Training the gut

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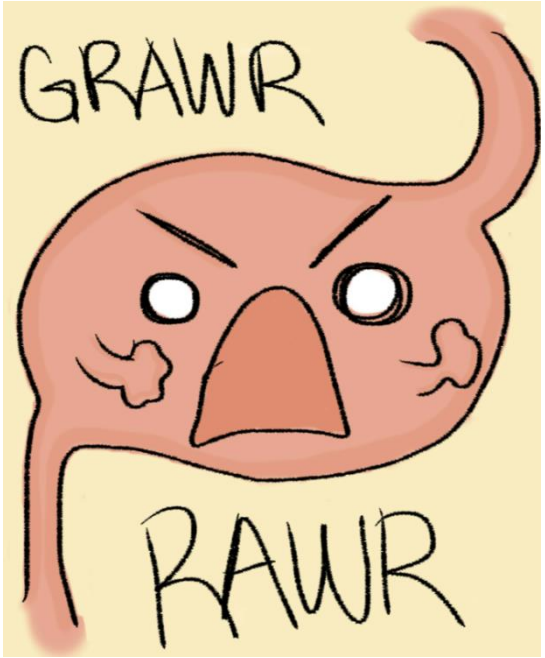
Why train the gut?



Exercise induced GI symptoms

- Reduced gastric emptying
- Altered GI motility
- Potential malabsorption
- Increased intestinal distention
- Upper-GI symptoms: bloating, urge to regurgitate and regurgitation
- Lower-GI symptoms: loose stools and diarrhoea

Causes of GI stress

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Exercise Intensity

- Intensities of ≥60% $\dot{V}O_{2max}$ significantly disturb markers of gut integrity, function, and promote GI symptoms
- Exercise intensities of ≥70% $\dot{V}O_{2max}$ and intermittent high intensity exercise impair gastric emptying

Exercise Duration

- Longer exercise durations cause greater the disturbance to markers of gut integrity, function and GI symptoms

Exercise Mode

- Running causes greater intestinal disturbance than other exercise modes e.g. cycling, swimming, rowing or gym fitness

Horner KM, Schubert MM, Desbrow B, Byrne NM, King NA. Acute exercise and gastric emptying: a meta-analysis and implications for appetite control. *Sports Med* 2015; 45(5): 659-678.

Jeukendrup AE, Vet-Joop K, Sturk A, et al. Relationship between gastro-intestinal complaints and endotoxaemia, cytokine release and the acute-phase reaction during and after a long-distance triathlon in highly trained men. Clin Sci 2000; 98: 47-55.

