



# ***2019 NSCA PERSONAL TRAINERS VIRTUAL CONFERENCE***

**OCTOBER 7 – 11**

**#NSCAPT19**

# ***Gender Differences in Response to Pre-Exercise Stimulants***

Lonnie Lowery, PhD

# ***CONFLICT OF INTEREST STATEMENT***

I have one potential conflict of interest in relation to this presentation: The application for a non-provisional patent related to macronutrient-impregnated coffee filters.

# Coffee & Caffeine: Popularity / Market



- Coffee: 83% of Americans drink it.<sup>1</sup>
- 1/3 of Americans drink specialty coffees.<sup>1</sup>

1. National Coffee Association, 2013



Americans ages 18-39

**16%** had an espresso-based beverage in the past day

Americans ages 60+

Only **6%** had an espresso-based beverages in the past day, but...

**24%** favor gourmet varieties of traditional coffee for daily consumption (up 5%)

consumption of traditional coffee  
**down 7%**  
from 56% to 49%

# *Coffee and Caffeine: Variation in products*

**“Another notable find is the wide range of caffeine concentrations (259-564 mg/dose) in the same coffee beverage obtained from the same outlet on six consecutive days.”**

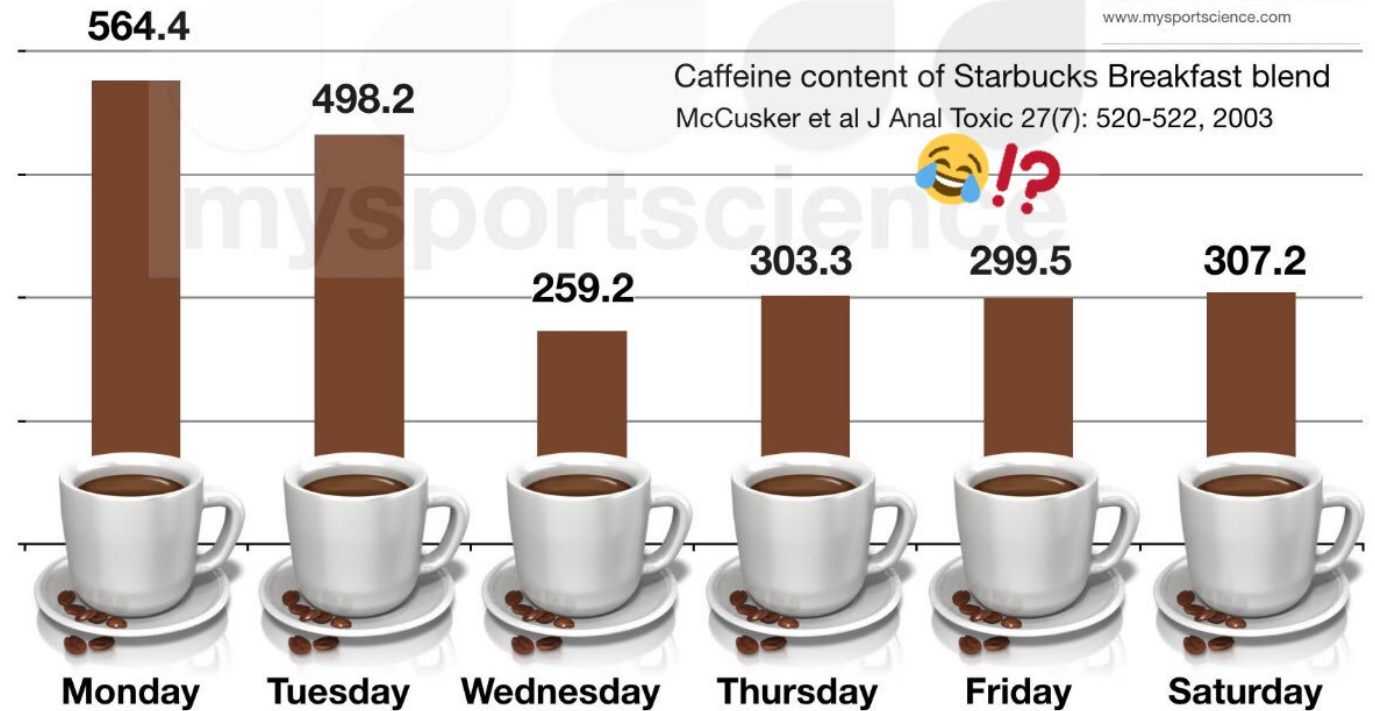
**-McCusker, Journal of Analytical Toxicology, 2003**

