gastrointestinal disorders

MDPI

Communication

An Irish Multi-Centre Study of Behaviours, Attitudes and Barriers to Exercise in Inflammatory Bowel Disease, a Survey from the Patient's Perspective

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Abstract: Background: Physical activity (PA) in inflammatory bowel disease (IBD) has many potential favourable outcomes including anti-inflammatory effects, improvement in quality of life and improvements in patient body composition. It is recognised that patients with IBD have a significantly decreased exercise tolerance. Aim: 1. To assess physical activity levels, behaviours and barriers to PA in IBD. 2. To assess the likelihood of patients with IBD to engage in a community-based exercise programme. 3. To examine the presence of body image concerns in IBD. Method: Patient surveys were distributed in Beaumont and Connolly Hospitals between October and December 2021. Descriptive statistics, Chi-squared testing and Pearson's correlations were completed using Minitab. $p < 0.05$ denoted statistical significance. Results: Data were recorded for a total of 203 patients. Out of all patients, 62% ($n = 126$) had Crohn's disease (CD). Over half of the cohort were male ($n = 115$). Mean weight among females was 75 kg and 83 kg among males. Exercise behaviours: Out of all patients, 71% exercise regularly, on average for 59 min, 3.2 days/week. Walking was the most common form of PA (74%). A post-diagnosis change in exercise behaviour was found in 66% with three-quarters exercising less. The primary barrier to exercise was fatigue (54%). Female gender ($p = 0.007$) and age < 45 years ($p = 0.02$) were associated with body image dissatisfaction reported in 62% of patients. Conclusion: These data demonstrate the patient-reported impact of IBD on patient participation in PA. Concerns regarding body image were common and associated with gender and age. A feasibility study of a physician-derived exercise programme in patients with active IBD is underway in Beaumont Hospital to determine the effect on patient response to therapy, inflammation and body composition outcomes (NCT05174754).

Keywords: inflammatory bowel disease; ulcerative colitis; Crohn's disease; IBD; physical activity; exercise; fatigue; body image

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1. Introduction

Exercise is an important lifestyle intervention and health measure with many benefits including improved cardiorespiratory fitness, improvement in quality of life, favourable body composition changes and improved fatigue levels [1]. The World Health Organization (WHO) recommends that adults aged 18–64 years should do at least 150–300 min of moderate-intensity aerobic physical activity or at least 75–150 min of vigorous-intensity aerobic physical activity throughout the week [2].

Inflammatory bowel disease (IBD) is a chronic gastrointestinal disorder which encompasses both Crohn's disease (CD) and ulcerative colitis (UC) with a trend toward a relapsing–remitting course [3–5]. Exercise in IBD is largely underutilised as an adjunctive therapy despite previous studies showing a multitude of benefits in patients with quiescent and mild to moderate CD and UC. Benefits of exercise in IBD include an improvement in

quality of life, luminal symptoms, fatigue and physical fitness and previous studies have shown that patients with IBD have the ability to exercise safely [6–9]. Potential benefits in patients with active disease are largely unexplored.

Fatigue is a debilitating symptom for many patients with IBD and is often associated with significant stress [10,11]. Additionally, body image dissatisfaction is common amongst patients with IBD and is associated with a negative impact on quality of life [12,13]. Fatigue, which is independently associated with body image dissatisfaction, has been shown to improve with exercise in existing studies. Hence, it is plausible that body image dissatisfaction may be improved with the use of exercise programmes also [14].

A survey was developed to further our understanding of the exercise behaviours, attitudes and barriers to exercise, willingness to engage in a supervised exercise programme and the presence of body image issues among our IBD patient population. This survey was carried out as a precursor to the development of a new referral pathway to a community-based physician-derived exercise programme and a feasibility randomised controlled exercise study on patients with moderate to severe IBD undergoing induction with disease-modifying therapies (Clinicaltrials.gov NCT05174754) [15,16].

2. Results

2.1. Results for Patient Demographics

A total of 203 patients with IBD were surveyed, of which 57% were male (n = 115) and 62% (n = 126) had an underlying diagnosis of CD. Patients were relatively well-dispersed across age categories, with 27% of patients in the 45–60-year age group (n = 55). The mean self-reported weight for females was 75 kg (SD 17.82) and 83 kg (SD 19.16) for men, with an anticipated significant difference between genders, p = 0.002 (Figure 1). No significant difference in weight was observed between CD (mean 79 kg) and UC patients (mean 81 kg), p = 0.474 (Table 1).

