TE OPE KĀTUA O AOTEAROA
DEFENCE FORCE

Joint Support Group (JSG)

PHYSICAL HEALTH & WELLBEING

NZDF Wellbeing Series

6th November 2024

Dr (MAJ) David Edgar, OC Physical Performance Squadron

PTE Ryan Simpkin, Human Performance Specialist (Nutrition)

Sleep


Up to 60% of the worlds population sleep poorly or suffer from sleep deprivation

Sleep?

- What we do know

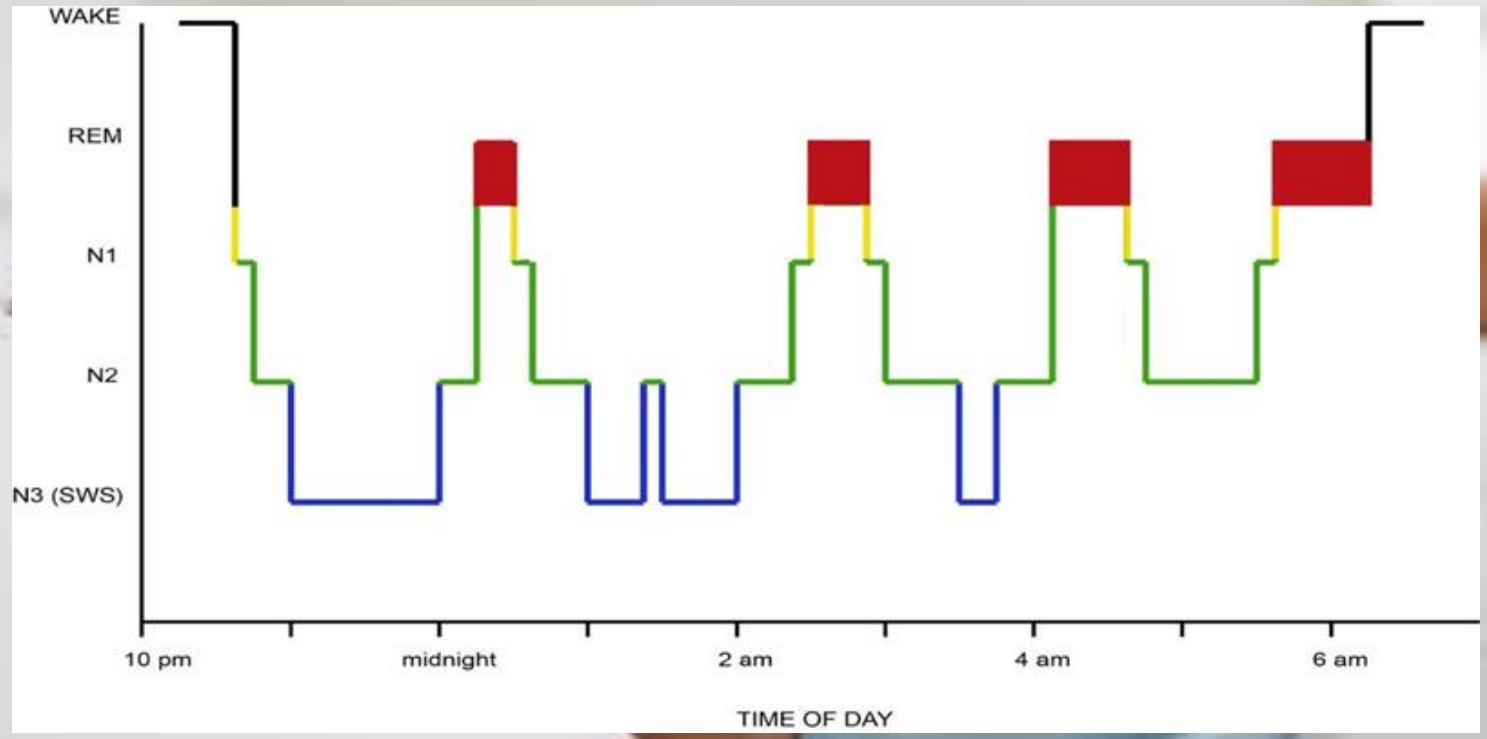
Better sleep (Optimal sleep) = **Enhanced Physical Performance**

Better sleep (Optimal sleep) = **Enhanced Cognitive Function**

- **Improved Health & Wellbeing!**


Sleep is FREE!

What is Sleep?



The human sleep cycle (Carskadon & Dement, 2005). WAKE; indicated being awake, REM; represents rapid eye movement, N1; sleep stage one, N2 sleep stage two, N3 (SWS); represents sleep stage three, slow wave sleep.

