Supplementary material

MEDLINE

Date of search: November 05, 2022

Number of hits: 1181

Search strategy: ("Inflammatory Bowel Diseases"[Mesh] OR "inflammatory bowel disease"[tiab] OR IBD[tiab] OR crohn* [tiab] OR "ulcerative colitis"[tiab]) AND ("Physical Fitness"[Mesh] OR "Physical Functional Performance"[Mesh] OR "Physical Endurance"[Mesh] OR "Muscle Strength"[Mesh] OR "Pliability"[Mesh] OR "Range of Motion, Articular"[Mesh] OR "Physical Exertion"[Mesh] OR "Exercise"[Mesh] OR "Exercise Test"[Mesh] OR "Ergometry"[Mesh] OR "High-Intensity Interval Training"[Mesh] OR "Resistance Training"[Mesh] OR "Physical Therapy Modalities"[Mesh] OR "Muscle Stretching Exercises"[Mesh] OR "Exercise Therapy"[Mesh]) OR ("Physical Fitness"[tiab] OR "Physical Activit*"[tiab] OR "Physical function*"[tiab] OR "Physical capacit*"[tiab] OR "Functional capacit*"[tiab] OR "Physical Performan*"[tiab] OR "Functional Performan*"[tiab] OR "Cardiorespiratory Fitness"[tiab] OR "Cardiorespiratory Endurance"[tiab] OR "Aerobic Endurance"[tiab] OR "Aerobic Capacit*"[tiab] OR "Cardiovascular Endurance"[tiab] OR "Muscle performan*"[tiab] OR "Muscle strength"[tiab] OR "Muscular strength"[tiab] OR "Muscle endurance"[tiab] OR "Muscular endurance"[tiab] OR Flexibility[tiab] OR "Range of Motion"[tiab] OR Pliability[tiab] OR Ergometr*[tiab] OR Exercis*[tiab] OR "Endurance training"[tiab] OR "Interval training"[tiab] OR "Resistance training"[tiab] OR "Muscle training"[tiab] OR "Strength training"[tiab] OR "Physical Therap*"[tiab] OR Exertion[tiab] OR Yoga[tiab])

No limits or filters were used

EMBASE

Date of search: November 05, 2022

Number of hits: 4052

Search strategy: (exp ulcerative colitis/ or exp Crohn disease/ or exp inflammatory bowel disease/ or 'Inflammatory bowel disease'.ab,kw,ti. or 'Ulcerative

colitis'.ab,kw,ti. or "'Crohn*'".ab,kw,ti) AND (exp fitness/ or exp exercise/ or exp "physical activity, capacity and performance"/ or exp cardiorespiratory fitness/ or exp aerobic capacity/ or exp functional status/ or exp ergometry/ or exp muscle strength/ or exp "range of motion"/ or exp pliability/ or exp exercise test/ or exp physiotherapy/ or exp kinesiotherapy/ or exp "joint characteristics and functions"/ or exp muscle exercise/ or exp muscle training/ or exp muscle stretching/ or exp functional training/ or 'Physical Fitness' or 'Physical Activit' OR 'Physical function*' or 'Physical capacit*' or 'Functional capacit*' or 'Physical Performan*' or 'Functional Performan*' or 'Cardiorespiratory Fitness' or 'Cardiorespiratory Endurance' or 'Aerobic Endurance' or 'Aerobic Capacit*' or 'Cardiovascular Endurance' or 'Muscle performan*' or 'Muscle strength' or 'Muscular strength' or 'Muscle endurance' or 'Muscular endurance' or Flexibility or 'Range of Motion' or Pliability or Ergometr* or Exercis* or 'Endurance training' or 'Interval training' or 'Resistance training' or 'Muscle training' or 'Strength training' or 'Physical Therap*' OR Exertion or Yoga.ab,kw,ti.)

No limits or filters were used

CINAHL

Date of search: November 05, 2022

Number of hits: 591

Search strategy: (MH "Inflammatory Bowel Diseases+" OR MH "Colitis, Ulcerative" OR MH "Crohn Disease" OR "Inflammatory Bowel Disease*" OR "Ulcerative Colitis" OR Crohn* OR IBD) AND (MH "Physical Fitness+" OR MH "Physical Performance" OR MH "Physical Endurance+" MH "Exercise+" OR MH "Exertion+" OR MH "Muscle Strength+" OR MH "Pliability" OR MH "Range of Motion" OR MH "Exercise Test+" OR MH "Ergometry" OR MH "Therapeutic Exercise+" OR MH "Stretching" OR MH "Physical Activity" OR MH "Functional Status" OR MH "Physical Therapy+" OR MH "Yoga") OR ("Physical Fitness" OR "Physical Activit*" OR "Physical function*" OR "Physical capacit*" OR "Functional capacit*" OR "Physical Performan*" OR "Functional Performan*" OR "Cardiorespiratory Fitness" OR "Cardiorespiratory Endurance" OR "Aerobic Endurance" OR "Aerobic Capacit*" OR "Cardiovascular

Endurance" OR "Muscle performan*" OR "Muscle strength" OR "Muscular strength" OR "Muscle endurance" OR "Muscular endurance" OR Flexibility OR "Range of Motion" OR Pliability OR Ergometr* OR Exercis* OR "Endurance training" OR "Interval training" OR "Resistance training" OR "Muscle training" OR "Strength training" OR "Physical Therap*" OR Exertion OR Yoga)

No limits or filters were used

Web Of Science

Date of search: November 05, 2022

Number of hits: 1121

Search strategy: (ALL=("Inflammatory Bowel Disease*" OR "Ulcerative Colitis" OR Crohn* OR IBD)) AND ALL=(("Physical Fitness" OR "Physical Activit*" OR "Physical function*" OR "Physical capacit*" OR "Functional capacit*" OR "Physical Performan*" OR "Functional Performan*" OR "Cardiorespiratory Fitness" OR "Cardiorespiratory Endurance" OR "Aerobic Endurance" OR "Aerobic Capacit*" OR "Cardiovascular Endurance" OR "Muscle performan*" OR "Muscle strength" OR "Muscular strength" OR "Muscle endurance" OR "Muscular endurance" OR Flexibility OR "Range of Motion" OR Pliability OR Ergometr* OR Exercis* OR "Endurance training" OR "Interval training" OR "Resistance training" OR "Muscle training" OR "Strength training" OR "Physical Therap*" OR Exertion OR Yoga))

No limits or filters were used

PEDRO

Date of search: November 05, 2022

Number of hits: 17

Search strategy: Inflammatory Bowel Disease

No limits or filters were used

CENTRAL

Date of search: November 05, 2022

Number of hits: 361

Search strategy: ("Inflammatory Bowel Disease*" OR "Ulcerative Colitis" OR "Crohn* disease" OR IBD):ti,ab,kw AND ("Physical Fitness" OR "Physical Activit*" OR "Physical function*" OR "Physical capacit*" OR "Functional capacit*" OR "Physical Performan*" OR "Functional Performan*" OR "Cardiorespiratory Fitness" OR "Cardiorespiratory Endurance" OR "Aerobic Endurance" OR "Aerobic Capacit*" OR "Cardiovascular Endurance" OR "Muscle performan*" OR "Muscle strength" OR "Muscular strength" OR "Muscle endurance" OR "Muscular endurance" OR Flexibility OR "Range of Motion" OR Pliability OR Ergometr* OR Exercis* OR "Endurance training" OR "Interval training" OR "Resistance training" OR "Muscle training" OR "Strength training" OR "Physical Therap*" OR Exertion OR Yoga):ti,ab,kw

No limits or filters were used

Supplementary Table 1 Description and main findings of studies examining cardiorespiratory fitness in patients with inflammatory bowel disease

Ref.	Study design, country	Sample size (*n*)	Sample features	CD, UC, IBD-U (*n*)	Female sex, %	Age in yr, mean (SD)	Disease activity	Control group	Test protocol	Main findings, mean (SD), mean (95%CI) median (IQR), median (quartiles), or median (range)
Bottoms *et al*[1], 2019	Secondary analysis of Tew *et al*[2], United Kingdom	25	N/A	25, 0, 0	60%	N/A for total sample	Remission (*n* = 32) or mildly active disease (*n* = 4)	N/A	CPET: Incremental ramp cycle ergometer test with work rate starting at 0 W which increased	VO_2peak[1]: CD, 28.2 (SD: 8.6) mL/kg/min

									by 15-20 W/min until exhaustion (pedaling frequency <60 rpm)[3]	
Brevinge *et al*[4], 1995	Cross-sectional study, Sweden	29	With ileostomy ≥1 year [group 1: < 10 cm ileal resection, *n* = 7; group 2: 15-30% small bowel resection, *n* = 12;	29, 0, 0	N/A for total sample	N/A for total sample	Remission (*n* = 20)	Healthy age-matched, sex-matched, height-matched, and weight-matched CG, *n* = 23	Incremental ramp bed-adapted cycle ergometer test: Work rate starting at 80-100 W which increased by 20 W/min until	WRpeak: N/A for total sample CD group 1, 166 (SD: 63) W; CD group 2, 128 (SD: 32) W; CD group 3, 100 (SD: 34) W; CG, 201 (SD: 47) W WRpeak CD group 1 =

			group 3: > 50% small bowel resection, *n* = 10]						exhaustion	WRpeak CG (*P* = N/A) WRpeak CD group 2, group 3 < WRpeak CG (*P* < 0.01)
Cabalzar *et al*[5], 2017	Cross-sectional study, Brazil	18	Starting with IFX treatment	18, 0, 0	61%	38.6 (13.7)	Moderate to severe active disease (*n* = 18)	Healthy age-matched and sex-matched CG, *n* = 12	Incremental shuttle walk test: Walking 10 m course with audio-driven speed increment until not being able to maintain the required	Distance[1]: CD, 513.7 (SD: 237) m; CG, 983.0 (SD: 263) m Distance CD < distance CG (*P* = 0.001)