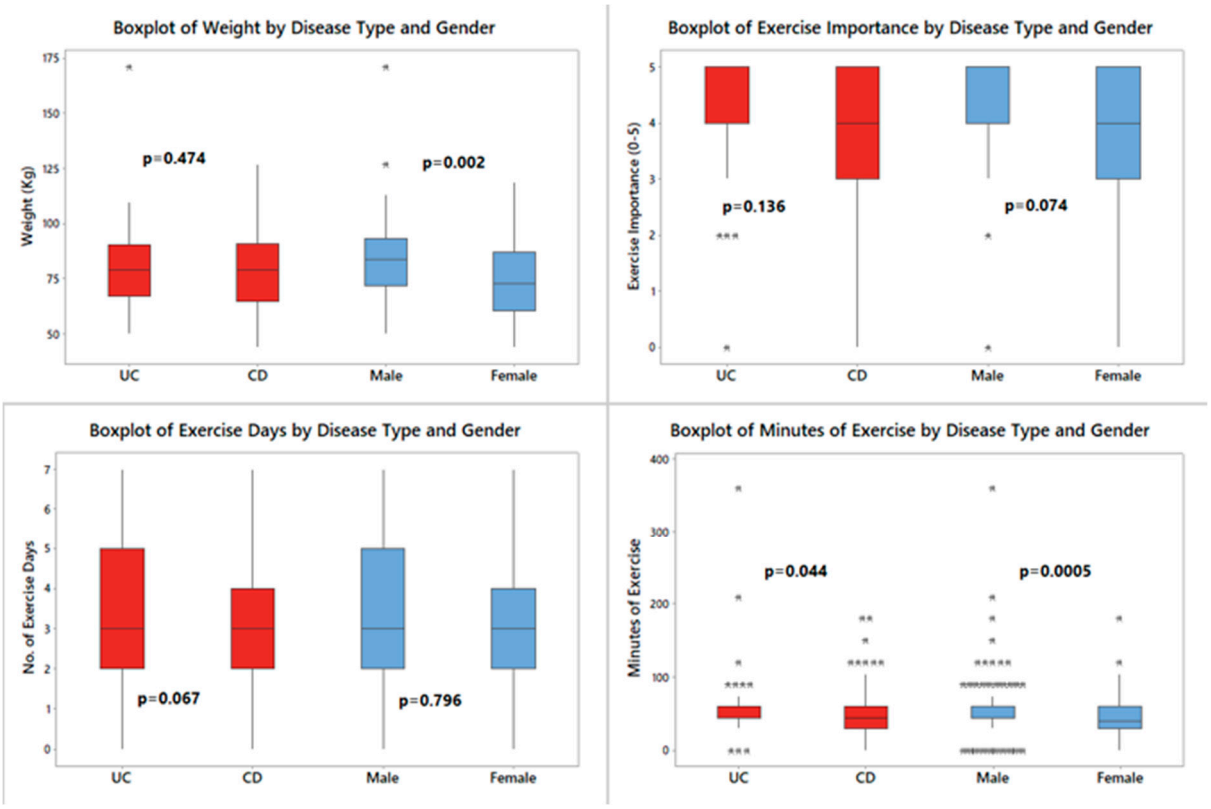

Figure 1. Results of disease- and gender-based weight and exercise patterns. UC—ulcerative colitis; CD—Crohn's disease.

Table 1. Patient demographics.

Demographic	Result *n* (%)
Disease type	
Crohn's disease	126 (62%)
Ulcerative colitis	69 (34%)
Indeterminate	1 (0.5%)
Unknown to patient	7 (3.5%)
Gender	
Male	115 (57%)
Female	86 (42%)
Non-binary	1 (0.5%)
Rather not disclose	1 (0.5%)
Age category (years)	
18–25	37 (18%)
25–35	43 (21%)
35–45	48 (24%)
45–60	55 (27%)
60–70	13 (6.4%)
70–80	5 (2.5%)
80+	2 (1%)
Weight (self-reported)	
Total responses	176/203 (87%)
Unsure of weight	26 (13%)
Rather not say	1 (0.5%)
Weight result (n, mean kg)	
Male	97, 83 (SD 19.16)
Female	73, 75 (SD 17.82)
Crohn's disease	107, 79 (SD18.1)
Ulcerative colitis	61, 81 (SD 19.0)

2.2. Participant-Reported Adherence to Exercise Programmes and Barriers to Exercise

Participants frequently reported difficulty adhering to prior exercise programmes (67%, (*n* = 133)) and of this 67%, 63% (*n* = 83) reported their prior issues were due to their underlying diagnosis of IBD. Receiving a diagnosis of IBD resulted in a change in exercise behaviour in 66% of respondents (*n* = 124), with 75% (*n* = 93) reporting exercising less after their formal diagnosis of IBD. The most common barrier to exercise was fatigue which was reported by over half (54%) of respondents (*n* = 63/117) (Tables 2 and 3).

Table 2. Results of barriers to exercise.

Barrier	Result (n, %)
Total Response	**117/203 (58%)**
No energy	63/117 (54%)
No time	36/117 (31%)
Too unwell from IBD symptoms	39/117 (33%)
Joint pains	36/117 (31%)
Toilet concerns	36/117 (31%)
Cost	10/117 (9%)
Do not like exercising	13/117 (11%)
Stoma issues	5/117 (4%)

Multiple selections allowed by each participant; 117 patients reported barriers to exercise. IBD—inflammatory bowel disease.

Table 3. Results of Exercise Behaviour.

Exercise Variable	Result *n* (%)
Regular exercise (n, %)	
Yes	148 (73%)
No	55 (27%)
No. of days of exercise/week	
Total responses	148/148 (100%)
Mean, SD	4, 1.42
No. of minutes exercising/day	
Total responses	140/148 (95%)
Median, IQR	60, 41.25–60
Rating of exercise importance (0–5)	
Total responses	197/203 (97%)
Mean, SD	4, 0.97
Benefits of exercise (n, %)	
- Feel physically better	181/196 (92%)
- Improved energy	165/196 (84%)
- Improved mood	182/196 (93%)
- Relief of anxiety	165/190 (87%)
Preferred location of exercise (more than one answer allowed)	
Total responses	201/203 (99%)
- Outdoors	141/201 (70%)
- At home	40/201 (20%)
- At the gym	49/201 (24%)
Difficulty adhering to exercise programmes	
Total responses	198/203 (98%)
Yes	133/198 (67%)
Adherence difficulty due to IBD diagnosis	
Total responses	131/133 (99%)
Yes	83/131 (63%)
Change in exercise pattern post-diagnosis	
Total responses	188/203 (93%)
Yes	124/188 (66%)
If yes, did you exercise more/less:	
Total responses	124/124 (100%)
Less	93/124 (75%)

SD—standard deviation; IBD—inflammatory bowel disease.

