

The role of obesity in the manifestation of caffeine-induced effects in women

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**What goes best with a
cup of coffee? Another
cup...**

Henry Rollins

Caffeine is one of the most commonly used stimulants in the world.

It is estimated that around 90 % of people worldwide consume caffeine.

Caffeine is a methyloxanthine and is found in various foods and drinks, including coffee, energy drinks, caffeine supplements, tea and chocolate.

Safety of the caffeine dosage (mg caffeine per day):

- doses of more than 2000 mg per day may pose potential risks,**
- 400 mg per day is not associated with risks in people without caffeine hypersensitivity (EFSA, FDA).**

The relative dosages in relation to body weight used to optimise dosing in sports are generally divided into 3 groups:

- low doses of caffeine (≤ 3 mg/kg)**
- moderate (between 5 and 6 mg/kg),**
- and high doses of caffeine (≥ 7 mg/kg body weight).**

Overall, low (≤ 3 mg/kg body weight) or moderate (~ 6.0 mg/kg) doses of caffeine are considered safe for individuals without comorbidities and pharmacokinetic disorders.

Therefore, there are recommendations for the absolute (mg per day) and relative (mg per kilogram of body weight) amount of caffeine.

Is it enough?

- if a higher body fat percentage may affect enzyme activity, leading to altered metabolism and excretion of caffeine, and adipose tissue may act as a reservoir for caffeine, slow its release and alter its dynamics, and caffeine is essentially distributed in the aqueous cell compartments and muscle tissue contains more water than adipose tissue.

Individuals with a higher body fat percentage may have higher serum levels of caffeine and its metabolites and process caffeine more slowly than individuals with a lower body fat percentage. Therefore, even relatively low doses of caffeine can trigger the full spectrum of caffeine-related side effects

Considering the explanations given, we hypothesized that if the caffeine dose is calculated in mg/kg of total body weight, non-obese individuals would experience fewer caffeine-related side effects than obese individuals, and that the longer-lasting side effects would differ between the two groups.

Materials and methods

- one hundred and sixty participants were recruited (age: 23.4 ± 2.8 ; body weight: 64.1 ± 11.1 kg; BMI: 23.1 ± 3.3 kg/m²; relative fat mass: $29.3 \pm 6.4\%$; free fat mass: 44.8 ± 4.9 kg),
- after BIA analysis (mBCA 515 SECA medical analyzer), participants were divided into 2 main groups: non-obese (< 30% body fat) (n=73) and obese (n=87) (> 30% body fat), and each group was divided into 2 subgroups: Caffeine (received 6 mg/kg body weight of caffeine) and placebo
- side effects were recorded one hour after ingestion and within twenty-four hours,
- the effects after caffeine intake were categorised into three subgroups: neutral (increased urine output), positive (improved cognition; increased vitality/activity) and negative (muscle soreness, tachycardia and palpitations, anxiety or nervousness, headache, gastrointestinal problems and insomnia).

Results

- There was a significant correlation between caffeine consumption per kilogram of body weight and the occurrence of side effects after 60 minutes.
- The strongest significance level ($p \leq 0.002$) was found for the occurrence of negative effects.
- Positive effects showed a significant correlation with caffeine consumption ($p \leq 0.015$, Cramer's $V = 0.27$).

- A significant association was found for increased urinary excretion ($p \leq 0.014$, Cramer's $V = 0.27$)
- There were no significant differences in the occurrence of adverse events within 24 hours between obese and non-obese subjects taking 6 mg/kg body weight.
- There was no statistically significant placebo effect.