								speed or showing any symptoms	
Cabalzar *et al*[6], 2019	Cross-sectional study, Brazil	26	In IFX induced remission for at least 6 mo	26, 0, 0	54%	40.4 (12.7)	Remission (n = 26)	Asymptomatic patients with functional dyspepsia, n = 20	Incremental shuttle walk test: Walking 10 m course with audio-driven speed increment until not being able to maintain the required speed or showing any	Distance: CD, 665 (quartiles: 405) m CG: 710 (quartiles: 409) m Distance CD = distance CG (P = 0.77)

									symptoms	
Cronin *et al*[7], 2019	Cross-over RCT, Ireland	17	Physically inactive	N/A for total sample	N/A for total sample	25 (6.5)	Remission (*n* = 17)	N/A	Rockport one-mile walk test: Walking one mile as fast as possible[8]	Estimated VO_2max[1]: IBD, 43.41 mL/kg/min
Fiorindi *et al*[9], 2022	Prospective study, Italy	61	Patients scheduled for elective surgery	45, 16, 0	41%	N/A for total sample	Active disease requiring surgery (*n* = 61)	N/A	DASI questionnaire	DASI score[1]: N/A for total sample; CD, 44.3 (SD: 14.5); UC: 45.5 (SD: 14.0)
Jensen *et al* [10], 2002	Follow-up study of Kissmeyer-Nielsen *et al*[11],	20	Patients who accepted follow-up 4-6 yr after	0, 20, 0	60%	38 (9)	N/A	N/A	Incremental ramp cycle ergometer test: Work rate starting	Heart rate at 1.5 W/kg: UC baseline, 143 (SD: 21) beats/min;

	Denmark		J-pouch surgery					at 25 W which increased by 25 W/ 3 min until exhaustion	UC 4-6 yr postoperatively, 129 (SD: 22) beats/min (P = 0.004)
Kissmeyer-Nielsen *et al*[11], 1999	RCT, Denmark	24	Undergoing elective J-pouch surgery (group 1 [hGH group], n = 12; group 2 [placebo group], n = 12)	0, 24, 58% 0	N/A for total sample	Active disease requiring surgery (n = 24)	N/A	Incremental ramp cycle ergometer test: Work rate starting at 25 W which increased by 25 W/3 min until exhaustion	Heart rate at 1.5W/kg[1]: N/A for total sample; At baseline in group 1 and 2, mean 146 beats/min; 10 days postoperatively: 16% heart rate increase in group 1, 23% heart rate

								increase in group 2; 30 days postoperatively group 1 and 2: heart rate close to baseline; 90 days postoperatively: relative heart rate decrease of 4% in group 1, 3% decrease in group 2
Loudon *et al*[12], 1999	Pilot study, 16 Canada	Sedentary patients	16, 0, 0	83%	38.3 (7.5)	In remission (*n* = N/A) or	N/A	CAFT step test: Incremental series of	Estimated VO_2max[1]: CD: 30.6 (SD: 4.7) mL/kg/min

					mildly active disease (*n* = N/A)		stepping sequences performed on two 20.3 cm steps to a six-count musical rhythm	
Mahlmann *et al*[13], 2017	Pilot study, Switzerland	21	N/A	12, 7, 48% 3	13.88	Remission (*n* = 14) or active disease (*n* = 7)	Healthy age-matched and sex-matched CG, *n* = 23	6-min walk test: Walking as far as possible for 6 min	Distance[1]: N/A for total sample; IBD active disease, 655 (95%CI: 542, 769) m; IBD remission, 709 (95%CI: 657, 761) m; CG, 678 (95%CI: 640,

										715) m
Nguyen *et al*[14], 2013	Cross-sectional study, Canada	7	N/A	7, 0, 0	N/A	15.2 (2.3)	Remission (*n* = 7)	Healthy age-matched and sex-matched CG (*n* = 7)	Incremental ramp cycle ergometer test: Height-based increase of work rate every 2 min until exhaustion (pedaling frequency < 50 rpm)	VO_2peak: CD, 43.1 (SD: 6.5) mL/kg/min; CG, 53.5 (SD: 4.6) mL/kg/min; VO_2peak CD < VO_2peak CG (P < 0.01)
Öhrström *et al*[15], 2004	Cross-sectional study, Sweden	38	Patients who underwent IPAA ≥ 12	0, 38, 0	32%	N/A for total sampl	Absence of pouchitis (*n* = 38)	Reference values[16,17]	CPET: Incremental ramp cycle ergometer	% of predicted WRpeak: N/A for total sample; UC

			mo before inclusion		e			test with work rate starting at 50-100W which increased by 5 W/20s (men) or 5 W/30s (women) until exhaustion (pedaling frequency < 60 rpm)	female, 96% (range: 59–102); UC males, median 91% (range: 51–113); WRpeak UC = WRpeak ref (*P* = N/A)
Otto *et al*[18], 2012	Retrospective study, United Kingdom	100	Patients awaiting colorectal surgery	54, 46, 0	N/A	41.1 (14.9)	Active disease requiring surgery (*n* = 100)	Reference values[19]	Incremental ramp cycle ergometer test (8-12 min): Work	VO_2peak: CD, 20.0 (SD: 7.9) mL/kg/min; UC, 21.9 (SD: 7.1)

								rate increments based on prediction quotation and PA until exhaustion (pedaling frequency < 40 rpm)	mL/kg/min; Total, 20.9 (SD: 7.6) mL/kg/min; VO_2peak total < VO_2peak ref (P < 0.0001)
Ploeger *et al*[20], 2011	Cross-sectional study, Canada	29	N/A	19, 10, 41% 0	13.7 (2.3)	Remission (n = N/A) or mildly active disease (n = N/A)	Healthy age-matched and sex-matched youth	Incremental ramp cycle ergometer test: Height-based increase of work rate every 2 min until	VO_2peak: CD, 34.9 (SD: 6.5) mL/kg/min; UC, 37.8 (SD: 7.7) mL/kg/min; Total, 36.0 (SD: 7.0) mL/kg/min;

										exhaustion (pedaling frequency < 50 rpm)	VO_2peak CD, UC, total < VO_2peak ref ($P < 0.05$, $P < 0.001$)
Sarli *et al*[21], 2016		Cross-sectional study, Turkey	40	N/A	18, 22, 0	40%	36.6 (6)	N/A	Healthy CG, $n = 30$	Bruce treadmill stress test: Starting with walking at 1.7 mph speed at 10% grade for 3 min with increase in speed (2.5 mph - 3.4 mph - 4.2	HRR-index: HRR1 IBD, 18 (SD: 8); HHR1 CG: 31 (SD: 7); HRR2 IBD, 36 (SD: 12); HRR2 CG, 51 (SD: 8); HRR3 IBD, 46 (SD: 12); HRR3 CG, 62 (SD: 11); HRR5 IBD, 55 (SD: 13); HRR5 CG, 71 (SD: 15); HRR-

										mph) and grade (12% - 14% - 16%) every 3 min until exhaustion[22]	indices IBD < HRR-indices CG ($P < 0.001$)
Tew *et al*[2], 2019		Pilot RCT, United Kingdom	36	N/A	36, 0	0,	53%	36.9 (11.2)	Remission (n = 32) or mildly active disease (n =4)	N/A	CPET: Incremental ramp cycle ergometer test with work rate starting at 0 W which increased by 15-20 W/min until exhaustion	VO_2peak[1]: CD, 28.2 (SD: 8.6) mL/kg/min

								(pedaling frequency < 60 rpm)[3]	
Van Erp *et al*[23], 2021	Pilot study, The Netherlands	25	With severe fatigue	21, 3, 40% 1	45 (2.6)	Remission (*n* = 25)	N/A	CPET: Incremental ramp cycle ergometer test: protocol N/A	VO_2max[1]: IBD: 28 (IQR: 25-31) mL/kg/min
Vogelaar *et al*[24], 2015	Cross-sectional study, The Netherlands	20	With fatigue (*n* = 10), without fatigue (*n* = 10)	15, 5, 50% 0	37.3 (11.4)	Remission (*n* = 20)	Reference values[25]	1. Incremental ramp cycle ergometer test (8-12 min): Work rate starting at 20 W, which increased	1. VO_2peak: N/A for total sample IBD with fatigue, 1.99 (SD: 0.44) L/min; IBD without fatigue, 2.43 (SD: 0.75)

									by 15-20 W/min until exhaustion (pedaling frequency < 60 rpm 2. 6-min walk test: Walking as far as possible along a 30-meter marked track for 6 min	L/min; VO_2peak IBD < VO_2peak ref (P = N/A) 2. Distance: N/A for total sample IBD with fatigue, 538.40 (SD: 72.32) m IBD without fatigue, 597.70 (SD: 80.50) m Distance IBD < distance ref (P = N/A)
Zhang *et al*[26], 2022	Prospective study, China	238	Inpatients	177, 61, 0	68%	38.5 (14.0)	Remissio n (*n* =79), or	N/A	6-min walk test: Walking	Speed: N/A for total sample;

								mild (*n* = 84), moderate (*n* = 40), or severe (*n* = 35) active disease		distance of 12m at constant speed, with time recorded between 3-9 minutes	IBD well-nourished, 1.20 (IQR: 1.10-1.39) m/s; IBD malnourished, 1.22 (IQR: 1.11-1.36) m/s

[1] = baseline values are shown. CAFT step test: Canadian home fitness step test; CD: Crohn's disease; CG: Control group; CPET: Cardiopulmonary exercise test; DASI: Duke activity status index; hGH: Human growth hormone; HR: Heart rate; HRR1: Heart rate recovery at the 1st minute; HRR2: Heart rate recovery at the 2nd minute; HRR3: Heart rate recovery at the 3rd minute; HRR5: Heart rate recovery at the 5th minute; HRR-index: Heart rate recovery index; IBD: Inflammatory bowel disease; IFX: Infliximab; IPAA: Ileal pouch-anal anastomosis; IPAQ: International physical activity questionnaire; IQR: Interquartile range; N/A: Not available; PA: Physical activity; RCT: Randomized controlled trial; SD: Standard deviation; UC: Ulcerative colitis; VO_2max: Maximal oxygen uptake; VO_2peak: Oxygen uptake at peak exercise; WRpeak: Work rate at peak exercise.