2.3. Results of Participants' Exercise Behaviours and Attitudes toward Exercise

A large proportion of patients reported regular exercise behaviour (73%, n = 148). However, of these self-reported regular exercisers, the compliance rate with the WHO recommendations was 73% (n = 107) and for the entire cohort (including infrequent exercisers), the compliance rate was 55% (n = 107/195). The mean number of participant exercise days a week was 4 days (SD 1.42) and the median number of minutes per exercise day was 60 min (IQR 41.25, 60). We found that men exercise for longer than women on exercise days (60 min (n = 108) vs. 40 min (n = 82), p = 0.0005) and UC participants exercise for longer than CD participants (60 min (n = 61) vs. 45 min, (n = 105), p = 0.044) (Figure 1).

When asked to rate the importance of exercise on a Likert scale from 0–5 (0 being of no importance and 5 being of utmost importance), 97% responded (n = 197) and the mean score was 4 (Std. dev. 0.97). There was no significant difference in patient-perceived importance of exercise when comparing between genders (p = 0.074) and disease phenotypes (p = 0.136). The number of days participants exercised for positively correlated with patient-perceived importance of exercise (Pearson correlation = 0.394, $p < 0.001$, Figure 2). There was no

significant correlation observed between exercise minutes per exercise day (p = 0.11) or patient weight with importance of exercise (p = 0.998).

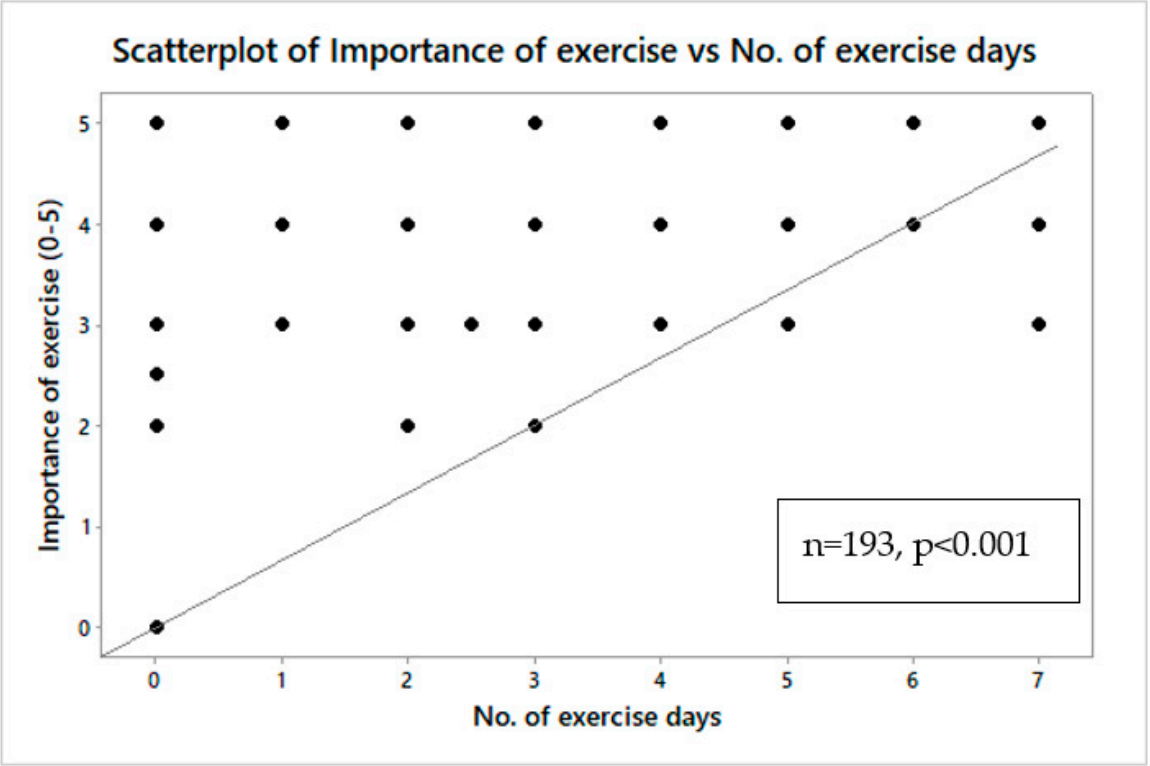

Figure 2. Scatterplot of the correlation of no. of exercise days and exercise importance. Total number of patients who responded = 193; each dot represents each patient who recorded the value for importance of exercise and no. of exercise days.

2.4. Perceived Benefits of Exercise and Participant Interest in Exercise Programmes

Participants responded to whether they found exercise to be beneficial in feeling physically better (92% said yes, n = 81), improving energy levels (84% said yes, n = 165), improving mood (93% said yes, n = 182) and relieving anxiety (87% said yes, n = 165) (Table 3).

Participants demonstrated an interest in personalised exercise advice; in total, 94% (n = 190) responded, of whom 70% (n = 133) indicated they would like to avail of the opportunity to receive personalised exercise advice. The option to participate in a physician-derived exercise programme appealed to many, with 75% (n = 140) indicating their interest in a such a programme.

The outdoors was the most popular location for exercise in 70% of respondents (n = 141), with walking being the most common form of exercise (78%, n = 143/183, Figure 3).

