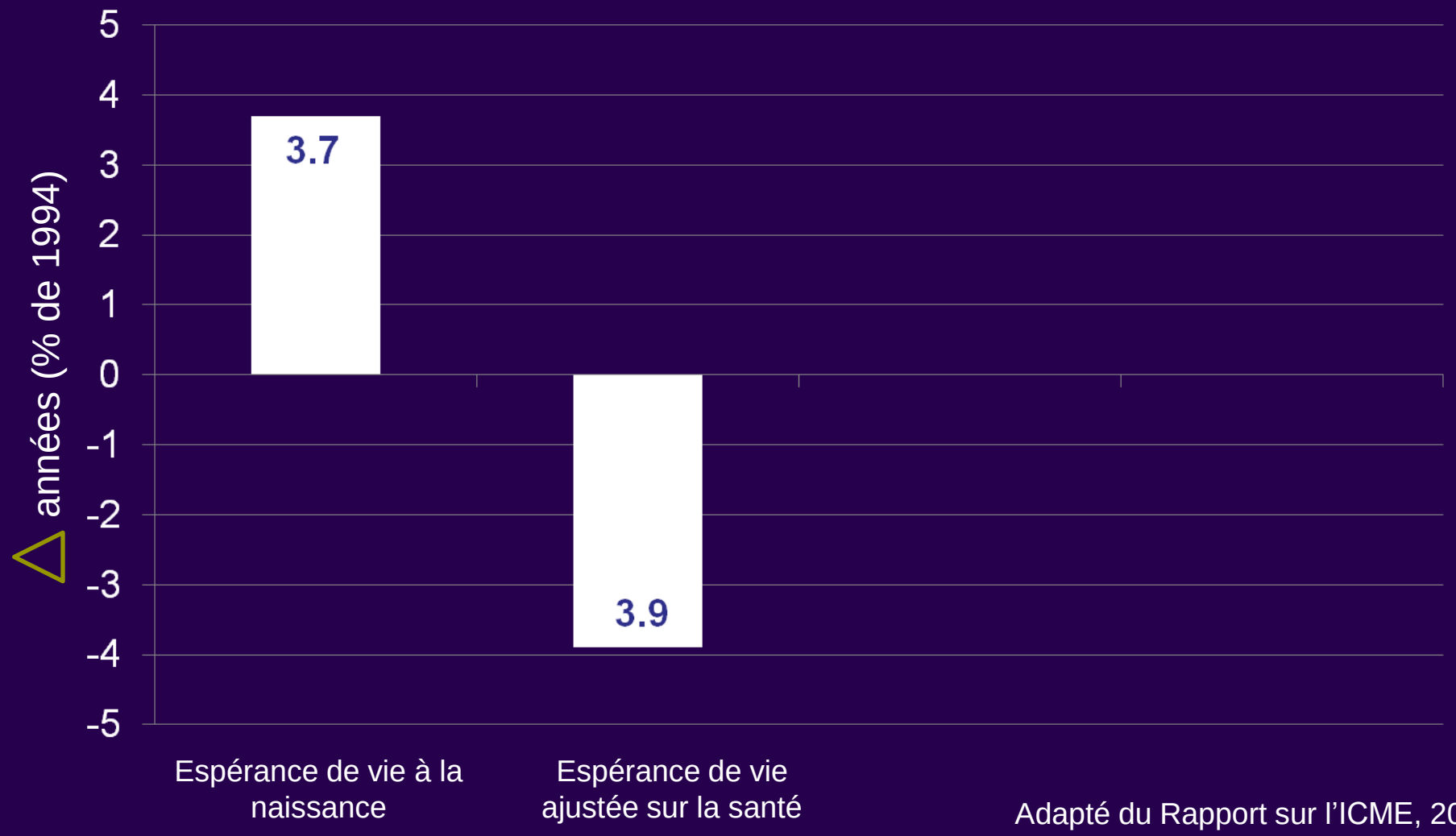
Activité humaine et obésité : bien plus qu'une question de mouvement ou de calories

Angelo Tremblay
Département de kinésiologie
Université Laval

Tendances de l'espérance de vie au Canada entre 1994 et 2010

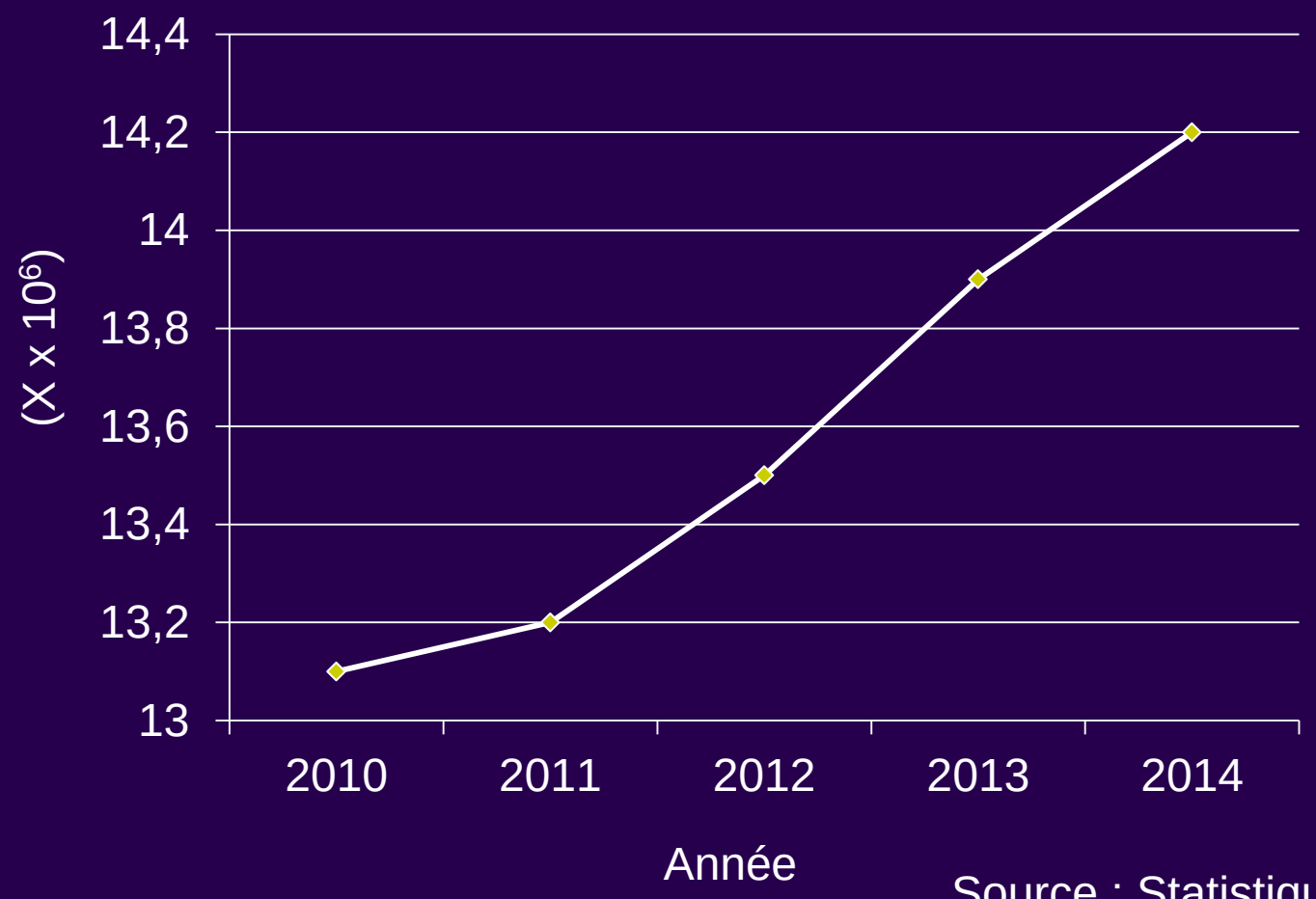


Adapté du Rapport sur l'ICME, 2012

Pourquoi en sommes-nous là alors que la technologie devait nous procurer bonheur, santé et bien-être?

