



# Performing under Pressure; on the Biology, Psychology and Sociology of stress in high-performance professions

# On the chaos that is Nutrition Science

- ▶ Everyone has their favourite diet and tests it against the standard American diet (MacDonald's, Burger king and worse).
  - ▶ Very few randomised trails
    - ▶ Extremely complicated to get people to follow a diet
    - ▶ Animal studies usually do not translate well
  - ▶ Mostly self-report data (highly unreliable)
- ▶ Mostly aimed at the treatment of disease rather than optimum function
  - ▶ Heart disease, obesity, diabetes
  - ▶ With the exception of sport's science, longevity research

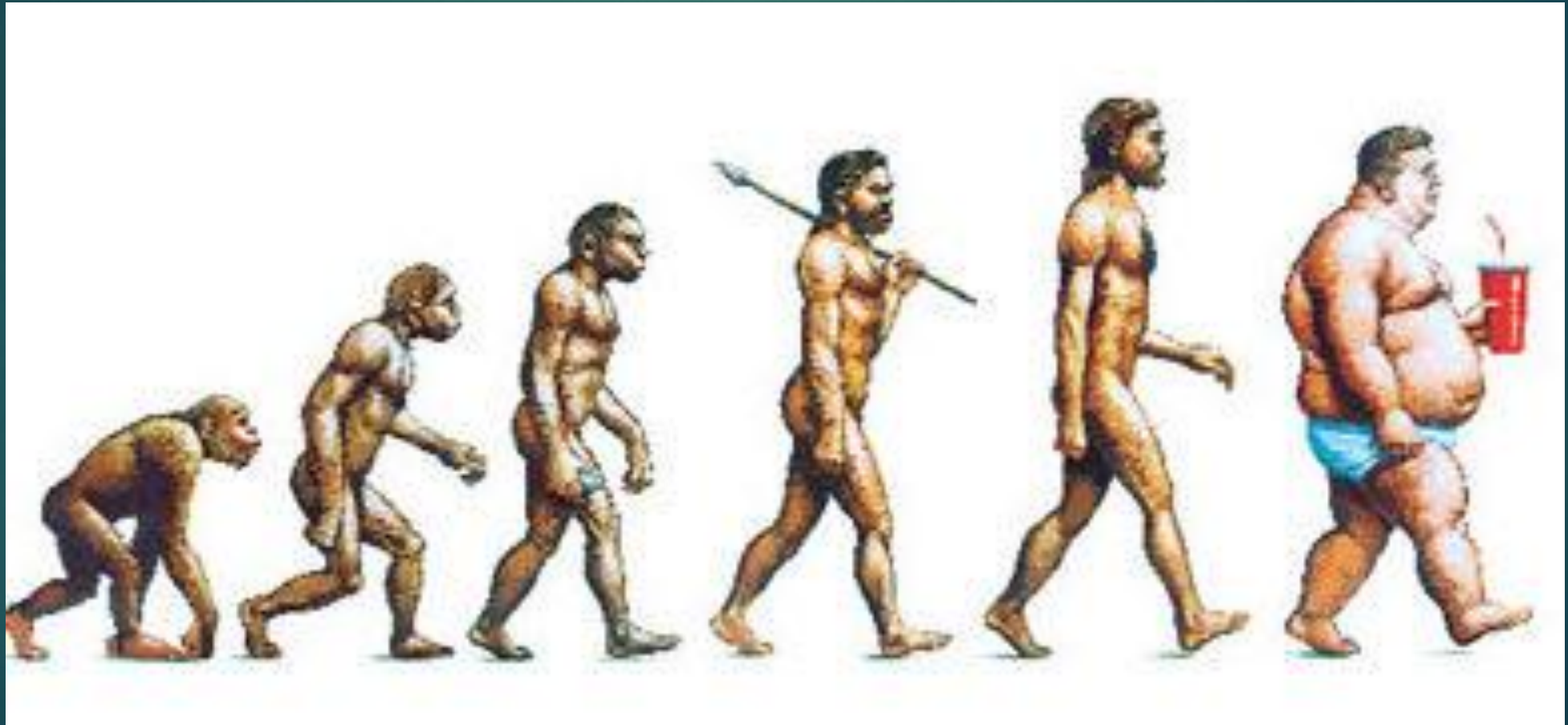
# The first question to ask: What are your aims?