# Coffee and Caffeine: Variation in products

The same coffee from the same outlet on different days can have very different caffeine content



@jeukendrup  
www.mysportscience.com





# *Caffeine:* *Mechanisms of action*

CNS excitability

Peripheral NS

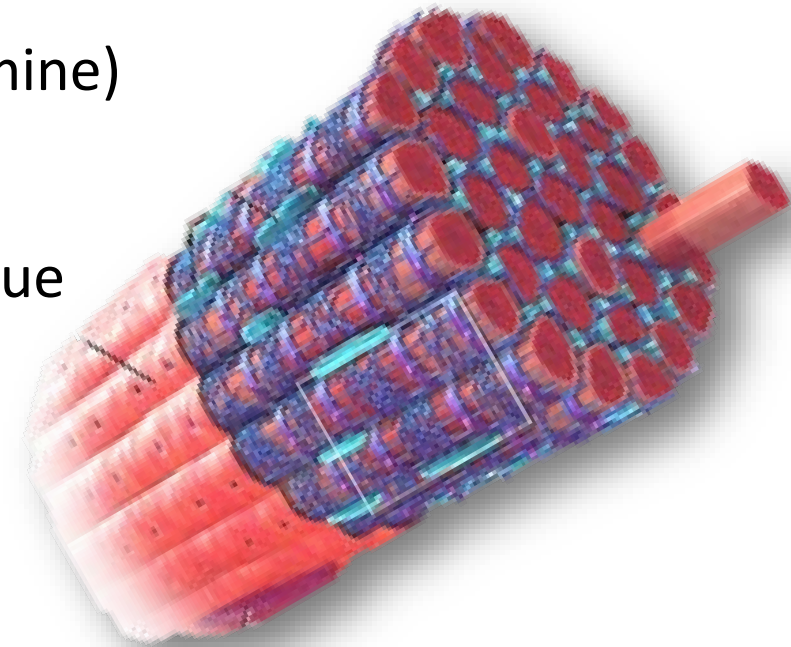
Catecholamines (EPI, Dopamine)

