LETTER TO THE EDITOR

“Role of exercise in preventing and restoring gut dysbiosis in patients with inflammatory bowel disease”: A letter to the editor

Neasa Mc Gettigan, Aoibhlinn O’Toole, Karen Boland

Specialty type: Gastroenterology and hepatology

Provenance and peer review: Invited article; Externally peer reviewed.

Peer-review model: Single blind

Peer-review report’s scientific quality classification

Grade A (Excellent): 0
Grade B (Very good): 0
Grade C (Good): C, C
Grade D (Fair): 0
Grade E (Poor): 0

P-Reviewer: Li D, Maslennikov R

Received: September 13, 2021
Peer-review started: September 13, 2021
First decision: November 7, 2021
Revised: November 10, 2021
Accepted: January 19, 2022
Article in press: January 19, 2022
 Published online: February 28, 2022

Abstract

Exercise-induced changes of the microbiome in inflammatory bowel diseases (IBD) is a promising field of research with the potential for personalized exercise regimes as a promising therapeutic adjunct for restoring gut dysbiosis and additionally for regulating immunometabolic pathways in the management of IBD patients. Structured exercise programmes in IBD patients of at least 12 wk duration are more likely to result in disease-altering changes in the gut microbiome and to harness potential anti-inflammatory effects through these changes along with immunometabolic pathways.

Key Words: Inflammatory bowel diseases; Microbiota; Dysbiosis; Metabolism; Exercise; Cytokines

Core Tip: Exercise-induced changes of the microbiome in inflammatory bowel diseases (IBD) is a promising field of research with the potential for personalized exercise regimes as a promising therapeutic adjunct for restoring gut dysbiosis and additionally for regulating immunometabolic pathways in the management of IBD patients. We have observed that exercise programmes of at least 12 wk duration are required to exert any meaningful effects on gut dysbiosis restoration and suggest that the positive effects of a more prolonged programme may extend to inflammatory mediation through regulation of immunometabolism.
TO THE EDITOR

We read with interest a review article by Koutouratsas et al.[1] on the “Role of exercise in preventing and restoring gut dysbiosis in patients with inflammatory bowel diseases: A review”. We agree with the authors conclusion that the effects of prescribed exercise on the microbiome is a promising area for further research and that the potential for personalized exercise regimes is a promising therapeutic adjunct when considering the restoration of gut dysbiosis in the management of inflammatory bowel diseases (IBD) patients.

With personalization of exercise regimes in mind, we find it is pertinent to consider the duration of any given exercise programme prescribed for IBD patients. This review article presents the findings of a number of clinical trials in humans examining the effect of various forms of exercise on gut microbiome composition, functionality and diversity. Interestingly, we would like to remark on the duration of exercise programmes and to highlight that the studies of short-term exercise programmes (6 wk duration or less) did not show any clinically significant effect on gut microbiome diversity or composition[2,3] in comparison to studies of at least 12-wk duration which showed changes in gut microbiome composition, diversity and functionality[4,5]. A study of IBD patients not included in the review of 8 wk duration of a prescribed aerobic exercise programme also did not show any significant difference in gut microbiome composition/diversity in response to the exercise programme but other benefits were demonstrated including an improvement in muscle mass and body fat %[6]. Furthermore, two studies of elite athletes, one of rugby players and the other of rowers showed significant differences in microbiome with exercise which likely reflects the habitual nature of the exercise in addition to other factors such as diet[7,8].

A range of exercises have been shown to be safe in patients with IBD including moderate intensity aerobic exercise, resistance training and high intensity interval training[6,9,10]. We suggest that any future studies examining the effects of exercise on changes in the gut microbiome should be of at least 12 wk duration with consideration given to the recommended physical activity guidelines to avoid potential harmful effects of excessive vigorous exercise whilst also being mindful of disease activity (i.e., a personalized approach would be the optimum)[11-13].