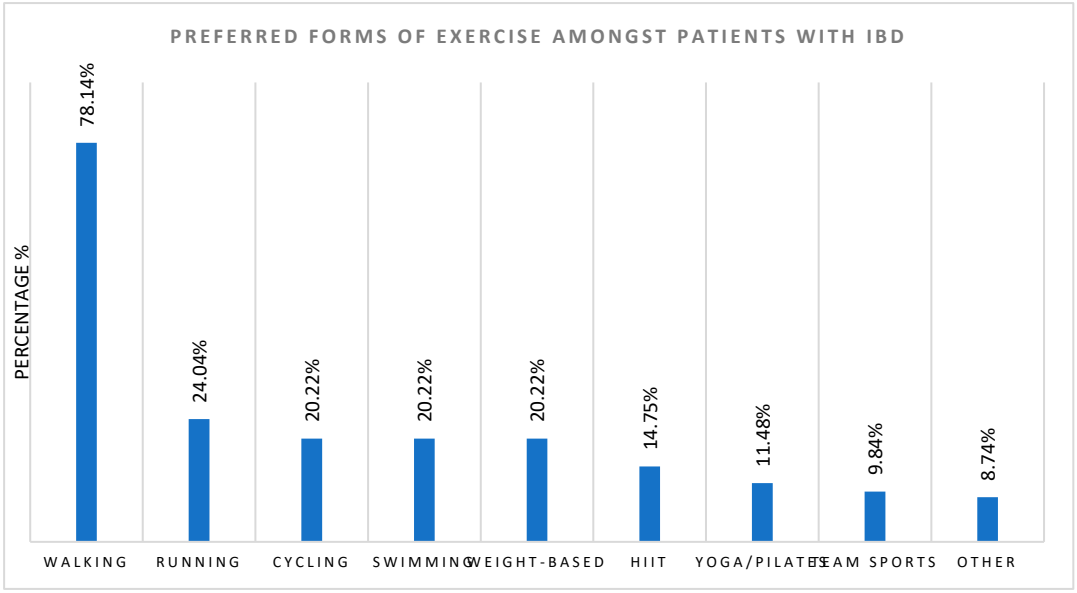

Figure 3. Preferred forms of exercise, total responses n = 183. Multiple options allowed per patient.

2.5. Results of Novel Body Image Questions

Of the total respondents (94%, n = 190) to body image questions, 62% (n = 117) reported having body image concerns. Of these, 91% (n = 105) felt that regular exercise could potentially improve their body image concerns. Results of 2 × 2 Chi-squared tables found that female gender was more likely to result in body image concerns compared to male gender (x^2 = 7.206, DF = 1, p = 0.007) in addition to patients under the age of 45 years compared to those over 45 years (x^2 = 5.441, DF = 1, p = 0.02). There was no association found between disease type or exercise pattern and the presence of body image issues (Table 4).

Table 4. Results of Chi-squared analysis for association with body image issues.

Categorical Data	Pearson Chi-Square	DF	p Value	Fisher's Exact Test
Gender				
Female vs. Male	7.206	1	0.007	0.010
Disease Type				
CD vs. UC	0.202	1	0.653	0.753
Age				
<45 yrs. vs. >45 yrs.	1.982	1	0.020	0.029
Exercise pattern				
Irregular vs. Regular	0.707	1	0.400	0.506

CD—Crohn's disease; UC—ulcerative colitis; DF—degrees of freedom.

3. Discussion

The survey was well-received amongst our patients with IBD. We found that more than 70% of participants exercise on a regular basis, of whom over 50% met the WHO physical activity guidelines for adults of 150–300 min of moderate aerobic exercise a week or 75–150 min of vigorous exercise a week [2]. These results are promising as physical inactivity has been reported following a diagnosis of IBD [17,18]. However, a significant proportion of patients reported that they exercised less because of their diagnosis and had difficulty adhering to exercise programmes as a result of their underlying IBD. The reliance on participant recall through the medium of a survey may lead to inaccurate reporting

by participants. However, the simple 'yes' or 'no' nature of the response to the change in exercise behaviour before and after diagnosis did not require a significant level of detail to recall which potentially reduced the participants' inaccuracy in their account.

We subjectively note that patients with IBD seek evidence-based advice on diet and exercise from their physicians, particularly in active disease. There are currently no existing guidelines on exercise in IBD, although a review by Eckert et al. summarised recommendations for physical activity based on a review of the current literature for patients with mild to moderate disease [7].

Previous studies have shown that moderate-intensity combined aerobic training in unfit patients with IBD with quiescent disease can quickly achieve favourable body composition changes without significant adverse effects [6]. A published survey by Chae et al. found that patients with IBD reported exercise as being pleasant, beneficial, sensible and uplifting [19]. Furthermore, studies have shown that exercise is safe in patients with inactive or mildly active IBD [9,20,21]. Only a few studies examining the effects of exercise on disease-related outcomes included moderately active patients and no studies to date have included patients with severe disease [22,23]. In fact, there have been studies that excluded patients who were on biologic therapies given the aim of these studies was to examine the effect of prolonged walking on cytokines and neutrophils/monocytes, respectively [24,25]. Whilst we did not specifically capture participants' disease activity, patients were recruited from our infusion units and, hence, were not excluded if they were on biologic therapy. Likewise, surveys were distributed in the inpatient wards of both hospitals, thus ensuring the inclusion of patients with IBD with more severe disease and those requiring rescue therapy in acute severe UC, which is more representative of real-world data and patient populations.