Adenosine antagonism

Direct effects on muscle tissue

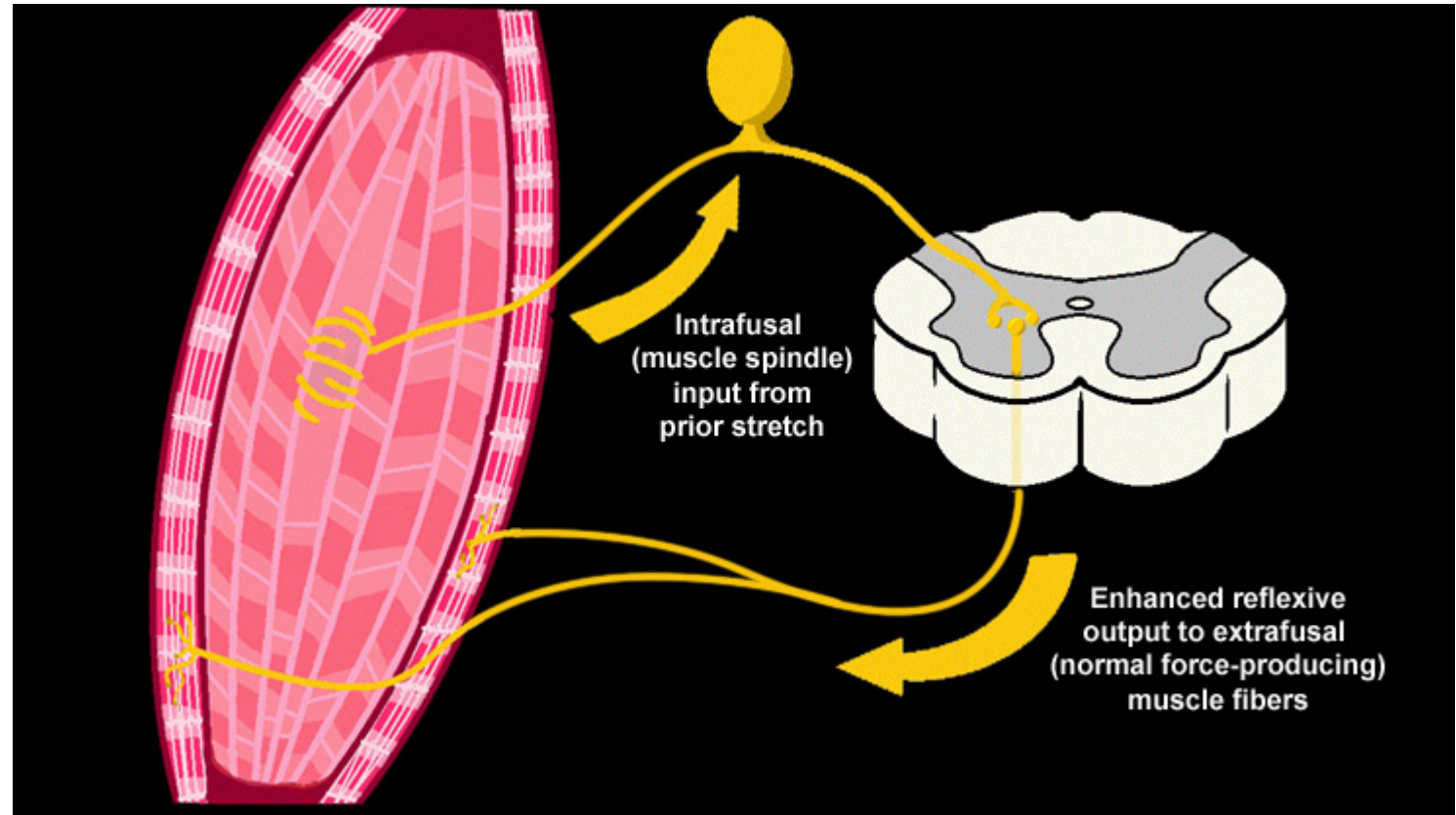
SR calcium efflux →

Analgesia

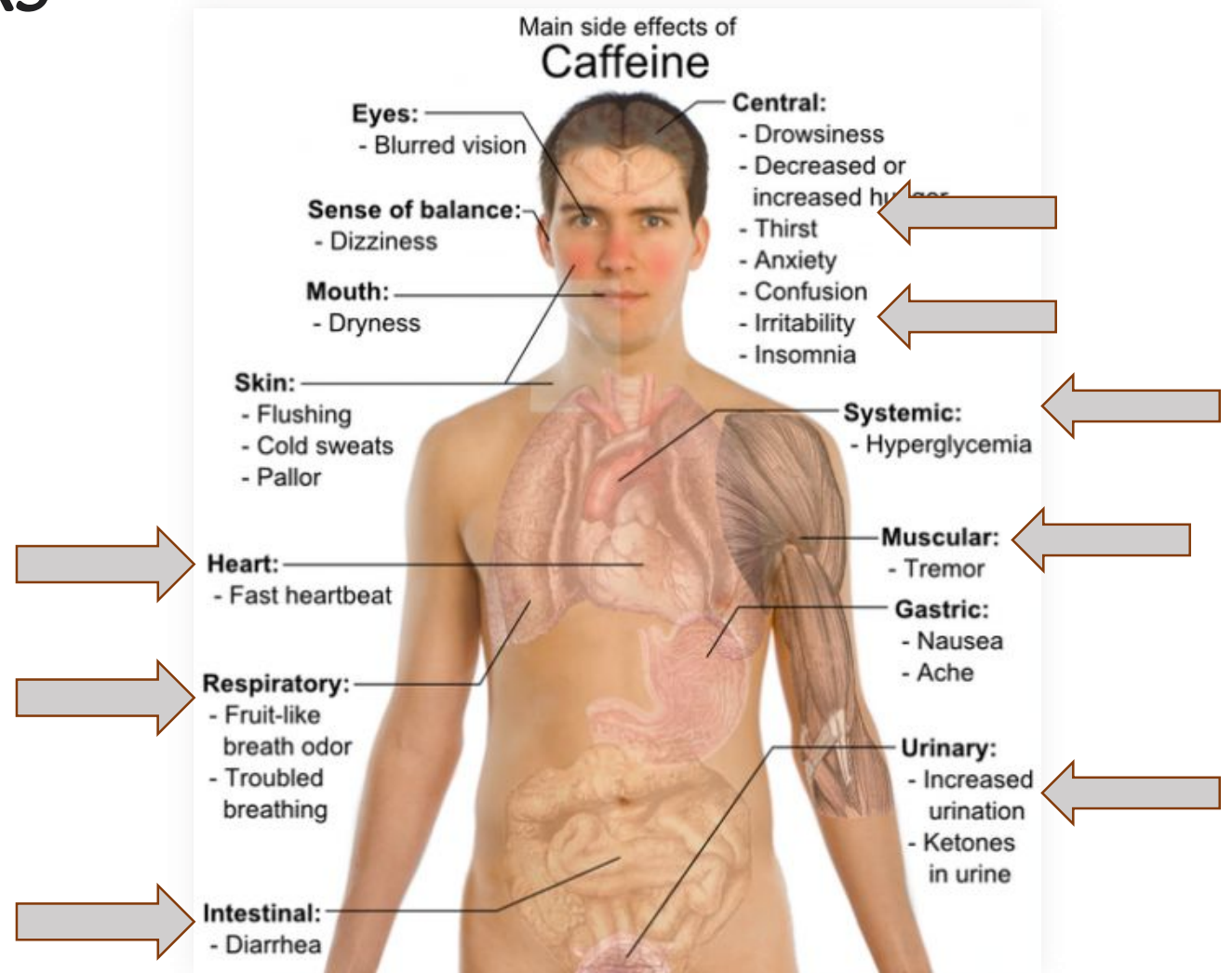




# *Mechanisms: Augmenting the Stretch Reflex*



# Coffee & Caffeine: Media Attention, Risks



# Coffee & Caffeine: Risks & Benefits



- Although energy drinks have been linked to specific cardiovascular events in prone persons<sup>1</sup>, coffee has had a more beneficial reception<sup>2</sup>
  - Reduced Type II DM risk<sup>2</sup>
  - Reduce HTN<sup>2</sup>
  - Reduced depression and obesity<sup>2</sup>