Le contexte actuel

Nombre de Canadiens rapportant un surplus de poids entre 2010 et 2014

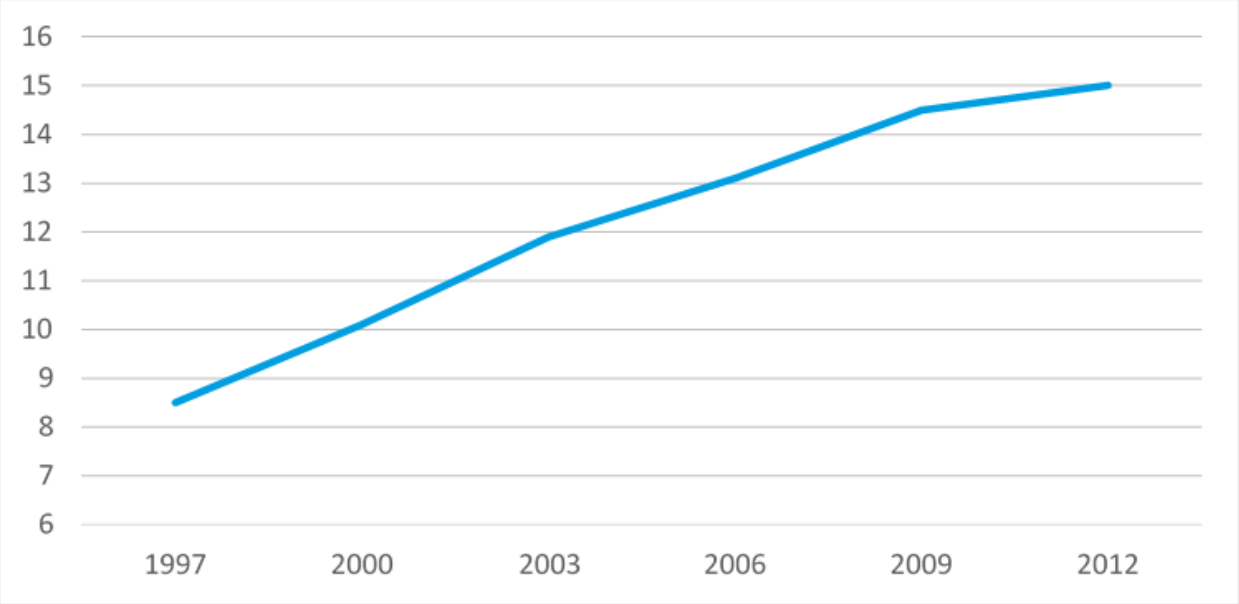


Source : Statistiques Canada

Le contexte actuel

% de Francais rapportant un surplus de poids entre 1997 et 2012 (OBEPI)

Figure 1 - Évolution entre 1997 et 2012 du pourcentage d'adultes de 18 ans ou plus obèses* en France métropolitaine



**Déclarant un indice de masse corporelle supérieur ou égal à 30 kg/m² (obésité).*

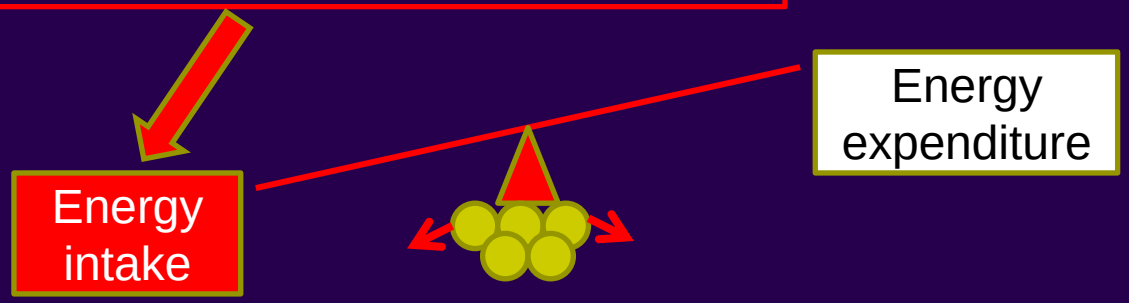
Sources : Inpes, Institut Roche, TNS Healthcare(Kantarhealth) (Enquête ObÉPI).

Et pourquoi sommes-nous davantage obèses?

Inadequate macronutrient intake
Insufficient micronutrient intake
Alcohol consumption
Sedentary behavior
Lack of exercise
Short sleeping / Poor sleep quality
Inadequate feeding behaviors
Persistent organic pollutants
Demanding mental work
Suboptimal gut microbiota
Increase in atmospheric CO_2 ?

X

HEREDITY

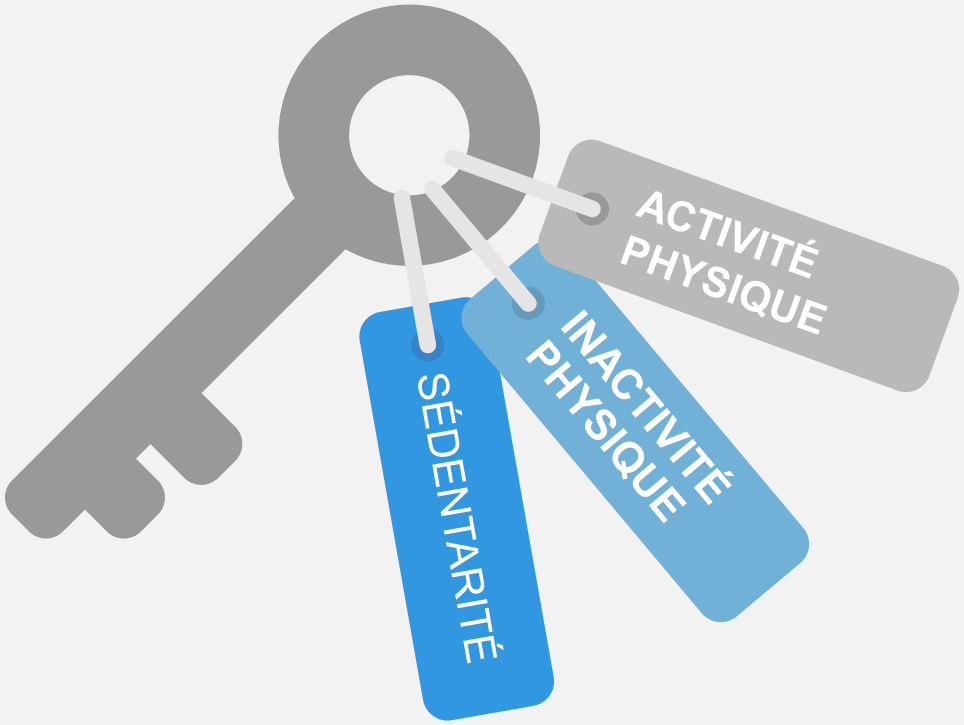


Changement du profil d’activité

- Ce qu’on a en partie perdu :
  - exercice vigoureux
  - sommeil

- Ce qui a remplacé :
  - travail cognitif

Définitions pertinentes



Mouvement corporel produit par la contraction de muscles squelettiques en générant un DE > MB

Non atteinte des recommandations en Activité Physique

Activité <1.5 Mets (SBRN)

ONAPS
Observatoire National de l'Activité Physique et de la Sédentarité

Mean energy expenditure and work intensity of Colombian sugarcane loaders

Work intensity: 42% VO_2max

Energy cost of work: 6.3 kcal/min

Daily energy expenditure: 3281 kcal/day

Adapted from Spurr G et al. AJCN 30: 1740-1746, 1977.