The outdoors was the favoured location for exercise in the majority of our patients (70%) and the most popular form of activity was walking (78%). These results are similar to those from previous surveys which reviewed physical activity in IBD [26,27]. We note that this may be as a result of the COVID-19 pandemic wherein access to indoor public gyms has been limited. We read, with interest, a recent systematic review of online self-reported surveys in the general population that found weight, diet and exercise changed simultaneously during the COVID-19 pandemic with significant weight gain, an increase in food intake in excess of 20% and a 6% decrease in physical activities [28]. Our survey shows that the mean weight reported by participants in both males and females is greater than the average reported weight for men and women in Western Europe; this fits with the rising trend in obesity across Europe and globally [29,30]. One limitation of our survey was that self-reported height was not included and, therefore, it was not possible to calculate body mass index (BMI). The inclusion of anthropometric data was not a focus of our survey and detailed anthropometric measurements in addition to body composition measurements will be investigated in response to prescribed exercise as part of our ongoing feasibility study (NCT05174754).

The most common barrier to exercise reported by participants was fatigue followed by luminal symptoms, toilet concerns, joint pains and a lack of time. Fatigue is present in 40–70% of all patients with IBD and is one of the most recognised debilitating symptoms in IBD, particularly in those with active disease [31–33]. Exercise has been shown to improve fatigue scores in patients with IBD; however, there is significant heterogeneity associated with the tools used to score fatigue levels [9,34,35]. The majority of participants (84%) felt that exercise improves their energy levels. The inclusion of a fatigue score is an important consideration for future studies examining the effects of exercise on disease management in patients with IBD.

Finally, body image dissatisfaction was reported by two-thirds of survey respondents and was associated with female gender and younger age (< 45 years). Patients felt that engaging in regular physical activity could positively address the presence of body image concerns. Previous studies in adolescents have shown a relationship with body image dissatisfaction and lack of physical activity; however, this remains a poorly studied area

despite its frequency in patients with chronic diseases [36–39]. In addition to a positive effect on body image, the majority of participants felt that exercise has the additional benefits of enhancing both physical wellness and psychological wellness (mood and anxiety). Further studies are required to understand the complex relationship of body image dissatisfaction and IBD.

4. Materials and Methods

The investigators designed a 19-question, two-page survey that takes 2–3 min to complete based on previous surveys on exercise and physical activity in IBD [17,18,40–43]. The survey includes novel questions on body image, willingness to receive personalised exercise advice and willingness to participate in a physician-supervised exercise programme. A multi-centre survey was carried out in Beaumont and Connolly Hospitals, Dublin, Ireland. Surveys were collected over a three-month period between October and December 2021.

4.1. Ethical Considerations

All surveys were carried out anonymously with no identifiable patient data recorded. The surveys were explained to the participants and time was allowed prior to completion for participant questions. Approval was granted to carry out the survey by the respective Beaumont and Connolly Hospitals' Audit and Quality Improvement Committees—A2021/191/No. 91021. Surveys were collected in person from the IBD outpatient clinics, gastroenterology inpatient wards and the infusion suites in both participating hospitals.

4.2. Participants

Patients aged 18 years or older with a diagnosis of IBD, independent of disease severity, were considered as eligible to participate in the survey. All patients encountered on recruitment days with a diagnosis of IBD were invited to participate. Patients were excluded if they had a severe physical disability precluding exercise or significant intellectual disability, existing language barriers, or visual impairments impeding their ability to carry out the survey (Figure 4). Data were not collected on disease severity or specific IBD treatment as part of this survey; however, patients on biologics were included from the infusion suites.

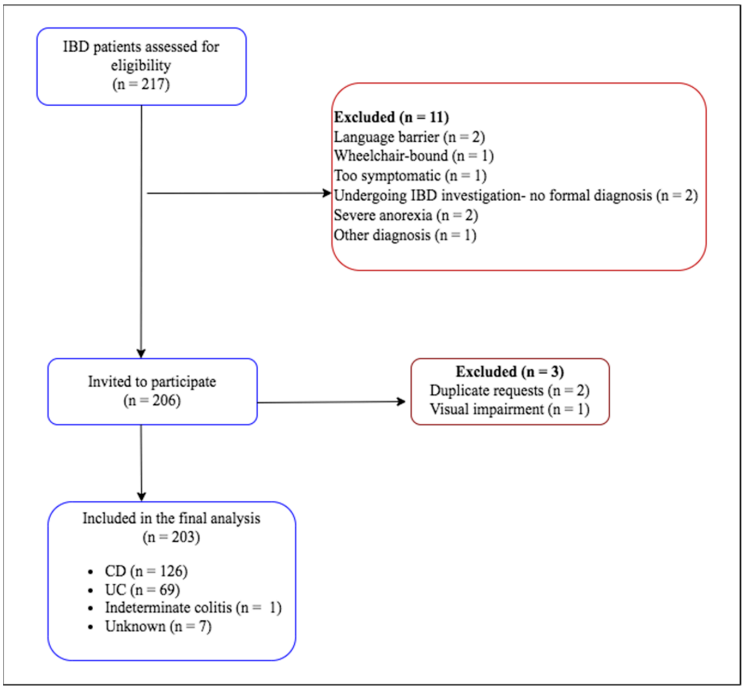

Figure 4. STROBE Flow diagram. IBD—inflammatory bowel disease; CD—Crohn's disease; UC—ulcerative colitis.

4.3. Study Questionnaire

Eligible patients were asked to complete a single paper copy of an anonymous survey. A total of 19 questions were included in the survey which was reviewed and approved by three independent expert IBD consultants prior to dissemination. Questions were selected following a review of the literature in this field.

Binary questions (yes or no), Likert scales and multi-choice options were included in the survey. Basic demographic questions included disease type, age category, gender and weight. Questions eliciting physical exercise habits and patient attitudes included participation in regular exercise, exercise frequency (8-point Likert scale) and time spent exercising per exercise day (minutes–hours).