  - Reduced oral cancer risk<sup>3,4</sup>

1. Jonjev, Z. & Bala G., 2013;
2. O'Keefe, J., et al. J Am Coll Cardiol. 2013
3. Radoj, L, et al. Cancer Epidemiol. 2013
4. Hildebrand, J. Am J Epidemiol. 2013

# *Coffee Research: What Else Can Interfere?*

## *(Controls, Subpopulations)*

Prior intake

24 h, Breakfast

Withdrawal

Subpar control group

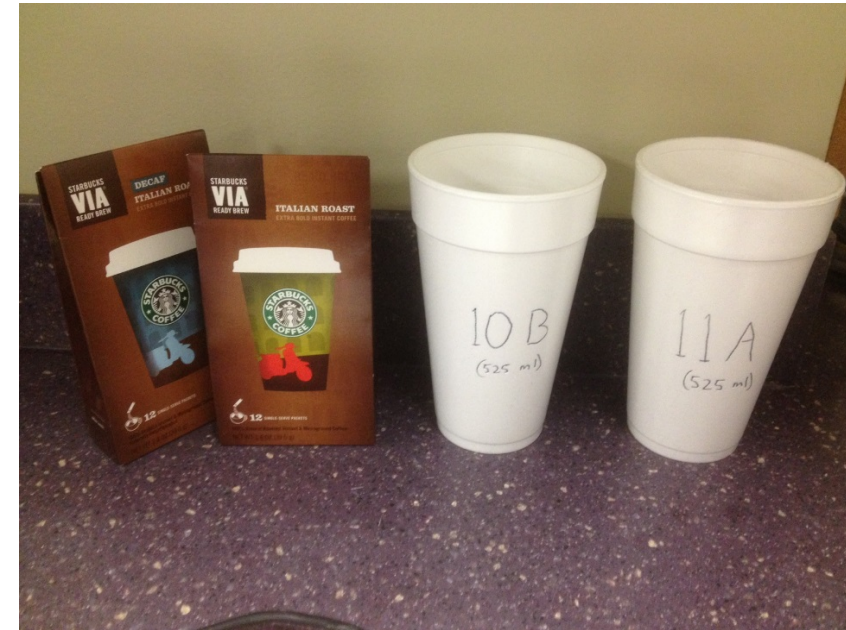
Hawthorne Effect

Fitness Status

Exercise Type

Single effort, 30 s anaerobic

Endurance



# ***Women: Not slightly smaller men***

How do they differ regarding caffeine responses?