Supplementary Table 2 Description and main findings of studies examining muscular strength in patients with inflammatory bowel disease.

Ref.	**Study**	**Samp**	**Sample**	**CD,**	**Fema**	**Age in**	**Disease**	**Control**	**Test protocol**	**Main**

	design, country	**le size, *n***	**features**	**UC, IBD-U, *n***	**le sex, %**	**yr, mean (SD), mean (95%CI), median (IQR) or median (range)**	**activity**	**group**		**findings, mean (SD), mean (95%CI) median (IQR), median (quartiles), or median (range)**
Altowati *et al*[27], 2018	Prospective study, Scotland	19	Starting with IFX therapy	19, 0, 0	37%	15.1 (range: 11.2 - 17.2)	Remission (*n* = 3), or mild (*n* = 7), or moderate-to-severe (*n* = 9)	Reference values[28]	HGS: Non-dominant hand	HGS peak torque SDS (adjusted for height): CD, -1.5 (range -4.5 - 0.49); HGS SDS was low (*P* < 0.0001)

							active disease			
Asscher *et al*[29], 2021	Prospective study, The Netherlands	405	N/A	191, 202, 12	47%	70 (IQR: 67-74)	Remission (*n* = 320) or active disease (*n* = 85)	Reference values[30]	HGS: Dominant hand	Number (%) of patients with low HGS peak torque: CD, UC, and IBD-U, 77 (19.9%) patients according to ref
Bian *et al*[31], 2022	Cross-sectional study, China	140	N/A	140, 0, 0	49%	32.6 (SD: 10.2)	Remission (*n* = 119) or active disease (*n* = 21)	N/A	HGS: Dominant hand	HGS peak torque: N/A for total sample; CD males, 35.11 (SD: 1.53) kg; CD females, 26.24 (SD: 3.17) kg

Bin *et al*[32], 2010	Prospective cohort study, Brazil	75	N/A	75, 0, 0	51%	38.2 (SD: 13.3)	Remission (*n* = 75)	Reference values[33]	HGS: Non-dominant hand	HGS peak torque: CD, 10.4 (SD: 3.2) kg/f; Low HGS (< 2 SD of ref) in 73.3% of patients
Bryant *et al*[34], 2015	Cross-sectional study, Australia	137	N/A	95, 42, 0	45%	N/A for total sample	Remission (*n* = 59) or active disease (*n* = 78)	Reference values[35]	HGS: Dominant hand	HGS peak torque/z-score: CD, 39.5 (SD: 12.1) pounds/square inch/-0.50 (SD: 1.1); UC, 40.9 (SD: 12.3) pounds/square inch/-0.50 (SD: 1.0); Total, z-score 0.51 (SD: 1.1);

										HGS peak torque z-score CD, UC < HGS ref (P < 0.01)
Cabalzar *et al*[5], 2017	Cross-sectional study, Brazil	18	Starting with IFX	18, 0, 0	61%	38.6 (SD: 13.7)	Moderate-to-severe active disease (n = 18)	Healthy age-matched and sex-matched CG, n = 12	1. HGS: Dominant hand 2. Respiratory muscle strength: MIP and MEP	1. HGS peak torque: CD, 31.72 (SD: 8.55) kgf ; CG, 39.00 (SD: 13.37) kgf; HGS peak torque CD = HGS peak torque CG (P = 0.09) 2. MIP and MEP: CD MIP, -68.93 (SD: 26.61) cmH2O; CD MEP, 81.07 (SD: 30.26)

										cmH2O; CG MIP, -100 (SD: 29.63) cmH2O CG MEP, 108 (SD: 25.30) cmH2O; Respiratory muscle strength CD < respiratory muscle strength CG (P = 0.013, P = 0.032)
Cabalzar *et al*[6], 2019	Cross-sectional study, Brazil	26	In IFX induced remission for at least 6 mo	26, 0, 0	54%	40.4 (SD: 12.7)	Remission (n = 26)	Asymptomatic patients with functional dyspepsia, n = 20	HGS: Dominant hand	HGS peak torque: CD, 31 (IQR: 15) kgf; CG, 29 (IQR: 20) kgf; HGS peak torque

										CD = HGS peak torque CG (P = 0.54)
Casanova *et al*[36], 2017	Prospective study, Spain	333	N/A	189, 144, 0	52%	45 (IQR: 15–86)	Remission (n = 246), or mild (n = 68), or moderate (n = 12), severe (n = 3) active disease	Reference values[37]	HGS: Dominant hand	Number of patients (%) classified in HGS percentiles: IBD < p10, 26 (7.8%); IBD p10–p90, 196 (58.9%); IBD > p90, 65 (19.5%); IBD unknown: 46 (13.8%)
Cioffi *et al*[38], 2020	Cross-sectional study, Italy	140	N/A	140, 0, 0	41%	38.8 (SD: 13.9)	Remission (n = 78), mild-to-	Healthy age-matched, sex-matched and BMI-	HGS: Dominant and non-dominant	HGS peak torque: CD, 28.2 (SD: 10.2) kg; CG, 33.8

							moderate active disease (*n* = 62)	matched CG, *n* = 83	hand	(SD: 7.97) kg; HGS peak torque CD < HGS peak torque CG (*P* = 0.00)
Davies *et al*[39], 2020	Cross-sectional study, United Kingdom	20	N/A	20, 0, 0	45%	15.6 (SD: 0.5)	Remission (*n* = 11) or active disease (*n* = 9)	Healthy age-matched, sex-matched and BMI-matched CG, *n* = 9	HGS: Dominant and non-dominant hand	HGS peak torque: CD dominant hand, 25.6 (SD: 1.5) kg/kg forearm LM; CD non-dominant hand, 24.3 (SD: 1.4) kg/kg forearm LM; CG dominant hand, 23.8 (SD: 1.3) kg/kg

									forearm LM; CG non-dominant hand 23.9 (SD: 1.1) kg/kg forearm LM; HGS peak torque CD = HGS peak torque CG (*P* = N/A)
Davies *et al*[40], 2021	Cross-sectional study, United Kingdom	8	N/A	8, 0, 0	50%	41.3 (SD: 4.5)	Active disease (*n* = 8)	Healthy age-matched, sex-matched and BMI-matched CG, *n* = 8	HGS: Dominant and non-dominant hand	HGS peak torque: CD dominant hand, 24.0 (SD 2.4) kg/kg forearm LM; CD non-dominant hand, 24.6 (SD:

										2.1) kg/kg forearm LM; CG dominant hand, 29.2 (SD: 2.5) kg/kg forearm LM; CG non-dominant hand, 27.5 (SD: 2.3) kg/kg forearm LM; HGS peak torque CD = HGS peak torque CG (*P* = N/A)
Geerling *et al*[41], 1998	Cross-sectional study, The	32	With longstanding disease	32, 0, 0	56%	40.0 (IQR: 34.3-54.0)	Remission (*n* = 17) or active	Healthy age-matched and sex-matched CG, *n* = 32	Isokinetic dynamometry (Cybex II): KE and KF	<u>KE peak torque:</u> CD 60°/s, 123.1 (SD: 27.4) Nm;

	Netherlands	disease (n = 15)	peak torque (60°/s, 180°/s)	CD 180°/s, 81.5 (SD: 18.5) Nm; CG 60°/s, 136.5 (SD: 53.8) Nm; CG 180°/s, 88.7 (SD: 39.7) Nm; KE peak torque CD = KE peak torque CG (P = N/A) KF peak torque: CD 60°/s, 71.6 (SD: 22.3) Nm; CD 180°/s, 45.6 (SD: 15.2) Nm; CG 60°/s, 87.6 (SD: 33.4) Nm;

									CG 180°/s, 59.3 (SD: 31.9) Nm; KF peak torque CD CG (60°, 180°/s) < KF peak torque CG ($P < 0.02$, $P < 0.05$)
Geerling *et a*[42], 2000	Cross-sectional study, The Netherlands	69	Recently diagnosed	23, 46	52%	35.4 (SD: 13.6)	Remission (n = 61) or active disease (n = 8)	Healthy age-matched and sex- matched CG (n = 69)	Isokinetic muscular strength dynamometry (Cybex II): KE and KF peak torque (60°/s, 180°/s)	<u>KE peak torque:</u> N/A for total sample; CD 60°/s, 127.5 (SD: 33.4) Nm; CD 180°/s, 81.5 (SD: 25.7) Nm; CG for CD 60°/s, 142.4 (SD: 33.2) Nm; CG for

	CD 180°/s, 93.2 (SD: 37.2) Nm; UC 60°/s, 148.8 (SD: 44.6) Nm; UC 180°/s, 96.1 (SD: 30.7) Nm; CG for UC 60°/s, 155.7 (SD: 50.0) Nm; CG for UC 180°/s, 100.5 (SD: 38.4) Nm; KE peak torque CD and UC = KE peak torque CG (*P* = N/A) <u>KF peak torque:</u> N/A

	for total sample; CD 60°/s, 74.9 (SD: 23.5) Nm; CD 180°/s, 46.8 (SD: 25.3) Nm; CG for CD 60°/s, 86.8 (SD: 19.8) Nm; CG for CD 180°/s, 57.8 (SD: 22.0) Nm; UC 60°/s, 89.7 (SD: 31.9) Nm; UC 180°/s, 58.6 (SD: 21.3) Nm; CG for UC 60°/s, 98.5 (SD: 37.3) Nm; CG for UC 180°/s,