‘Six Top Tips For Sleep’

Stuff article (Sleep Research in the Military)

One: Sleep Hygiene

Two: Reduce bright light

- Lounge
- Kitchen
- Hallways
- Bedroom

- **Suppression of melatonin!**
- **ESSENTIAL SLEEP HORMONE!**

Three: Get off Devices

- Melatonin Suppression

- We need melatonin to be release 30-40min prior to sleep!

Four: Reduce/ get rid of artificial light in the bedroom

- Drapes
- Clocks
- Phones
- TVs
- Hair Drier

Five: Keep the bedroom Cool

- Body temp at night
- Sleep better cool
- Fresh air
- Fans
- Natural airflow
- Layers on the bed

Six: Reduce Caffeine from 12pm (Lunch)

- Coffee
- Energy Drinks
- Neural stimulation
- Melatonin suppression
- Dehydration

Optimal Sleep

SLEEP

- Enhanced physical performance
- Enhanced cognitive performance
- Circadian rhythm
- Melatonin Release

Received: 31 January 2021 | Revised: 27 April 2021 | Accepted: 28 April 2021
DOI: 10.1111/jsr.13393

Journal of Sleep Research

RESEARCH ARTICLE

Sleep duration and physical performance during a 6-week military training course

David T. Edgar[1,2] | Nicholas D. Gill[1] | Christopher Martyn Beaven[1] | Jennifer L. Zaslona[4] | Matthew W. Driller[3]

[1]Division of Health, Engineering, Computing & Science, Te Huataki Waiora School of Health, University of Waikato, Tauranga, New Zealand

[2]New Zealand Defence Force, Wellington, New Zealand

[3]Sport and Exercise Science, School of Allied Health, Human Services and Sport, La Trobe University, Melbourne, Vic., Australia

[4]Sleep/Wake Research Centre, Massey University, Wellington, New Zealand

Correspondence
David T. Edgar, Division of Health, Engineering, Computing & Science, Te Huataki Waiora School of Health, University of Waikato, Tauranga, New Zealand.
Email: David.Edgar@nzdf.mil.nz

Summary

Sleep is vital in influencing effective training adaptations in the military. This study aimed to assess the relationship between sleep and changes in physical performance over 6 weeks of military training. A total of 22 officer-trainees (age: 24 ± 5 years) from the New Zealand Defence Force were used for this prospective cohort study. Participants wore wrist-actigraphs to monitor sleep, completed subjective wellbeing questionnaires weekly, and were tested for: 2.4-km run time-trial, maximum press-up and curl-ups before and after 6 weeks of training. Average sleep duration was calculated over 36 nights (6:10 ± 0:28 hr:min), and sleep duration at the mid-point (6:15 hr:min) was used to stratify the trainees into two quantile groups (UNDERS: 5:51 ± 0:29 hr:min, n = 11) and (OVERS: 6:27 ± 0:09 hr:min, n = 11). There were no significant group × time interactions for 2.4-km run, press-ups or curl-ups (p > .05); however, *small* effects were observed in favour of OVERS for 2.4-km run (59.8 versus 44.9 s; d = 0.26) and press-ups (4.7 versus 3.2 reps; d = 0.45). Subjective wellbeing scores resulted in a significant group × time interaction (p < .05), with *large* effect sizes in favour of the OVERS group for Fatigue in Week 1 (d = 0.90) and Week 3 (d = 0.87), and Soreness in Week 3 (d = 1.09) and Week 4 (d = 0.95). Sleeping more than 6:15 hr:min per night over 6 weeks was associated with *small* benefits to aspects of physical performance, and *moderate* to *large* benefits on subjective wellbeing measures when compared with sleeping < 6:15 hr:min.

KEYWORDS
actigraphy, armed forces, exercise recovery, sleep restriction

Received: 23 May 2022 | Revised: 31 October 2022 | Accepted: 7 December 2022
DOI: 10.1111/jsr.13837

RESEARCH ARTICLE

Operation early-bird: Investigating altered light exposure in military barracks on sleep and performance—a placebo-controlled study

David T. Edgar[1,2] | C. Martyn Beaven[1] | Nicholas D. Gill[1] | Jennifer L. Zaslona[3] | Matthew W. Driller[1,4]