Body size and “competing” hormones affect dosing and caffeine breakdown in the bloodstream.

- Relative vs. absolute dosing
- Relative vs. absolute performance
- External validity
- Estrogen (natural or birth control)
- Coffee vs. energy drink vs. pill vs. gum
- Timing with exercise



# ***Women: Not slightly smaller men***

How do they differ regarding caffeine responses?

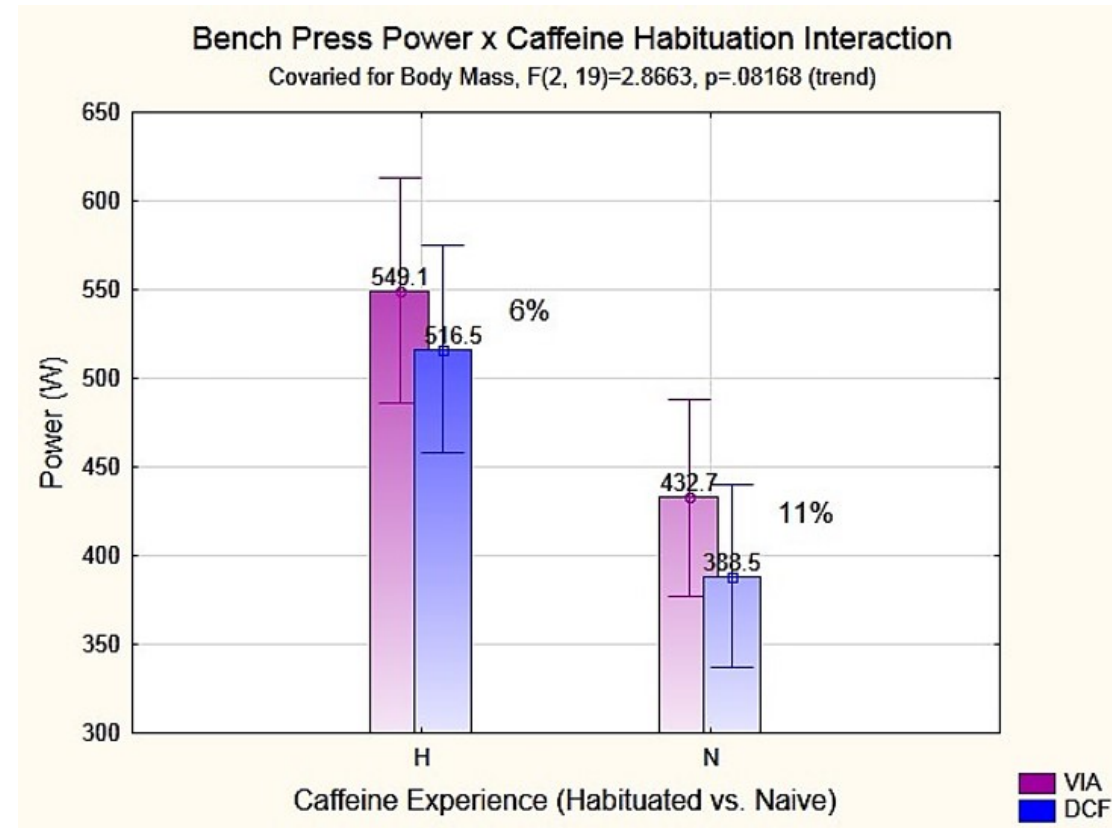
Body size and “competing” hormones affect dosing and caffeine breakdown in the bloodstream.

- “Consistent with previous results found in younger women, these results indicate that exogenous estrogen in older women may inhibit CYP1A2-mediated caffeine metabolism.”

-Pollock, 1999

# Women: Other issues

How do they differ regarding caffeine responses?