Causes of GI stress

Environmental Conditions

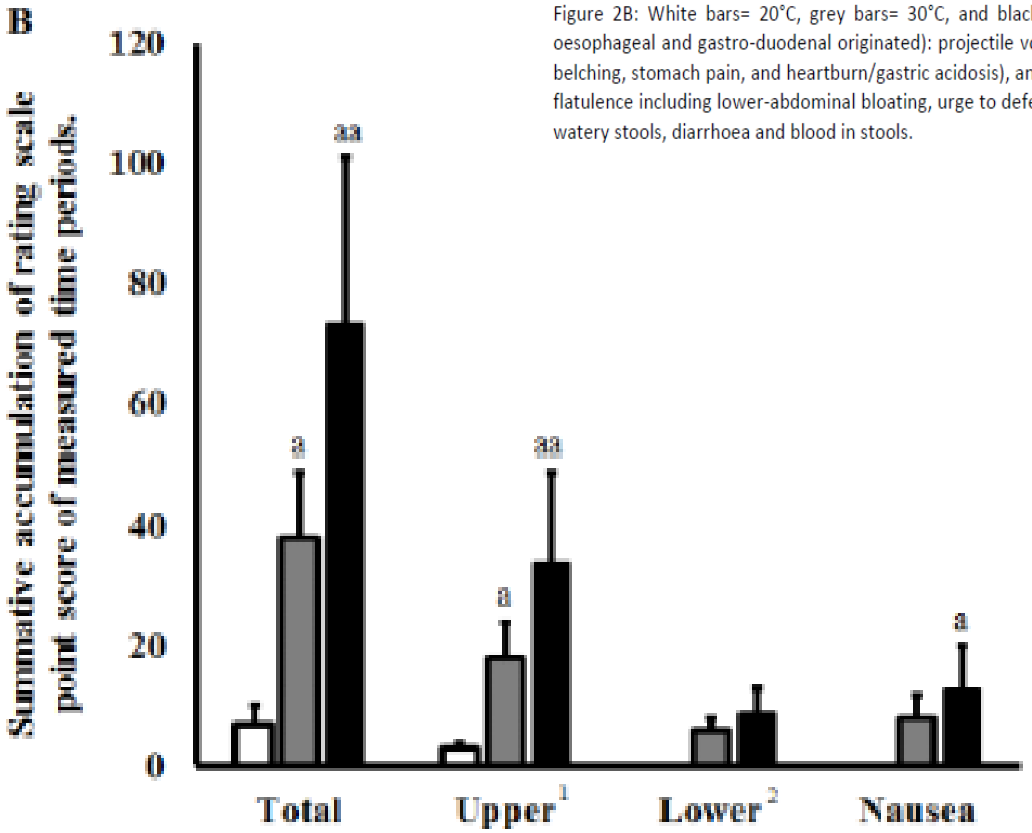

Figure 2B: White bars= 20°C, grey bars= 30°C, and black bars= 35°C. [1] Upper-gastrointestinal symptoms (gastro-oesophageal and gastro-duodenal originated): projectile vomiting, regurgitation, urge to regurgitate, gastric bloating, belching, stomach pain, and heartburn/gastric acidosis), and [2] lower-gastrointestinal symptoms (intestinal originated): flatulence including lower-abdominal bloating, urge to defecate, abdominal pain, abnormal defecation including loose watery stools, diarrhoea and blood in stools.

Snipe R, Kitic C, Gibson P, Costa RJS. Heat stress during prolonged running results in exacerbated intestinal epithelial injury and gastrointestinal symptoms. Exercise and Sports Science Australia 2016.

