Nutrition, activité physique et bilan d'énergie : qu'apprenons-nous des situations extrêmes ?

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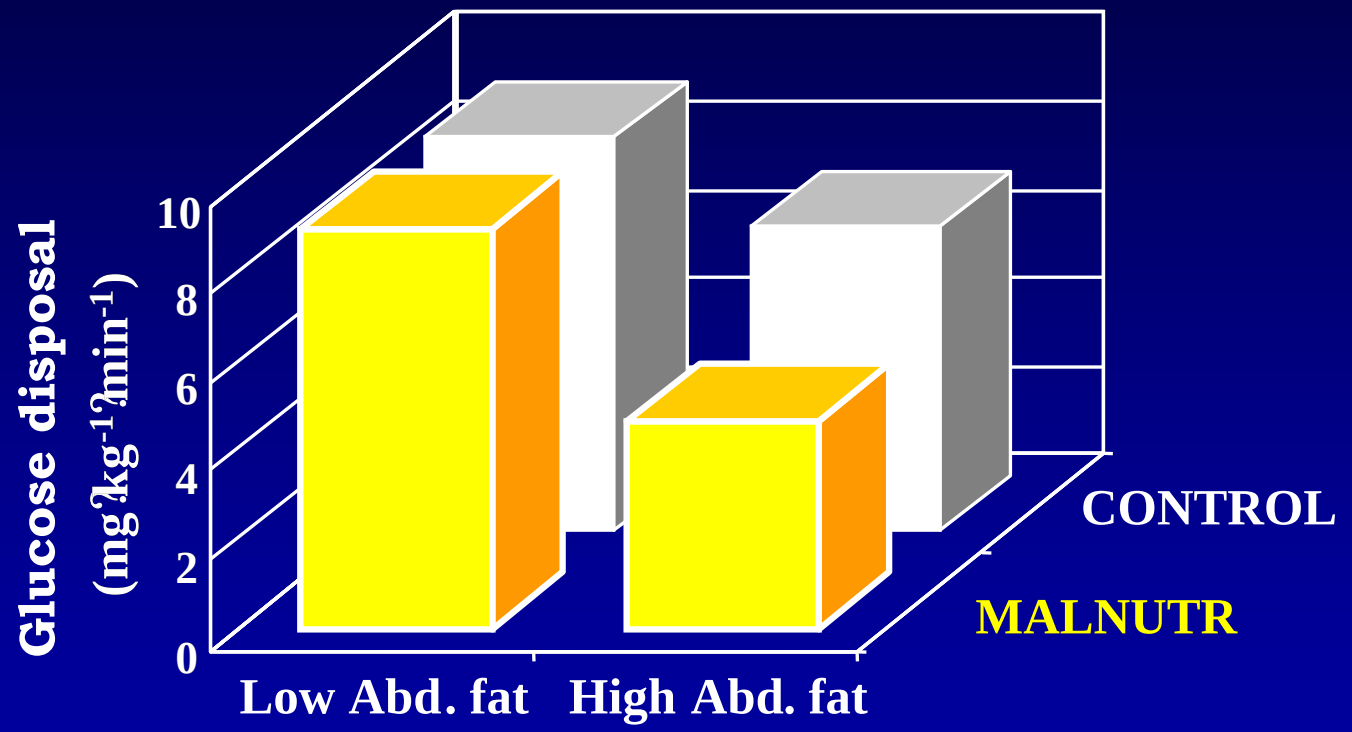
Que tout compte à partir du début

Insulin sensitivity and BMI or abdominal fat



Group effect (p=0.08),abd. fat effect (p<0.01), interaction (p=0.05)

Boulé NG, IJO, 2003

2

Que l'apport calorique est l'objet d'une exceptionnelle capacité d'adaptation à l'effort prolongé et répété

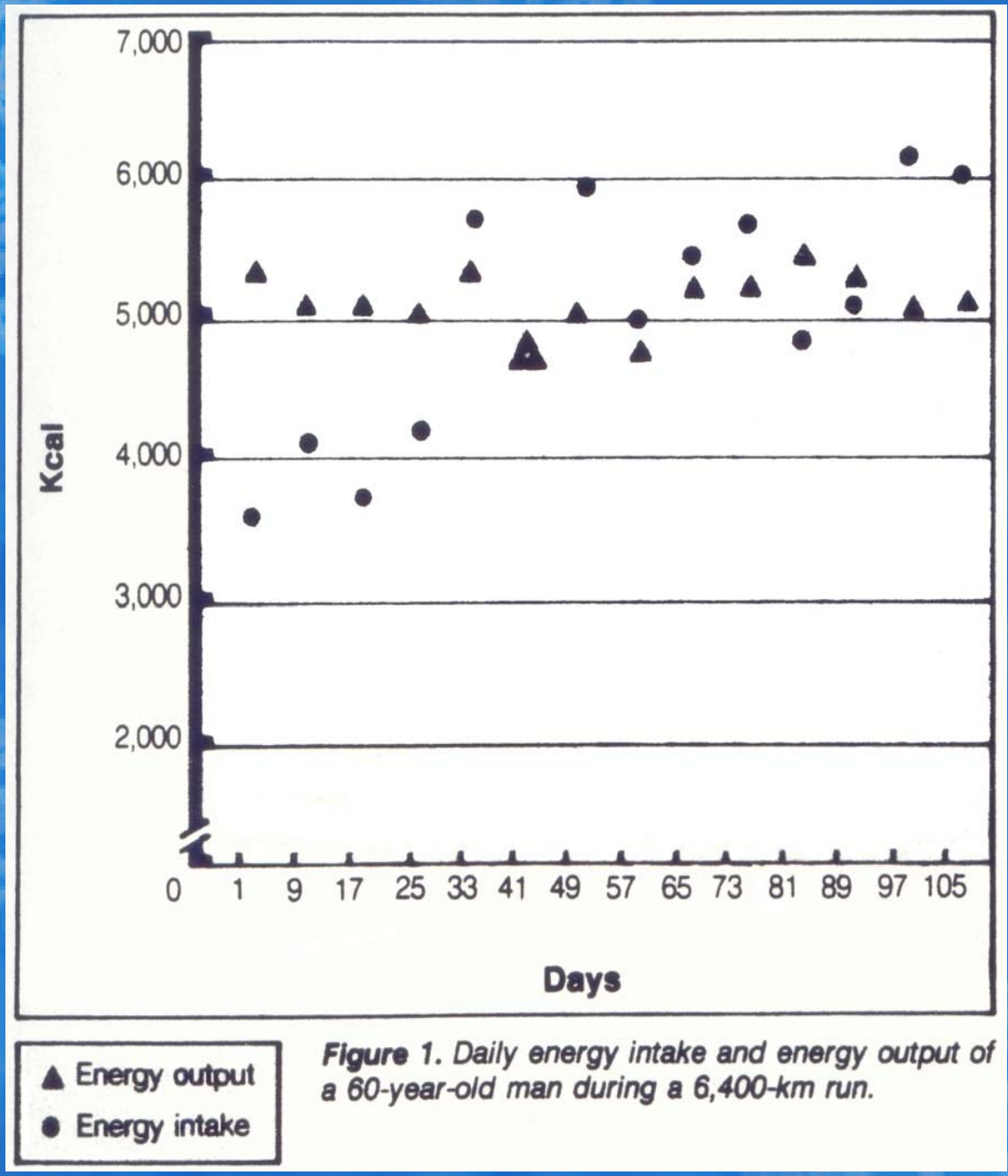


Figure 1. *Daily energy intake and energy output of a 60-year-old man during a 6,400-km run.*

From Jobin J et al, Phys Sports Med, 2004

3

Que des déficits métaboliques demeurent détectables même avec un mode de vie très athlétique

Table 1. *Characteristics of the weight-reducing program of each ex-obese runner*

Subject	*Initial body body weight*[1] *(kg)*	*Final body weight (kg)*	*Weight loss*		*Modes of treatment*		*Duration*[3]
			(kg)	*(%)*[2]	*Diet*	*Exercise*	*(Yr)*
PJ	115.9	60	55.9	48.2	Yes[4]	Running	2
RC	99.1	68.6	30.5	30.8	No	Running	5
RG	104.5	68.2	36.3	34.7	Yes[4]	Running	5
AP	106.8	68.2	38.6	36.1	No	Running	10
YB	109.1	73.2	35.9	32.9	Yes[4]	Running	4

1 These values represent retrospective self reports.
2 Percentage of the initial body weight.
3 Total duration between the onset of the program and the time when the subjects were not able to lose further weight.
4 Subject PJ: His diet consisted of eliminating fried foods and pastries.
Subject RG: He reduced his intake of pastries, various dried pastes, and bread. He increased his vegetable intake.
Subject YB: He abstained from eating eggs, butter, bread, and dessert.