Mohney, 2015



# *How do we know?*

## Laboratory and field tests

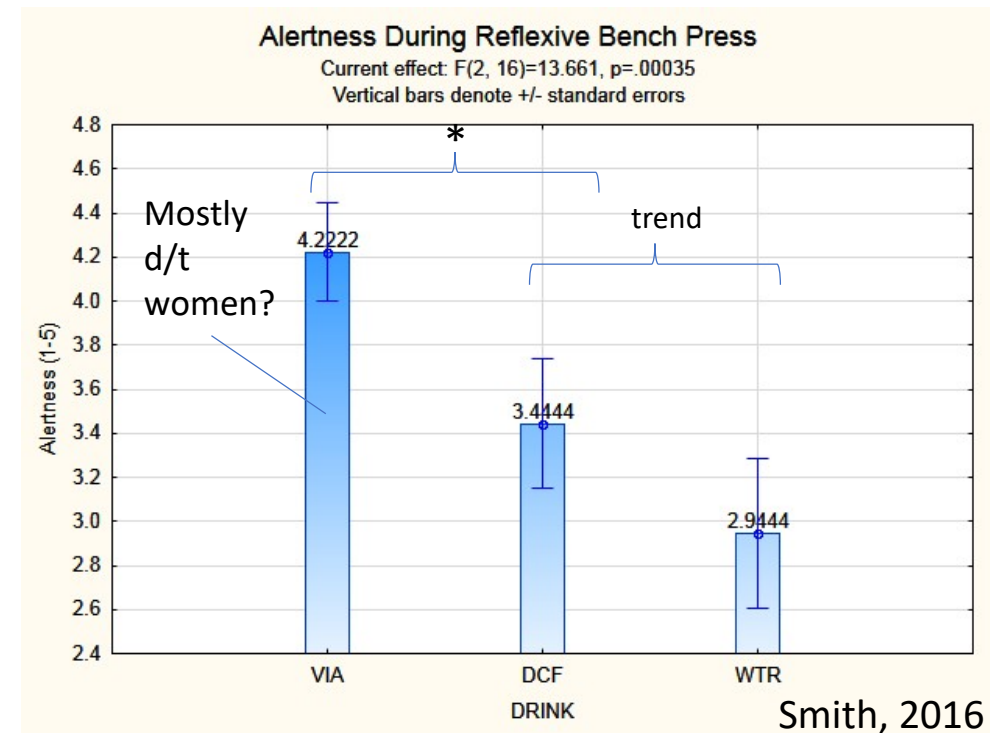
Mental and physical tests can be performed after pre-workout ingestion of dietary stimulants.

- Subjective Alertness, focus, sense of energy (1-5 scale)
- Strict bench press “speed work” (velocity, power at 50% 1RM)
- Submaximal stretch reflex: max dynamic effort (m/s, W)
- Bike sprints?
- Vertical jump?
- Serum adrenaline
- Serum caffeine

# How do we know?

## Laboratory and field tests

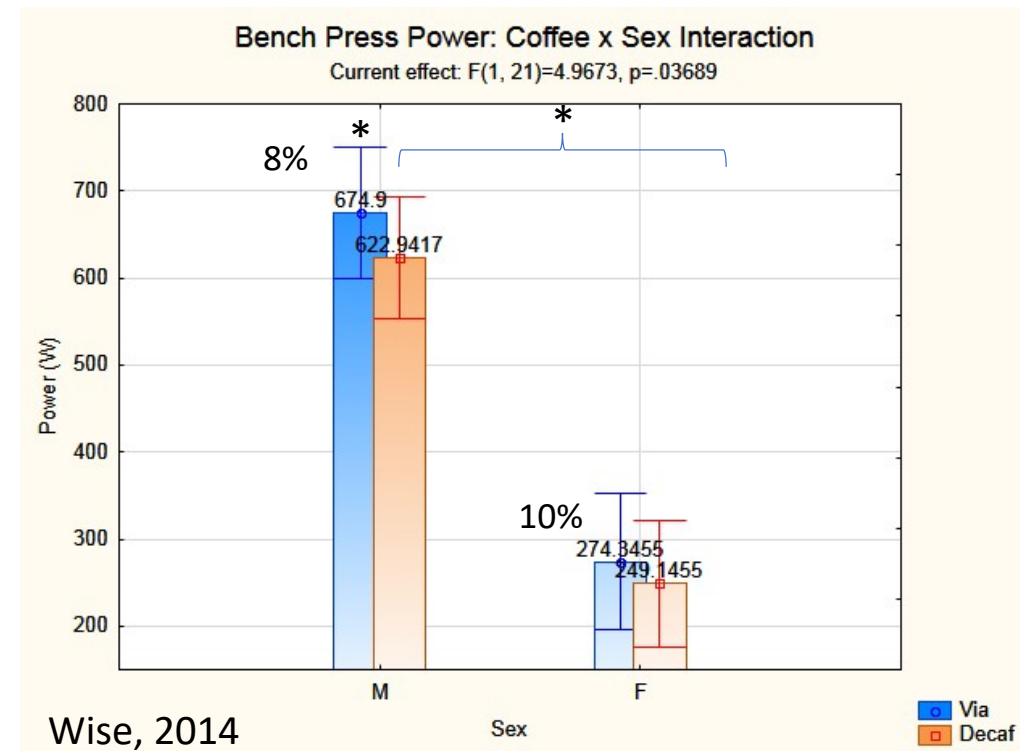
Mental and physical tests can be performed after pre-workout ingestion of dietary stimulants (coffee).



