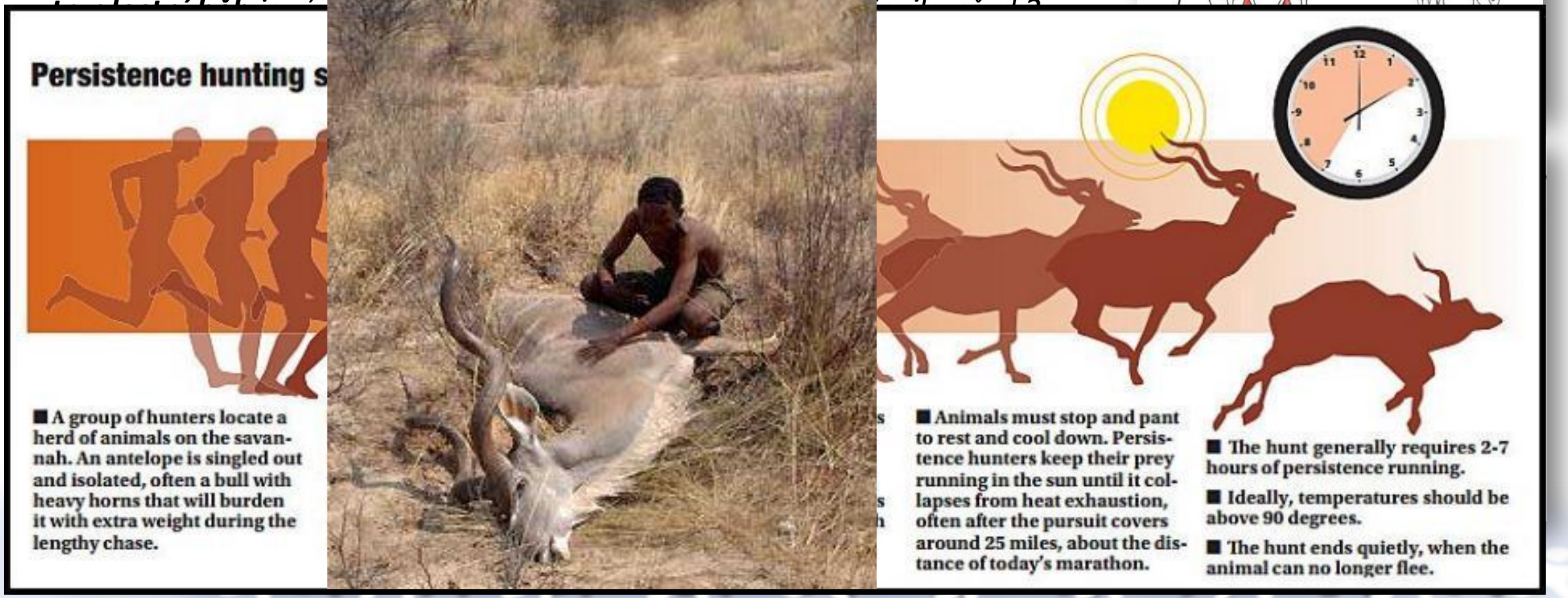
Dennis M. Bramble[1] **& Daniel E. Lieberman**[2]

[1]*Department of Biology, University of Utah, Salt Lake City, Utah 84112, USA*
[2]*Peabody Museum, Harvard University, Cambridge, Massachusetts 02138, USA*

NATURE | VOL 432 | 18 NOVEMBER 2004 |



"Vzpřímená chůze je k *bjevila nejspíše*
brzy po oddělení vývoj *sílií ukazuje, že*

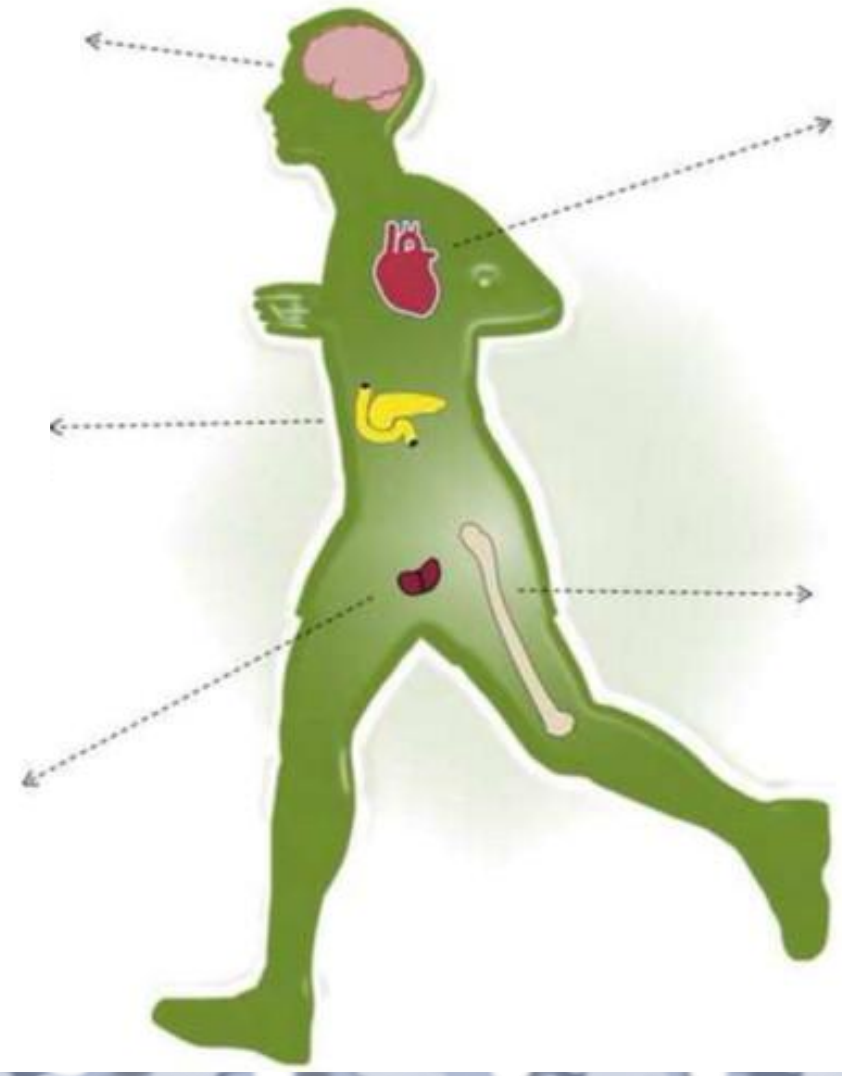


Zdravotní účinky pohybové aktivity

Neurologické
↓ Napětí/deprese
↓ Demence
↑ Kognitivní funkce
↓ CMP

Endokrinologické
↓ Hmotnost
↓ Diabetes
↓ LDL cholesterol
↑ HDL cholesterol

Onkologické
↓ Ca prostaty
↓ Ca prsu
↓ Ca tlustého střeva
↓ Hematologické malignity