Exercise has been shown as a promising therapeutic intervention or adjunct to influence metabolism in disorders including multiple sclerosis through regulation of immune cells[14]. This is mediated through cytokine secretion, and modulation of metabolic regulators including tryptophan[15,16]. Therefore, we suggest that future studies on the effects of structured exercise programmes in IBD patients should be at least of 12 wk duration to promote disease-altering changes in the gut microbiome and harness potential anti-inflammatory effects through these changes along with immunometabolic pathways. These benefits would be in addition to promoting sustained exercise behavioral patterns.

FOOTNOTES

Author contributions: Mc Gettigan N wrote the letter, O’Toole A and Boland K revised the letter.

Conflict-of-interest statement: The authors have no conflict-of-interests.

Open-Access: This article is an open-access article that was selected by an in-house editor and fully peer-reviewed by external reviewers. It is distributed in accordance with the Creative Commons Attribution NonCommercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: https://creativecommons.org/Licenses/by-nc/4.0/

Country/Territory of origin: Ireland

ORCID number: Neasa Mc Gettigan 0000-0001-5744-0435; Aoibhlinn O’Toole 0000-0002-1426-2787; Karen Boland 0000-0003-2327-9924.

S-Editor: Wang JJ
L-Editor: A
P-Editor: Wang JJ
REFERENCES

1. Koutouratsas T, Philippou A, Kolios G, Koutsilieris M, Gazouli M. Role of exercise in preventing and restoring gut dysbiosis in patients with inflammatory bowel diseases: A review. World J Gastroenterol 2021; 27: 5037-5046 [PMID: 34094733 DOI: 10.3748/wjg.v27.i30.5037]

2. Taniguchi H, Tanisawa K, Sun X, Kubo T, Hoshino Y, Hosokawa M, Takeyama H, Higuchi M. Effects of short-term endurance exercise on gut microbiota in elderly men. Physiol Rep 2018; 6: e13935 [PMID: 30536648 DOI: 10.1484/phy2.13935]

3. Rettedal EA, Cree JME, Adams SE, MacRae C, Skidmore PML, Cameron-Smith D, Gant N, Blenkiron C, Merry TL. Short-term high-intensity interval training exercise does not affect gut bacterial community diversity or composition of lean and overweight men. Exp Physiol 2020; 105: 1268-1279 [PMID: 32478429 DOI: 10.1113/EP088744]

4. Quiroga R, Nistal E, Estébanez B, Porras D, Juárez-Fernández M, Martínez-Flórez S, García-Mediavilla MV, de Paz JA, González-Gallego J, Sánchez-Campos S, Cuevas MJ. Exercise training modulates the gut microbiota profile and impairs inflammatory signaling pathways in obese children. Exp Mol Med 2020; 52: 1048-1061 [PMID: 32624568 DOI: 10.1038/s12276-020-0459-0]

5. Morita E, Yokoyama H, Imai D, Takeda R, Ota A, Kawai E, Hisada T, Emoto M, Suzuki Y, Okazaki K. Aerobic Exercise Training with Brisk Walking Increases Intestinal Bacteroides in Healthy Elderly Women. Nutrients 2019; 11 [PMID: 30999699 DOI: 10.3390/nu11040868]

6. Cronin O, Barton W, Moran C, Sheehan D, Whiston R, Nugent H, McCarthy Y, Molloy CB, O'Sullivan O, Cotter PD, Molloy MG, Shanahan F. Moderate-intensity aerobic and resistance exercise is safe and favorably influences body composition in patients with quiescent Inflammatory Bowel Disease: a randomized controlled cross-over trial. BMC Gastroenterol 2019; 19: 29 [PMID: 30755154 DOI: 10.1186/s12876-019-0952-x]