A six-point Likert scale was used to assess patients' attitude toward the importance of exercise (0 being of minimal importance and 5 being very important). Novel binary questions were included to explore patients' attitudes toward the potential benefits of exercise:

- Does exercise make you feel physically better?
- Does exercise lead to an improvement in fatigue?
- Does exercise improve your mood?
- Does exercise help to relieve anxiety?

Participants were asked if their exercise pattern was impacted upon post- IBD diagnosis and if they were interested in personalised exercise advice. Multi-answer questions were included to establish patient-reported barriers to exercise and preferred type of physical activity. Preference of exercise location was included which the investigators deemed particularly significant given the ongoing COVID-19 pandemic. Finally, the presence of body image concerns was addressed which included the effect of exercise on combating body image issues (see supplementary data for a copy of the survey).

4.4. Statistical Analysis

Statistical analysis was carried out using Minitab17. A sample size calculation was not carried out as this was part of a feasibility study. Descriptive statistics were reported as mean and standard deviation for parametric continuous data, median and interquartile range (IQR) for non-parametric continuous data, and percentages for categorical data. Further, 2×2 Chi-squared tables were carried out as tests of association for categorical data and Pearson's correlation coefficient was used to perform correlation studies. Independent sample t-tests or Mann–Whitney U tests (depending on the distribution of the data) were carried out to examine differences between CD and UC patients and gender types. A p value of < 0.05 denoted statistical significance.

5. Conclusions

This survey has informed the investigators that our patients with IBD are receptive to personalised exercise advice and have demonstrated a promising enthusiasm toward participating in a physician-supervised exercise programme. A pilot programme of physician-supervised exercise in addition to standard care in patients with active IBD is now underway in Beaumont Hospital, Dublin, to determine the impact on physical fitness, disease activity and body composition (NCT05174754).

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/gidisord4040029/s1.

Author Contributions: N.M.G., survey design, idea conception, data analysis, writing of the manuscript and final approval of the manuscript. K.A., data collection and final approval of the manuscript. S.B., data collection and final approval of the manuscript. C.F., data collection and final approval of the manuscript. C.L., data collection and final approval of the manuscript. T.L., data collection and final approval of the manuscript. O.K., development of the survey and final approval of the manuscript. A.O., survey development and final approval of the manuscript. K.B., survey developments, critical

appraisal of the manuscript and final approval of the manuscript. All authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement: Approval was granted to carry out the survey by the respective Beaumont and Connolly Hospitals' Audit and Quality Improvement Committees—A2021/191/No. 91021.

Informed Consent Statement: Not applicable.

Data Availability Statement: Data can be provided upon request.

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References

1. Warburton, D.E.R.; Nicol, C.W.; Bredin, S.S.D. Health benefits of physical activity: The evidence. *Can. Med. Assoc. J.* **2006**, *174*, 801–809. [CrossRef] [PubMed]
2. Bull, F.C.; Al-Ansari, S.S.; Biddle, S.; Borodulin, K.; Buman, M.P.; Cardon, G.; Carty, C.; Chaput, J.-P.; Chastin, S.; Chou, R.; et al. World Health Organization 2020 guidelines on physical activity and sedentary behaviour. *Br. J. Sports Med.* **2020**, *54*, 1451–1462. [CrossRef] [PubMed]
3. Torres, J.; Mehandru, S.; Colombel, J.F.; Peyrin-Biroulet, L. Crohn's disease. *Lancet* **2017**, *389*, 1741–1755. [CrossRef]
4. Molodecky, N.A.; Soon, I.S.; Rabi, D.M.; Ghali, W.A.; Ferris, M.; Chernoff, G.; Benchimol, E.I.; Panaccione, R.; Ghosh, S.; Barkema, H.W.; et al. Increasing Incidence and Prevalence of the Inflammatory Bowel Diseases With Time, Based on Systematic Review. *Gastroenterology* **2012**, *142*, 46–54.e42. [CrossRef] [PubMed]
5. Ng, S.C.; Shi, H.Y.; Hamidi, N.; Underwood, E.; Tang, W.; Benchimol, E.I.; Panaccione, R.; Ghosh, S.; Wu, J.C.Y.; Chan, F.K.L.; et al. Worldwide incidence and prevalence of inflammatory bowel disease in the 21st century: A systematic review of population-based studies. *Lancet* **2018**, *390*, 2769–2778. [CrossRef] [PubMed]
6. Cronin, O.; Barton, W.; Moran, C.; Sheehan, D.; Whiston, R.; Nugent, H.; McCarthy, Y.; Molloy, C.B.; O'Sullivan, O.; Cotter, P.D.; et al. 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. [CrossRef]
7. Eckert, K.G.; 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. [CrossRef]
8. Jones, K.; Baker, K.; Speight, R.A.; Thompson, N.P.; Tew, G.A. Randomised clinical trial: Combined impact and resistance training in adults with stable Crohn's disease. *Aliment. Pharmacol. Ther.* **2020**, *52*, 964–975. [CrossRef]
9. Tew, G.A.; Leighton, D.; Carpenter, R.; Anderson, S.; Langmead, L.; Ramage, J.; Faulkner, J.; Coleman, E.; Fairhurst, C.; Seed, M.; et al. High-intensity interval training and moderate-intensity continuous training in adults with Crohn's disease: A pilot randomised controlled trial. *BMC Gastroenterol.* **2019**, *19*, 19. [CrossRef]
10. Schreiner, P.; Rossel, J.-B.; Biedermann, L.; O Valko, P.; Baumann, C.R.; Greuter, T.; Scharl, M.; Vavricka, S.R.; Pittet, V.; Juillerat, P.; et al. Fatigue in inflammatory bowel disease and its impact on daily activities. *Aliment. Pharmacol. Ther.* **2021**, *53*, 138–149.
11. Grimstad, T.; Norheim, K.B.; Isaksen, K.; Leitao, K.; Hetta, A.K.; Carlsen, A.; Karlsen, L.N.; Skoie, I.M.; Gøransson, L.; Harboe, E.; et al. Fatigue in Newly Diagnosed Inflammatory Bowel Disease. *J. Crohn's Colitis* **2015**, *9*, 725–730. [CrossRef] [PubMed]
12. Muller, K.R.; Prosser, R.; Bampton, P.; Mountifield, R.; Andrews, J.M. Female gender and surgery impair relationships, body image, and sexuality in inflammatory bowel disease: Patient perceptions. *Inflamm. Bowel Dis.* **2010**, *16*, 657–663. [CrossRef] [PubMed]
13. McDermott, E.; Mullen, G.; Moloney, J.; Keegan, D.; Byrne, K.; Doherty, G.A.; Cullen, G.; Malone, K.; Mulcahy, H.E. Body image dissatisfaction: Clinical features, and psychosocial disability in inflammatory bowel disease. *Inflamm. Bowel Dis.* **2015**, *21*, 353–360. [CrossRef] [PubMed]
14. Beese, S.E.; Harris, I.M.; Dretzke, J.; Moore, D. Body image dissatisfaction in patients with inflammatory bowel disease: A systematic review. *BMJ Open Gastroenterol.* **2019**, *6*, e000255. [CrossRef] [PubMed]
15. Kehoe, B.; Skelly, F.; Moyna, N.; Cantwell, M.; Boran, L.; Daly, L.; McCarren, A.; Dowd, K.; Woods, C.; McCaffrey, N.; et al. The effect of participating in MedEx Wellness, a community-based chronic disease exercise rehabilitation programme, on physical, clinical and psychological health: A study protocol for a cohort trial. *Contemp. Clin. Trials Commun.* **2020**, *19*, 100591. [CrossRef]