Kardiovaskulární
↓ Mortality
↓ ICHS
↓ Krevní tlak
↑ Endoteliální funkci

Muskuloskeletální
↓ Osteoporóza
↓ Pády
↓ Nemohoucnost

Ahmed Merghani, Aneil Malhotra, Sanjay Sharma. Trends in Cardiovascular Medicine, 2015, Available online 18 June 2015

Genetické riziko

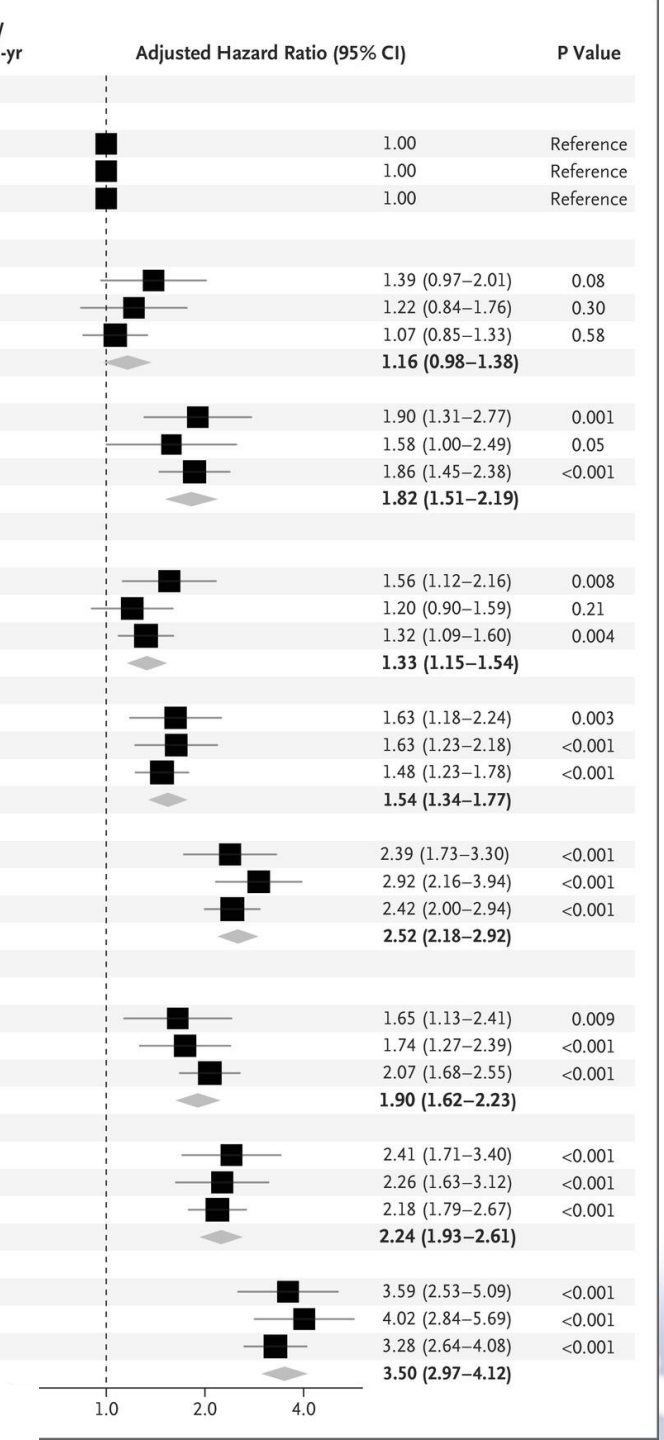
+

adherence ke zdravému životnímu stylu

a

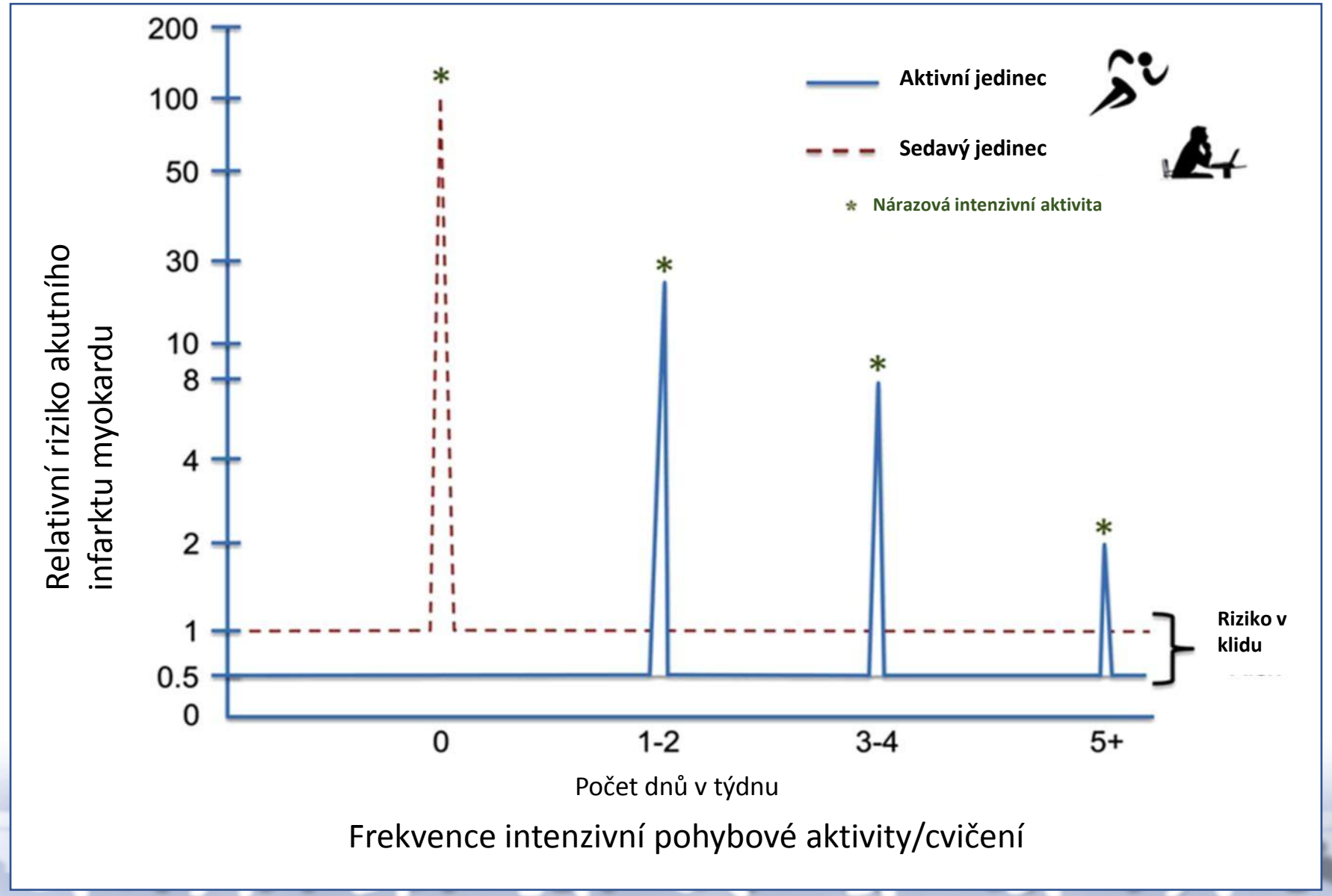
Riziko ischemické choroby srdeční (IM, PCI a NSS)