From Tremblay A et al, IJO 8: 641-648, 2004

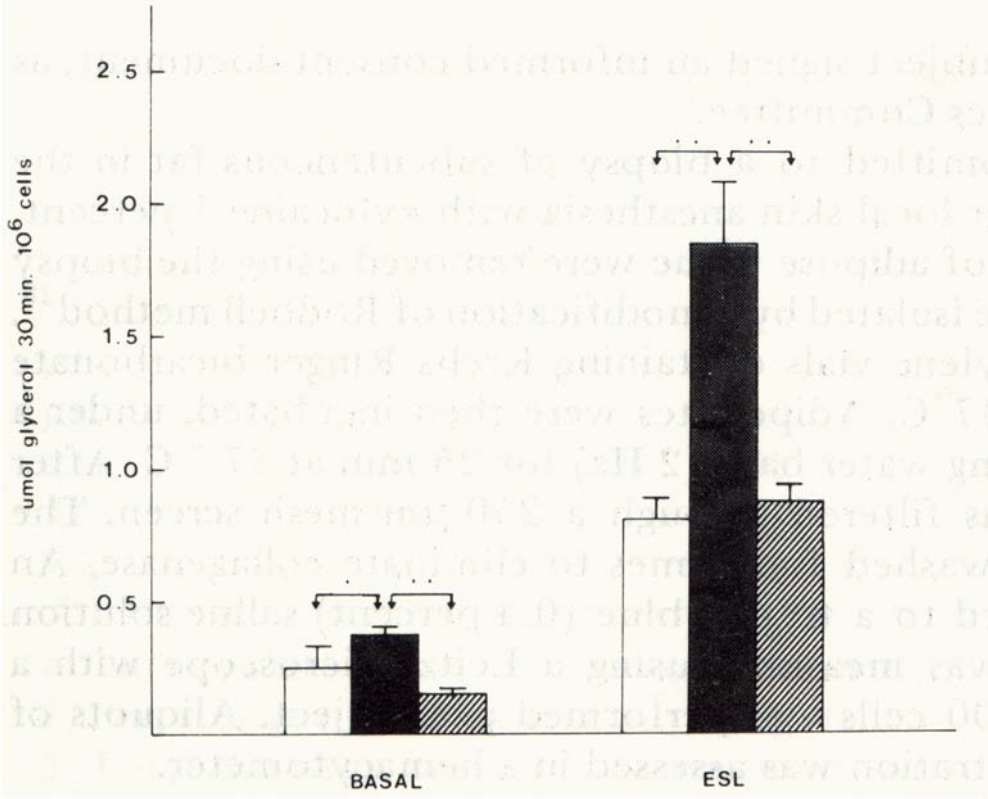


Figure. *Basal and epinephrine stimulated (10^{-4}) lipolysis (ESL); open columns – ex-obese runners; solid columns – elite runners; and diagonally-striped columns – sedentary controls (Mean ± SEM). *$P<0.05$; **$P<0.01$.*

From Tremblay A et al, IJO 8: 641-648, 2004

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Que l'exercice physique peut beaucoup aider au maintien d'un poids corporel réduit

Impact de l’arrêt de l’entraînement (2 mois) sur la composition corporelle de nageuses d’élite

	Avant	Après
Poids corporel (kg)	61,7	64,4
Masse grasse (kg)	12,3	16,4
Énergie corporelle (MJ)	689	843

Adapté de Alméras et al, Physiol. Behav 61: 811-817, 1997

Characteristics of individuals maintaining a weight loss of at least 30 pounds (13.6 kg) for at least 1 year

Body weight loss	30.1 kg
Duration of maintenance	5.7 years
Relative fat intake	25 % kJ
Physical activity participation*	11 847 kJ/week

* Including strenuous physical activities

Adapted from McGuire MT et al. IJO 22:572-577, 1998.

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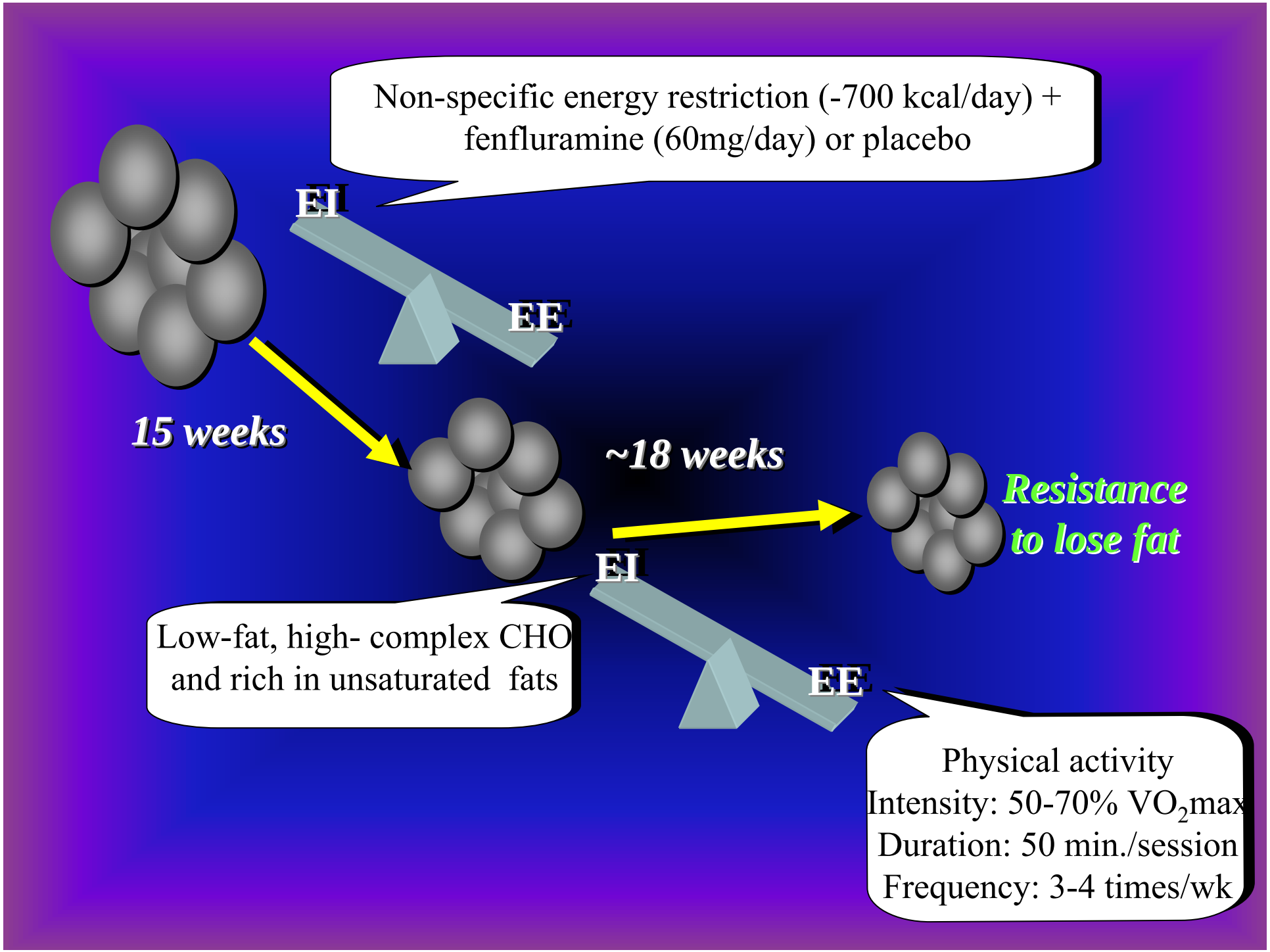
Que trop d'une bonne chose peut nuire davantage qu'aider