# How do we know?

## Laboratory and field tests

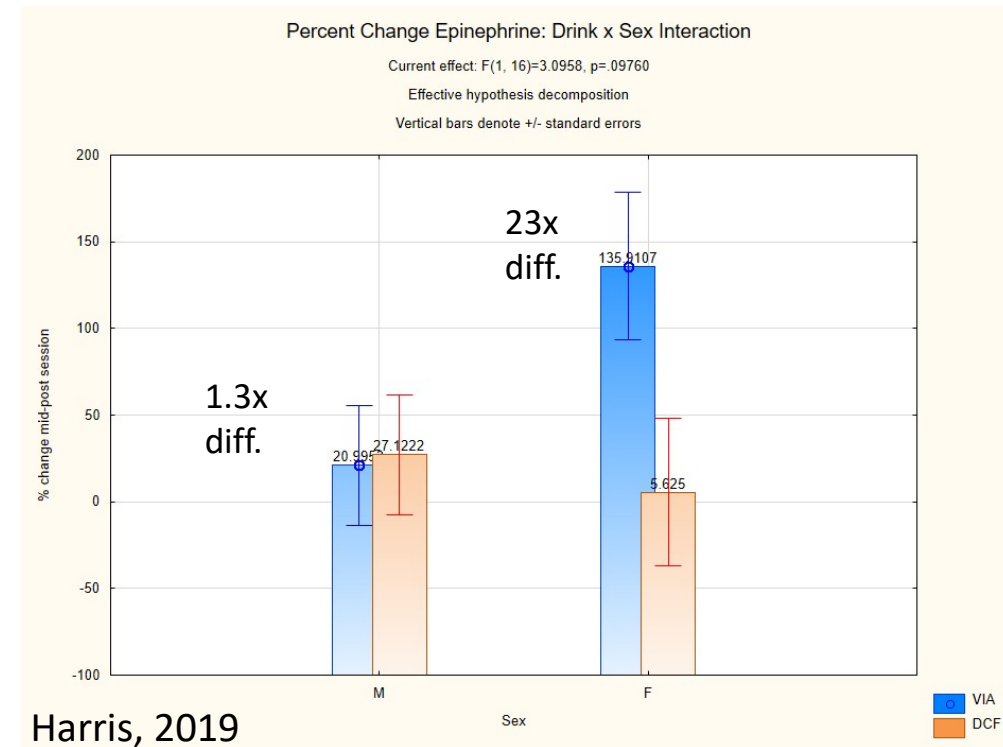
Mental and physical tests can be performed after pre-workout ingestion of dietary stimulants (coffee).



# How do we know?

## Laboratory and field tests

Mental and physical tests can be performed after pre-workout ingestion of dietary stimulants (coffee).



# ***How do we know?***

## Laboratory and field tests

Does all that adrenaline hamper dietary carbohydrate metabolism?