La pratique régulière d’exercice vigoureux

- est associée à une diminution de l’adiposité (Tremblay et al, AJCN 1990; Yoshioka et al, IJO 2001).

- favorise une augmentation du potentiel oxydatif musculaire (Tremblay et al, Metabolism 1994) et du métabolisme de repos (Yoshioka et al, IJO 2001; Tremblay et al, CJPP 1992).

- diminue l’apport énergétique relativement à la dépense (Imbeault et al, BJN 1997).

- favorise une augmentation de la stimulation beta-adrénergique (Tremblay et al, CJPP 1992; Yoshioka et al, IJO 2001).

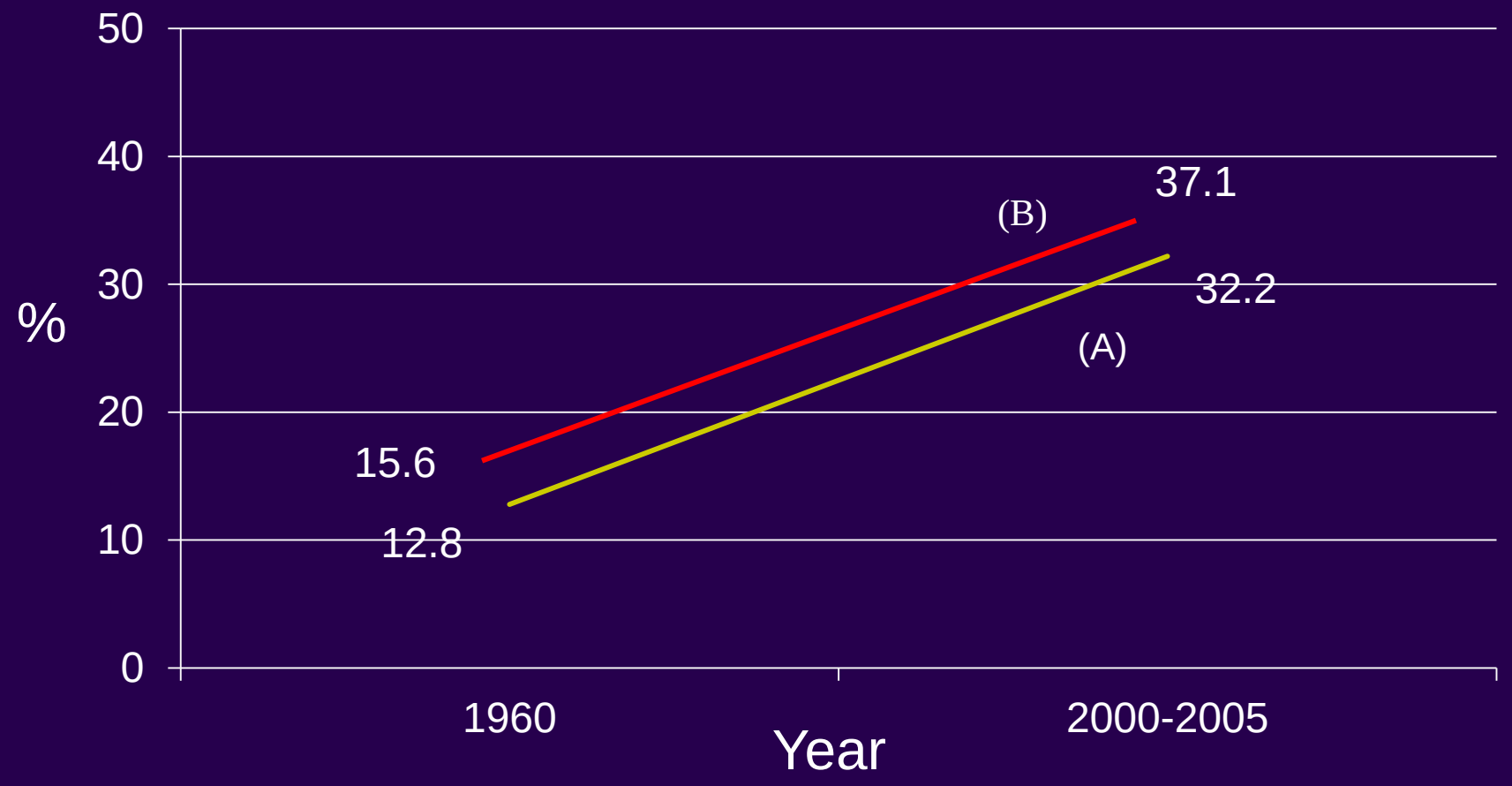
Sleep loss in children and adolescents over years

Subjects: 690,747 children from 20 countries
Study period: 1905 to 2008
Analysis: Linear regression (n = 641) of sleep duration on year of measurement at the age x sex x day type x country level
Median rate of change: - 0.75 min nightly per year (- 77.3 min/night over a century)

Matricciani et al. Sleep Med Rev (2012) 16: 203-211

Proportion of obese adults (A) and of young adults sleeping less than 7 hours per night (B) in the US:

Is there a link?



Adapted from: Flegal et al, IJO 1998, Ogden et al. JAMA 2006 and the National Sleep Foundation 2002

Sleep loss: WHY ?

Effect of sleep curtailment on appetite control

- Design: randomized, 2-period, 2-condition crossover clinical study in 12 healthy men
- Intervention: 2 days of sleep restriction and 2 days of sleep extension under controlled conditions of caloric intake and physical activity
- Results:
  - ↓ plasma leptin (18%)
  - ↑ ghrelin (28%)
  - ↑ hunger (24%)
  - ↑ appetite (23%)

Spiegel K *et al*. *Ann Intern Med* (2004)

Sleep deprivation increases energy intake in healthy men

Variable	Condition	
	Normal sleep (8h)	Reduced sleep (4h)
Energy intake (kcal/d)	2478	3037*
Lipid intake (% kcal)	38	41*

Values are means. * $p < 0.01$

Adapted from Brondel et al. AJCN 91: 1550-9, 2010

Insufficient sleep interferes with the outcome of a short term diet-based weight loss program

Variable	14-day moderate energy restriction with different sleep durations	
	8.5h/d	5.5h/d
▲ body weight	2.9	3.0
▲ fat mass (kg)	1.4	0.6*
▲ fat-free mass (kg)	1.5	2.4*
▲ body energy (kcal)†	14550	8028
(kcal/d)	1039	573

Values are means. * $p < 0.05$
† Based on the energy equivalent of fat mass and fat-free mass

Adapted from Nedeltcheva et al. Ann Int Med 153: 435-41, 2010

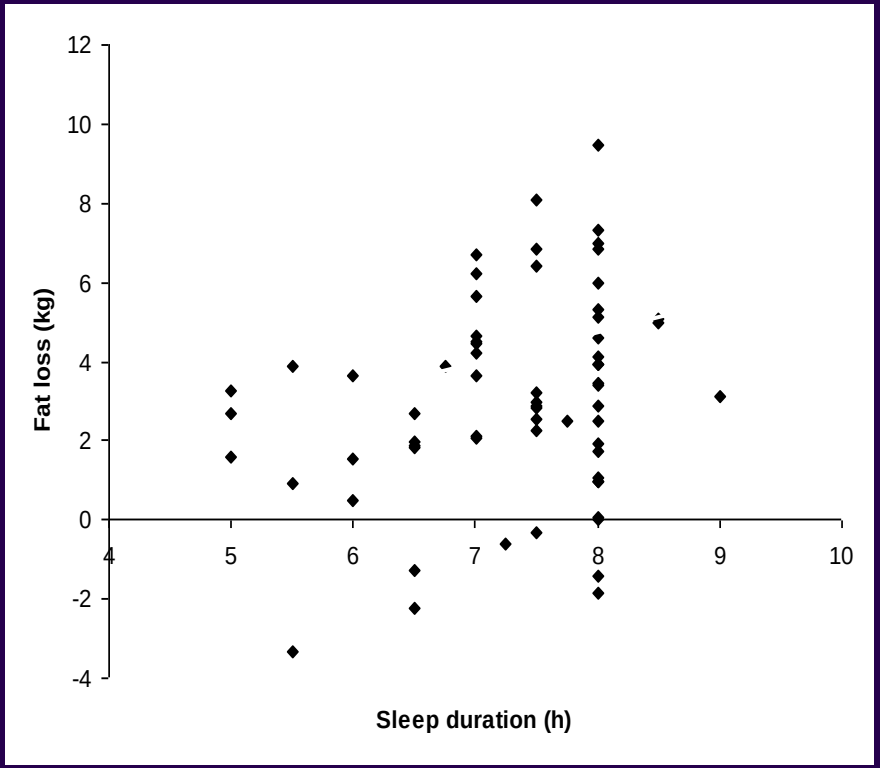
Sleeping habits predict the magnitude of fat loss in adults exposed to moderate caloric restriction