Causes of GI stress

Feeding Tolerance

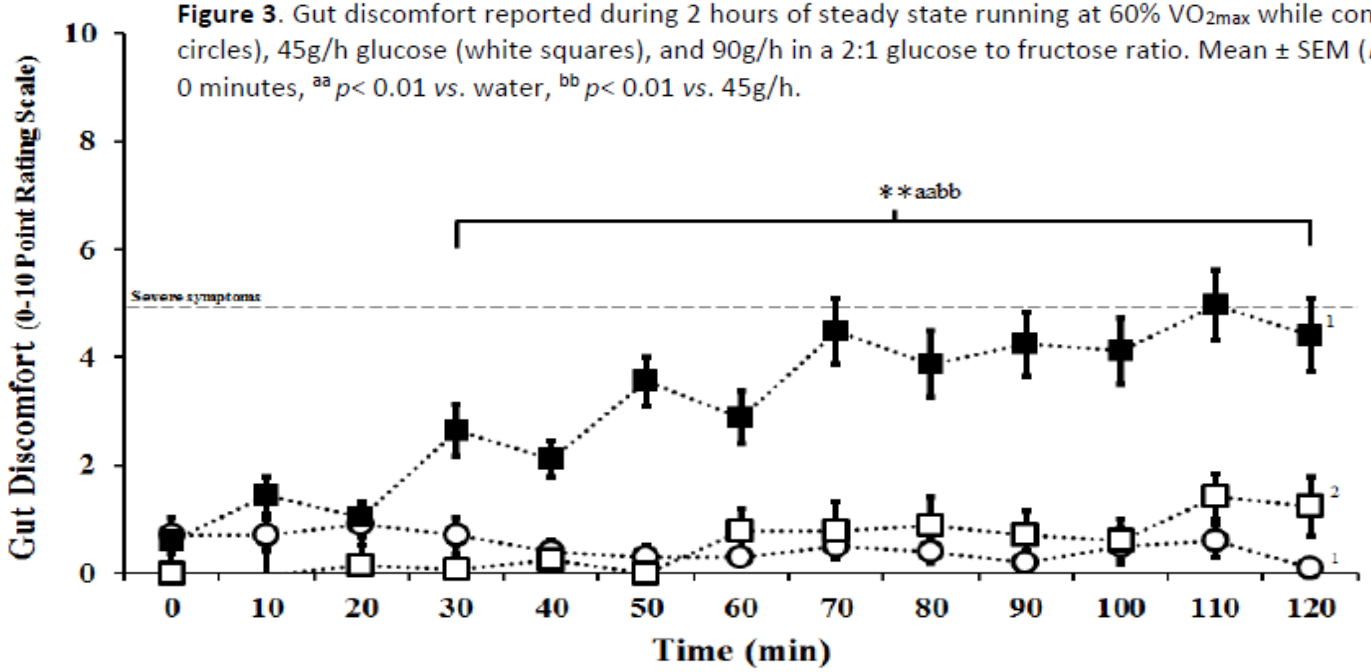

Figure 3. Gut discomfort reported during 2 hours of steady state running at 60% VO_{2max} while consuming water (white circles), 45g/h glucose (white squares), and 90g/h in a 2:1 glucose to fructose ratio. Mean ± SEM (n= 36): ** p< 0.01 *vs.* 0 minutes, [aa] p< 0.01 *vs.* water, [bb] p< 0.01 *vs.* 45g/h.

[1] running performed in 20°C ambient conditions and [2] running performed in 35°C ambient conditions.

- 90g/h CHO resulted in malabsorption in 68% of athletes.
- Symptoms appeared within 30mins of the running protocol
- 100% participants experienced at least one GI symptom; 67% reported at least one severe GI symptom

Costa, R.J.S., Miall, A., Khoo, A., Rauch, C., Snipe, R., Camões-Costa, V., Gibson, P., (2017). Gut-training: The impact of two weeks repetitive gut-challenge during exercise on gastrointestinal status, glucose availability, fuel kinetics, and running performance. *Appl.Physiol.Nutri.Metab.*, (In press).