[1]Faculty of Health, University of Waikato, Hamilton, New Zealand

[2]New Zealand Defence Force, Wellington, New Zealand

[3]Sleep/Wake Research Centre, Massey University, Wellington, New Zealand

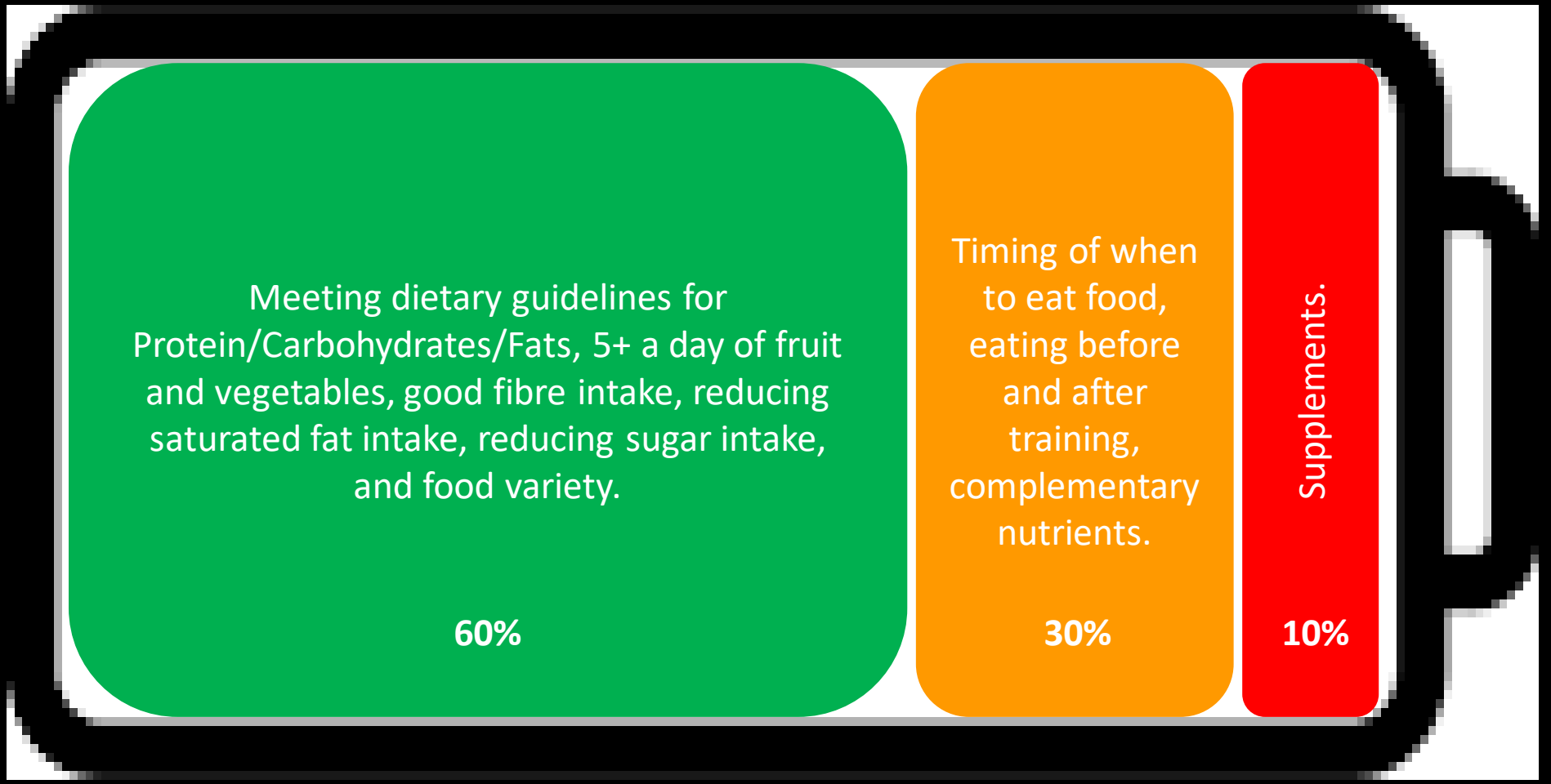
[4]Sport, Performance, and Nutrition Research Group, School of Allied Health, Human Services and Sport, La Trobe University, Melbourne, Australia

Correspondence
David T. Edgar, Faculty of Health, University of Waikato, Hamilton, New Zealand, New Zealand Defence Force.
Email: david.edgar@nzdf.mil.nz