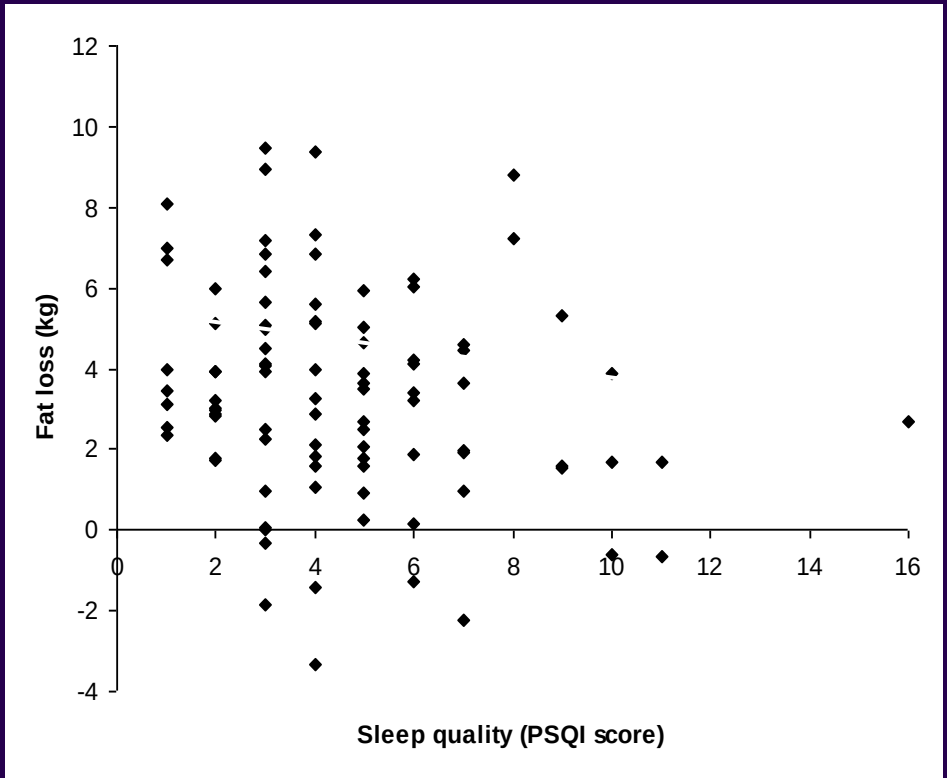
Chaput and Tremblay, Obes Facts 2012

Subjects: 123 overweight and obese men and women
(BMI = 33.2 ± 3.6 kg)

Caloric restriction: 600-700 kcal/day over 15 to 24 weeks

Mean weight loss: 4.5 ± 3.9 kg (76% from fat)





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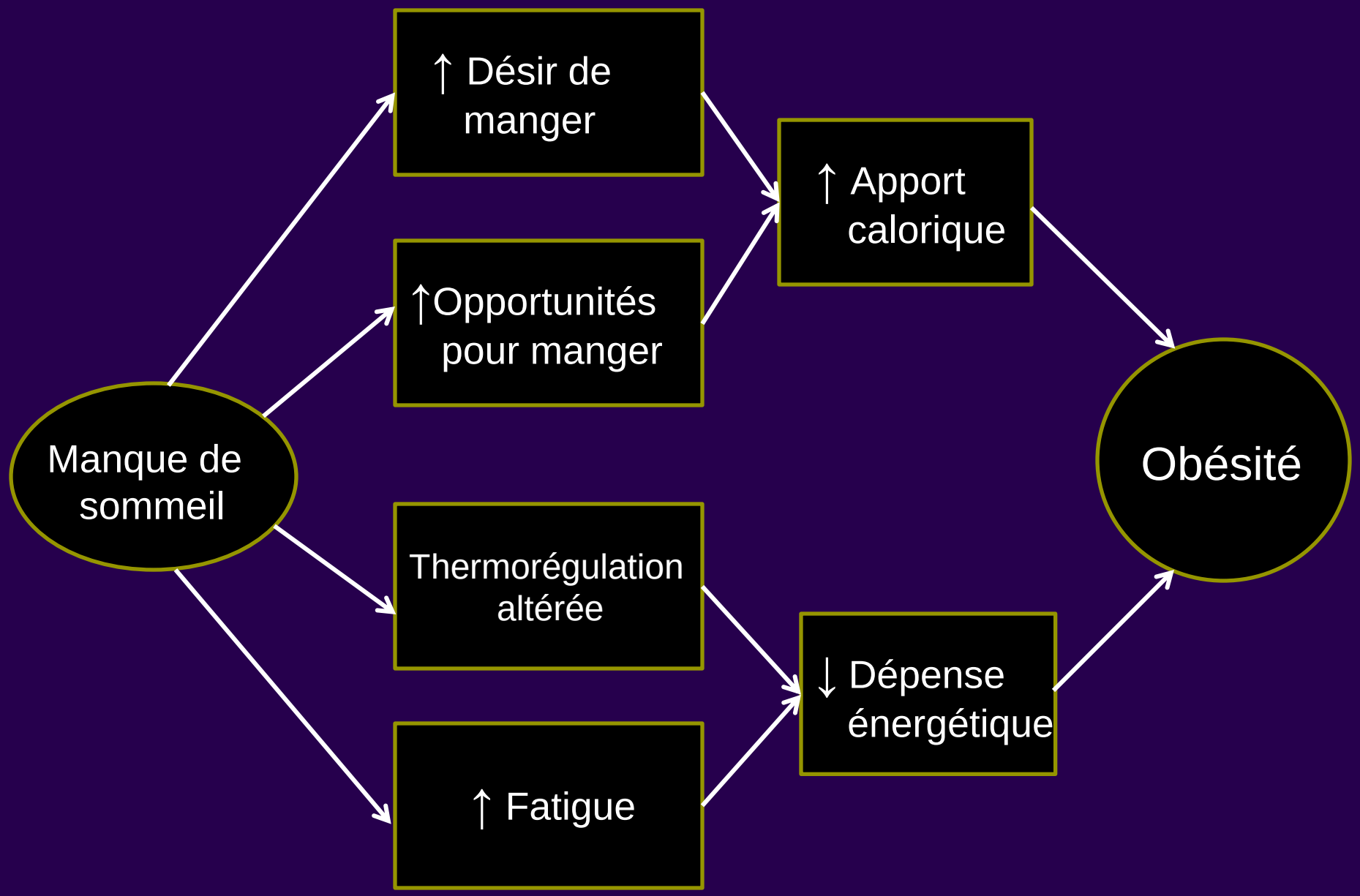
Manque de sommeil
↑ Désir de manger
↑Opportunités pour manger
Thermorégulation altérée
↑ Fatigue
↑ Apport calorique
↓ Dépense énergétique
Obésité