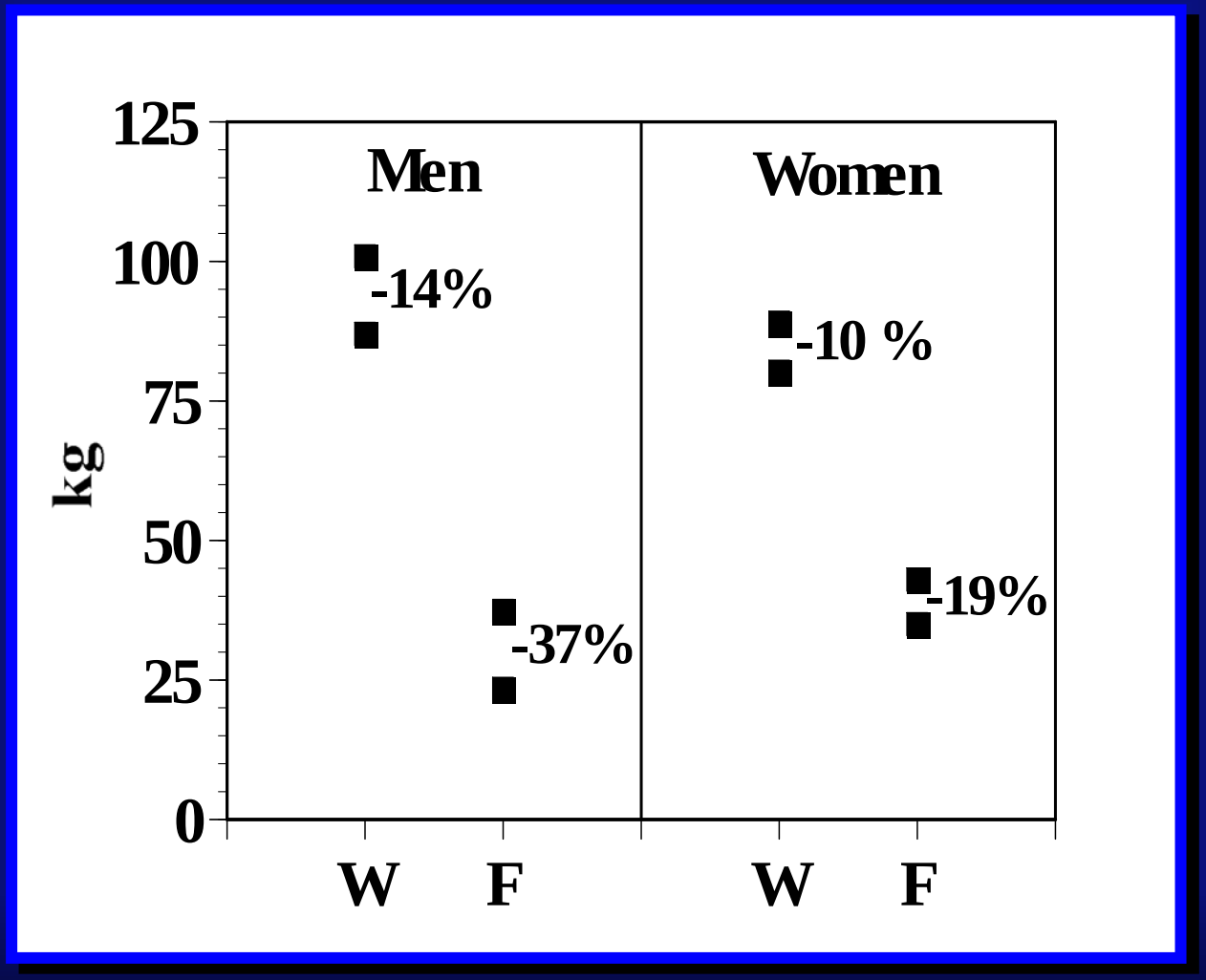

Non-specific energy restriction (-700 kcal/day) + fenfluramine (60mg/day) or placebo
EI
EE
15 weeks
~18 weeks
Resistance to lose fat
EI
EE
Low-fat, high- complex CHO and rich in unsaturated fats
Physical activity
Intensity: 50-70% VO_2max
Duration: 50 min./session
Frequency: 3-4 times/wk

Mean exercise intensity and duration in reduced-obese men and women

	Men	*Women*
Intensity (heart beats/min)	*140*	*129*
(% VO_2max)	*71*	*52*
Duration (min / session)	*49*	*52.2*
(n weeks)	*18.3*	*17*
Frequency (n sessions/ week)	*3.1*	*4.3*

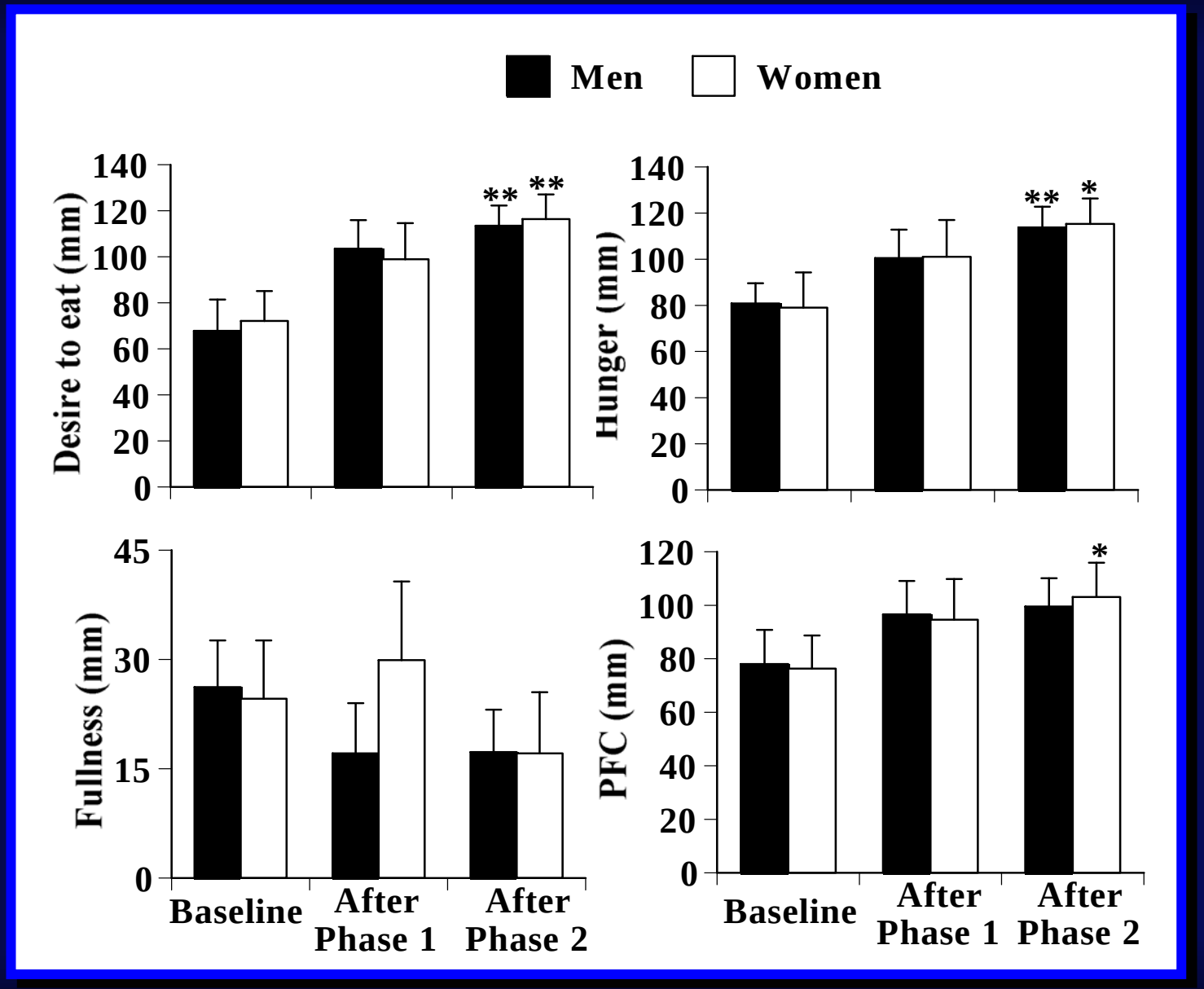
Adapted from Obes Res 7: 323-333, 1999

Body weight (W) and fat losses (F) before and after an exercise-low fat diet follow-up



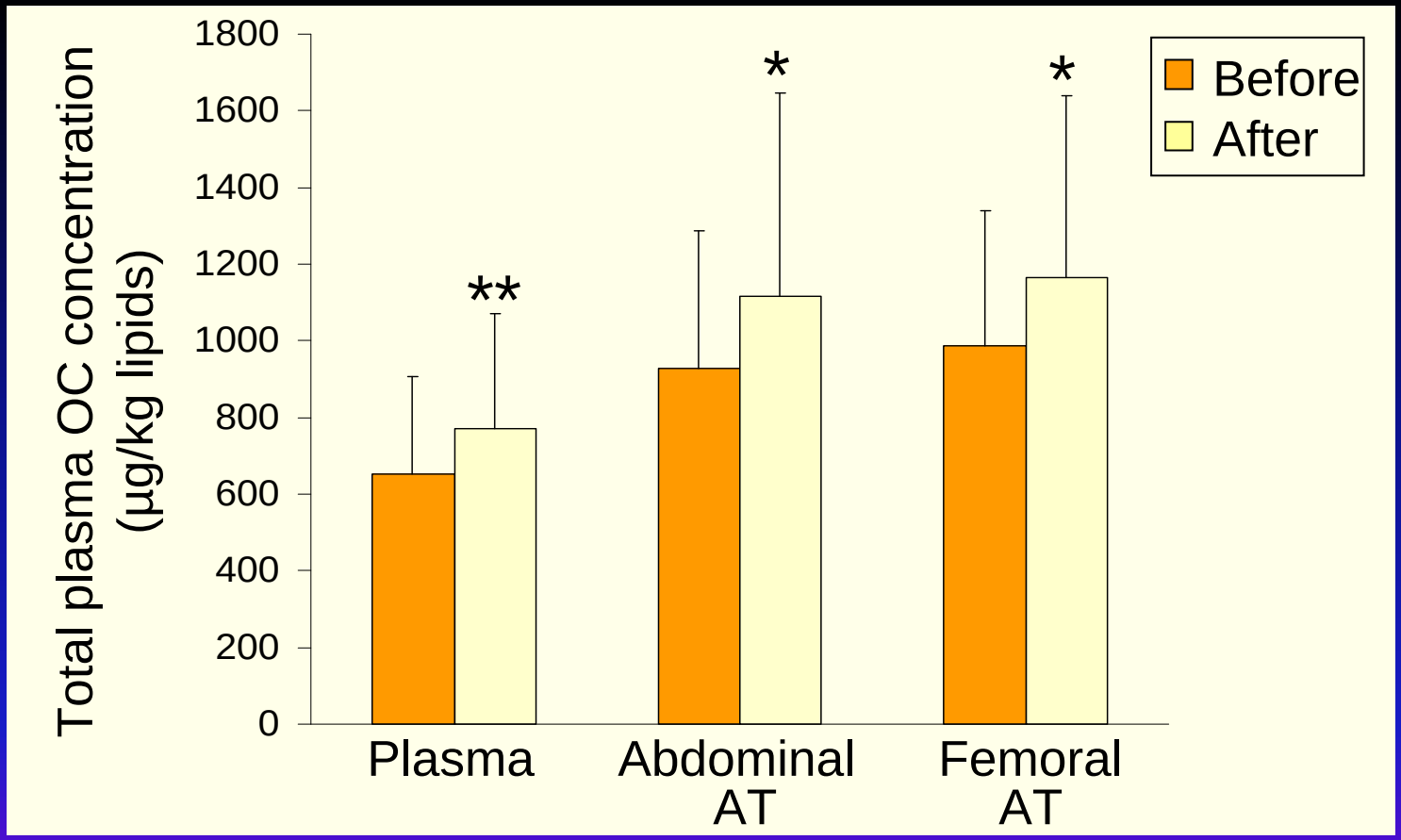
Adapted from Doucet, E. et al. Obes Res (1999), 7 : 323-33.