Summary

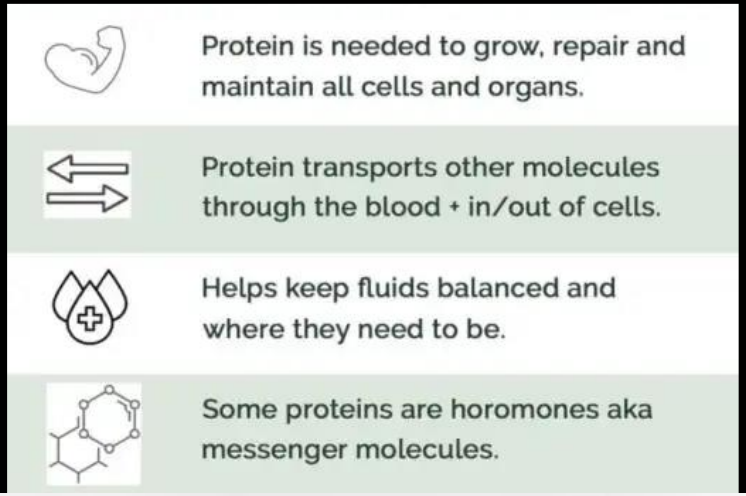
The manipulation of light exposure in the evening has been shown to modulate sleep, and may be beneficial in a military setting where sleep is reported to be problematic. This study investigated the efficacy of low-temperature lighting on objective sleep measures and physical performance in military trainees. Sixty-four officer-trainees (52 male/12 female, mean ± SD age: 25 ± 5 years) wore wrist-actigraphs for 6 weeks during military training to quantify sleep metrics. Trainee 2.4-km run time and upper-body muscular-endurance were assessed before and after the training course. Participants were randomly assigned to either: low-temperature lighting (LOW, $n = 19$), standard-temperature lighting with a placebo "sleep-enhancing" device (PLA, $n = 17$), or standard-temperature lighting (CON, $n = 28$) groups in their military barracks for the duration of the course. Repeated-measures ANOVAs were run to identify significant differences with post hoc analyses and effect size calculations performed where indicated. No significant interaction effect was observed for the sleep metrics; however, there was a significant effect of time for average sleep duration, and *small* benefits of LOW when compared with CON ($d = 0.41–0.44$). A significant interaction was observed for the 2.4-km run, with the improvement in LOW (Δ92.3 s) associated with a *large* improvement when compared with CON (Δ35.9 s; $p = 0.003$; $d = 0.95 \pm 0.60$), but not PLA (Δ68.6 s). Similarly, curl-up improvement resulted in a *moderate* effect in favour of LOW (Δ14 repetitions) compared with CON (Δ6; $p = 0.063$; $d = 0.68 \pm 0.72$). Chronic exposure to low-temperature lighting was associated with benefits to aerobic fitness across a 6-week training period, with minimal effects on sleep measures.

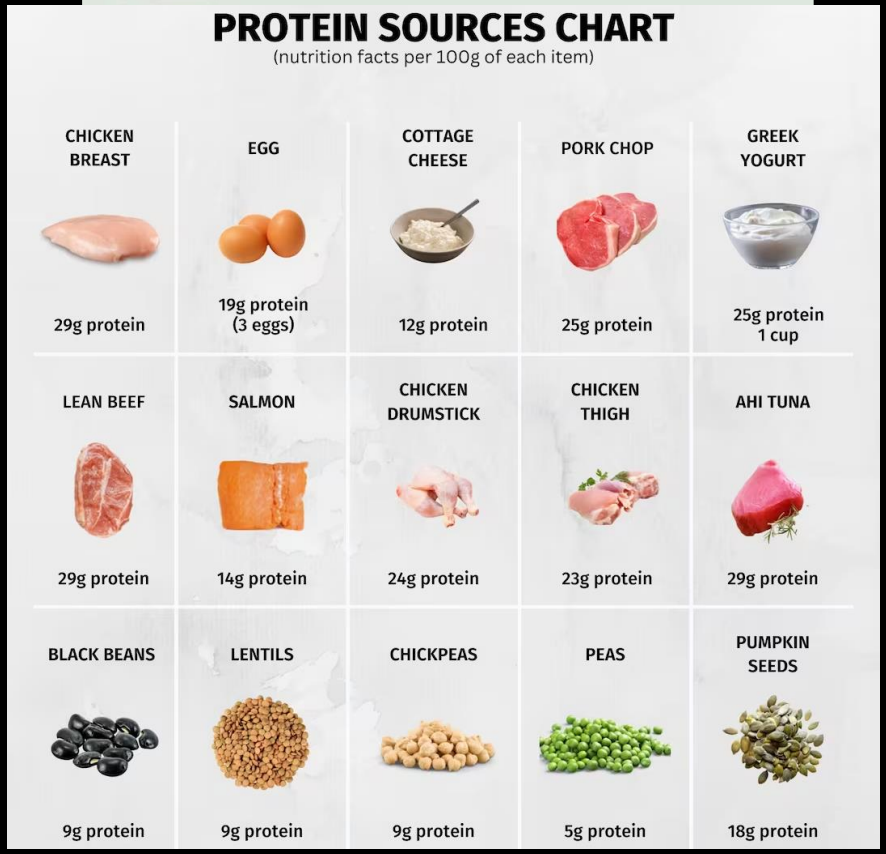
Nutrition Factors to Achieve Peak Performance