										64.8 (SD: 30.4) Nm; KF peak torque CD and UC = KF peak torque CG (*P* = N/A)
Hradsky *et al*[43], 2017	Prospective study, Czech Republic	55	N/A	38, 17, 0	45%	13.5 (IQR: 12.0-15.4)	Remission (*n* = 28) or active disease (*n* = 22)	Reference values[44]	Jumping mechanography: Standing two-legged jumps (P_{max} and P_{max}/BW) and multiple one-leg hopping test (F_{max} and F_{max}/BW)	$\underline{P_{max}\ z\text{-score}^1}$: CD and UC P_{max}, -0.24 (IQR: -0.96 – 0.44); P_{max} UC and CD < P_{max} ref (*P* = N/A) $\underline{F_{max}\ z\text{-score}^1}$: CD and UC F_{max}, 0 (IQR: -0.53 – 0.82); F_{max} UC and CD = F_{max} ref (*P* = N/A)

								P_{max}/BW z-score[1]: CD and UC P_{max} /BW, -0.06 (IQR: -0.65 – 0.51); P_{max} /BW UC and CD = P_{max} /BW ref (*P* = N/A) F_{max}/BW z-score[1]: CD and UC F_{max} /BW, 0.22 (IQR: -0.63 – 0.80); F_{max}/BW UC and CD = F_{max}/BW ref (*P* = N/A)
Jansen *et al*[45], 2016	Prospective study, Germany	55	N/A	55, 0, 0	65%	40 (SD: 11)	Remission on	N/A	HGS: Dominant hand	HGS peak torque: CD at baseline, 38.2

									(SD: 9.9) kg; CD after 6 mo, 37.9 (SD: 10.0) kg
Jensen *et al*[10], 2002	Follow-up study of Kissmeyer-Nielsen *et al*[11], Denmark	20	Patients who accepted follow-up 4-6 yr after J-pouch surgery	0, 20, 0	60%	38 (SD: 9)	N/A	N/A	1. Isometric dynamometry (Metitur): KE peak torque (60° knee flexion), AF peak torque (90° elbow flexion) 2. HGS: Dominant hand 3. Pinching strength: Dominant	1.1 KE peak torque: UC preoperatively, 475 (SD: 187) N; UC 4-6 yr postoperatively, 532 (SD: 179) N (P = 0.080) 1.2 AF peak torque: UC preoperatively, 258 (SD: 93) N; UC 4-6 yr postoperatively, 275 (SD: 83) N (P = 0.017)

			hand 4. TMS (sum of all four muscle groups above)	2. HGS peak torque: UC preoperatively, 445 (SD: 108) N; UC 4-6 yr postoperatively, 496 (SD: 139) N $P = 0.011$) 3. Pinch peak torque: UC preoperatively, 65 (SD: 14) N; UC 4-6 yr postoperatively, 67 (SD: 14) N $P = 0.554$) 4. TMS: UC preoperatively, 1272 N; UC 4-6 yr

											postoperatively, 1400 (SD: 347) N (P = 0.016)
Jones *et al*[46], 2020		RCT, United Kingdom	47	N/A	47, 0	68%	49.3 (SD: 13.0)	Remission (n = 31) or mild active disease (n = 16)	Healthy age-matched, sex-matched, PA-matched, BMI-matched and ethnicity-matched CG, n = 33	1. Isokinetic dynamometry (Biodex): KE peak torque (60°/s, 180°/s), EF peak torque (60°/s, 120°/s) 2. HGS: Non-dominant hand	KE peak torque[1]: CD 60°/s, 72.6 (SD: 33.3) Nm; CD 180°/s, 46.2 (SD: 23.0) Nm; CG 60°/s, 94.6 (SD: 46.6) Nm; CG 180°/s, 60.1 (SD: 34.9) Nm; KE peak torque CD < KE peak torque CG (P = 0.001, P = 0.011)

	EF peak torque[1]: CD 60°/s, 25.4 (SD: 11.2) Nm; CD 120°/s, 22.3 (SD: 9.1) Nm; CG 60°/s, 26.0 (SD: 12.4) Nm; CG 120°/s, 22.2 (SD: 11.2) Nm; EF peak torque CD = EF peak torque CG (P = 0.664, P = 0.747) 2. HGS peak torque[1]: CD, 32.7 (SD: 11.3) kg; CG, 35.7 (SD: 11.7) kg

										HGS CD < HGS CG (P = 0.037)
Kissmeyer-Nielsen *et al*[11], 1999	RCT, Denmark	24	Undergoing elective J-pouch surgery (group 1 [hGH group], n = 12; group 2 [placebo group], n = 12)	0, 24, 0	58%	N/A for total sample	Active disease requiring surgery (n = 24)	N/A	TMS as sum of KE peak torque (60° knee flexion), AF peak torque (90° elbow flexion), HGS (dominant hand), and pinching strength (dominant hand)	TMS: At baseline in group 1 and 2, N/A; 10 days postoperatively, 7.6% TMS decrease in group 1, 17.1% TMS decrease in group 2; 30 days postoperatively, TMS increased with 4.1% in group

										1 and with 13.1 in group 2; 90 days postoperatively, group 1 equal to baseline, group 2 5.9% below baseline.
Knudsen *et al*[47], 2015	Cross-sectional study, Denmark	43	N/A	N/A	47%	N/A	N/A	Reference values[48]	HGS: Dominant and non-dominant hand	Number (%) of patients with low HGS peak torque (<20 kg in women, <30 kg in men): IBD, 6 (14%)
Lee *et al*[49], 2009	Cross-sectional study, Australia	60	N/A	60, 0, 0	63%	43.7 (SD: 12.2)	N/A	N/A	HGS: Sum of dominant and non-dominant	HGS peak torque: CD, 65.7 (SD: 19.9) kg

									hand	
Lee *et al*[50], 2015	Cross-sectional study, United States	64	Recently diagnosed	64, 0, 0	41%	12.8 (SD: 2.7)	Remission to mild active disease (*n* = 26), moderate-to-severe active disease (*n* = 38)	CG of healthy subjects, *n* = 264	Isometric dynamometry (Biodex): AD PT (20° plantar flexion)	AD peak torque: CD, 14.7 (IQR: 10.1-18.8) ft/lbs; CG, 17.9 (IQR: 11.2-24.8) ft/lbs; AD peak torque CD (remission-mild activity) = AD peak torque CG (*P* = 0.72); AD peak torque CD (moderate-to-severe activity) < AD peak torque CG (*P* =

										0.05)
Lee *et al*[51], 2018	Prospective study, United States	138	With low bone density	138, 0	52%	14.2 (SD: 2.8)	Remission (*n* = 85), or mild (*n* = 46), or moderate-to-severe (*n* = 7) active disease	Healthy subjects, *n* = 264	Isometric dynamometry (Biodex): AD peak torque (20° plantar flexion)	AD peak torque z-score[1]: (relative to age, sex, race, adjusted for tibia length): CD, -0.43 (SD: 0.90) AD peak torque CD < AD peak torque ref (*P* < 0.0001)
Lu *et al*[52], 2016	Cross-sectional study, China	150	N/A	150, 0, 0	27%	34.6 (SD: 11.6)	Remission (*n* = 56) or active disease	Healthy CG, *n*=254; age-matched, sex-matched and BMI-	HGS: Dominant hand	HGS peak torque of total population (CD n=150, CG n=254): N/A

	(*n* = 94)	matched CG, *n* = 88	for total sample; CD female, 22.30 (SD: 4.97) kg; CD male, 39.76 (SD: 8.85) kg; CG female, 26.26 (SD: 5.22) kg; CG male, 45.00 (SD: 8.06) kg; HGS peak torque CD females and males < HGS peak torque CG (*P* < 0.0001) HGS in pair-matched population

										(CD n=88, CG n=88): CD, 33.31 (SD: 11.56) kg; CG: 37.14 (SD: 10.44) kg; HGS peak torque CD < HGS peak torque CG (*P* < 0.0001)
Maratova *et al*[53], 2017	Cross-sectional study, Czech Republic	70	N/A	53, 17, 0	44%	13.8 (IQR: 11.9-15.5)	Remission or mild active disease (*n* = N/A)	Reference values[44]	Jumping mechanography: Standing two-legged jumps (P_{max} and P_{max}/BW) and multiple one-leg	P_{max} z-score: CD and UC P_{max}, -0.2 (IQR: -1.0 – 0.6); P_{max} UC and CD < P_{max} ref (*P* < 0.05) F_{max} z-score: CD and UC

	hopping test (F_{max} and F_{max}/BW)	F_{max}, 0.3 (IQR: -0.5 – 0.9); F_{max} UC and CD = F_{max} ref (*P* = N/A) <u>P_{max}/BW z-score:</u> CD and UC P_{max} /BW:,-0.1 (IQR: -0.6 – 0.5); P_{max} /BW UC and CD = P_{max} /BW ref (*P* = N/A) <u>F_{max}/BW z-score:</u> CD and UC F_{max} /BW, 0.3 (IQR: -0.6 – 0.8); F_{max} /BW

