Impact of transitioning to a Mediterranean diet on CO_2 emissions and a marker of gut health

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INTRODUCTION

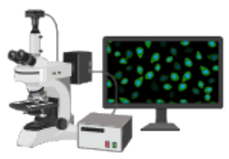
- The Mediterranean diet (MedDiet) traditionally consists of a high intake of plant-based foods (fruits and vegetables), olive oil and fibre-rich foods (nuts, beans and seeds); moderate intake of red wine, dairy, poultry and fish; low intake of red meat (Guasch-Ferré & Willett, 2021).
- Animal products contribute 56% of greenhouse gas (GHG) emissions in the food sector and cause biodiversity loss from the conversion of land into habitats for livestock (Rust, *et al*, 2020). Hence, transitioning to diet high in plant-based food (as traditional advocated in the MedDiet) could be beneficial to the environment.
- The MedDiet has been found to be beneficial to gut health due to the increased production of short-chain fatty acids (SCFA) which are produced from the bacteria fermentation of dietary fibres and resistant starch (Nagpal, et al, 2019).

AIMS

- Conduct secondary data analysis using the MedEx-UK data. The specific aims of the analysis were to:
  - Investigate the impact of a MedDiet and physical activity (PA) intervention on a marker of gut health (stool short chain fatty acid concentrations [SCFA]).
  - Investigate the impact of a MedDiet and PA intervention on diet-associated CO_2 emissions.
- Assist with participant screening and recruitment for the MedEx-UK2 study.

METHODS

Familiarise myself with the MedEx-UK study.

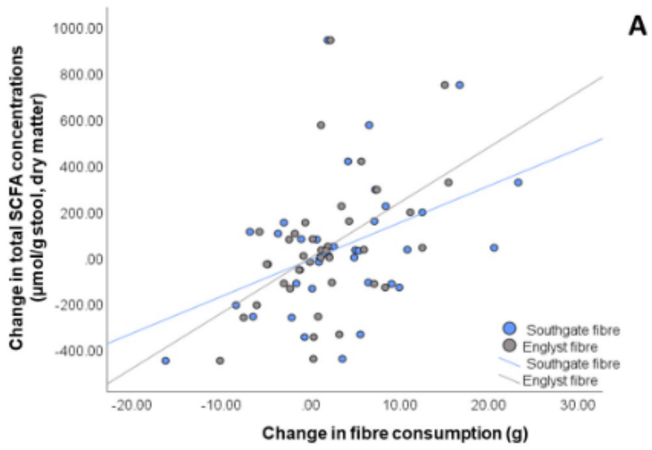


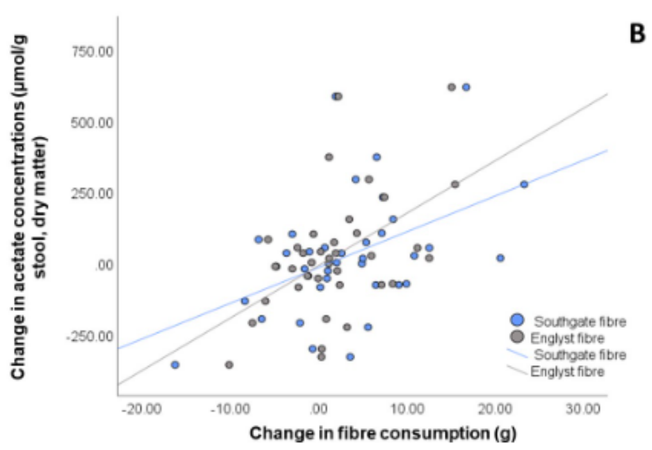
Process and clean data, to perform initial analyses which included:
- ANCOVA analysis to investigate the effect each group had on SCFA concentrations/ CO_2 emissions.
- Correlations between the change in SCFA concentrations/CO_2 emissions with the change in MedDiet score.

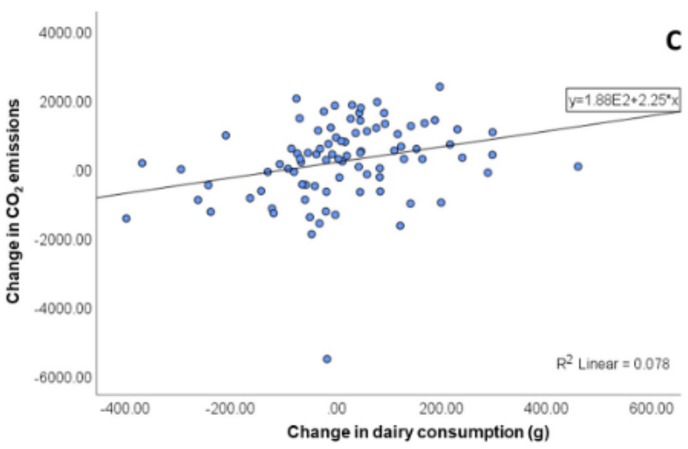
Further correlational analyses relating to specific elements of the MedDiet:
- The change in fibre intake with the change in SCFA concentrations.
- The change in red meat and dairy intake with the change in CO_2 emissions.