Protein

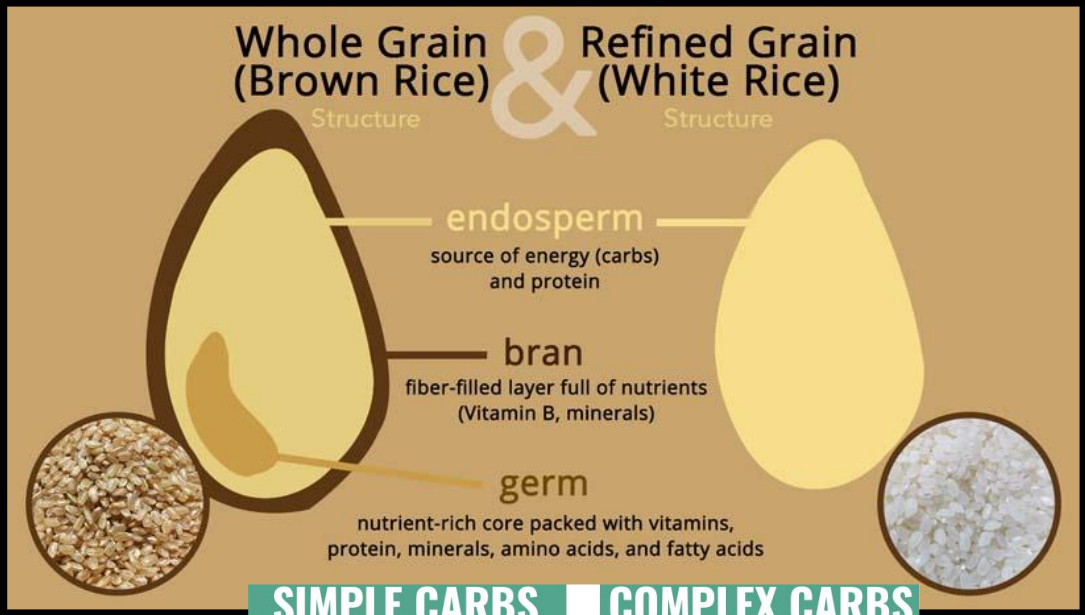
- Important nutrient to help build and grow muscle tissue.
- Important to have protein after exercise to maximise muscle building.
- Recommended daily intake: Low activity = 1 – 1.6g/kg/d, High Activity = 1.6 – 2.2g/kg/d 80kg person = 80 – 128g/d or 128 – 176g/d