Fasting appetite after weight loss



Adapted from Doucet, E. et al. Int J Obes (2000).

Total [OC] in plasma and abdominal and femoral adipose tissue (AT) before and after weight loss

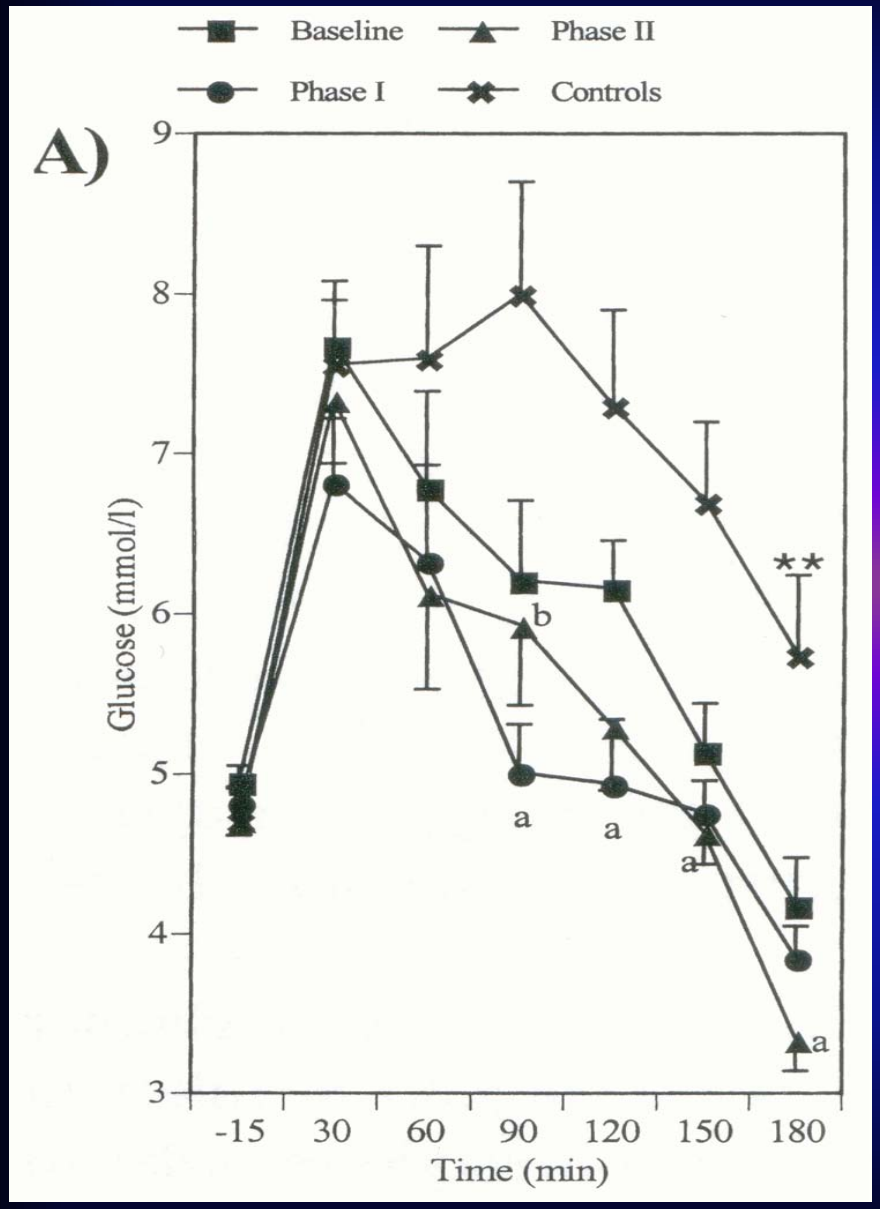


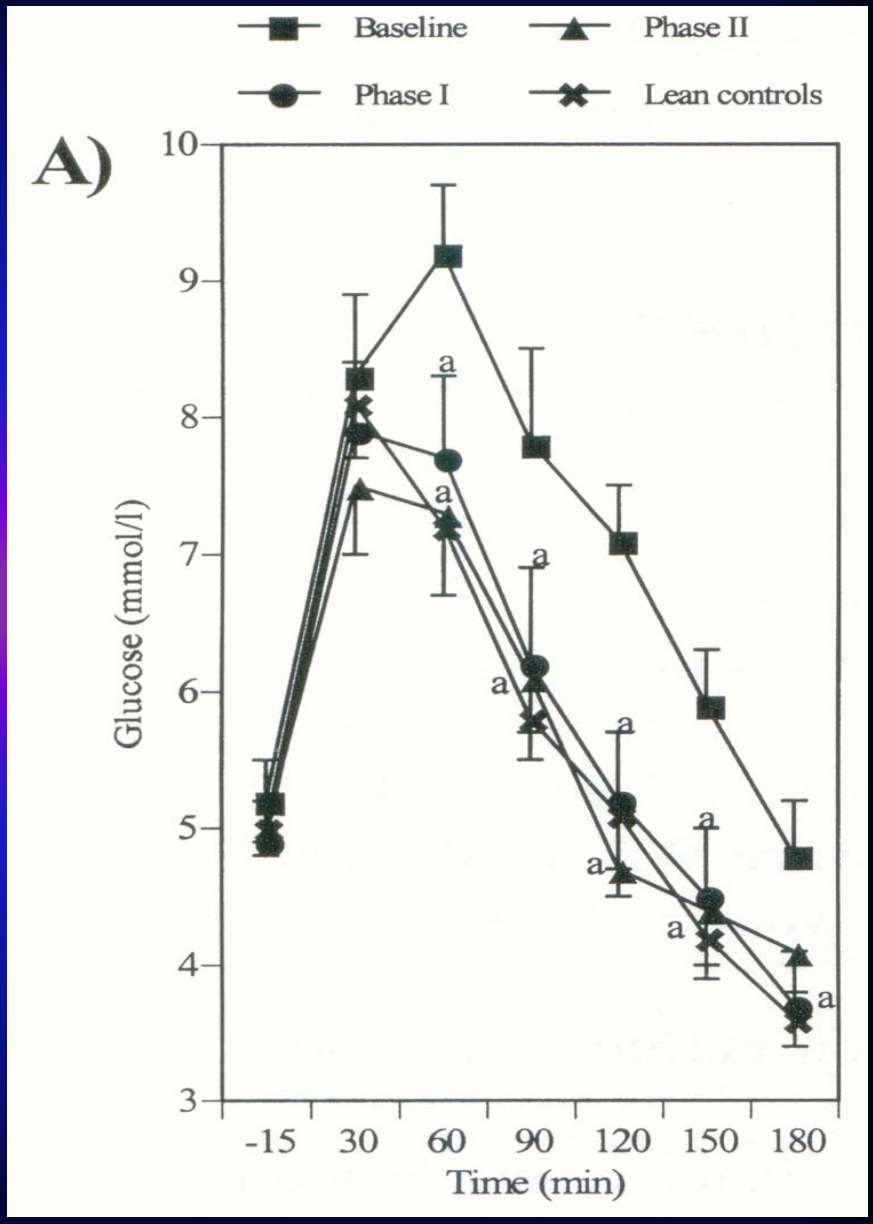
* P < 0.05, ** P < 0.001

Chevrier *et al*., Int J Obes 2000, 24: 1272

Les OC et la biologie humaine

- Les OC sont présents chez tous les organismes vivants
- La concentration dans l ’organisme est corrélé + avec la masse grasse
- Lors de la perte de poids, [OC] ↑ dans le plasma et les tissus
- Cette ↑ est corrélée avec les changements du métabolisme énergétique (↓ DER, $[T_3]_{plasma}$ et activité des enzymes oxydantes du muscle squelettique)
- Peut favoriser le regain de poids
- OC pourraient être associés à d ’autres effets néfastes lors de la perte de poids ??