Causes of GI stress

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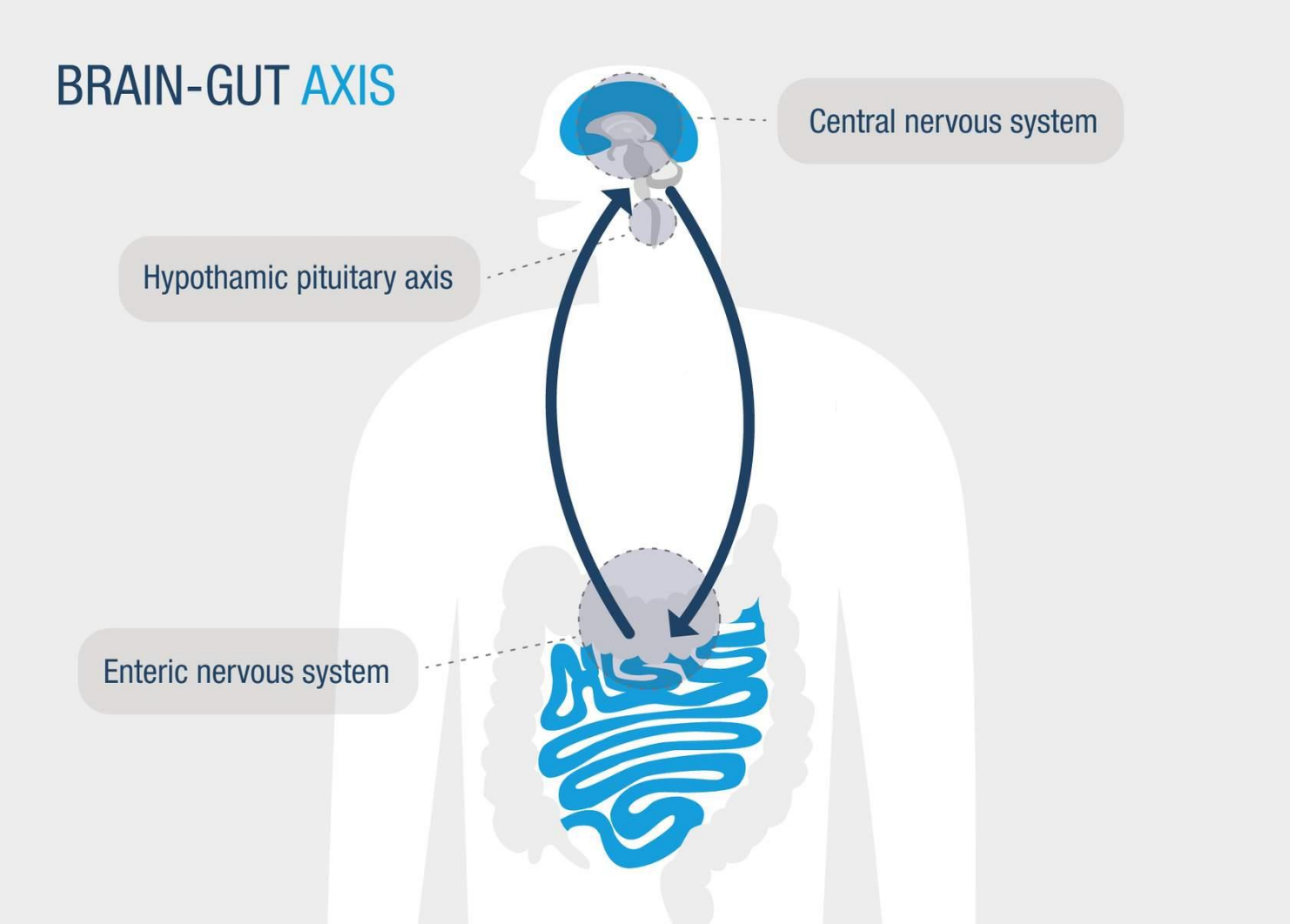
Dietary FODMAPS

- **F**ermentable
- **O**ligosaccharides: fructans and galactooligosaccharides found in wheat, rye, breads, cakes, pasta, garlic and onion
- **D**isaccharides: lactose founds found in milk, yogurt and ice-cream
- **M**onosaccharides: fructose in excess of glucose found in apples, pears, mangoes, artichokes, asparagus, and sport nutrition products such as gels, bars, drinks and recovery powders
- **A**nd **P**olyols: sugar alcohols sorbitol, mannitol, xylitol and maltitol found in stone fruits, apples, pears, cauliflower, mushrooms, low-carb bars and powders