Subgroup	No. of Events/ Total No.	Incidence/ 1000 person-yr	Adjusted Hazard Ratio (95% CI)	P Value
Low genetic risk				
Favorable lifestyle				
ARIC	44/484	5.0	1.00	Reference
WGHS	61/2103	1.5	1.00	Reference
MDCS	134/1444	5.0	1.00	Reference
Combined				
Intermediate lifestyle				
ARIC	82/613	7.6	1.39 (0.97–2.01)	0.08
WGHS	52/1509	1.9	1.22 (0.84–1.76)	0.30
MDCS	179/2060	4.8	1.07 (0.85–1.33)	0.58
Combined			**1.16 (0.98–1.38)**	
Unfavorable lifestyle				
ARIC	74/466	9.7	1.90 (1.31–2.77)	0.001
WGHS	27/668	2.3	1.58 (1.00–2.49)	0.05
MDCS	122/974	7.3	1.86 (1.45–2.38)	<0.001
Combined			**1.82 (1.51–2.19)**	
Intermediate genetic risk				
Favorable lifestyle				
ARIC	203/1480	7.8	1.56 (1.12–2.16)	0.008
WGHS	219/6319	1.9	1.20 (0.90–1.59)	0.21
MDCS	488/4336	6.2	1.32 (1.09–1.60)	0.004
Combined			**1.33 (1.15–1.54)**	
Intermediate lifestyle				
ARIC	272/1926	8.2	1.63 (1.18–2.24)	0.003
WGHS	202/4414	2.5	1.63 (1.23–2.18)	<0.001
MDCS	710/6145	6.5	1.48 (1.23–1.78)	<0.001
Combined			**1.54 (1.34–1.77)**	
Unfavorable lifestyle				
ARIC	244/1282	11.7	2.39 (1.73–3.30)	<0.001
WGHS	147/1983	4.3	2.92 (2.16–3.94)	<0.001
MDCS	481/2953	9.7	2.42 (2.00–2.94)	<0.001
Combined			**2.52 (2.18–2.92)**	
High genetic risk				
Favorable lifestyle				
ARIC	71/495	8.2	1.65 (1.13–2.41)	0.009
WGHS	103/2094	2.6	1.74 (1.27–2.39)	<0.001
MDCS	248/1430	9.7	2.07 (1.68–2.55)	<0.001
Combined			**1.90 (1.62–2.23)**	
Intermediate lifestyle				
ARIC	124/623	11.8	2.41 (1.71–3.40)	<0.001
WGHS	92/1462	3.4	2.26 (1.63–3.12)	<0.001
MDCS	333/2029	9.4	2.18 (1.79–2.67)	<0.001
Combined			**2.24 (1.93–2.61)**	
Unfavorable lifestyle				
ARIC	116/445	17.0	3.59 (2.53–5.09)	<0.001
WGHS	68/670	5.8	4.02 (2.84–5.69)	<0.001
MDCS	207/1018	12.5	3.28 (2.64–4.08)	<0.001
Combined			**3.50 (2.97–4.12)**	