Telephone screening to assess potential participants eligibility to take part in the MedEx-UK2 study.

RESULTS







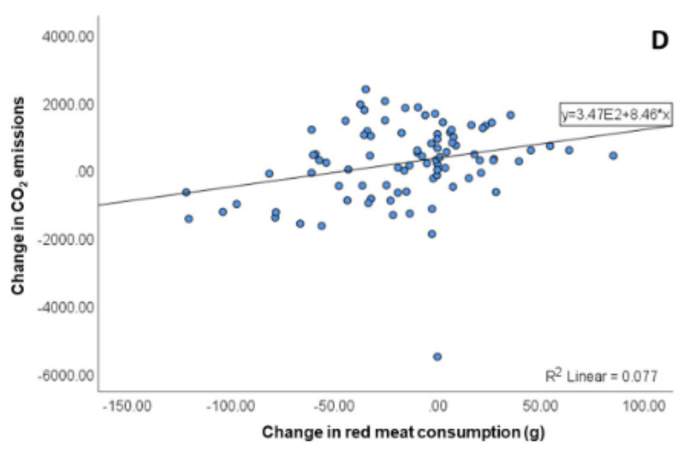


Figure 1. Scatterplots showing the relationship between the change in Southgate and Englyst fibre intake with the change in total SCFA (A) and acetate (B) concentrations. Additionally, the correlations between the change in dairy (C) and red meat (D) intake with the change in CO_2 emissions.

The MedDiet & PA intervention did not significantly impact stool SCFA or diet-associated CO_2 emissions.

CO_2 emissions: 3832.930; 95% CI: 3518.763 - 4147.096; $p = 0.497$.
Total SCFA: 486.470; 95% CI: 331.824 - 641.117; $p = 0.919$.

No relationship was found between the change in MedDiet score and the change in SCFA concentrations or diet-associated CO_2 emissions.

CO_2 emissions: $r(86) = 0.112$, $p = 0.298$.
Total SCFA: $r(37) = 0.250$, $p = 0.125$.

Higher Southgate and Englyst fibre intake were associated with increased total SCFA and acetate concentrations.

Total SCFA:
Southgate: $r(35) = 0.424$, $p = 0.009$.
Englyst: $r(35) = 0.471$, $p = 0.003$.
Acetate:
Southgate: $r(35) = 0.461$, $p = 0.004$.
Englyst: $r(35) = 0.501$, $p = 0.002$.

Reduced consumption of red meat and dairy was associated with a reduction in diet-associated CO_2 emissions.

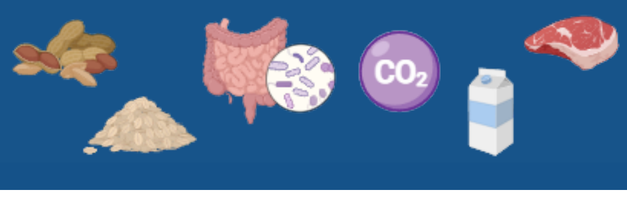
Red meat intake: $r(35) = 0.289$, $p = 0.006$.
Dairy intake: $r(35) = 0.349$, $p = 0.001$.

DISCUSSION

- As seen in our results, high fibre intake increases SCFA concentrations which positively impacts gut health by:
  - Maintaining gut barrier integrity (Nogal, *et al*, 2021).
  - Reducing inflammation providing protection from digestive disorders and colorectal cancer.
  - Reducing the risk of developing type 2 diabetes, CVD and preventing obesity (Lattimer & Haub, 2010).
- A diet lower in red meat and dairy intake could have a positive impact on:
  - The environment due to the reduction in CO_2 emissions, as seen in our results.
  - Human health as a diet high in red meat has been associated with an increased risk of developing non-communicable diseases such as obesity and cadiovascular diseases (Rust, *et al*, 2020).
  - Global economy due to the health-related costs.

CONCLUSION

The results from this study imply that simply recommending the MedDiet does not improve gut health or reduce CO_2 emissions. Recommendations should instead focus on specific dietary elements previously found to have a positive impact on the environment and gut health.



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