								UC and CD = F_{max} / BW ref (*P* = N/A)
Marra *et al*[54], 2019	Cross-sectional study, Italy	46	Physically active (*n* = 10) or sedentary (*n* = 36)	46, 0, 0	0%	N/A for total sample	N/A	Healthy age-matched and anthropometric-matched CG (without regular exercise)	HGS: Non-dominant hand	HGS peak torque: N/A for total sample; CD physically active, 39.2 (SD: 4.9) kg; CD sedentary, 35.0 (SD: 6.8) kg; CG: 39.2 (SD: 2.9) kg; HGS peak torque CD sedentary < HGS peak torque CG (*P* < 0.05); HGS

										peak torque physically active = HGS peak torque CG (*P* = N/A)
Norman *et al*[55], 2006	Cross-sectional study, Germany	69	N/A	46, 23, 0	58%	38.5 (SD: 13.4)	N/A	N/A	1. HGS: Dominant hand 2. Respiratory muscle strength: Peak expiratory flow	1. HGS peak torque: CD and UC, 31.5 (SD: 11.4) kg 2. Peak flow CD and UC, 375.8 (SD: 112.5) L/min
Salacinski *et al*[56], 2013	Cross-sectional study, United	19	≥ 1 small bowel resection and	19, 0	53%	44.2 (10.3)	Remission (*n* = 19)	Healthy age-matched and sex- matched CG (*n* = 19)	Isometric muscular strength dynamometr	KE peak torque/KE peak torque normalized to

	States	idiopathic musculoskeletal pain or weakness		y (customized): KE and KF peak torque (45° knee flexion)	BW: CD, 75.2 (SD: 45.4) Nm/0.06 (SD: 0.03) Nm/kg; CG, 105.6 (SD: 40.7) Nm/0.07 (SD: 0.03) Nm/kg; KE peak torque CD < KE peak torque CG (P = 0.013, normalized to BW P = 0.039) KF peak torque/KF peak torque normalized to BW: CD, 27.2 (SD: 10.7)

										Nm/0.02 (SD: 0.01) Nm/kg, CG, 53.7 (SD: 27.3) Nm/0.09 (SD: 0.02) Nm/kg; KF peak torque CD < KF peak torque CG (*P* = 0.001, normalized to BW *P* = 0.022)
Seeger *et al*[57], 2020	Pilot RCT	35	N/A	35, 0, 0	63%	N/A for total sample	Remission or mild active disease (*n* = N/A)	N/A	1. Isometric HHD: KE peak torque (45° knee flexion) 2. HGS: Dominant hand	Absolute values N/A

Steell *et al*[58], 2020	Cross-sectional study, Scotland	27	With childhood-onset disease	27, 0, 0	56%	23.2 (range: 18.0–36.1)	Remission (*n* = 20) or mild active disease (*n* = 7)	Healthy age- and sex-matched CG, *n* = 17	1. HGS: Dominant hand 2. Jumping mechanography: Standing two-legged jumps	<u>1. HGS peak torque:</u> CD, 26.3 (range: 17.0 - 41.8); CG, 31.5 (range: 22.1 – 52.5); HGS peak torque CD < HGS peak torque CG *(P* = 0.001) <u>2.1 P_{max}/BW and F_{max}/BW^{1}:</u> P_{max}/BW CD < P_{max}/BW CG (-5.0W/kg, range: –8.8, –1.2**,** *P* = 0.01); F_{max}/BW CD < F_{max}/BW CG (–

									0.48, 0.03, *P* = 0.009) 2.3 Jump height†: Jump height CD < jump height CG (-5.1cm, range: -8.6, -1.6, *P* = 0.01)
Subramaniam *et al*[59], 2015	Prospective study, Australia	19	Starting with IFX	19, 0, 0	42%	33.2 (SD: 10.7)	Active disease (*n* = 19)	N/A	Isokinetic dynamometry (Cybex/ HUMAC Norm): KE peak torque (30°/s, 60°/s, 90°/s)	KE peak torque[1]: CD 30°/s left leg, 166.5 (SD: 93.4) Nm, right leg 184.8 (SD: 96.6) Nm; CD 60°/s left leg, 172.8 (SD: 103.5) Nm, right leg 183.5 (SD:

										116.4) Nm; CD 90°/s left leg, 128.5 (SD: 55.9) Nm, right leg 139.4 (SD: 54.4) Nm
Tsiountsiou ra *et al*[60], 2014	Cross-sectional study, Scotland	80	N/A	53, 27, 0	45%	N/A for total sample	Remission (*n* = 52) or active disease (*n* = 28)	Healthy controls, *n* = 62	HGS: Non-dominant hand	HGS peak torque z-score: N/A for total sample; CD, -0.2 (IQR: -1.2 – 0.6); UC: 0.0 (IQR: 1.3 – 0.9); CG, 0.2 (IQR: -1.0 – 1.4); HGS peak torque CD and UC = HGS peak torque CG (*P* = N/A)

Ünal *et al*[61], 2021	Prospective study, Turkey	344	N/A	122, 222, 0	46%	49.4 (SD: 14.5)	Remission (*n* = 344)	Reference values[62]	HGS: Dominant hand	Number (%) of patients with low HGS peak torque (<22 kg in women, <32 kg in men)[1]: CD and UC, 107 (31.1%)
Valentini *et al*[63], 2008	Prospective study, Germany, Australia, and Italy	144	N/A	94, 50, 0	65%	N/A for total sample	Remission (*n* = 144)	Healthy age-matched, sex-matched, and BMI-, matched CG, *n* = 60	HGS: Dominant hand	HGS peak torque: N/A for total sample; CD, 32.8 (IQR: 26.0 – 41.1) kg; UC, 31.0 (IQR: 27.3 – 37.8) kg; CG, 36.0 (IQR: 31.0 – 52.0) kg; HGS peak torque CD < HGS

										peak torque CG (P = 0.005); HGS peak torque UC < HGS peak torque CG (P = 0.001)
Van Langenberg *et al*[64], 2014	Cross-sectional study, Australia	27	N/A	27, 0	56%	43 (95%CI: 38, 48)	Remission (n = 19) or active disease (n = 8)	Healthy age-matched and sex-matched CG, n = 22	Isometric dynamometry (Biodex): KE peak torque (60° knee flexion)	KE peak torque: CD 60°, 148.8 (95%CI: 130, 168) Nm; CG 60°, 133.6 (95%CI 111, 156) Nm; KE peak torque CD = KE peak torque CG (P = 0.29)
Vogelaar *et al*[24], 2015	Cross-sectional	20	With fatigue (n = 10),	15, 5, 0	50%	37.3 (11.4)	Remission (n =	Reference values[65]	Isokinetic dynamometr	KE peak torque: N/A

	study, The Netherlands	without fatigue (n = 10)		20)	y (Biodex): KE and KF peak torque (60°/s, 180°/s)	for total sample; IBD with fatigue 60°/s, 107.1 (SD: 25.4) Nm; IBD with fatigue 180°/s, 60.7 (SD: 12.3) Nm; IBD without fatigue 60°/s, 123.7 (SD: 38.0) Nm; IBD without fatigue 180°/s, 73.5 (SD: 21.4) Nm; KE peak torque FG and NFG < KE peak torque ref

	(*P* = N/A) KF peak torque: N/A for total sample; IBD with fatigue 60°/s, 51.7 (SD: 14.3) Nm; IBD with fatigue 180°/s, 31.1 (SD: 8.0) Nm; IBD without fatigue 60°/s, 63.0 (SD: 20.1) Nm; IBD without fatigue 180°/s, 38.9 (SD: 14.2) Nm; KF peak

										torque FG and NFG < KF peak torque ref (P = N/A)
Ward *et al*[66], 2017	Cross-sectional study, Canada	73	Within 35 days after diagnosis	73, 0, 0	36%	13.9 (range: 7.0-17.7)	Mild (n = 7), or moderate-to-severe active disease (n = 66)	Reference values[44]	Jumping mechanography: Standing two-legged jumps (P_{max} and P_{max}/BW)	P_{max} z-score: CD P_{max}, -2.2 (SD: 1.5); P_{max} CD < P_{max} ref (P < 0.01) P_{max}/BW z-score: CD P_{max} /BW, -1.9 (SD: 1.6); P_{max} /BW CD < P_{max} /BW ref (P < 0.01)
Werkstetter *et al*[67], 2012	Cross-sectional study, Germany	39	N/A	27, 12, 0	38%	15.1 (SD: 2.9)	Remission (n = 26) or mild active	Healthy age- and sex-matched CG, n = 39	HGS: Non-dominant hand	HGS peak torque z-score: CD and UC, −0.34 (95%CI: −0.72, 0.42);

						disease (n = 13)			CG, 0.83 (95%CI: 0.41, 1.24); HGS peak torque CD and UC < HGS peak torque CG ($P \leq 0.015$)
Wiroth *et al*[68], 2005	Cross-sectional study, France	41	N/A	41, 0 ,0	59%	37 (SD: 10)	Remission (n = 41)	Healthy age-matched CG, n = 25	1. Isometric leg press strength (Vertex 2): LE peak torque (90° knee flexion) 2. HGS: Non-dominant hand	1. LE peak torque: CD, 28.8 (SD: 6.4) N/kg FFM; CG: 35.8 (SD: 6.7) N/kg FFM; LE peak torque CD < LE peak torque CG ($P < 0.001$) 2. HGS peak torque: CD, 6.2

										(SD: 1.2) N/kg FFM; CG, 6.6 (SD: 1.3) N/kg FFM; HGS CD = HGS CG (*P* = N/A)
Yamamoto *et al*[69],2022	Cross-sectional study, Japan	78	N/A	78, 0, 0	36%	42 (IQR: 31.8–51)	N/A	N/A	HGS: Dominant and non-dominant hand	HGS peak torque: IBD, 32.9 (IQR: 25.8–40.8) kg Number (%) of patients with low HGS peak torque (<18 kg in women, <28 kg in men)[1]: IBD, 7 (9.3%)
Zaltman *et al*[70], 2014	Case-control study,	23	Sedentary	0, 23, 0	100%	43.9 (SD: 10.0)	Remission (*n* = 8), mild	Case-control study, Brazil	1. Isometric dynamometry (IsoTeste):	1. KE peak torque: UC, 38.6 (SD: 4.4)