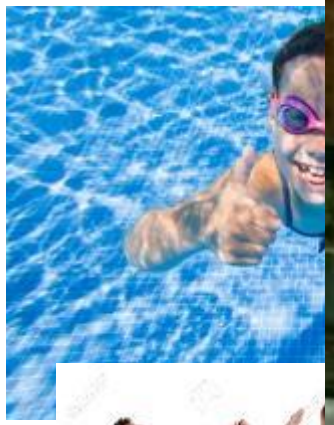


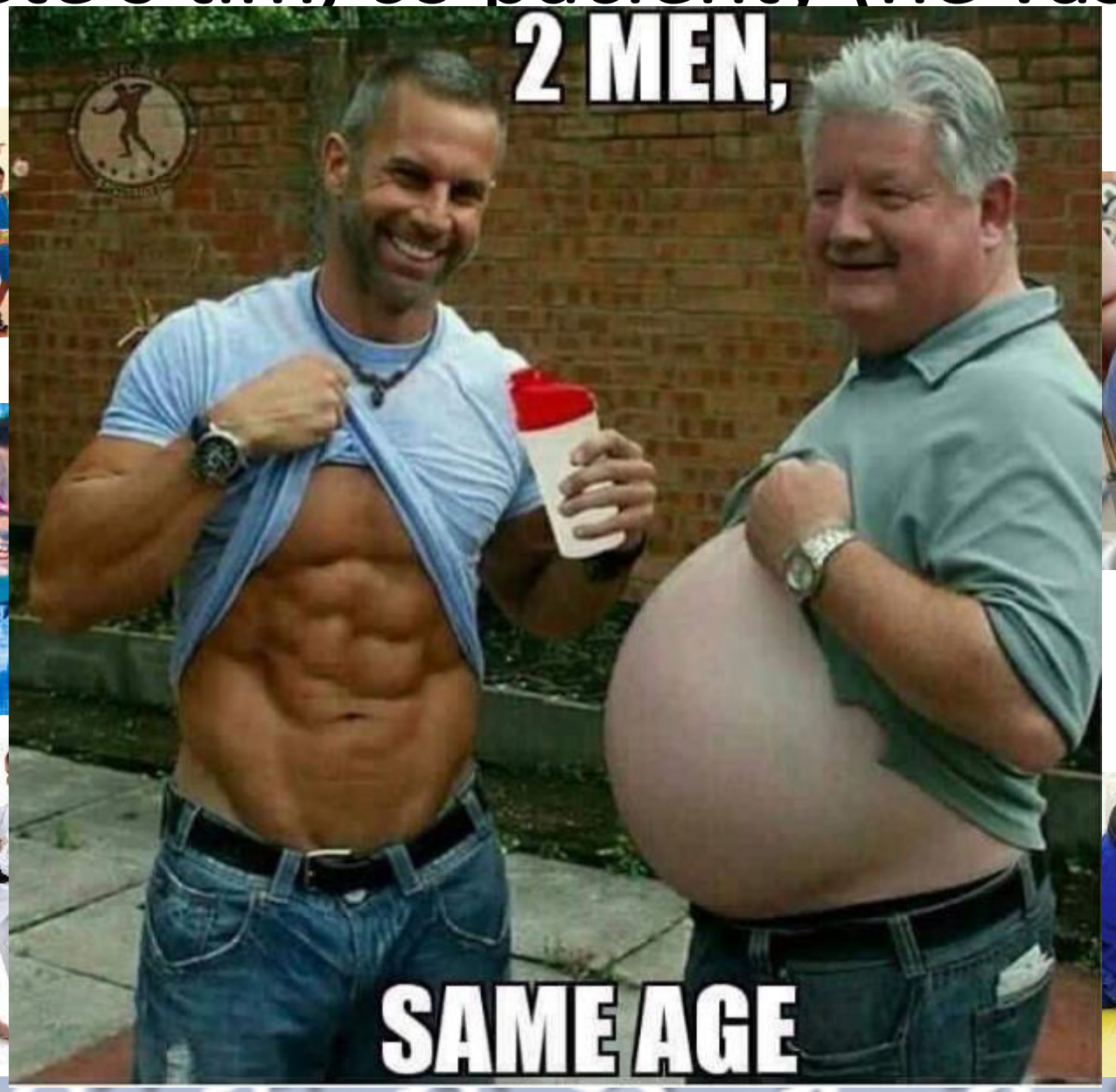
N Engl J Med 2016; 375:2349-2358

Riziko nárazové intenzivní aktivity

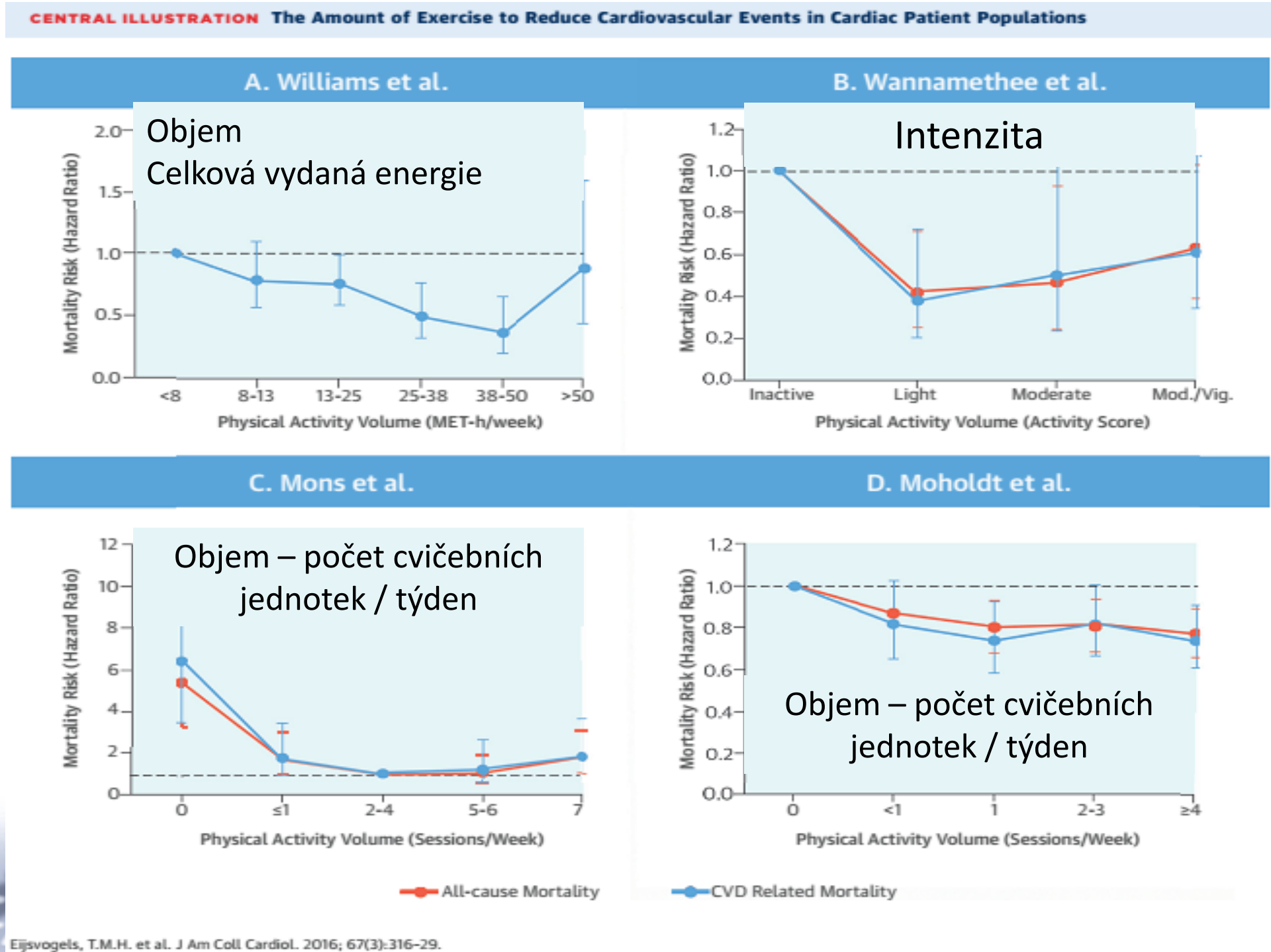


Začněte s tím, co pacienty (ne vás) baví





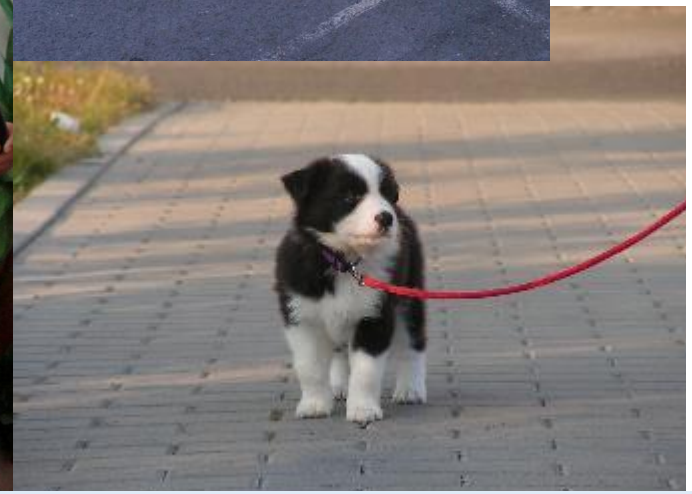
CO JE DŮLEŽITÉ – V PRESKRIPCI POHYBU?