- ▶ Nutrition is probably not a question of 'optimal' function, but of optimisation for a specific outcome.
    - ▶ Longevity
    - ▶ Peak performance
    - ▶ Psychological stability
- 
- ▶ Stress resilience and peak performance?

# The second question: what else are you doing/willing to do?

- ▶ Nutrition does not exist in a vacuum.
  - ▶ Physical exercise
    - ▶ Link with carbohydrate consumption
  - ▶ Sleep
    - ▶ Affects leptin levels, amongst other endocrine and neuroendocrine systems.
  - ▶ Mental health
    - ▶ Your mental state may influence metabolism and vice versa.

# The natural starting point: What did we evolve to eat?



# How far back do we go?

- ▶ Which ancestral species?
  - ▶ The further back you go the more fruit and leaves based diet gets (humans are believed to have first appeared between 300 and 500 thousand years ago).
    - ▶ After the advent of meat eating (at least 2.6 million years ago)
      - ▶ Energy surplus
    - ▶ After the advent of cooking (300 000 – 2 million years ago)
      - ▶ Energy surplus + gut-size reduction
    - ▶ After the agricultural revolution (+/- 11 700 years ago)
      - ▶ Rise in population, organisation and culture

Wrangham, R. (2009). *Catching Fire: How Cooking Made Us Human*. New York: Basic Books.

Thompson, J. C., Carvalho, S., Marean, C. W., & Alemseged, Z. (2019). Origins of the human predatory pattern: The transition to large-animal exploitation by early hominins. *Current Anthropology*, 60(1), 1–23. <https://doi.org/10.1086/701477>

Diamond, J. (2003). Guns, Germs, and Steel in 2003. *Antipode*, 35(4), 829–831. <https://doi.org/10.1046/j.1467-8330.2003.00357.x>

# Changes in the food supply

- ▶ Many of the foods of the time do no longer exist
  - ▶ Selective breeding of food stuffs
  - ▶ All year round access
  - ▶ Climate change & the disappearance of species



# Changes in consumption culture

- ▶ 3 meals a day with snacks
  - ▶ Throughout most of pre-agricultural history people went often through short periods (a few days) of food deprivation, but rarely through starvation.
- ▶ Non-stop availability
  - ▶ Obesity and diabetes
- ▶ High levels of food-processing
  - ▶ Excess levels of salt, sugar and unhealthy fats



# What do we actually know about prehistoric diet?

- ▶ Atkins, paleo, raw, vegan, carnivore, keto ... ?????
- ▶ We actually know surprisingly little
  - ▶ Generalist (all types of food stuffs)
  - ▶ An aim at digestibility (cooking)
- ▶ But!!!! This diet was consumed in a highly physically active context!

# Start of meat eating

- ▶ Climate change: more grass lands.
- ▶ Hunting is dangerous and hard. How do you start eating meat?
  - ▶ Scavenging (also rather dangerous but..... BONE MARROW!!!!)
    - ▶ Remains fresh for a few days because its encaged in a handy little box (bone)
    - ▶ Doesn't take complicated tools (a stone)
    - ▶ High in fat

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Thompson, J. C., McPherron, S. P., Bobe, R., Reed, D., Barr, W. A., Wynn, J. G., ... Alemseged, Z. (2015). Taphonomy of fossils from the hominin-bearing deposits at Dikika, Ethiopia. *Journal of Human Evolution*, 86, 112–135. <https://doi.org/10.1016/j.jhevol.2015.06.013>

# Hunting & endurance running

- ▶ Big game overheats quicker
- ▶ If you can cool more easily, hunting becomes easy.
  - ▶ No need for sophisticated tools
  - ▶ No need for extreme physical output