	Brazil				(*n* = 9), or moderate (*n* = 5), or severe (*n* = 1) active disease	KE peak torque (angle N/A) 2. HGS: Non-dominant hand	Kgf; CG, 41.0 (SD: 1.1) Kgf; KE peak torque UC < KE peak torque CG (*P* = 0.012) 2. HGS peak torque: UC, 23.1 (SD: 7.1) kgf; CG, mean (SD: 3.5) kgf; HGS peak torque UC = HGS peak torque CG (*P* = 0.362)
Zhang *et al*[26], 2022	Prospective study, China	238	Inpatients	177, 68% 61, 0	38.5 (SD: 14.0)	Remission (*n* = 79), or N/A	HGS: Dominant hand	HGS peak torque: N/A for total

		mild (*n* = 84), moderate (*n* = 40), or severe (*n* = 35) active disease	sample; CD and UC male well-nourished, 38.2 (SD: 7.6) kg; CD and UC female well-nourished, 23.1 (SD: 5.9) kg; CD and UC male malnourished, 33.2 (SD: 6.8) kg; CD and UC female malnourished; 19.3 (SD: 4.5) kg Number (%) of patients with

										low HGS peak torque (<18 kg in women, <28 kg in men)[1]: CD and UC male, 13 (22.8%); CD and UC female, 44 (77.2%)
Zhao *et al*[71], 2022	RCT, China	28	Adult patients with low nutritional risk state [RT + WP intervention (*n* = 15), RT + placebo intervention	N/A	31%	44.1	Remission (*n* = 3), or mild (*n* = 12), moderate (*n* = 9), or severe (*n* = 4)	N/A	HGS: N/A	HGS peak torque: N/A for total sample; IBD RT + WP, 36.7 (SD: 10.8) kg IBD; RT + placebo, 31.7 (SD: 12.6) kg

			(n = 13)]				active disease			

[1] = baseline values are shown. AD: Ankle dorsiflexor; AF: Arm flexor; BMI: Body mass index; BW: Body weight; CD: Crohn's disease; CG: Control group; CI: Confidence interval; EF: Elbow flexor; FFM: Fat free mass; F_{max}: Maximum force; hGH: Human growth hormone; HHD: Hand-held dynamometry; HGS: Handgrip strength; IBD: Inflammatory bowel disease; IBD-U: Inflammatory bowel disease unclassified; IFX: Infliximab; IQR: Interquartile range; KE: Knee extensor; KF: Knee flexor; LE: Leg extensor; LM: Lean mass; MEP: Maximal expiratory pressure; MIP: Maximal inspiratory pressure; N/A: Not available; PA: Physical activity; P_{max}: Maximum power; RCT: Randomized controlled trial; ref: References; RT: Resistance training; SD: Standard deviation; SDS: Standard deviation score; TMS: Total muscular strength; UC: Ulcerative colitis; WP: Whey protein.

Supplementary Table 3 Studies examining muscular endurance using isometric or isokinetic dynamometry in patients with Inflammatory Bowel Disease

Ref.	**Study design, country**	**Sample size, *n***	**Sample features**	**CD, UC, IBD-U, *n***	**Female sex, %**	**Age in yr, mean (SD), mean (95%CI)**	**Disease activity**	**Control group**	**Test protocol**	**Main findings, mean (SD), mean (95%CI), median (IQR)**
Davies *et*	Cross-	20	N/A	20,	45%	15.6	Remissio	Healthy	HGE:	HG fatigue

al[39], 2020	sectional study, United Kingdom			0, 0	(SD: 0.5)	n (*n* = 11) or active disease (*n* = 9)	age-matched, sex-matched, and BMI-matched CG, *n* = 9	Difference between maximum strength and strength at the end of 12 maximal contractions (dominant and non-dominant hand)	rate: CD dominant hand, 26% (SD: 2); CG dominant hand, 18% (SD: 3); CD non-dominant hand, 23% (SD: 2); CG non-dominant hand, 21% (SD: 4); HG fatigue rate CD = HG fatigue rate CG (*P* = N/A)
Davies *et al*[40], 2021	Cross-sectional study,	8	N/A	8, 0, 50% 0	41.3 (SD: 4.5)	Active disease (*n* = 8)	Healthy age-matched	HGE: Difference between	HG fatigue rate: CD dominant

	United Kingdom							, sex-matched , and BMI-matched CG, *n* = 8	maximum strength and strength at the end of 12 maximal contractions (dominant and non-dominant hand)	hand, 15% (SD: 3); CG dominant hand, 17% (SD: 4); CD non-dominant hand, 13% (SD: 2); CG non-dominant hand, 22% (SD: 5); HG fatigue rate CD = HG fatigue rate CG (*P* = N/A)
Jones *et al*[46] , 2020	RCT, United Kingdom	47	N/A	47, 0, 0	68%	49.3 (SD: 13.0)	Remission (*n* = 31) or mild active disease	Healthy age-matched , sex-matched	1. Chair-stand test: Stand up and sit down as many	1. Number of repetitions[1]:CD, 13 (SD: 3); CG, 17 (SD: 3) Repetitions

							(*n* = 16)	, PA-matched , BMI-matched , and ethnicity - matched CG, *n* = 33	times as possible during 30 s 2. Arm-curl test: Full-range curls with dumbbell (5lb women, 8 lb men) as many as possible during 30 s (non-dominant arm)	CD < repetitions CG (*P* < 0.001) <u>2. Number of repetition[1]:</u> CD, 16 (SD: 3); CG, 21 (SD: 4); Repetitions CD < repetitions CG (*P* < 0.001)
Salacinski *et al*[56], 2013	Cross-sectional study, United	19	≥ 1 small bowel resection and idiopathic	19, 0	53%	44.2 (SD: 10.3)	Remission (*n* = 19)	Healthy age-matched and sex-	Isometric dynamometry (customized)	<u>RF fatigue rate:</u> CD, -0.069 (SD: 0.06) Hz/s;

	States		musculoskeletal pain or weakness				matched CG (n = 19)	: Slope of median VL and RF muscle activation frequency measured with EMG during 60s submaximal (60% of maximum) contraction (45° knee flexion)	CG, -0.142 (SD: 0.09) Hz/s; RF fatigue rate CD < RF fatigue rate CG (P = 0.015) VL fatigue rate: CD, -0.028 (SD: 0.042) Hz/s; CG, -0.027 (SD: 0.085) Hz/s; VL fatigue rate CD = VL fatigue rate CG (P = 0.969)
Trivic *et al*[72], 2022	Intervention study,	42	N/A	22, 18, 2	40%	N/A for	Remission (n = 42)	N/A	Sit-ups, push-ups,	Sit-ups number of

	Croatia	total sample	back extensions, squats: As many times as possible during 30 s during 30 s. Plank position: As long as possible maintaining the correct form	repetitions[1]: IBD, 19.32 (SD: 5.82) Back extensions number of repetitions[1]: IBD, 27.39 (SD: 12.09) Push-ups number of repetitions[†]: IBD, 17.37 (SD: 6.67) Squats number of repetitions[†]: IBD, 22.10 (SD: 4.87) Plank position

										time†: IBD, 81.0 (SD: 46.26) s
Van Langenberg *et al*[64], 2014	Cross-sectional study, Australia	27	N/A	27, 0, 0	56%	43 (95% CI: 38, 48)	Remission (*n* = 19) or active disease (*n* = 8)	Healthy age- and sex-matched CG, *n* = 22	Isometric dynamometry (Biodex): Fatigue rate as decrement of KE peak torque from maximal peak torque (repetition 2 or 3) to peak torque at the end of 30 maximal contractions (at 60° knee flexion)	KE fatigue rate: CD, -5.2 (95%CI: -8.2, -2.2) Nm/min; CG, -1.3 (95%CI: -3.9, 1.4) Nm/min; KE fatigue rate CD > KE fatigue rate CG *P* = 0.047)

Wiroth *et al*[68], 2005	Cross-sectional study, France	41	N/A	41, 0, 0	59%	37 (SD: 10)	Remission (*n* = 41)	Healthy age-matched CG, *n* = 25	1. Isometric leg press endurance (Vertex 2): Mean LE peak torque (90° knee flexion) over a 15 s maximum contraction 2. HGE: Mean HGS (non-dominant hand) over a 15 s maximum contraction 3. Chair-	1. LE peak torque (15 s): CD, 21.1 (SD: 5.2) N.kg/FFM; CG, 26.5 (SD: 5.8) N.kg/FFM; LE peak torque CD < LE peak torque CG *P* < 0.001) 2. HGS peak torque (15 s): CD, 4.4 (SD: 1.0) N.kg/FFM; CG, 4.9 (SD: 1.0)

									stand test: Stand up and sit down 12 times as quickly as possible	N.kg/FFM; HGE CD = HGE CG (*P* = N/A) <u>3. Time to perform 12 repetitions:</u> CD, 29.2 (SD: 5.5) s; CG, 21.9 (SD: 2.8) s; Time CD > time CG (*P* < 0.001)
Zaltman *et al*[70] , 2014	Case-control study, Brazil	23	Sedentary	0, 23, 0	100%	43.9 (SD: 10.0)	Remission (*n* = 8), mild (*n* = 9), or moderate (*n* = 5), or severe (*n*	Healthy age-matched, sex-matched, and BMI-	Chair stand test: Stand up and sit down 5 times as quickly as possible	<u>Time to perform 5 repetitions:</u> UC, 9.8 (SD: 2.4) s; CG, 6.7 (SD: 1.6) s; Time CD >