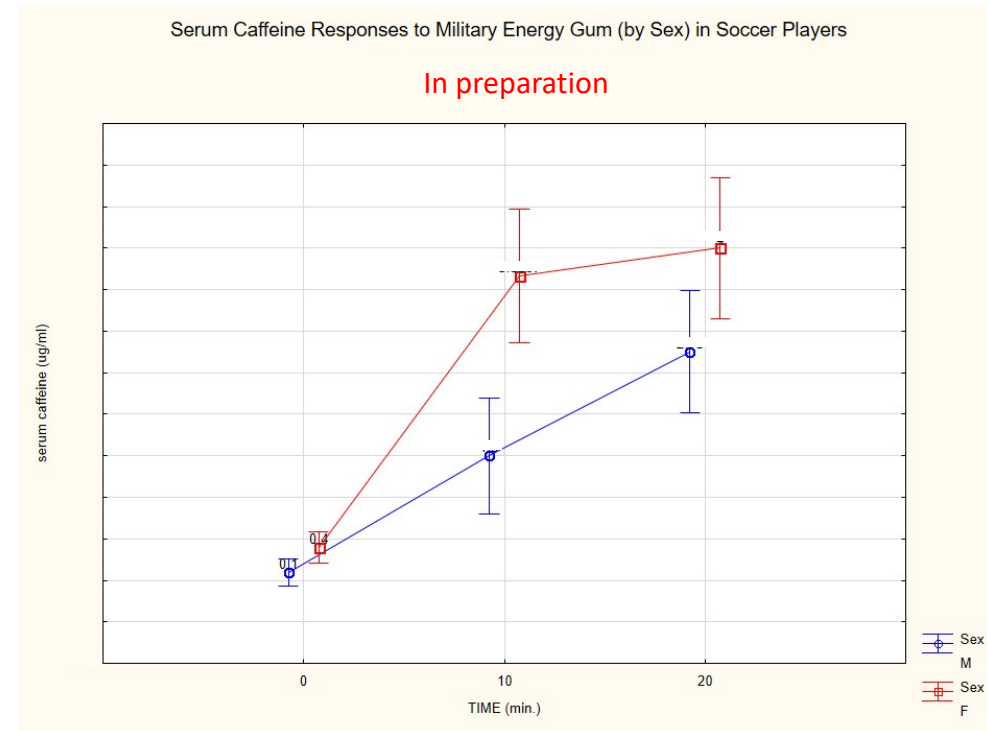
“Various coffee components had a neutral or positive role in the metabolism of glucose and muscle glycogen...”

...Coffee beverages should be tested as an option for athletes’ glycogen recovery.”

# How do we know?

## Laboratory and field tests

Mental and physical tests can be performed after pre-workout ingestion of dietary stimulants (caffeine gum).



Myers and Fees,  
2019.

In preparation

# ***Practical Applications***

## “Pre-workout” use in mixed-sex environments

1. Women are not slightly smaller men.
2. Mental, physical, and performance comparisons between sexes can be done by considering **absolute** and **relative comparisons** (or statistical adjustments for body size or baseline).
3. Comparatively-elevated **serum caffeine** and adrenaline (**epinephrine**) in women support careful comparisons showing women may “get more out of a cup of coffee” (underlying mechanisms).
4. Caffeine absorption across the oral mucosa, such as with **caffeine gum** is rapid, perhaps particularly in women.



# References

1. Astorino TA and Roberson D. Efficacy of acute caffeine ingestion for short-term high-intensity exercise performance: a systematic review. *J Strength Cond Res.* 2010 Jan;24(1):257-65.
2. Astorino TA, Roupoli LR, Valdivieso NR. Caffeine does not alter RPE or pain perception during intense exercise in active women. *Appetite.* 2012 Oct; 59(2): 585-90.
3. Harris, M., Putman, R., Ruffner, K., Slack, G., Vansickle, A., Mendel, R., and Lowery, L. The Effects of Gender on Psychometric and Epinephrine Responses to Pre-Exercise Coffee. *Journal Int Soc Sports Nutr* 2019; In review.
4. Pollock, B., et al. Inhibition of caffeine metabolism by estrogen replacement therapy in postmenopausal women. *J Clin Pharmacol.* 1999; 39(9):936-40.
5. Smith, B., Feucht, A., Slack, G., Rogers, J., LaRock, F., Mendel, R., Lowery, L. (2016). Coffee But Not Anticipation of Coffee Alters the Outcome of Explosive Bench Pressing. *FASEB Journal* 2016; 30:898.10
6. Wise, A., Frank, M., Holy, A., Mohny, S., and Lowery, L. (2014). The Effects of VIA® Instant Coffee on Bench Press Performance: A Gender Comparison. *Journal Int Soc Sports Nutr* 2014; 1(Suppl 1):P13.