« Qui dort dîne »

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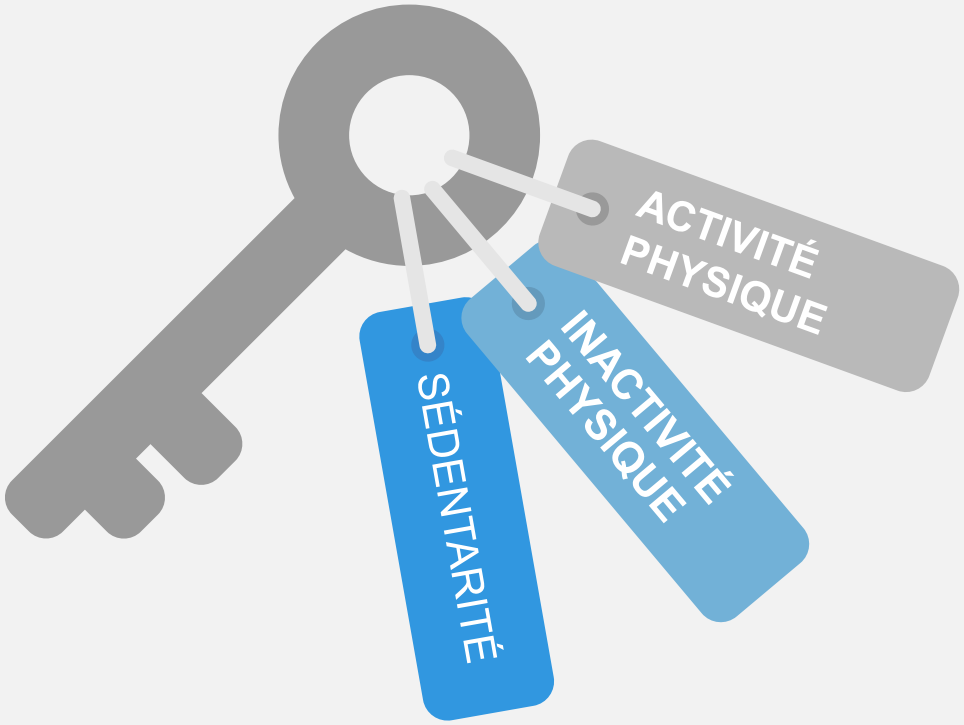

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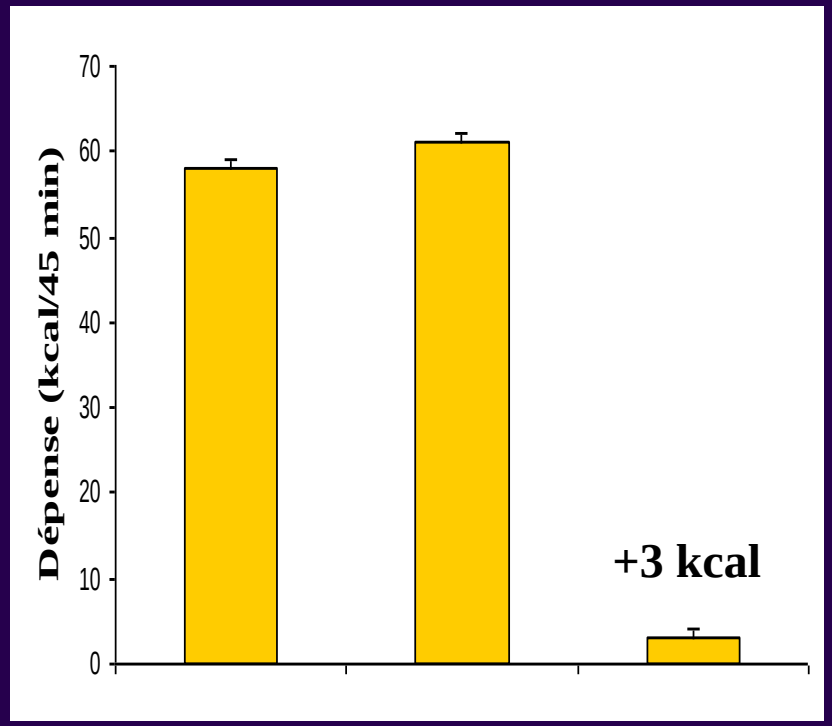
Effets d’un travail informatique exigeant sur la vigilance cognitive, l’apport énergétique et en aliment-confort, et la stabilité glycémique

Impact of mental work on energy intake

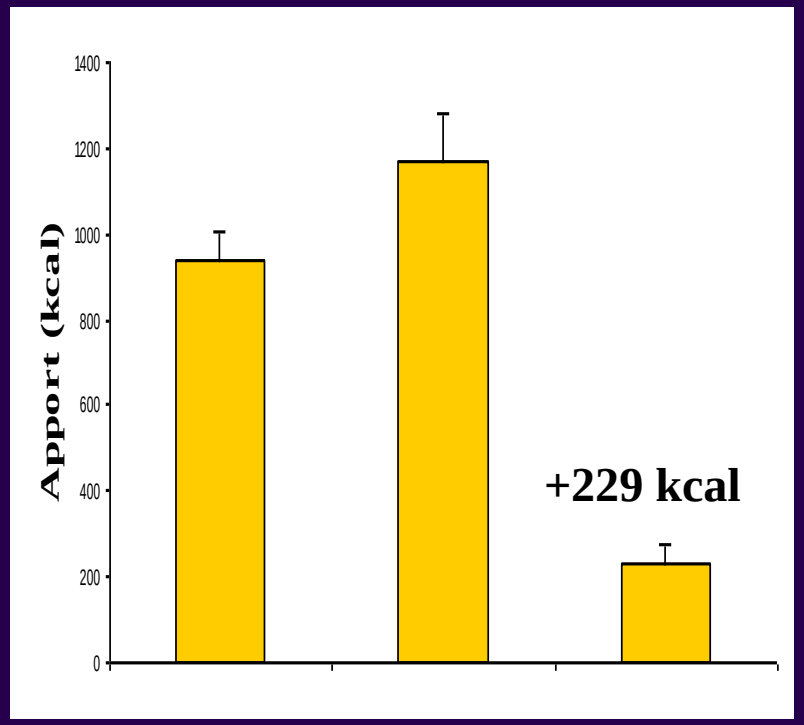
- 15 female students at university
- 2 tasks: read an article and write an abstract of 350 words or rest
- 45 minutes for each task
- *Ad libitum* buffet after the task
- Anthropometric measurements, energy expenditure, heart rate, blood pressure, daily food intake, analog visual scales, TFEQ, STAI