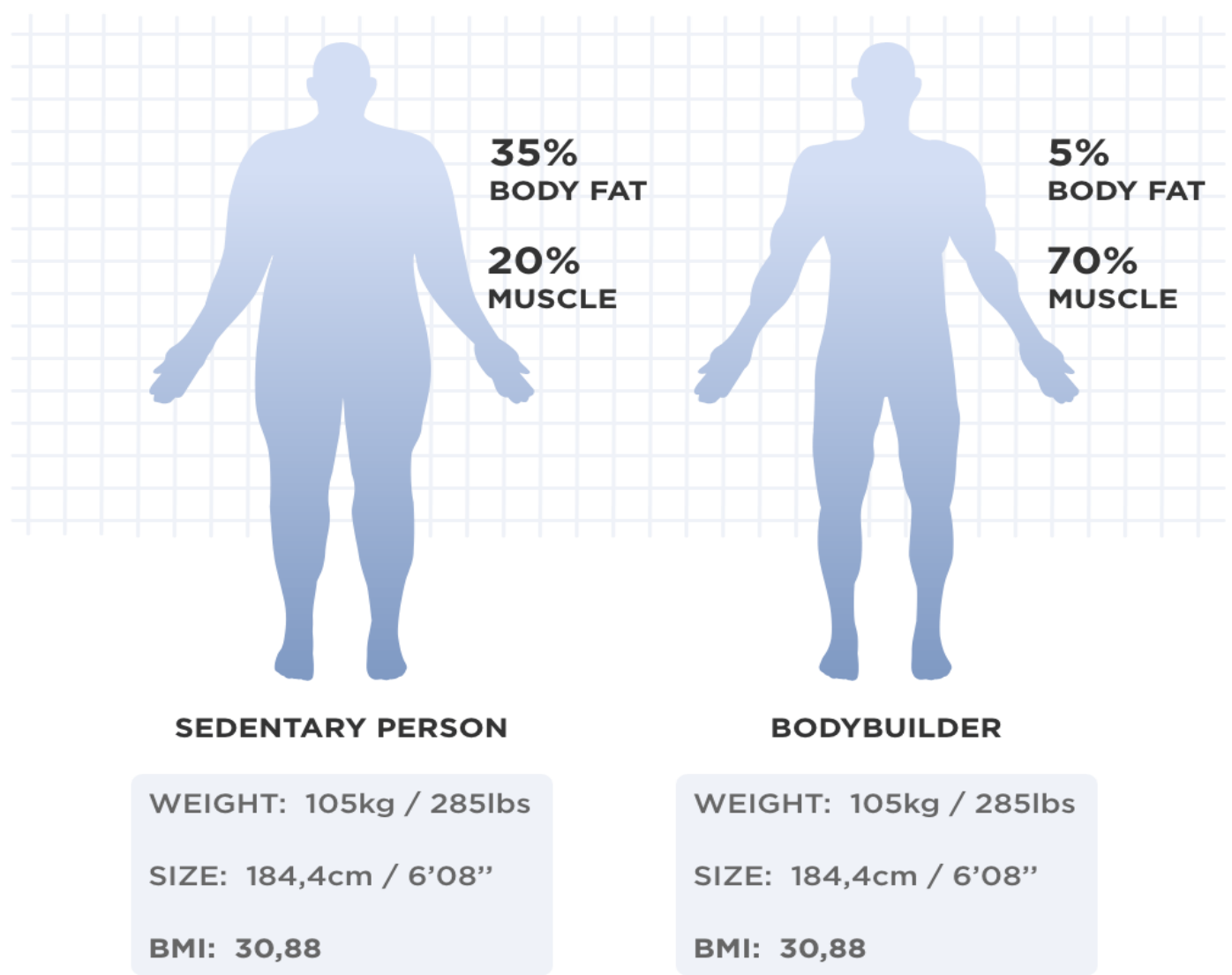
Conclusions

There was a statistically significant difference between non-obese and obese women and the occurrence of desirable and undesirable caffeine-induced effects shortly after consuming 6 mg/kg body weight of caffeine.

Participants with a fat percentage of more than 30% were more likely to report muscle pain, palpitations and gastrointestinal discomfort after caffeine consumption than participants with a lower fat percentage.

These results clearly confirm our original hypothesis and underline the need to adjust the caffeine dose not to body mass but to individual body composition, in particular the ratio of body fat mass to lean mass.

The caffeine dosage should be reconsidered and based more on body composition



Thank You

ANOTHER COFFEE BRAKE?