Causes of GI stress



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REVIEW ARTICLE

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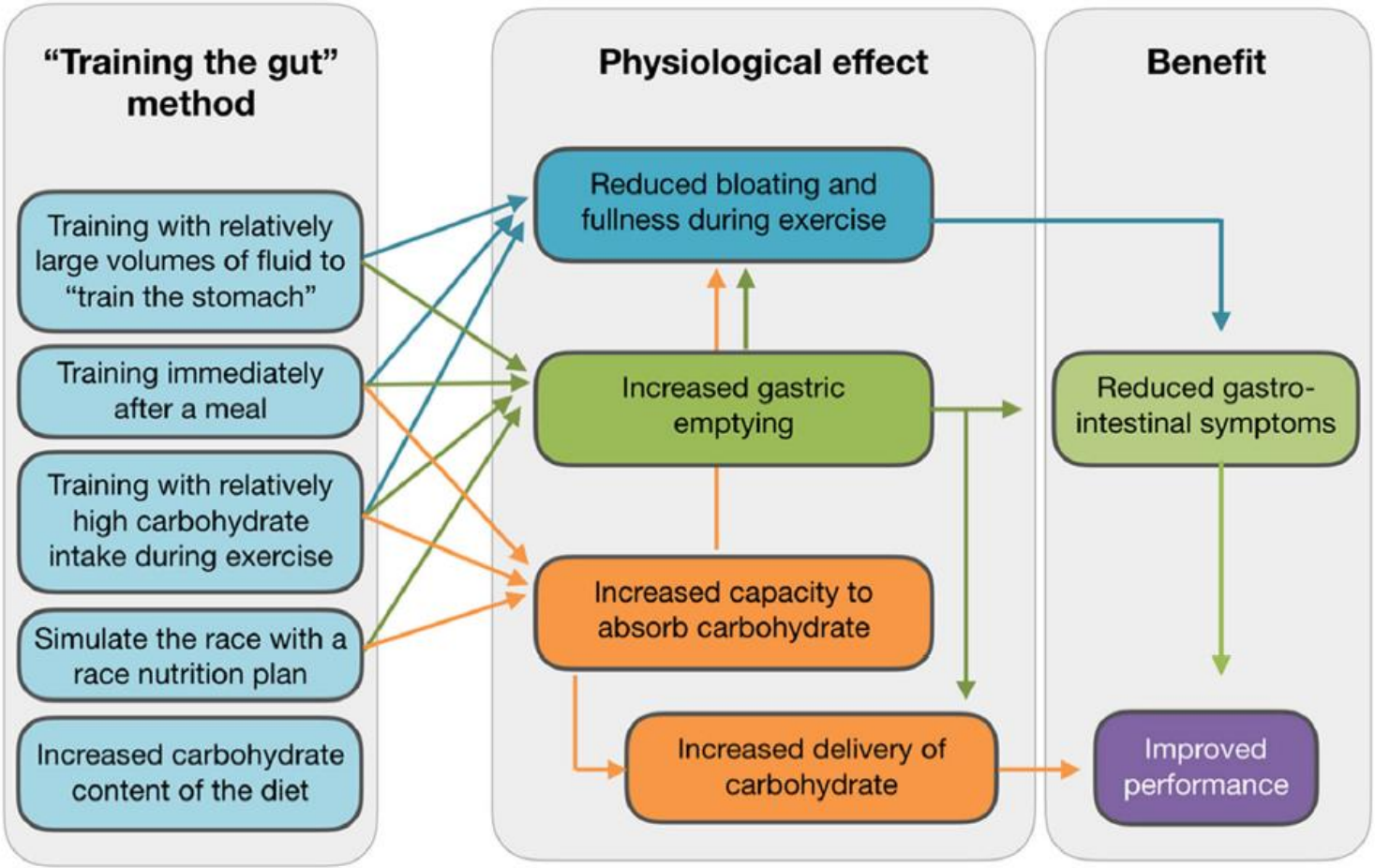
Training the Gut for Athletes

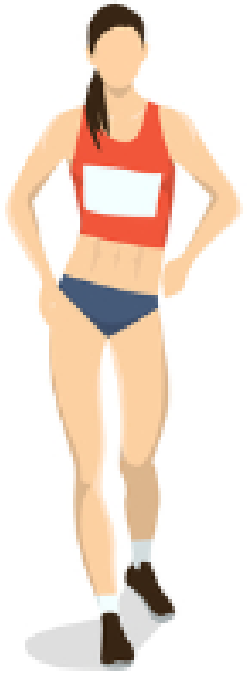
Asker E. Jeukendrup[1]



A summary of methods to "train the gut", the adaptations that may occur in the gut, and implications for performance

Case Study

Subject	**31 year old female**
Sport	**Race walking**
Aim	**To increase CHO consumption during training and competition**
Timeframe	**Feb 2017 – Aug 2018**



Feb 2017

No ingestion of CHO intake during training

Little ingestion of fluid during training

No monitoring of food intake

Feb – Mar 17

Personal meal plan

Mar 17

CHO 35g/hr

Aug 17

CHO 40g/hr

Mar 18

CHO 35g/hr

May 18

CHO 35g/hr

Aug 18

Asian Games

CHO ~60g/hr

Conclusions

1. GI issues are very common amongst athletes and many factors exacerbate GI symptoms
2. The gut is adaptable and can be trained
3. Most importantly, know your athlete