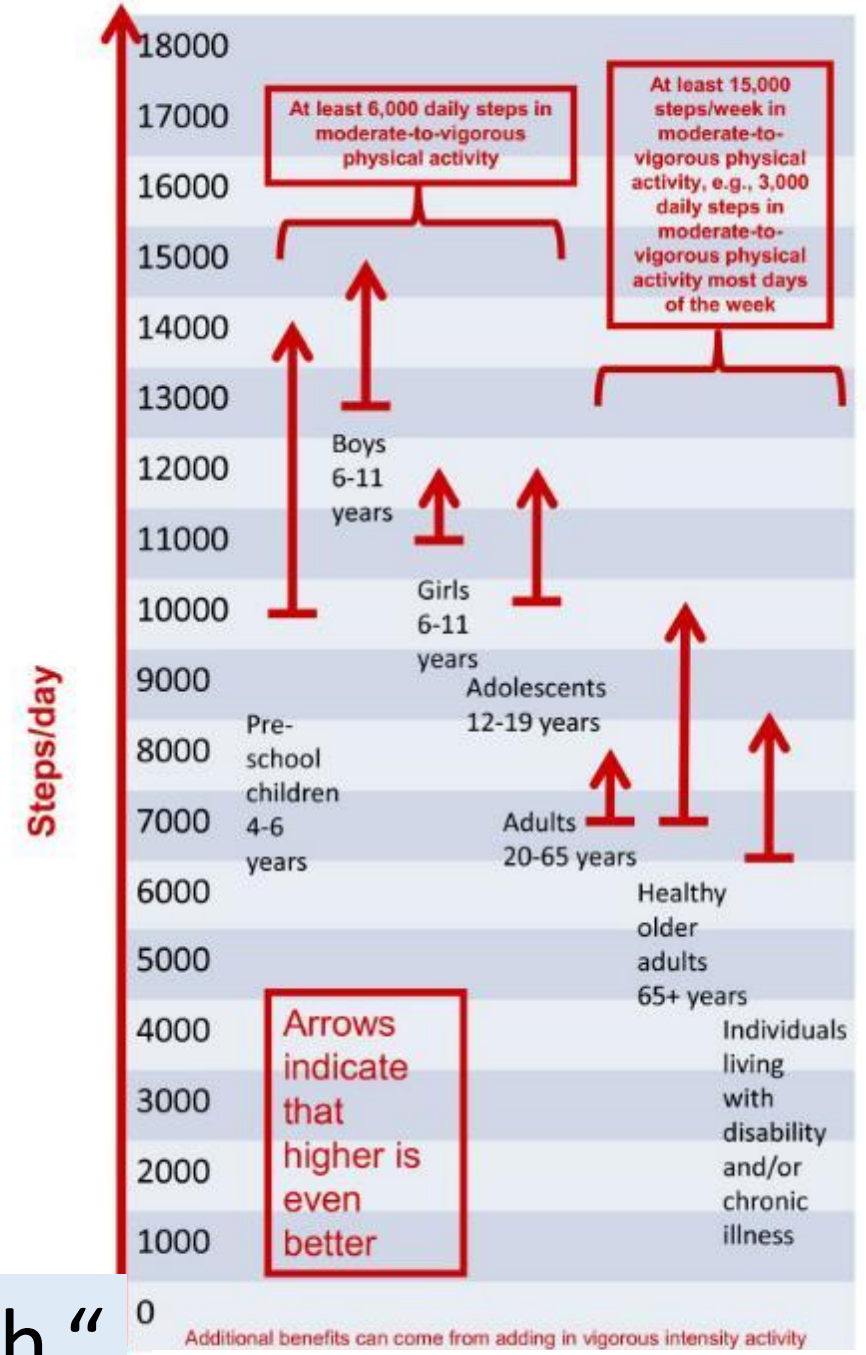


Eijsvogels, T.M.H. et al. J Am Coll Cardiol. 2016; 67(3):316–29.