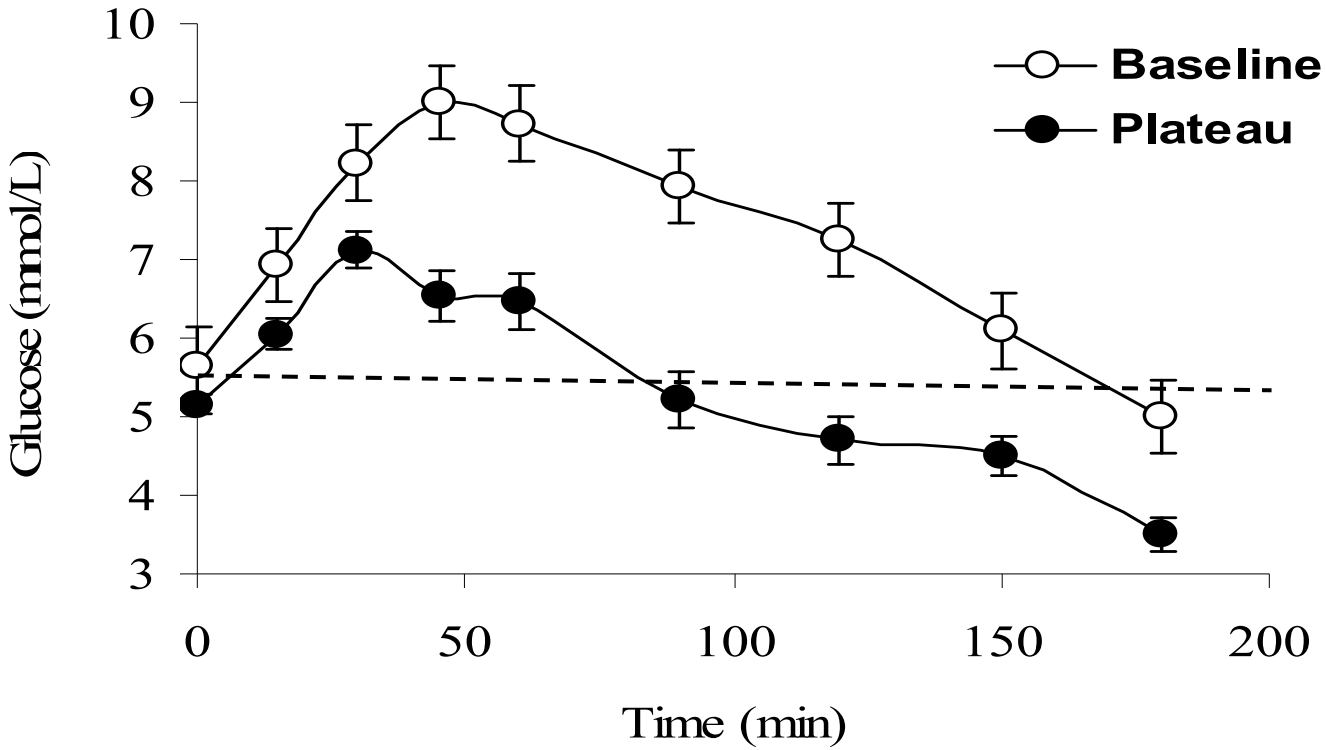
Tremblay et al, Obes Res 1999

Impact of physical activity and healthy diet on weight loss up to resistance to further lose fat

Baseline -5 kg -10 kg Plateau

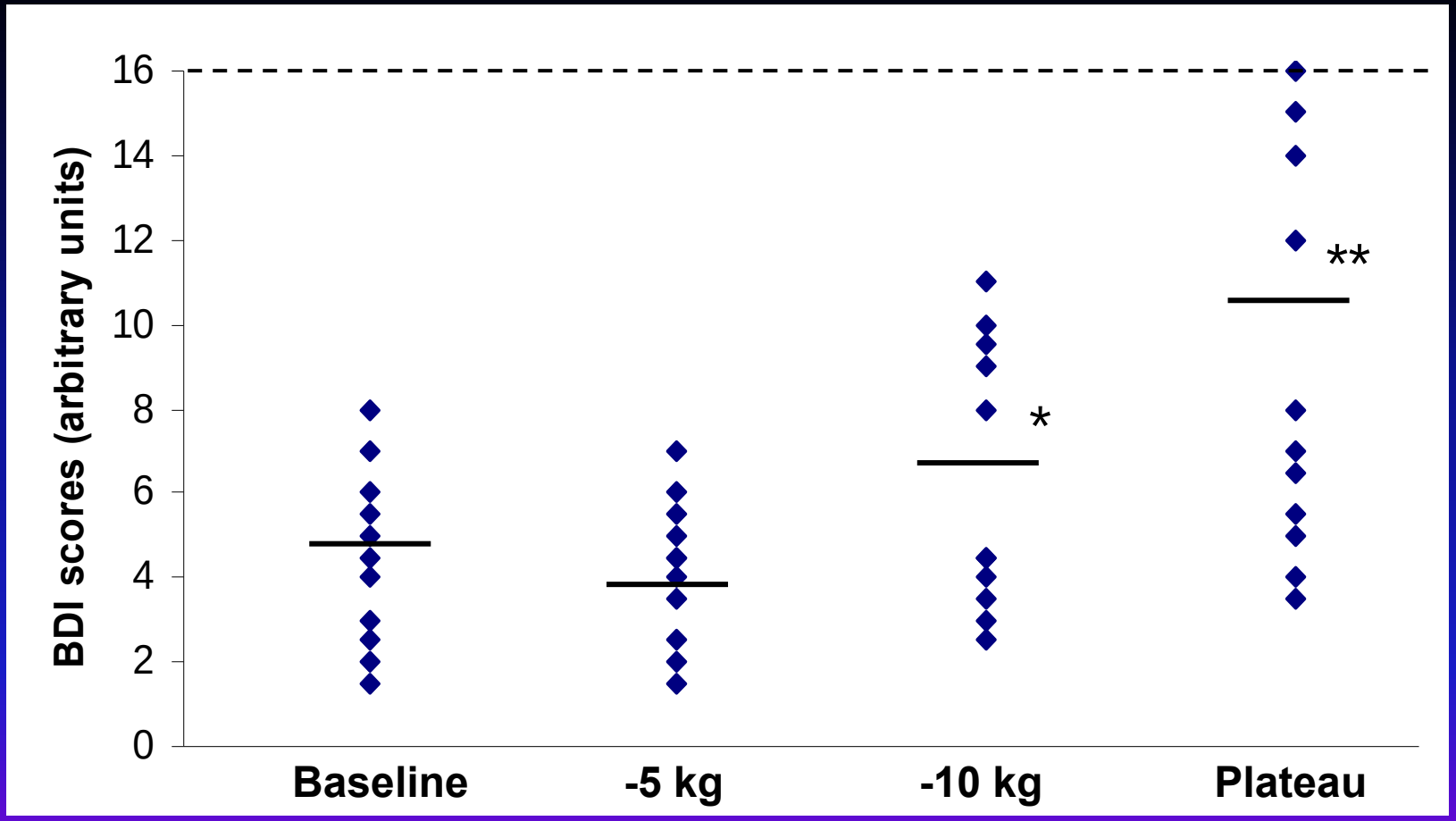
X

Mean plasma glucose concentrations during the OGTT over the course of the weight reducing program



Adapted from Chaput JP et al, APNM 33: 86-92, 2008

Evolution of depression symptoms over the course of the weight reducing program

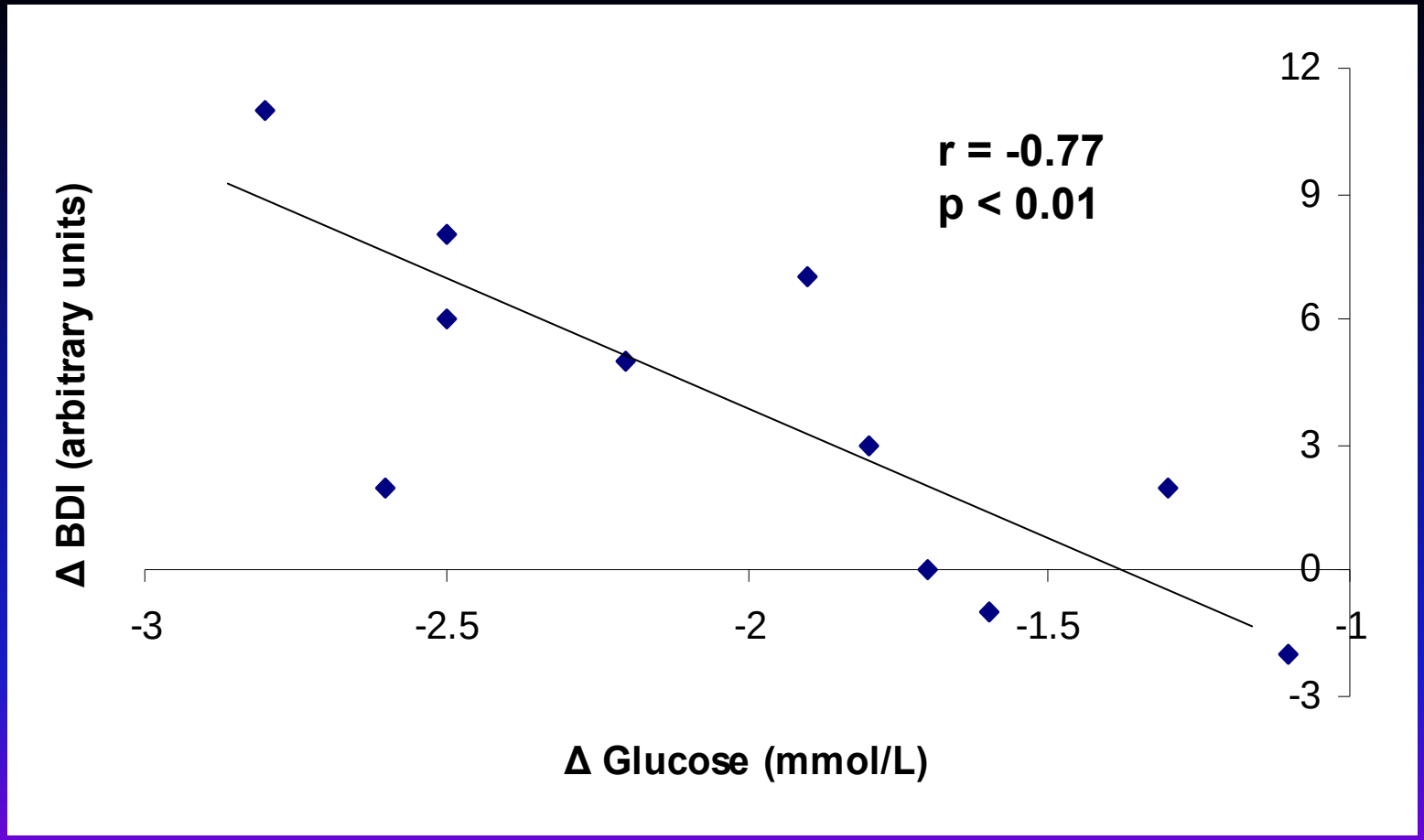


***Significantly different from baseline mean score (p<0.05); **(p<0.01).**

Adapted from Chaput JP et al. Physiol Behav 2005 and Chaput JP et al. Depress Anxiety 2006.