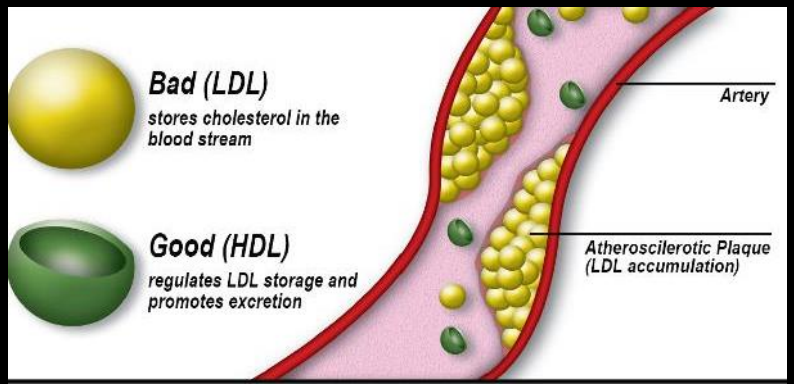
Carbohydrates

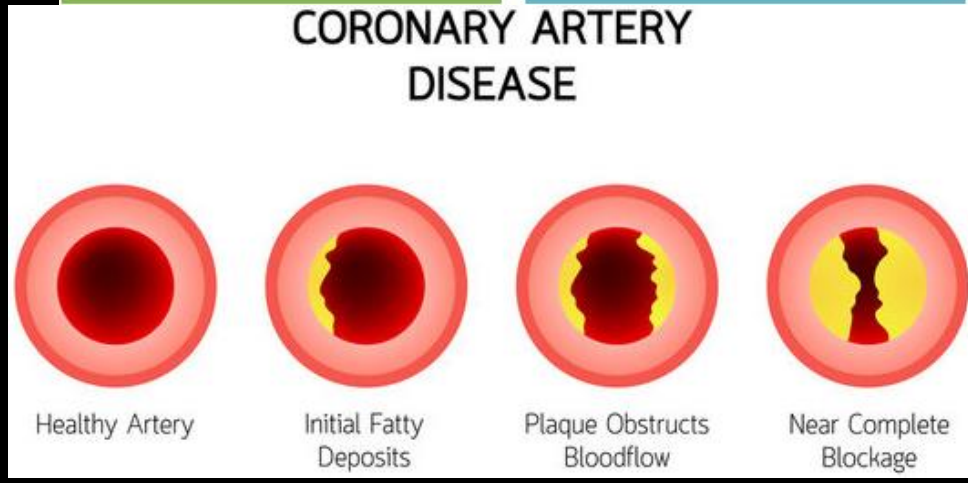
- The body's primary fuel source during intense exercise.
- Simple carbs are good for short bursts of energy (usually during exercise). More Digestible.
- Complex Carbs are good for sustained energy throughout the day.