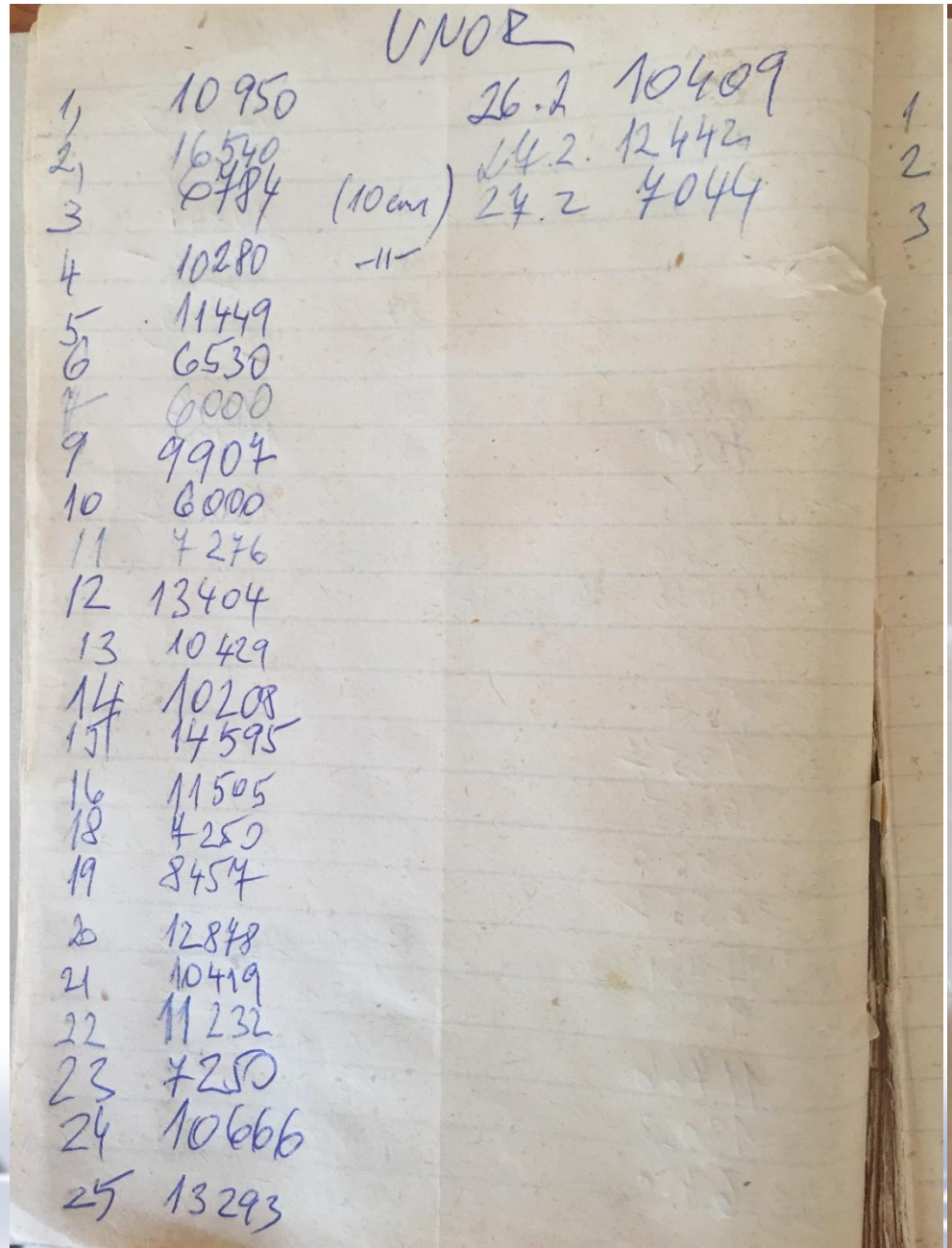
Pohyb v primární/sekundár

± 10.000 kroků denně (nebo 6000 kroků nebo > 700





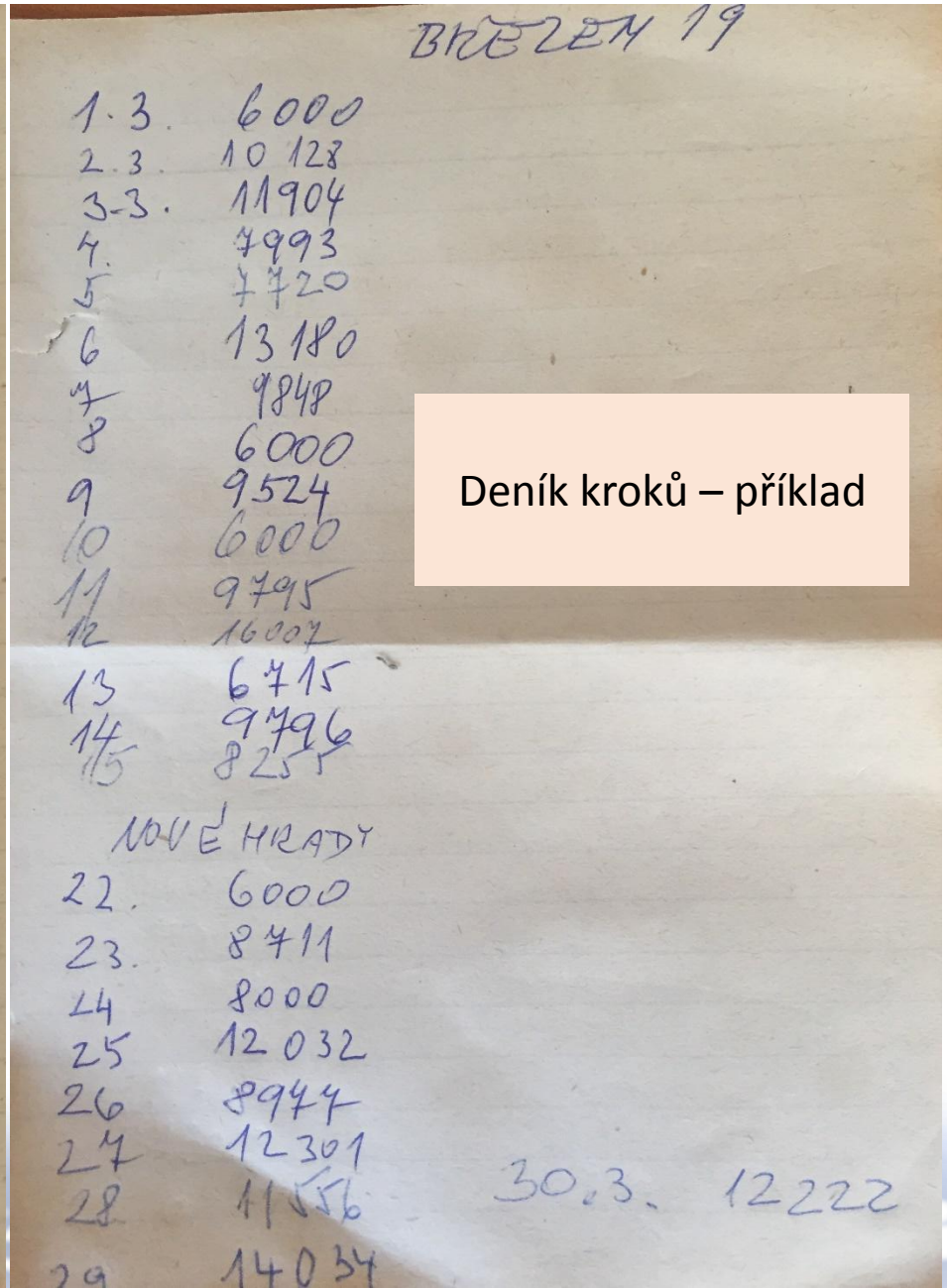
„Start low, go slowly, aim high and stay high.“



ÚNOR

1,	10 950	26.2	10409
2,	16540	14.2.	12442
3	8784	27.2	7044
4	10280		
5	11449		
6	6530		
7	6000		
9	9907		
10	6000		
11	7276		
12	13404		
13	10429		
14	10208		
15	14595		
16	11505		
18	4250		
19	8457		
20	12878		
21.	10419		
22	11232		
23	7250		
24	10666		
25	13293		

(10 cm) 1
-11- 2
3



BŘEZEN 19

1.3.	6000
2.3.	10 128
3-3.	11904
4.	7993
5	7720
6	13 180
7	9848
8	6000
9	9524
10	6000
11	9795
12	16007
13	6715
14	9796
15	8251

NOVÉ HRADY

22.	6000
23.	8711
24	8000
25	12 032
26	8944
27	12301
28	11756
29	14034

30.3. 12222

Deník kroků – příklad

European Heart Journal (2016) **37**, 2315–2381
doi:10.1093/eurheartj/ehw106

2016 European Guidelines on cardiovascular disease prevention in clinical practice

The Sixth Joint Task Force of the European Society of Cardiology and Other Societies on Cardiovascular Disease Prevention in Clinical Practice (constituted by representatives of 10 societies and by invited experts)

Developed with the special contribution of the European Association for Cardiovascular Prevention & Rehabilitation (EACPR)