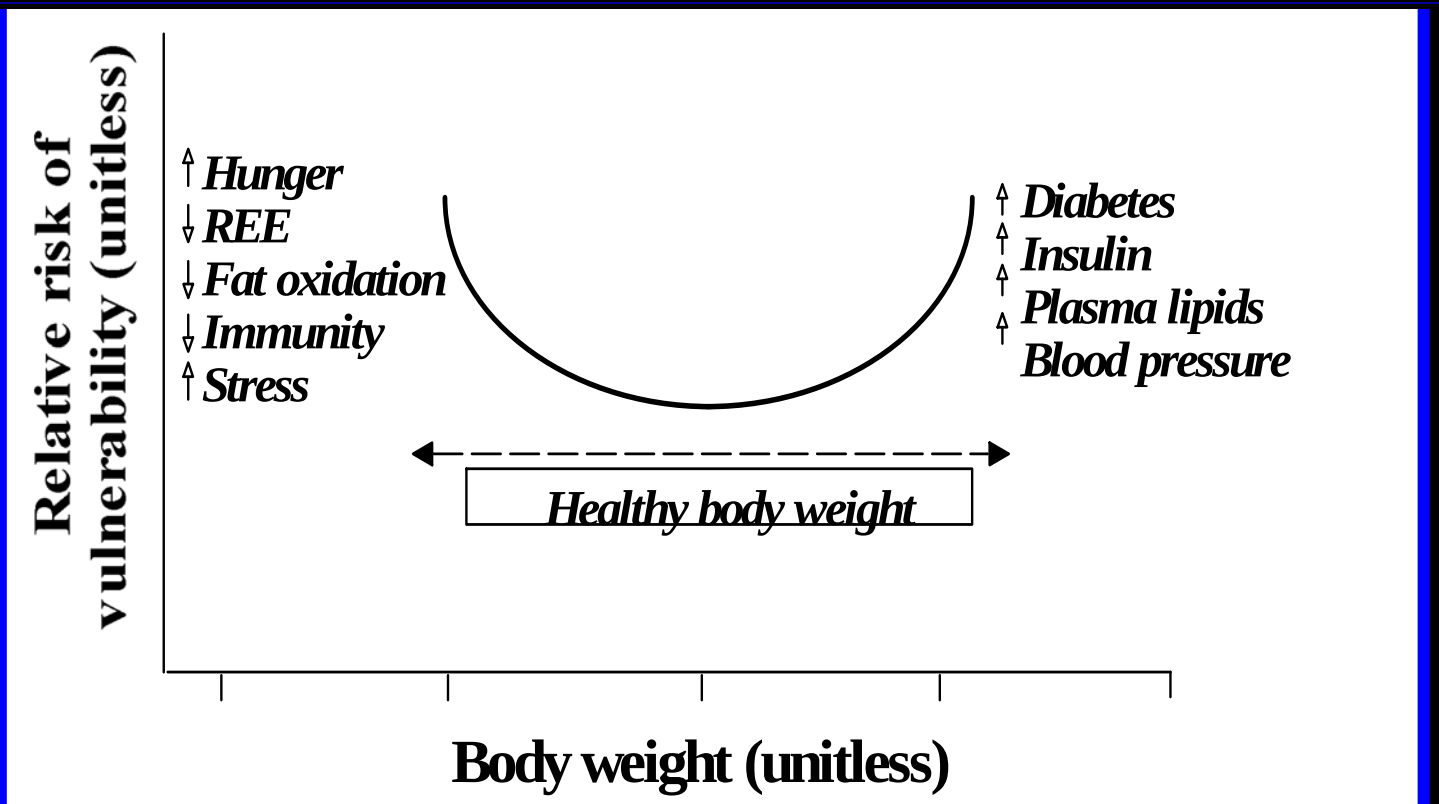
Relationship between change in glucose concentrations at 180 min of the OGTT and change in BDI scores

(plateau – baseline values)



Adapted from Chaput JP et al, APNM 33: 86-92, 2008

Illustration of the notion of a healthy body weight seated between the risks of excess weight gain and excess weight loss



From Tremblay, A. and Doucet, E., Obes Rev (2000).

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Que certains ingrédients ont des propriétés étonnantes :

- *Des épices qui rassasient*
- *Des “chips” qui désintoxiquent*

Combined effects of red pepper and caffeine on 24h energy balance

	(kcal/day)
Decrease in EI :	*956*
Increase in EE :	*76*
Change in EB :	*1032*

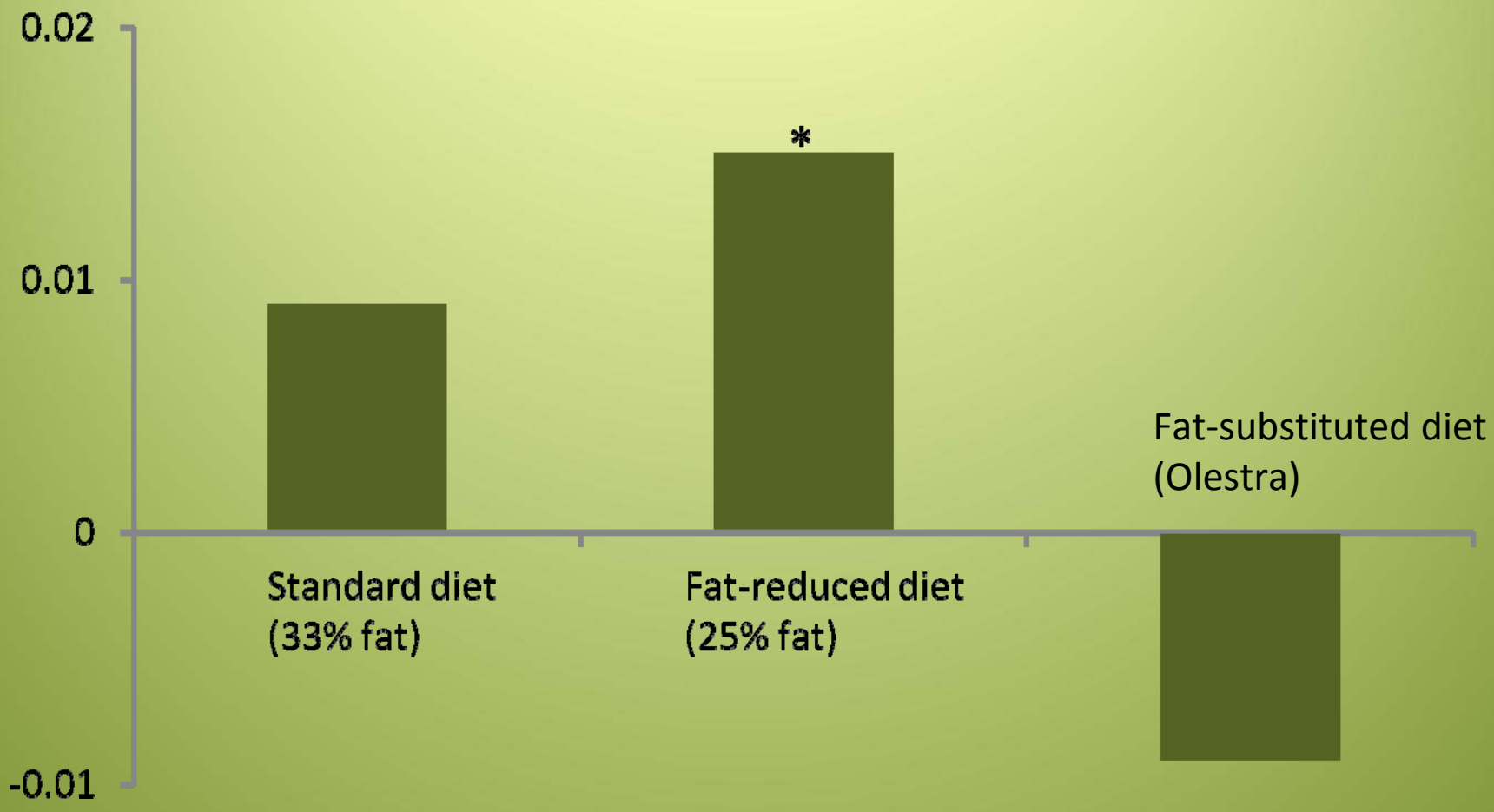
Adapted from Yoshioka et al, BJN 85: 203-211, 2001.