Energy cost of the two tasks and spontaneous energy intake

Energy expenditure



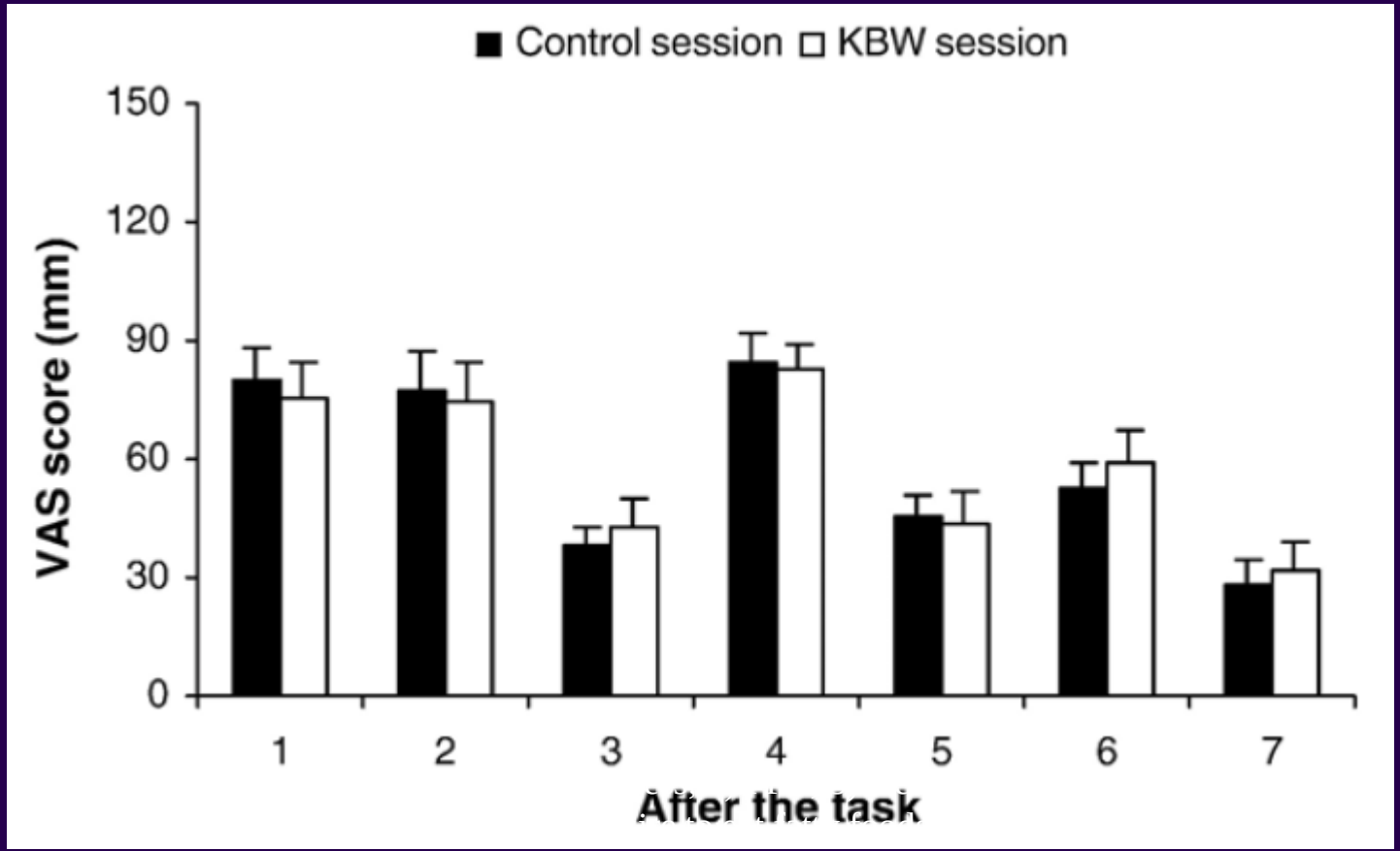
Energy intake



Energy balance: Δ intake – Δ expenditure = +226 kcal

Chaput et Tremblay, *Physiol. Behav.* 90: 66-72, 2007

Appetite sensation markers measured after each testing session



Chaput and Tremblay, Physiol. Behav. 90: 66-72, 2007.

Mental workload quantification

	Control	Reading-writing	Test-battery
NASA-Task Load Index[1]	18.5 ± 12.8	59.2 ± 15.4**	63.3 ± 16.2**
Reaction time (ms)[2]	617 ± 84	857 ± 193**	883 ± 136**

** $p < 0.01$ versus control values.
[1] Questionnaire assessing the overall perceived workload.
[2] Secondary task assessing the degree of mental solicitation.

Adapted from Chaput et al, Psychosomatic Med 70: 797-804, 2008.

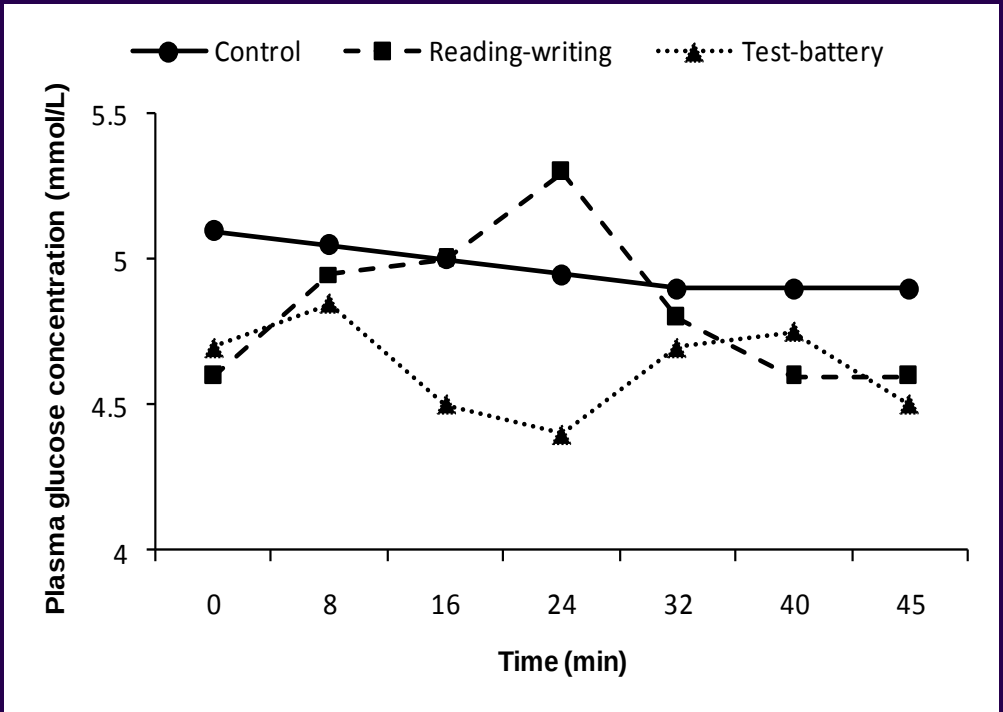
Mean energy intake in the buffet-type meal

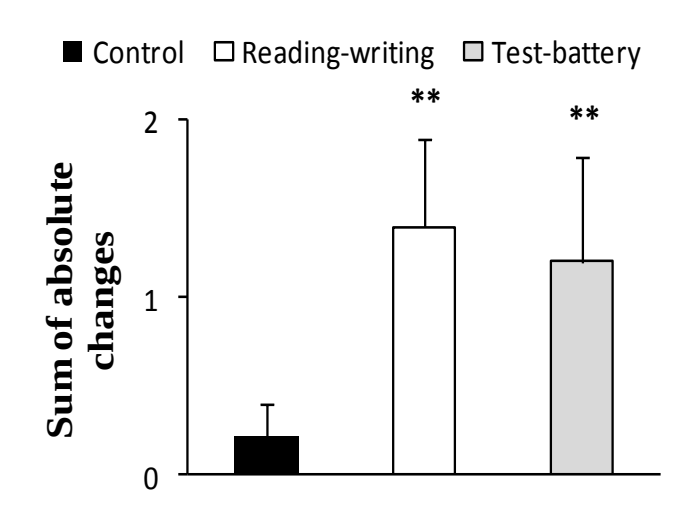
	Control	Reading-writing	Test-battery
Mean energy intake (kcal)	860	1063*	1113*
Energy intake from desserts (kcal)	180	288*	299*

* $p < 0.05$ versus control values.

Adapted from Chaput et al, Psychosomatic Med 70: 797-804, 2008.