16. Tully, R.; Loughney, L.; Bolger, J.; Sorensen, J.; McAnena, O.; Collins, C.G.; Carroll, P.A.; Arumugasamy, M.; Murphy, T.J.; Robb, W.B.; et al. The effect of a pre- and post-operative exercise programme versus standard care on physical fitness of patients with oesophageal and gastric cancer undergoing neoadjuvant treatment prior to surgery (The PERIOP-OG Trial): Study protocol for a randomised controlled trial. *Trials* **2020**, *21*, 638.
17. Gatt, K.; Schembri, J.; Katsanos, K.H.; Christodoulou, D.; Karmiris, K.; Kopylov, U.; Pontas, C.; E Koutroubakis, I.; Foteinogiannopoulou, K.; Fabian, A.; et al. Inflammatory Bowel Disease [IBD] and Physical Activity: A Study on the Impact of Diagnosis on the Level of Exercise Amongst Patients With IBD. *J. Crohn's Colitis* **2018**, *13*, 686–692. [CrossRef]
18. Chan, D.; Robbins, H.; Rogers, S.; Clark, S.; Poullis, A. Inflammatory bowel disease and exercise: Results of a Crohn's and Colitis UK survey. *Front. Gastroenterol.* **2013**, *5*, 44–48. [CrossRef]
19. Chae, J.; Yang, H.I.; Kim, B.; Park, S.J.; Jeon, J.Y. Inflammatory Bowel Disease Patients' Participation, Attitude and Preferences Toward Exercise. *Int. J. Sport. Med.* **2016**, *37*, 665–670. [CrossRef]
20. Loudon, C.P.; Corroll, V.; Butcher, J.; Rawsthorne, P.; Bernstein, C.N. The effects of physical exercise on patients with Crohn's disease. *Am. J. Gastroenterol.* **1999**, *94*, 697–703. [CrossRef]
21. Seeger, W.A.; Thieringer, J.; Esters, P.; Allmendinger, B.; Stein, J.; Schulze, H.; Dignass, A. Moderate endurance and muscle training is beneficial and safe in patients with quiescent or mildly active Crohn's disease. *United Eur. Gastroenterol. J.* **2020**, *8*, 804–813. [CrossRef] [PubMed]
22. Klare, P.; Nigg, J.; Nold, J.; Haller, B.; Krug, A.B.; Mair, S.; Thoeringer, C.K.; Christle, J.W.; Schmid, R.M.; Halle, M.; et al. 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. [CrossRef] [PubMed]
23. Fagan, G.; Schultz, M.; Osborne, H. Sa1877—Individualised, Unsupervised Exercise Program Achieves High Levels of Compliance and Improvements in Patient Reported Outcomes—A Prospective Cohort Study in Patients with Ibd. *Gastroenterology* **2019**, *156*, S-438. [CrossRef]
24. Lamers, C.R.; de Roos, N.M.; Bongers, C.C.W.G.; Haaf, D.S.M.T.; Hartman, Y.A.W.; Witteman, B.J.M.; Hopman, M.T.E. Repeated prolonged moderate-intensity walking exercise does not appear to have harmful effects on inflammatory markers in patients with inflammatory bowel disease. *Scand. J. Gastroenterol.* **2020**, *56*, 30–37. [CrossRef] [PubMed]
25. Spijkerman, R.; Hesselink, L.; Bertinetto, C.; Bongers, C.C.W.G.; Hietbrink, F.; Vrisekoop, N.; Leenen, L.P.H.; Hopman, M.T.E.; Jansen, J.J.; Koenderman, L. Refractory neutrophils and monocytes in patients with inflammatory bowel disease after repeated bouts of prolonged exercise. *Cytom. Part B Clin. Cytom.* **2021**, *100*, 676–682. [CrossRef] [PubMed]
26. Tew, G.A.; Jones, K.; Mikocka-Walus, A. Physical Activity Habits, Limitations, and Predictors in People with Inflammatory Bowel Disease: A Large Cross-sectional Online Survey. *Inflamm. Bowel Dis.* **2016**, *22*, 2933–2942. [CrossRef] [PubMed]
27. Fagan, G.; Osborne, H.; Schultz, M. Physical Activity in Patients with Inflammatory Bowel Disease: A Cross-Sectional Study. *Inflamm. Intest. Dis.* **2021**, *6*, 61–69. [CrossRef]
28. Chew, H.; Lopez, V. Global Impact of COVID-19 on Weight and Weight-Related Behaviors in the Adult Population: A Scoping Review. *Int. J. Environ. Res. Public Health* **2021**, *18*, 1876. [CrossRef]
29. Heterogeneous contributions of change in population distribution of body mass index to change in obesity and underweight. NCD Risk Factor Collaboration, Lurilli et al. *Elife* **2021**, *10*, e60060.
30. Rising rural body-mass index is the main driver of the global obesity epidemic in adults. *Nature* **2019**, *569*, 260–264. [CrossRef]
31. Farrell, D.; McCarthy, G.; Savage, E. Self-reported Symptom Burden in Individuals with Inflammatory Bowel Disease. *J. Crohn's Colitis* **2015**, *10*, 315–322. [CrossRef] [PubMed]
32. Farrell, D. *Symptom Burden in Individuals with Inflammatory Bowel Disease: A Mixed Methods Study*; University College Cork: Cork, Ireland, 2013.
33. D'Silva, A.; Fox, D.E.; Nasser, Y.; Vallance, J.K.; Quinn, R.R.; Ronksley, P.E.; Raman, M. Prevalence and Risk Factors for Fatigue in Adults With Inflammatory Bowel Disease: A Systematic Review With Meta-Analysis. *Clin. Gastroenterol. Hepatol.* **2021**, *20*, 995–1009.e7. [CrossRef] [PubMed]
34. McNelly, A.S.; Monti, M.; Grimble, G.K.; Norton, C.; Bredin, F.; Czuber-Dochan, W.J.; Berliner, S.; Forbes, A. The effect of increasing physical activity and/or omega-3 supplementation on fatigue in inflammatory bowel disease. *Gastrointest. Nurs.* **2016**, *14*, 39–50. [CrossRef]
35. van Erp, L.W.; Roosenboom, B.; Komdeur, P.; Dijkstra-Heida, W.; Wisse, J.; Horje, C.S.H.T.; Liem, C.S.; van Cingel, R.E.H.; Wahab, P.J.; Groenen, M.J.M. Improvement of Fatigue and Quality of Life in Patients with Quiescent Inflammatory Bowel Disease Following a Personalized Exercise Program. *Dig. Dis. Sci.* **2021**, *66*, 597–604. [CrossRef]
36. Davelaar, C.M.F. Body Image and its Role in Physical Activity: A Systematic Review. *Cureus* **2021**, *13*, e13379. [CrossRef]
37. Carraça, E.V.; Encantado, J.; Battista, F.; Beaulieu, K.; Blundell, J.E.; Busetto, L.; Baak, M.; Dicker, D.; Ermolao, A.; Farpour-Lambert, N.; et al. Effect of exercise training on psychological outcomes in adults with overweight or obesity: A systematic review and meta-analysis. *Obes. Rev.* **2021**, *22* (Suppl. 4), e13261. [CrossRef]
38. Duarte, L.S.; Palombo, C.N.T.; Cordero, K.S.; Kurihayashi, A.Y.; Steen, M.; Borges, A.L.V.; Fujimori, E. The association between body weight dissatisfaction with unhealthy eating behaviors and lack of physical activity in adolescents: A systematic review. *J. Child Health Care* **2020**, *25*, 44–68. [CrossRef]
39. Rodrigues, L.; Sim-Sim, M.M.F.; Sousa, L.; Faria-Schützer, D.B.; Surita, F.G. Self-concept and body image of people living with lupus: A systematic review. *Int. J. Rheum. Dis.* **2021**, *24*, 1339–1353. [CrossRef]