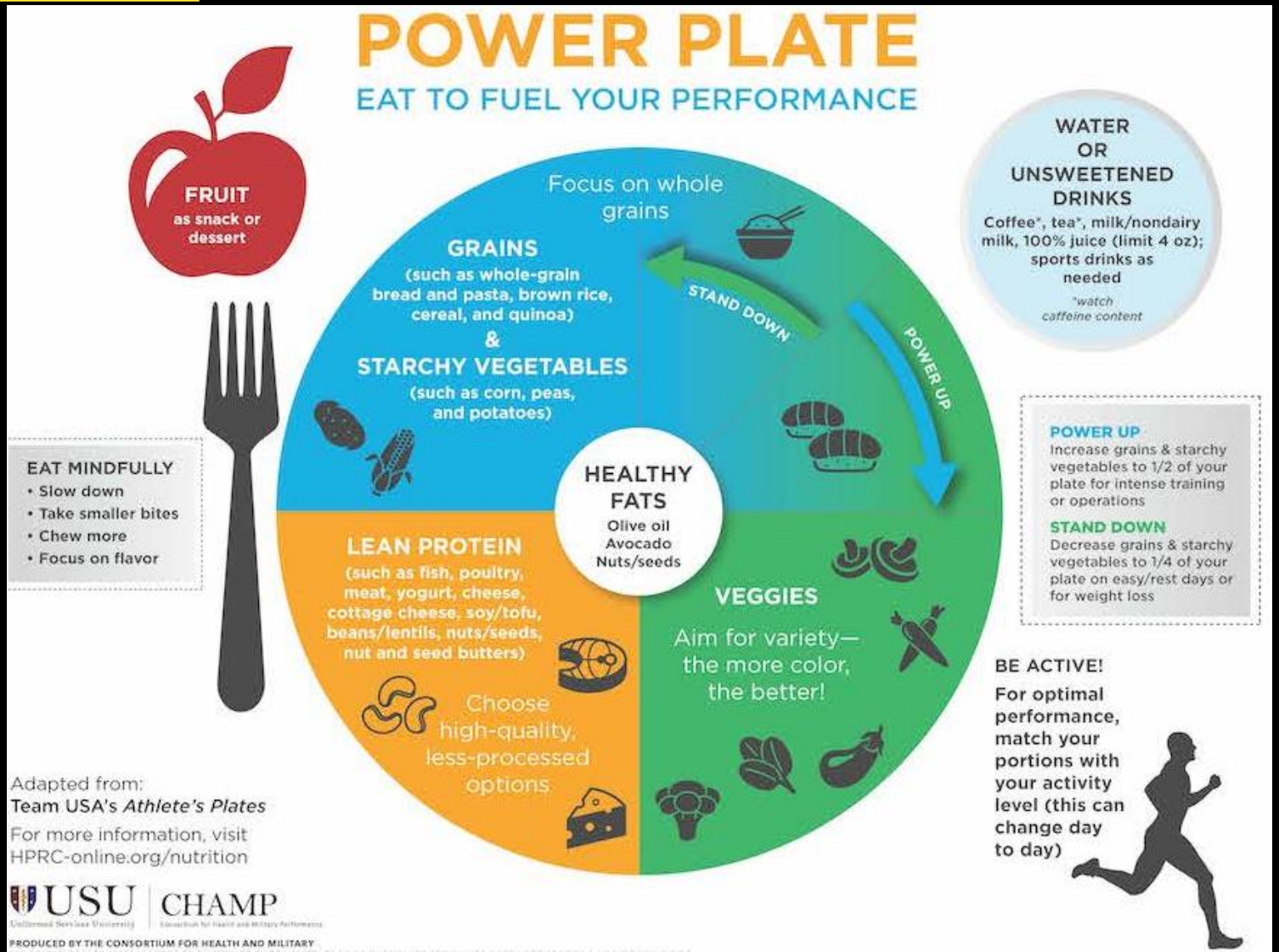
Fat

- Many important vitamins for health, important for hormones in the body.
- Polyunsaturated (PUFA), Monounsaturated (MUFA) are the best fats for health.
- Saturated fats are solid at room temperature (butter, meat fat, coconut oil. Linked with an increased risk of CVD.





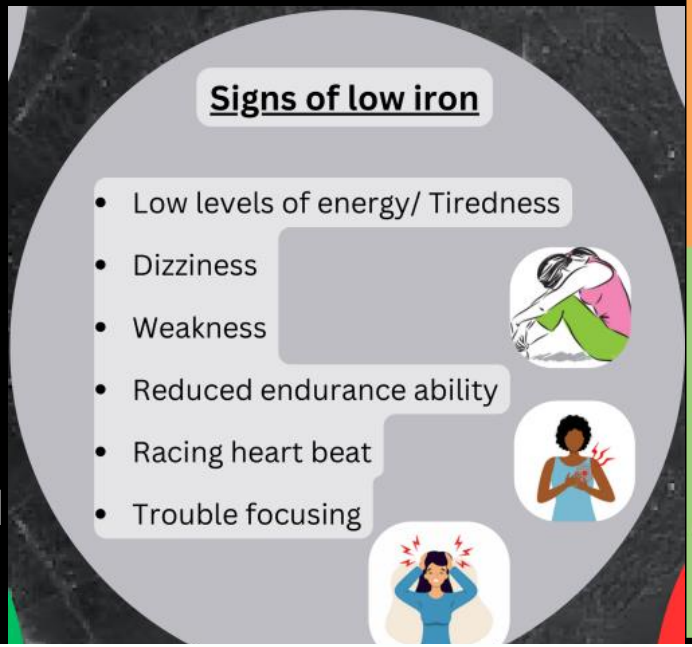
Power Plate Model



Iron

- Daily Intake:
  Male – 9mg/d
  Females – 18mg/d
  Pregnancy– 27mg/d

- Iron is essential in:
  Oxygen transport, Immunity, Growth & repair.



INHIBITS IRON ABSORPTION:
Avoid at the same meal as iron-rich foods

Calcium - found in dairy foods (milk, yoghurt, cheese) can decrease absorption by 50 - 60%

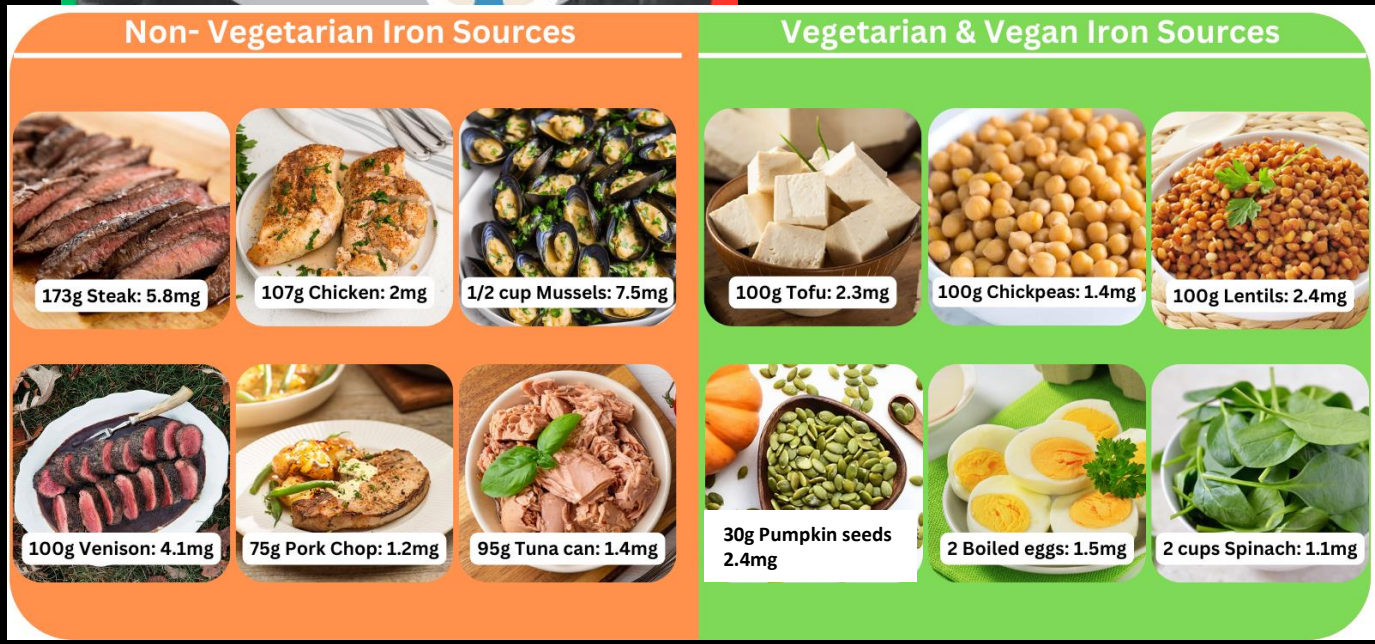
Tannins - in tea and coffee can reduce absorption by 60 - 70%