Glycemia over 45 minutes



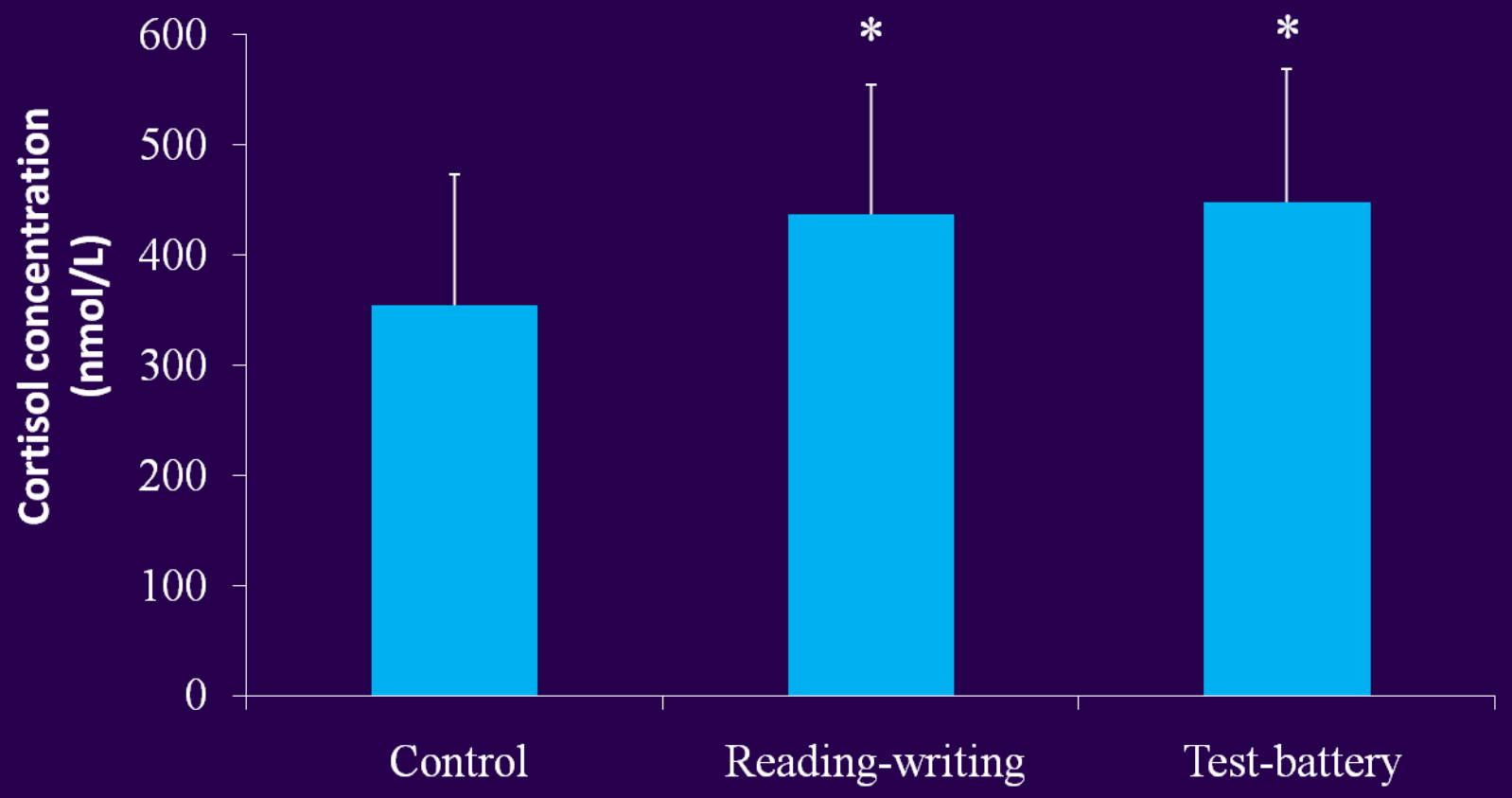


**p < 0.01 vs. control values

<u>Glucose instability</u> = sum of absolute changes between each time of blood collection.

Adapted from Chaput et al, Psychosomatic Med 70: 797-804, 2008

Cortisolemia over 45 minutes



*p < 0.05 versus control values.

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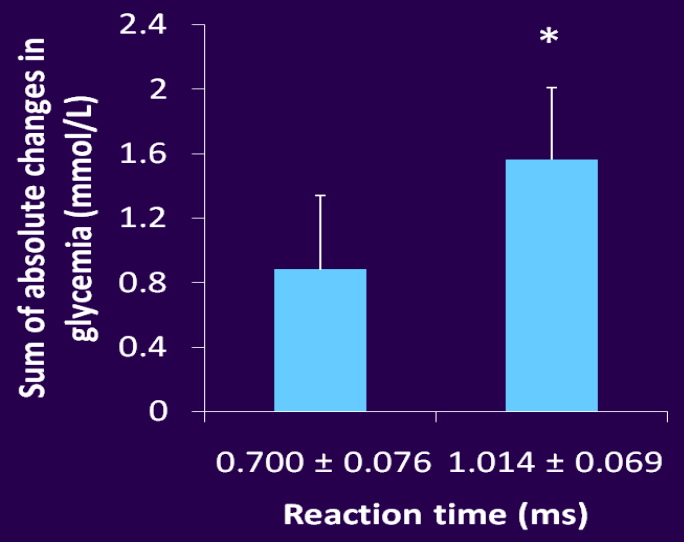
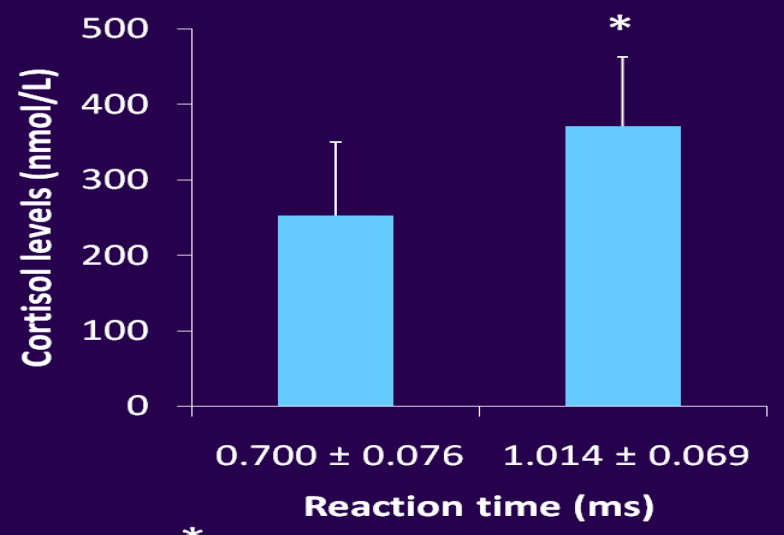
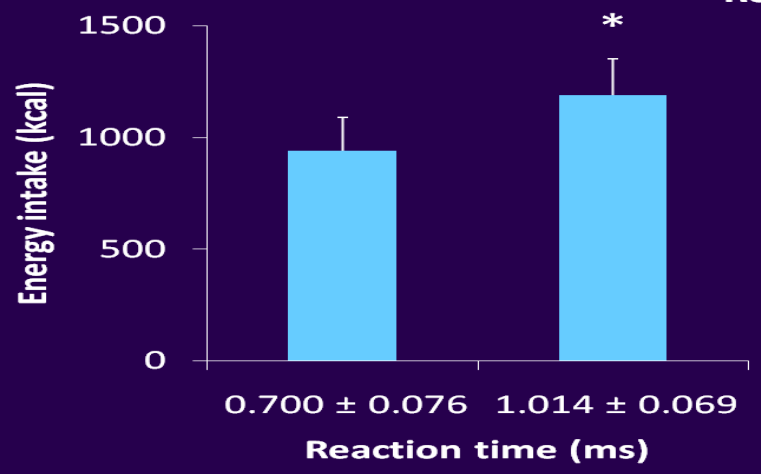
Impact of KBW on glucose instability, cortisolemia and ad libitum energy intake as assessed by the reaction time