Recommendations for physical activity

Recommendations	Class[a]	Level[b]	Ref[c]
It is recommended for healthy adults of all ages to perform at least 150 minutes a week of moderate intensity or 75 minutes a week of vigorous intensity aerobic PA or an equivalent combination thereof.	I	A	258–261
For additional benefits in healthy adults, a gradual increase in aerobic PA to 300 minutes a week of moderate intensity, or 150 minutes a week of vigorous intensity aerobic PA, or an equivalent combination thereof is recommended.	I	A	259, 260
Regular assessment and counselling on PA is recommended to promote the engagement and, if necessary, to support an increase in PA volume over time.[d]	I	B	262–264
PA is recommended in low-risk individuals without further assessment.	I	C	265, 266
Multiple sessions of PA should be considered, each lasting ≥10 minutes and evenly spread throughout the week, i.e. on 4–5 days a week and preferably every day of the week.	IIa	B	267, 268
Clinical evaluation, including exercise testing, should be considered for sedentary people with CV risk factors who intend to engage in vigorous PAs or sports.	IIa	C	265

Fyzická aktivita – klasifikace dle intenzity

	Cardiorespiratory Endurance Exercise										Resistance Exercise
	Relative Intensity				Intensity ($\%\dot{V}O_{2max}$) Relative to Maximal Exercise Capacity in METs			Absolute Intensity	Absolute Intensity (MET) by Age			Relative Intensity
Intensity	%HRR or $\%\dot{V}O_2R$	$\%HR_{max}$	$\%\dot{V}O_{2max}$	Perceived Exertion (Rating on 6–20 RPE Scale)	20 METs $\%\dot{V}O_{2max}$	10 METs $\%\dot{V}O_{2max}$	5 METs $\%\dot{V}O_{2max}$	METs	Young (20–39 yr)	Middle-aged (40–64 yr)	Older (≥65 yr)	% 1RM
Very light	<30	<57	<37	<Very light (RPE < 9)	<34	<37	<44	<2	<2.4	<2.0	<1.6	<30
Light	30–39	57–63	37–45	Very light–fairly light (RPE 9–11)	34–42	37–45	44–51	2.0–2.9	2.4–4.7	2.0–3.9	1.6–3.1	30–49
Moderate	40–59	64–76	46–63	Fairly light to somewhat hard (RPE 12–13)	43–61	46–63	52–67	3.0 to 5.9	4.8–7.1	4.0–5.9	3.2–4.7	50–69
Vigorous	60–89	77–95	64–90	Somewhat hard to very hard (RPE 14–17)	62–90	64–90	68–91	6.0–8.7	7.2–10.1	6.0–8.4	4.8–6.7	70–84
Near–maximal to maximal	≥90	≥96	≥91	≥Very hard (RPE ≥ 18)	≥91	≥91	≥92	≥8.8	≥10.2	≥8.5	≥6.8	≥85

Table adapted from the American College of Sports Medicine (14), Howley (173), Swain and Franklin (344), Swain and Leutholtz (346), Swain et al. (347), and the US Department of Health and Human Services (370).
HR_{max}, maximal HR; $\%HR_{max}$, percent of maximal HR; HRR, HR reserve; $\dot{V}O_{2max}$, maximal oxygen uptake; $\%\dot{V}O_{2max}$, percent of maximal oxygen uptake; $\dot{V}O_2R$, oxygen uptake reserve; RPE, ratings of perceived exertion (48).

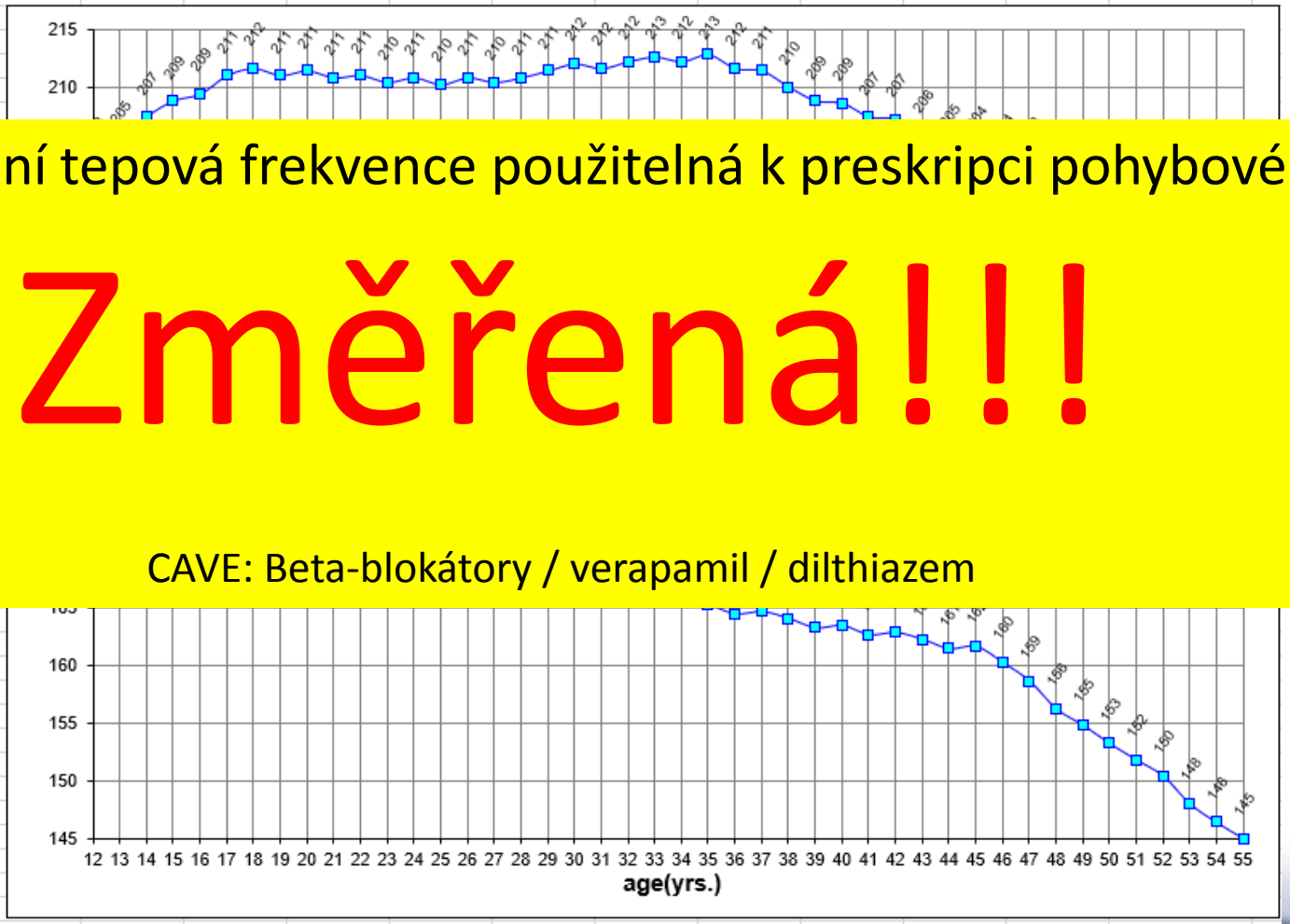
- Test mluvení
  - Nízká intenzita – zpěv
  - Střední intenzita – jedna krátká souvislá věta
  - Vysoká intenzita – sotva 1-2 slova

Garber, CE et al. Med Sci Sport Exerc 43(7):1334-1359, July 2011.