							= 1) active disease	matched CG, *n* = 23		time CG (*P* = 0.0001)
Zhang *et al*[26], 2022	Prospective study, China	238	Inpatients	177, 61, 0	68%	38.5 (SD: 14.0)	Remission (*n* = 79), or mild (*n* = 84), moderate (*n* = 40), or severe (*n* = 35) active disease	N/A	Chair stand test: Stand up and sit down 5 times as quickly as possible	Time to perform 5 repetitions: N/A for total sample; IBD well-nourished:, 9.5 (IQR: 6.6 - 11.2) s; IBD malnourished, 9.7 (IQR: 7.7 - 11.4) s
Zhao *et al*[71], 2022	RCT, China	28	With low nutritional risk state [RT + WP intervention (*n* = 15), RT +	N/A	31%	44.1	Remission (*n* = 3), or mild (*n* = 12), moderate	N/A	1. 3-meter walk test: Description N/A 2. Chair	1. Speed[1]: N/A for total sample; IBD RT + WP, 1.0 (SD) m/s; IBD

	placebo intervention (*n* = 13)]	(*n* = 9), or severe (*n* = 4) active disease	stand test: Stand up and sit down 5 times as quickly as possible	RT + placebo, 1.1 (SD: 0.2) m/s 2. Time to perform 5 repetitions†: N/A for total sample; IBD RT + WP, 7.0 (SD: 1.5) s; IBD RT + placebo, 6.6 (SD: 1.6) s

[1] = baseline values are shown. BMI: Body mass index; CD: Crohn's disease; CG: Control group; CI: Confidence interval; EMG: Electromyography; FFM: Fat-free mass; HG: Handgrip; HE: Handgrip endurance; HGS: Handgrip strength; IBD: Inflammatory bowel disease; IBD-U: Inflammatory bowel disease unclassified; IQR: Interquartile range; KE: Knee extensor; LE: Leg extensor; PA: Physical activity; RCT = Randomized controlled trial; RF: Rectus femoris; RT: Resistance training; SD: Standard deviation; UC: Ulcerative colitis; VL = Vastus lateralis; WP = Whey protein.

Supplementary Table 4 Description and main findings of studies examining the effect of physical activity or physical exercise training interventions in patients with Inflammatory Bowel Disease

Ref.	Study design, country	Sample size, *n*	Sample features	CD, UC, IBD-U, *n*	Female sex, %	Age in yr, mean (SD), median (IQR)	Disease activity	Healthy control group	Intervention, IG	Comparator, CG	HRPF components assessed	Effect on HRPF component, mean (SD), mean (95%CI), median (IQR)
Arruda *et al*[73], 2018	Prospective, pilot intervention study, United States	9	Pediatric patients	8, 1, 0	89%	14.1	N/A	N/A	Yoga (*n* = 9), 3 sessions/ wk online (30 min) + 3 in-person sessions in wk 1, 3, and 8 (60	N/A	Feasibility and acceptability, disease activity and wellness, all at wk 8	Yoga was feasible and acceptable. Reduction in stress, and improvement in

								min) for 8 wk		emotional self-awareness and ability to manage physical symptoms. Lack of power to detect statistically significant changes in disease activity, and wellness.
Bottoms *et al*[1],	Secondary	25	Adult patients	25, 0, 0	60% for	N/A	Remission or	N/A	HIIT (*n* = 13) or	N/A	Affective and	Affective and

2019	analysis of Tew *et al*[2], United Kingdom	total sample	mild active disease (*n* = N/A)	MICT (*n* = 12), 3 sessions/ wk for 3 mo	enjoyment responses at wek 1, 6 and 12; WRpeak at wk 4, 8, and 12; differentiated ratings of perceived exertion at wk 1, 6 and 12.	enjoyment responses after HIIT and MICT were similar. Increase in WRpeak after HIIT from baseline to wk 4 with difference of 20.5 (SD: 10.8) W (*P* = 0.03) and from wk 4 to wk 12 with 12.30

											(SD: 6.32) W, (P = 0.02); No change in WRpeak after MICT. Differentiated ratings of perceived exertion were greater during HIIT compared to MICT.
Cramer *et al*[74],	RCT, German	77	Adult patients	0, 77, 0	75% for	N/A	N/A	Yoga (n = 39),	1	Written self-care	HRQOL (IBDQ),	Increase in IBDQ in

2017	y	total sample	group session/wk (90 min) + encouragement to practice daily at home for 8 wk	advice (*n* = 38)	disease activity and safety at wk 12 and 24	the IG compared to the CG at wk 12 (Δ 14.7 [95%CI: 2.4–26.9], *P* = 0.018) and 24 (Δ 16.4 [95%CI: 2.5–30.3], *P* = 0.022); Disease activity decreased in the IG compared to the CG at week 24

												(Δ -1.2 [95%CI: 0.1- -2.3], *P* = 0.029)
Cronin *et al*[7], 2019	Cross-over RCT, Ireland	17	Physically inactive	N/A for total sample	N/A for total sample	25 (SD: 6.5)	Remission (*n* = 17)	N/A	Combined aerobic and resistance exercise program (*n* = 13, of which 7 crossed-over), 3 sessions per wk (60 min) for 8 wk	Usual care (n=7)	Body fat and lean tissue mass (DEXA), estimated VO_2max (Rockport one-mile walk test), disease activity, QOL (SF-36), anxiety and depression (HADS,	Total body fat decreased in the IG with 2.1% (IQR: -2.15 − -0.45), but increased in the CG with 0.1% (IQR: -0.4 – 1) after 8 wk, (*P* = 0.022); Total lean

			STAI, BDI-II), cytokine levels (IL-8, IL-10, IL-6, TNF-α), microbiome changes (α- and β-diversity), all at wk 8	tissue mass increased in the IG with 1.59 (IQR: 0.68 – 2.69) kg, but decreased in the CG with 1.38 (IQR: -2.45 – 0.26) kg after 8 wk. (P = 0.003); Improvement of estimated VO_2max in the IG

												from 43.41 mL/kg/m in to 46.01 mL/kg/m in after 8 wk (P = 0.003); No changes in disease activity, SF-36, HADS, STAI, BDI-II, cytokines, and microbiome after 8 wk.
Jones *et*	RCT,	47	N/A	47, 0,	68%	49.3	Remiss	Age-	Combined	Usual	BMD	BMD

al[46], 2020	United Kingdom	0	(SD: 13.0)	ion (*n* = 31) or mild active disease (*n* = 16)	matched, sex-matched, PA-matched, BMI-matched, and ethnicity-matched HC (*n* = 33)	impact and resistance exercise training (*n* = 23), 3 sessions/ wk (of 60 min) for 6 mo	care (*n* = 24)	(DEXA) at 6 mo; HGS, KE and EF strength (isokinetic dynamometry), chair-stand test, arm-curl test, HRQOL (IBDQ), QOL (EQ-5D), IBD-F, all at 3 and 6 mo	values were superior in the IG at lumbar spine (adjusted difference, 0.036 (95%CI: 0.024-0.048) g/cm2 (*P* < 0.001); Improvement of all muscular strength and endurance

		tests in the IG after 6 mo compared to the CG: difference of KE peak torque 60°/s, 22.4 (95%CI: 12.1, 32.8) Nm; KE peak torque 180°/s, 16.8 (95%CI: 9.0, 24.5) Nm; EF peak

torque 60°/s, 6.8 (95%CI: 3.9, 9.6) Nm; EF peak torque 180°/s, 6.3 (95%CI: 3.3, 9.3) Nm; HGS, 8.3 (95%CI: 6.2, 10.5) kg, chair-stand test, 4 (95%CI: 3, 6) repetitions, arm-curl

	test, 7 repetitions (95%CI:5, 8), (P < 0.001); EQ-5D was superior in the IG compared to the CG at 6 mo (adjusted difference 0.109 [95%CI: 0.038-0.181], (P = 0.004); IBD-F was lower in

									the IG compared to the CG at 6 mo (adjusted difference −2, [95%CI: −4, −1), (*P* = 0.005); IBDQ did not change after 6 mo.
Kaur *et al*[75], 2021	Prospective pilot intervention study, Canada	9	Adult patients	6, 3, 89% 0	52.1 (SD: 9.5)	Remission (*n* = 4) or active disease (*n* = 5)	N/A	Yoga (*n* = 9), 1 supervised session/week (30 min) + daily at	N/A	Acceptability, adverse events, salient beliefs, anxiety (GAD-7),	Yoga was acceptable with high attendance rates, only 1 adverse event

									home for 8 wk		depression (PHQ-9), stress (PSS-10), sleep quality (PSQI), QOL (SF-12; MCS and PCS), all at wk 8	unrelated to the intervention, and overall positive beliefs about the program. Improvement of GAD-7, PHQ-9, PSQI and SF-12 at wk 8, but not in PSS-10 (P = N/A).
Klare *et*	RCT,	30	N/A	19,	73%	41.1	Remiss	N/A	Moderate-	Usual	HRQOL	IBDQ total

al[76], 2015	German y	11, 0	(SD: 14.1)	ion or mild active disease (*n* = N/A)	intensity running program for untrained people (*n* = 15), 3 sessions/ wk for 10 wk	care (*n* = 15)	(IBDQ), disease activity, and body weight, inflammator y indices, all at wk 10	improved in IG (156.5 [SD: 35.0] to 184.9 [SD: 20.9, *P* = 0.001); and in the CG (167.7 [SD: 31.1] to 182.2 [SD: 26.6], *P* = 0.004) with no difference in IBDQ change between groups. IBDQ

							social sub-scale improved in the IG compared to CG (Δ 6.3 [SD: 5.5] vs. 1.9 [SD: 4.8], *P* = 0.023); Leucocytes decreased in IG (7.0 [SD: 2.2] to 5.6 [SD: 1.5], *P* = 0.016); No change in body weight

											and disease activity scores within and between groups.
Koch *et al*[77], 2020	Secondary analysis of Cramer et al[74] United Kingdom	77	Adult patients	0, 77, 0	75% for total sample	N/A	N/A	Yoga (*n* = 39), 1 supervised group session/ wk (90 min) + daily at home for 8 wk	Written self-care advice (*n*= 3 8)	Perceived stress, HRQOL (IBDQ), and disease activity at wk 12 and 24	Perceived stress at wk 12 fully mediated the effects of yoga on IBDQ (B, 16.23 [95%CI: 6.73 - 28.40] and disease

									activity (B, −0.28 [95%CI: 0.56, −0.06] at wk 24.
Lamers *et al*[78], 2022	Intervention study, the Netherlands	26	Adult patients with at least one flare-up in the past 2 yr	12, 14, 0	58%	36 (IQR: 30-52)	Remission or mild active disease (*n* = N/A)	N/A	PA advice according to Dutch physical activity guidelines (*n* = 26), 5 days/wk at moderate intensity (cardio + resistance) for 30 min per day for	N/A	Impact of disease on daily life (IBD-DI), disease activity, HRQOL (IBDQ), fatigue (IBD-F), physical activity (SQUASH)	Improvement in IBD-DI (0.7 [SD: 1.6] to 5.9 [SD: 1.7], *P* = 0.011) and IBD-F (20.1 [SD: 2.6] to 14.1 [SD: 2.6], *P* = 0.008) after 6 mo. No change IBDQ,