7. Clarke SF, Murphy EF, O'Sullivan O, Lucey AJ, Humphreys M, Hogan A, Hayes P, O'Reilly M, Jeffery IB, Wood-Martin R, Kerins DM, Quigley E, Ross RP, Shanahan F, Cotter PD. Exercise and associated dietary extremes impact on gut microbial diversity. Gut 2014; 63: 1913-1920 [PMID: 25202442 DOI: 10.1136/gutjnl-2013-306541]

8. Keohane DM, Woods T, O'Connor P, Underwood S, Cronin O, Whiston R, O'Sullivan O, Cotter P, Shanahan F, Molloy MGM. Four men in a boat: Ultra-endurance exercise alters the gut microbiome. J Sci Med Sport 2018; 22: 1059-1064 [PMID: 31053425 DOI: 10.1016/j.jsmas.2019.04.004]

9. Jones K, Baker K, Speight RA, Thompson NP, Tew GA. Randomised clinical trial: combined impact and resistance training in adults with stable Crohn's disease. Aliment Pharmacol Ther 2020; 52: 964-975 [PMID: 3319156 DOI: 10.1111/apt.16002]

10. Klare P, Nigg J, Nold J, Haller B, Krug AB, Mair S, Thoringer CK, Christie JW, Schmid M, Halle M, Huber W. The impact of a ten-week physical exercise program on health-related quality of life in patients with inflammatory bowel disease: a prospective randomized controlled trial. Digestion 2015; 91: 239-247 [PMID: 25823689 DOI: 10.1159/000371795]

11. Bull FC, Al-Ansari SS, Biddle S, Borodulin K, Buman MP, Cardon G, Carty C, Chappel JP, Chastin S, Chou R, Dempsey PC, DiPietro L, Ekeland U, Firth J, Friedenreich CM, Garcia L, Gichu M, Jago R, Katzmarzyk PT, Lambert E, Leitzmann M, Milton K, Ortega FB, Ranasinghe C, Stanatikis E, Tiedemann A, Tsoi RP, van der Ploeg HP, Wari V, Willumsen PC, DiPietro L, Ekelund U, Firth J, Friedenreich CM, Garcia L, Gichu M, Jago R, Katzmarzyk PT, Lambert E, Leitzmann M, Milton K, Ortega FB, Ranasinghe C, Stanatikis E, Tiedemann A, Tsoi RP, van der Ploeg HP, Wari V, Willumsen PC. World Health Organization 2020 guidelines on physical activity and sedentary behaviour. Br J Sports Med 2020; 54: 1451-1462 [PMID: 33239350 DOI: 10.1136/bjsports-2020-102955]

12. Haskell WL, Lee IM, Pate RR, Powell KE, Blair SN, Franklin BA, Schmid M, Halle M, Huber W. The impact of a ten-week physical exercise program on health-related quality of life in patients with inflammatory bowel disease: a prospective randomized controlled trial. Digestion 2015; 91: 239-247 [PMID: 25823689 DOI: 10.1159/000371795]

13. Eckert KG, Abbasi-Neureither I, Köppel M, Huber G. Structured physical activity interventions as a complementary therapy for patients with inflammatory bowel disease - a scoping review and practical implications. BMC Gastroenterol 2019; 19: 115 [PMID: 31266461 DOI: 10.1186/s12876-019-1034-9]

14. Afzal M, Dowlings JK, McCoy CE. Impact of Exercise on Immunometabolism in Multiple Sclerosis. J Clin Med 2020; 9 [PMID: 32967206 DOI: 10.3390/jcm9091606]

15. Strasser B, Geiger D, Schauer M, Gatterer H, Burtscher M, Fuchs D. Effects of Exhaustive Aerobic Exercise on Tryptophan-Kynurenine Metabolism in Trained Athletes. PLoS One 2016; 11: e0153617 [PMID: 27124720 DOI: 10.1371/journal.pone.0153617]

16. Pedersen BK, Toft AD. Effects of exercise on lymphocytes and cytokines. Br J Sports Med 2000; 34: 246-251 [PMID: 10953894 DOI: 10.1136/bjsm.34.4.246]