Maximální (vrcholová) srdeční frekvence

Maximal heart rate in graded exercise on cycle ergometer in men of age 12-55 (min^{-1})

age	HRmax (min^{-1})	SD
12	188	7,7
13	190	7,4
14	193	7,2
15	195	6,9
16	195	7,2
17	196	7,5
18	196	7,8
39	186	11,4
40	186	11,3
41	185	11,2
42	185	11,1
43	184	10,9
44	183	10,8
45	183	10,7
46	182	10,9
47	181	11,2
48	179	11,4
49	178	11,6
50	177	11,9
51	176	12,1
52	175	12,3
53	173	12,5
54	172	12,8
55	171	13



Jedině maximální tepová frekvence použitelná k preskripci pohybové aktivity:

Změřená!!!

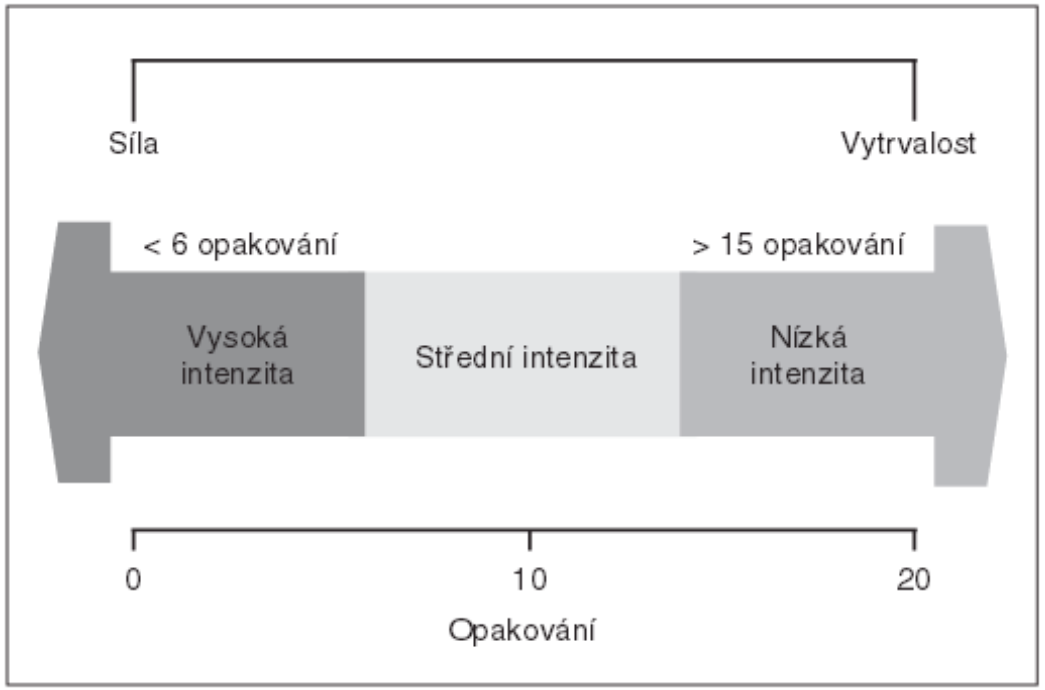
CAVE: Beta-blokátory / verapamil / dilthiazem

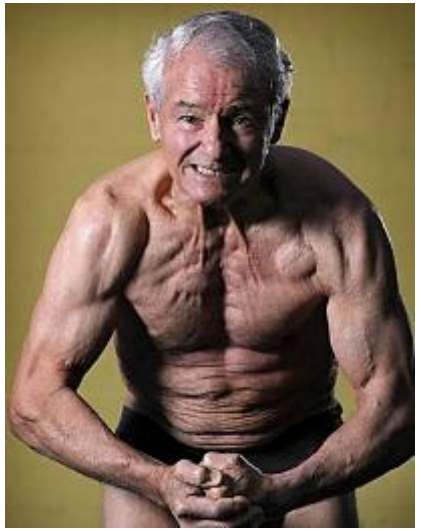
Dynamická aerobní zátěž

- Cíl – předepsat takovou zátěž, aby umožnila delší cvičení bez omezující únavy
  - 50-70% VO_{2max}, HRR_{max} (resp. 40% u pacientů se srdečním selháním NYHA III/IV
  - Ventilační prahy
  - Borgova škála 12 – 14
  - 65-85% Hr_{max} (změřené ☺)

Bodové hodnocení (RPE)	Subjektivní vyjádření
6	
7	velmi velmi lehké
8	
9	velmi lehké
10	
11	docela lehké
12	
13	poněkud těžší
14	
15	těžké
16	
17	velmi těžké
18	
19	velmi velmi těžké
20	

Odporový trénink („posilování“)

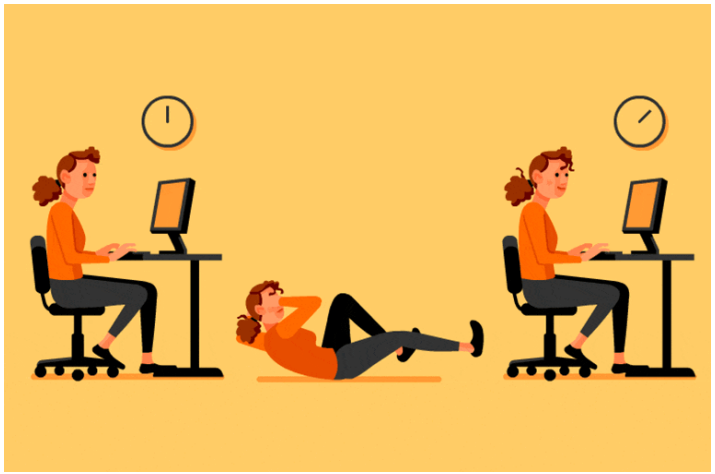




- ⇨ **Nižší počet opakování a těžší zátěž zvyšují sílu**
- ⇨ **Vyšší počet opakování s nižší zátěží zlepšují vytrvalost**
- ⇨ **Zátěž umožňující 8-15 opakování zlepšuje i sílu i vytrvalost**

Williams et al. Circulation 2007;116: 572

Exercise snacks – „Pohybové svačinky“



KPSP – každý pohyb se počítá!!

Stamatakis E, et al. Br J Sports Med Published Online First: 20 February 2019. doi: 10.1136/bjsports-2018-100397

„Kdo si neudělá čas na cvičení,
si možná bude muset udělat čas na to být nemocný.“

The Earl of Derby (1863)

Děkuji za pozornost
Dotazy vítány