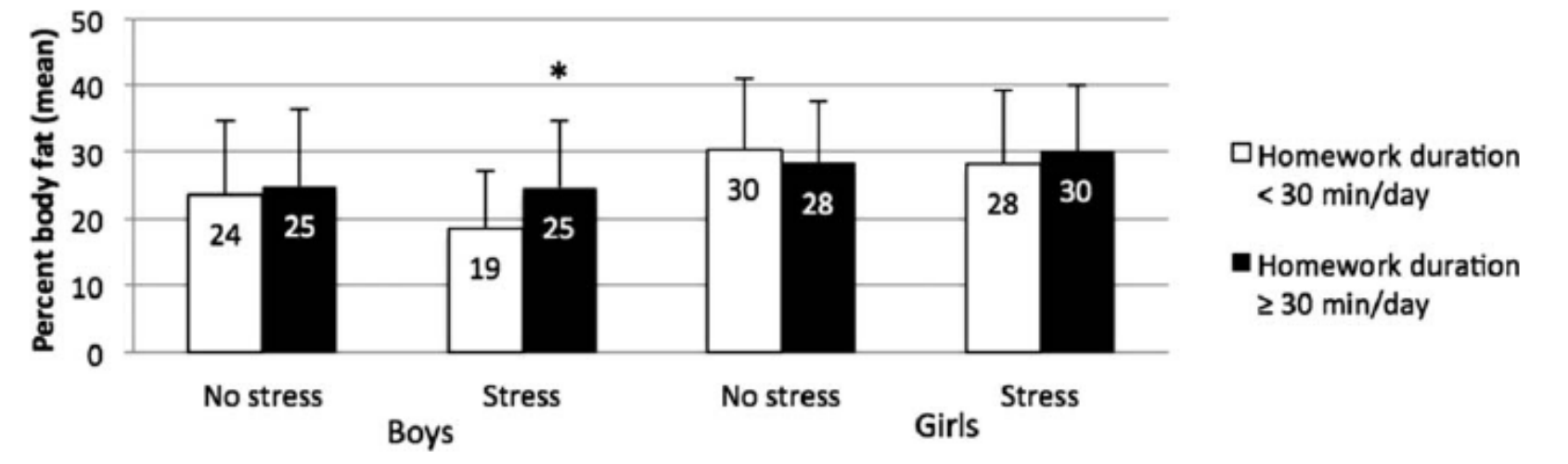






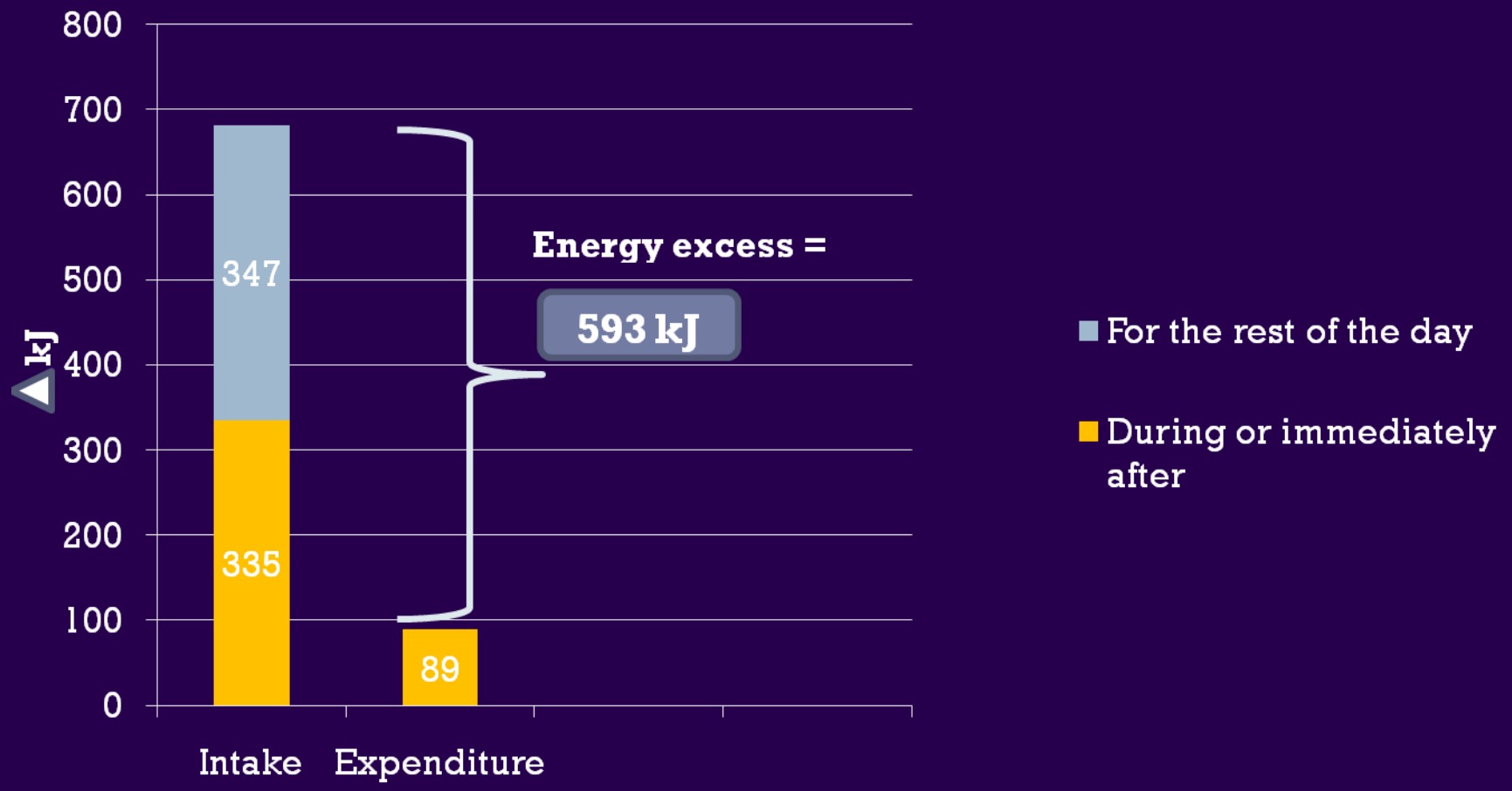
*$p < 0.05$.

Percent body fat by homework duration, stress status, and sex



From Michaud et al, Obesity 2015

Increase in energy intake and expenditure induced by a video game



Adapted from Chaput et al. *Am. J. Clin. Nutr.* 93: 1196-1203, 2011

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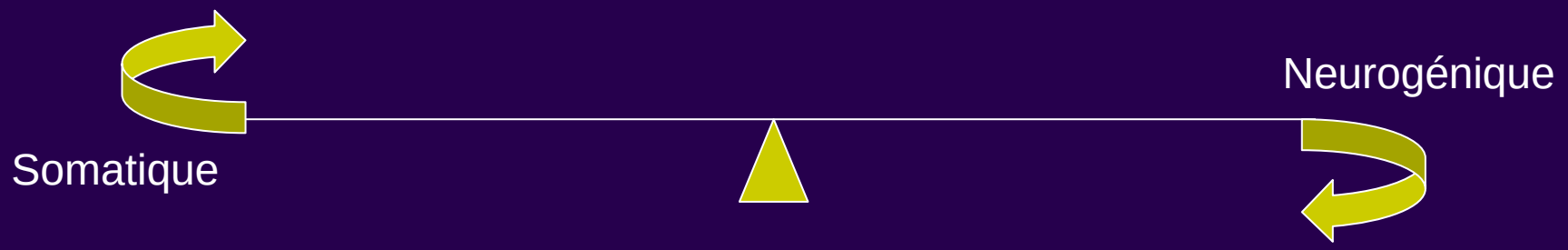
Modernité ➡ Changement de stimulation