Effect of Olestra on OC plasma concentrations during a weight-reducing program

Hélène Arguin, Université Laval
George Bray, Pennington Biomedical Research Center (Louisianne)
Jennifer Lovejoy, Bastyr University (Kenmore)
John Peters, Procter & Gamble (Cincinnati)
Angelo Tremblay, Université Laval

Objective: Evaluate the ability of Olestra to prevent the increase in OC concentrations induced by weight loss.

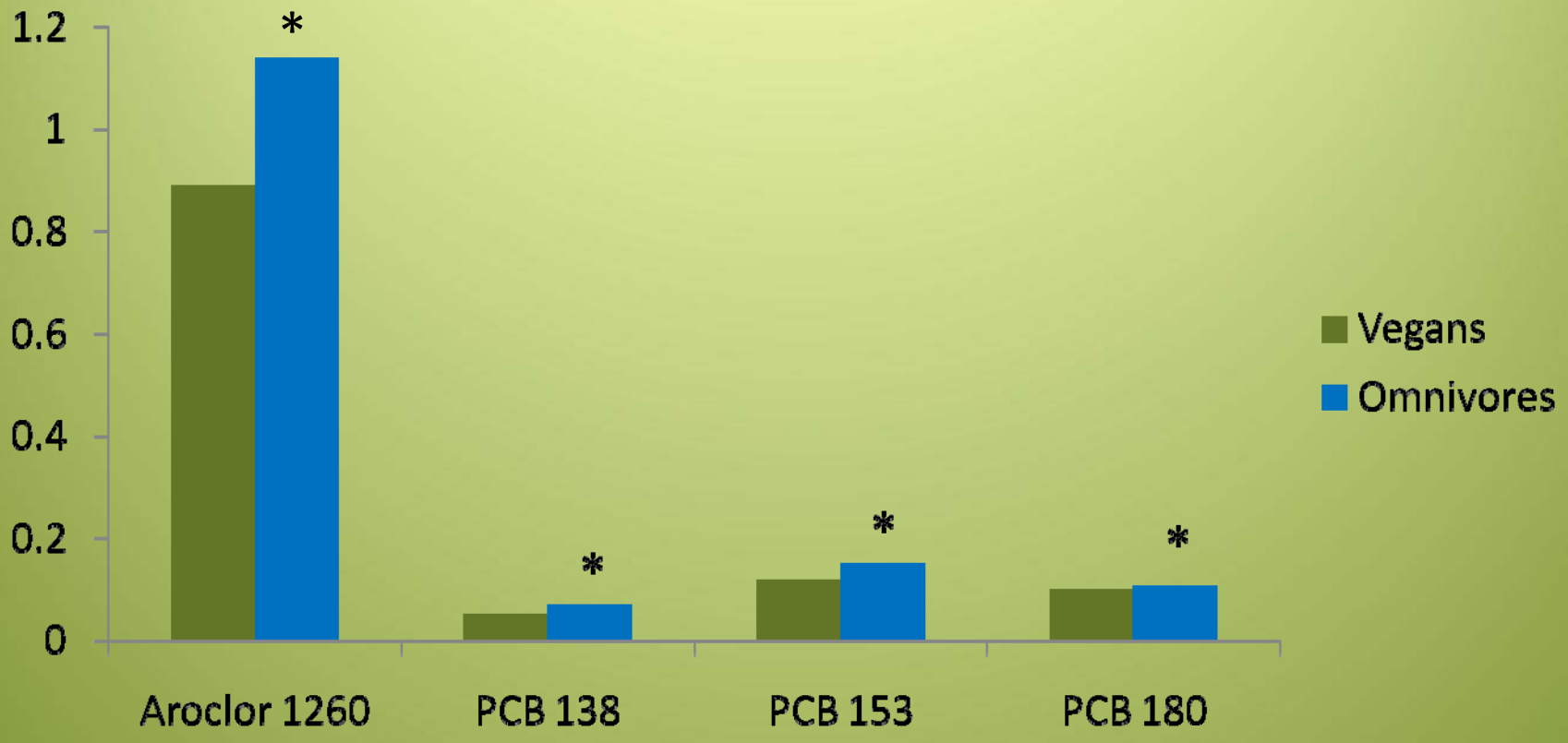
Changes in β-HCH plasma concentration in response to weight loss



B-HCH concentrations are adjusted for age, delta body weight and delta fat mass
**Significantly different from the fat-substituted diet, $p<0.05$*

Arguin et al, Br J Nutr, 2010

Mean plasma concentrations of POPs in vegans and omnivores



P-values are adjusted for age and BMI
**The 2 groups are significantly different , p<0.05*

Arguin et al, Br J Nutr, 2010

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Qu'un petit mangeur peut se méprendre sur lui-même

Energy requirements of a postobese man reporting a low energy intake at weight maintenance

(Tremblay A et al, Am J Clin Nutr 54: 506-508,1991)

Le sujet :

Âge : 45 ans

Poids maximal : 165,5 kg

Poids au moment de l'étude : 100,5 kg

Expérience #1 :

Apport énergétique rapporté (10 jours) : 5 251 kJ/jour

Perte de poids : 2 kg

Expérience #2 :

Apport énergétique rapporté (16 jours) : 8 008 kJ/jour

Métabolisme de repos mesuré : 7 832 kJ/jour

Variations du poids $\leq$ 0,4 kg

Energy requirements of a postobese man reporting a low energy intake at weight maintenance (suite)

(Tremblay A et al, Am J Clin Nutr 54: 506-508,1991)

Expérience #3 :

Lieu : Beltsville, USA

Mesure de la dépense d'énergie avec un apport de 7 950 kJ/jour

Dépense d'énergie (calorimétrie directe) : 12 552 kJ/jour

Dépense dénergie (calorimétrie indirecte) : 12 816 kJ/jour

Expérience #4 :

Mesure de la dépense d'énergie et du poids corporel avec un apport de 7 950 kJ/jour pendant 21 jours

Dépense d'énergie (eau doublement marquée) : 13 473 kJ/jour

Perte de poids : 3,7 kg

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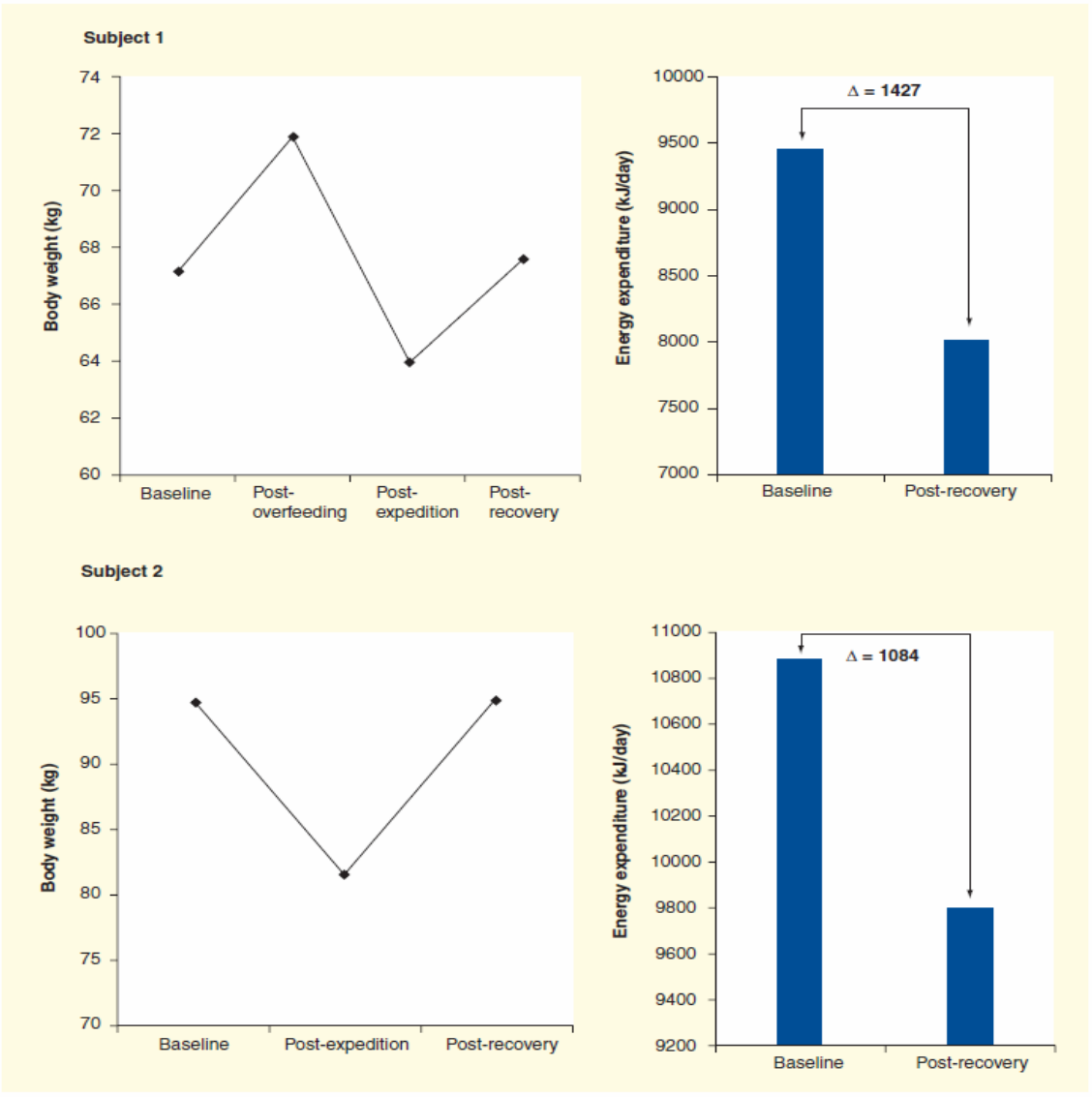
Que le yoyo peut modifier certains attributs biologiques, y compris la dépense d'énergie

Figure 1. Variations in body weight and daily energy expenditure in response to a weight cycle imposed by an expedition in Greenland (Subject 1) and in Antarctica (Subject 2).