# Key nutrients

## Macronutrients

- ▶ Carbohydrates (4cal/gram)
- ▶ Protein (4cal/gram)\*
- ▶ Fat (9cal/gram)\*

## Micronutrients

- ▶ Vitamins
- ▶ Minerals

# Micronutrients

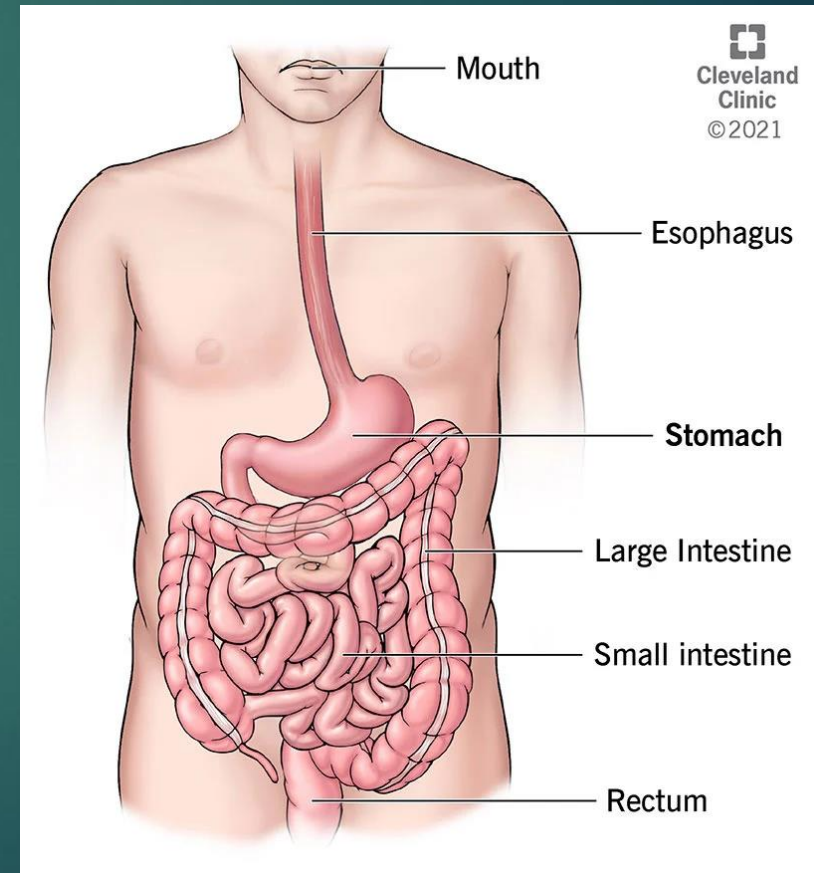
- ▶ Deficiencies, and in some cases excess, of a micronutrient may affect both the stress response and resilience. Regular bloodwork should tell you if you are deficient in anything.
  - ▶ Common deficiencies
    - ▶ Iodine
    - ▶ Calcium
    - ▶ Magnesium
    - ▶ Vitamins A, B12, D
    - ▶ Iron
  - ▶ Others to pay attention to:
    - ▶ Omega 3 fatty acids (anti-inflammatory)
    - ▶ Antioxidants

# Macronutrients

- ▶ The main sources of fuel and building materials
  - ▶ Fat and protein are essential
  - ▶ We can survive without carbohydrates
    - ▶ Endogenous production of glucose for the brain

# The digestive system has specific sensors for different nutrients

- ▶ Sugars
  - ▶ We like sweet things even if you numb taste buds
  - ▶ Stimulates endorphin secretion
- ▶ Amino acids (building blocks of protein)
  - ▶ We will eat until we have enough, not until we are full
    - ▶ L-tyrosine (dopamine precursor)
      - ▶ Chicken, turkey, fish, milk, yoghurt and almonds
    - ▶ Tryptophan (serotonin precursor)
- ▶ Fats (lipids)



# The system simplified

- ▶ What you do not use, you store. But, not all macronutrients are stored the same way.
  - ▶ Insulin
  - ▶ Fat metabolism
- ▶ Stress releases stored energy
  - ▶ Cortisol
- ▶ Stress for no real reason
  - ▶ You dump a lot of energy on the system, remove it, dump it back in, remove it, etc.



# Serotonin: the relax neuromodulator

- ▶ Carbohydrates stimulate serotonin secretion
  - ▶ Rest and digest – relax
  - ▶ SSRIs – Common anti-depressants but serious side-effects
    - ▶ Blunted emotions
    - ▶ Diminished motivation
    - ▶ Diminished hunger
    - ▶ Diminished sex-drive

# Fasting

- ▶ Autophagy
  - ▶ ketosis
- ▶ Longevity
- ▶ Regulation of insulin levels
- ▶ Neurogenesis

Mattson, M. P., Longo, V. D., & Harvie, M. (2017). Impact of intermittent fasting on health and disease processes. *Ageing Research Reviews*, 39, 46–58. <https://doi.org/10.1016/j.arr.2016.10.005>

Longo, V. D., Mitteldorf, J., & Skulachev, V. P. (2005). Opinion: Programmed and altruistic ageing. *Nature Reviews Genetics*, 6(11), 866–872. <https://doi.org/10.1038/nrg1706>