40. Craig, C.L.; Marshall, A.L.; Sjöström, M.; Bauman, A.E.; Booth, M.L.; Ainsworth, B.E.; Pratt, M.; Ekelund, U.L.; Yngve, A.; Sallis, J.F.; et al. International Physical Activity Questionnaire: 12-Country Reliability and Validity. *Med. Sci. Sports Exerc.* **2003**, *35*, 1381–1395. [CrossRef]
41. DeFilippis, E.M.; Tabani, S.; Warren, R.U.; Christos, P.J.; Bosworth, B.P.; Scherl, E.J. Exercise and Self-Reported Limitations in Patients with Inflammatory Bowel Disease. *Dig. Dis. Sci.* **2015**, *61*, 215–220. [CrossRef]
42. Lamers, C.R.; de Roos, N.M.; Koppelman, L.J.M.; Hopman, M.T.E.; Witteman, B.J.M. Patient experiences with the role of physical activity in inflammatory bowel disease: Results from a survey and interviews. *BMC Gastroenterol.* **2021**, *21*, 172. [CrossRef] [PubMed]
43. Kim, B.; Chae, J.; Kim, E.H.; Yang, H.I.; Cheon, J.H.; Kim, T.I.; Kim, W.H.; Jeon, J.Y.; Park, S.J. Physical activity and quality of life of patients with inflammatory bowel disease. *Medicine* **2021**, *100*, e26290. [CrossRef] [PubMed]