HELPS IRON ABSORPTION:
Include at the same meal as iron-rich foods

Vitamin C - (50+ mg) in the same meal as iron rich plant foods can increase absorption by up to 400% and help reverse the effects of iron inhibitors

Carotenoids - orange veggies and fruit, e.g. pumpkin, carrots, grapefruit and apricots

Fermented foods - reduce the presence of phytates e.g. kimchi, sauerkraut and miso



Nutritional Effects on Stress

Increases effects of Stress:

- Alcohol

- Excess Caffeine

- Sweetners & Sugar

- Saturated Fat

Decreases effects of Stress:

- Fruit & Veg

- Dietary Fibre

- Magnesium

- Omega 3 - Fatty Acids

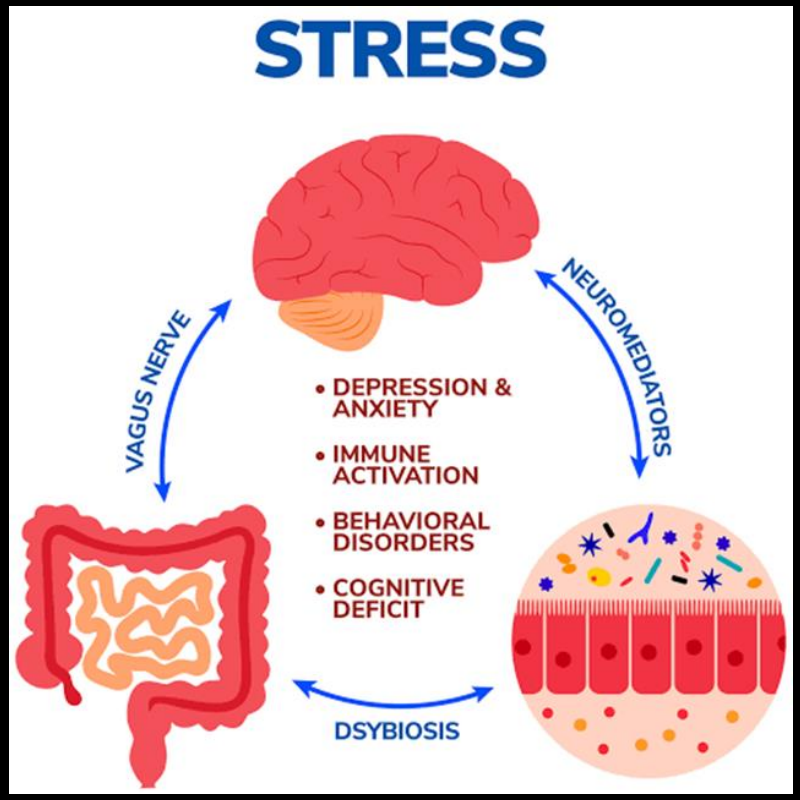
- Probiotics

Gut – Brain - Axis

- The Entreric Nervous System (Gut), and Central Nervous System (Brain) are linked via a bidirectional pathway (Vagus Nerve).

- Anxiety, stress, depression – have all been linked with gut health.

- Improving gut health:
  - Probiotics
  - Fibre (prebiotics)
  - Exercise
  - Omega-3 (anti-inflammatory)




HEI MANA MŌ AOTEAROA
A FORCE FOR NEW ZEALAND