Tremblay et al, Future Lipidol 2: 651-658, 2007

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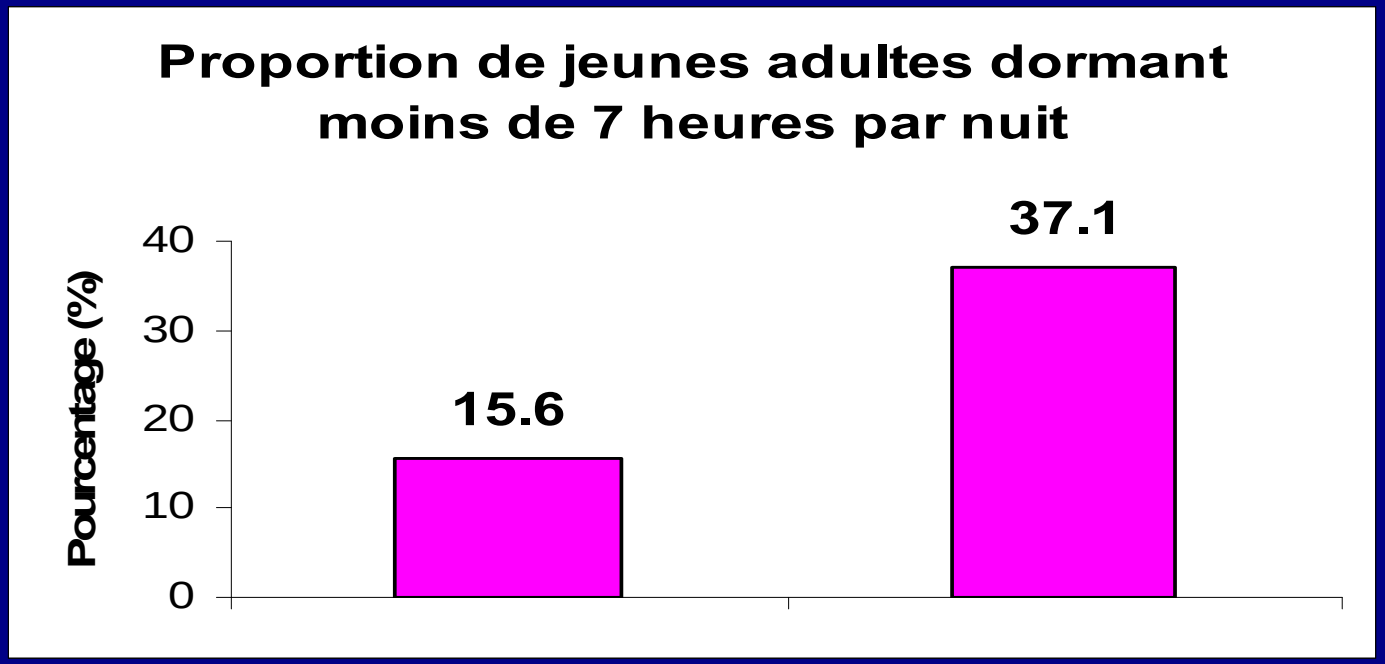
Qui dort dîne

Évolution du sommeil au cours des dernières années

- ↓ 1-2 heures/jour au cours des 40 dernières années (population américaine)



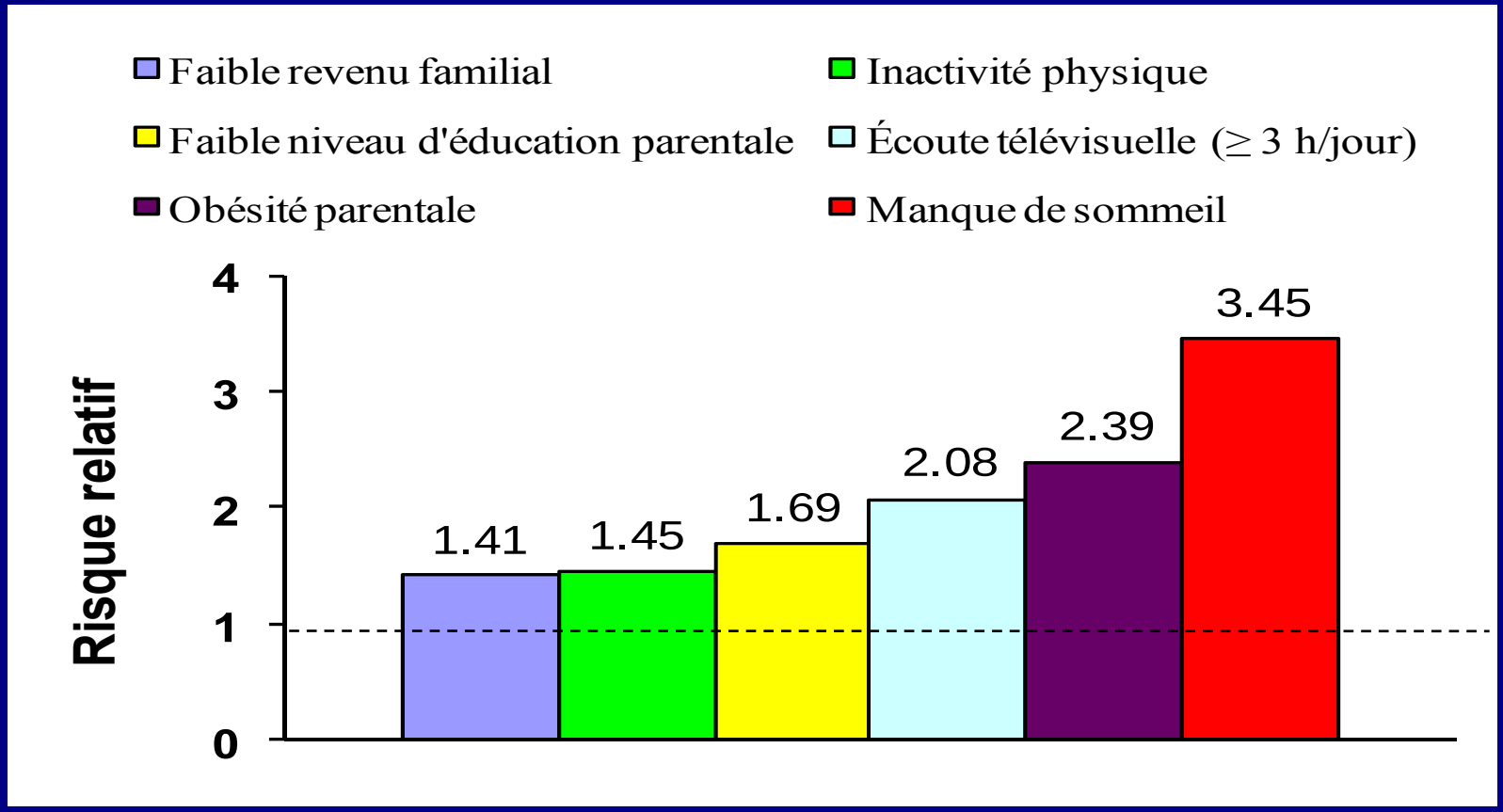
National Sleep Foundation (2006).

Que nous disent les données expérimentales?

- La privation du temps de sommeil est associée à :
  - [leptine] plasmatique plus faible.
  - [ghreline] plasmatique plus élevée.
  - [cortisol] plasmatique plus élevée.
  - Désir de manger accru.
  - Dominance du tonus sympathique.
  - Diminution de la tolérance au glucose.

Spiegel K *et al.* Lancet 1999;354:1435-9.
Spiegel K *et al.* Ann Intern Med 2004;141:846-50.

Risque pour un enfant de présenter un surpoids/obésité en fonction de différents facteurs



Adapted from Chaput *et al.* ***Int. J. Obes. 30: 1080-1085, 2006.***

Difference in mean body weight (kg) at baseline and over a 6y follow-up between normal sleepers and short or long sleepers

	Short sleepers	Long sleepers
baseline	7.6	3.1
6y follow-up	1.9	1.5
end of follow-up	9.5	4.6

Adapted from Chaput JP et al, Sleep 2008; 31: 517-23

Risk factors for overweight and obesity in adulthood: Results from the Quebec Family Study

Risk factors	Adjusted OR (cross-sectional)	▲ BW (kg) vs reference category (6 y follow-up)
Short sleep duration	3.81*	1.65
High disinhibition eating behavior	3.8*	1.46
Low dietary calcium intake	2.88*	1.3
High susceptibility to hunger behavior	2.2*	1.28
Non-participation in high-intensity physical exercise	2.03*	1.23
High dietary restraint behavior	2.01*	1.09
Non-consumption of multivitamin and dietary supplements	1.86*	0.87
High dietary lipid intake	1.64**	0.61
High alcohol intake	1.37**	0.39

*p < 0.01, ** p < 0.05

Adapted from Chaput et al, Obesity 2009