									6 mo		physical activity and disease activity after 6 mo.
Legeret *et al*[79], 2019	Pilot study, Switzerland	21	Pediatric patients	12, 9, 1	48%	13.35	Remission (n = 14) or active disease (n = 7)	Age-matched and sex-matched healthy controls (HC), n = 23	Moderate-intensity aerobic exercise training with active video gameplay (n = 21), 5 sessions/ wk (30 min) for 8 wk	N/A	Inflammatory indices (ESR, albumin, CRP, cortisol, hemoglobin, hematocrit, thrombocytes, leukocytes) before and after a single bout	A single bout of exercise increased albumin, hemoglobin, erythrocytes, hematocrit, and leukocytes in IBD patients

								of exercise and at wk 8	and HC, but CRP and thrombocytes were only elevated in IBD patients. Decrease in ESR, CRP, and thrombocytes in IBD patients and HC after 8 wk.
Loudon *et al*[12], 1999	Pilot study, Canada	16	Sedentary adult patients	16, 0, 0	83%	38.3 (SD: 7.5)	Remission or mild	N/A	Supervised indoor (group-)	N/A	HRQOL (IBDQ, IBD stress index)	Improvement in IBDQ (172

		active disease (n = N/A)	walking program, 3 sessions/ wk (20-35 min) for 12 wk	estimated VO_2max (CAFT step test), and BMI, all at wk 12	[SD: 27] to 189 [SD: 12], P = 0.01), IBD Stress Index (29.2 [SD: 15.4] to 19.5 [SD: 10.8], P = 0.0005), disease activity (HBI 5.9 [SD: 5.0] to 3.6 [SD: 3.1], P = 0.02), and estimated VO_2max

											(30.6 [SD: 4.7] to 32.4 [SD: 4.8] mL/kg/min, P = 0.00133) after 12 wk. No change in BMI.
Mahlmann *et al*[13], 2017	Pilot study, Switzerland	21	Pediatric patients	12, 7, 3	48%	13.88	Remission (n = 14) or active disease (n = 7)	Age-matched and sex-matched HC, n = 23	Moderate-intensity aerobic exercise training with active video gameplay (n = 21), 5 sessions/	N/A	Physiological functioning (KIDSCREEN27), depression (ChilD-S), sleep (EEG, ISI), PA (IPAQ,	Distance reached in 6 min increased in patients with active disease from 655 (95%CI: 542, 769)

				wk (30 min) for 8 wk	accelerometer), 6MWT, all at wk 8	to 758 (95%CI: 610, 906) m, in patients with remission from 655 (95%CI: 542, 769) to 758 (95%CI: 610, 906) m, and in CG from 678m (95%CI: 640, 715) to 727 (95%CI:

		74, 93) m, without between-group differences. Aspects of objective sleep improved in patients with IBD and HC. Self-reported fitness and daily PA only improved in patients

	with IBD with active disease (2.25 [95%CI 1.28, 3.22] to 3.14 [95%CI: 2.02, 4.28] and 8049 [95%CI: 4707, 11392] to 7970 [955CI: 6467, 9921] steps, respectively. No changes in

											KIDSCREEN-27, ChilD-S, and subjective sleep (P = N/A)
McNelly *et al*[80], 2016	Pilot RCT, United Kingdom	52	Adult patients with self-diagnosed fatigue	25, 26, 1	52%	N/A for total sample	Remission (n = 52)	N/A	Personal goal-setting exercise advise with intention to increase in PA levels with at least 30% (n = 26), 3-4	No exercise (n = 26)	Fatigue (FACIT-F, MFI, IBD-F), HRQOL (IBDQ), anxiety and depression (HADS), and PA (accelerometer) at baseline and at wk 12	No difference in FACIT-F between the IG and the CG after 12 wk. IBD-F was lower in the IG compared to the CG (-2.0

							sessions/ wk (30-60 min) for 12 wk			[95%CI: -3.8, -0.2], *P* = 0.03); No difference in MFI, HADS, and PA after 12 wk.
Ng *et al*[81], 2007	RCT, Canada	32	Physically inactive	32, 0, 0	56%	N/A for total sample	Remission or mild active disease (*n* = N/A)	N/A	Independent walking program (*n* = 16), 3 sessions/ wk (30 min) for 3 mo	No exercise (*n* = 16)	HRQOL (IBDQ, IBD stress index) and disease activity at 1, 2, and 3 mo	Improvement in IBDQ in the IG (5.19 to 5.98, *P* < 0.05), but not in the CG over 3 mo. IBD Stress

					Index significantly improved in the IG (31.44 to 18.75, $P < 0.05$), but not in the CG over 3 mo. Disease activity over 3 mo increased in the CG (HBI from 5.31 to 7.00, $P = 0.04$), but

												decreased in the IG (HBI from 6.69 to 3.63, *P* < 0.01).
Robinson *et al*[82], 1998	RCT, United Kingdom	117	Adult patients	117, 0, 0	59%	N/A for total sample	N/A	N/A	Floor-based, progressive, dynamic resistance training *(n* = 53), 2 sessions/ wk for 12 mo	Usual care (*n* = 54)	BMD (DEXA) at 12 mo	No difference in BMD between IG and CG after 12 mo. In fully compliant patients in the IG (*n* = 14), BMD improved at the

											greater trochanter (difference 4.67 [95%CI: 0.86–8.48], *P* = 0.02)
Seeger *et al*[57], 2020	Pilot RCT, Germany	45	N/A	45, 0, 0	63%	N/A for total sample	Remission or mild active disease (*n* = N/A)	N/A	Moderate endurance training (*n* = 17, only *n* = 9 were analyzed), or moderate muscle training (*n* = 15, only *n* = 13 analyzed),	Usual care (n=13)	Safety, feasibility, disease activity, wellbeing (sIBDQ) PA (sIPAQ), HGS, QS (isometric HHD), all at wk 12	Improvement of HGS and QS in both endurance training IG (*P* = 0.01, *P* = 0.035) and muscle training IG (*P* = 0.01, *P* = 0.002)

		3 sessions/ wk (30-40 min) for 12 wk	after 12 wk; HGS decreased and QS did not change in CG (P = 0.01, P = 0.23); No change in disease activity between groups. Emotional function subgroup of sIBDQ improved only in the

					endurance IG after 3 mo (13.78 to 15.67, *P* = 0.03); Increase in PA in the muscle IG (METs 1.7 to. 2.3, *P* = 0.002) and endurance IG (METs 1.1 to 2.3, *P* = 0.015); Lower dropout rate in muscle training IG

											compared to endurance IG (P = 0.04).
Sharma *et al*[83], 2015	RCT, India	100	Adolescent and adult patients (16 to 60 yr)	40, 60, 0	N/A	N/A	Remission (n = 100)	N/A	Yoga (n = 50), one week of each day a supervised session (60 min) + daily at home (60 min) for 8 wk	Usual care (n = 50)	Cardiovascular autonomic functions, immune markers, anxiety (STAI), disease-associated clinical symptoms, all at wk 8	Cardiovascular autonomic functions and immunological markers did not change. Improvements in STAI-S (38.88 [SD: 8.85] to

					32.8 [SD: 8.21], *P* = 0.01) and STAI-T (49.48 [SD: 8.7] to 41.24 [SD: 8.22], *P* = 0.001) in UC patients after 8 wk, but not in CD patients or CG. Fewer UC patients reported arthralgia

										(*n* = 3 *vs.* *n* = 10, *P* < 0.05) and colic pain compared to the CG (*n* = 5 vs. *n* = 14, *P* < 0.05) after 8 wk.
Tew *et al*[2] 2019	Pilot RCT, United Kingdom	36	Adult patients	36, 0, 0	53%	36.9 (SD: 11.2)	Remission (*n* = 32) or mildly active disease (*n* = 4)	N/A	HIIT (*n* = 13) or MICT (*n* = 12), 3 sessions/wk for 3 mo	Usual care (*n* = 11)	Feasibility, acceptability, VO_2peak (CPET) disease activity, HRQOL (IBDQ), QOL (EQ-5D-5-L),	HIIT and MICT were feasible and acceptable. Mean increase in VO_2peak, relative to

				IBD-F, anxiety and depression (HADS), and physical activity (IPAQ), all at 3 mo	control, was greater following HIIT than MICT (+ 2.4 mL/kg/min *vs.* + 0.7 mL/kg/min, $P <$ N/A) Two participants (one from each intervention group) had disease relapse.

Trivic *et al*[72], 2022	Intervention study, Croatia	42	Pediatric patients	22, 18, 2	40%	N/A for total sample	Remission (*n* = 42)	N/A	Personalized home-based structured resistance training (*n* = 42), 3 sessions/ wk for 6 mo	N/A	BMD and LBM (DEXA), disease activity, five task muscular endurance battery (sit-ups, push-ups, back extensions, squats, and plank position), physical activity (accelerometer), dietary intake	Increase in BMD (0.959 [SD: 0.023] to 0.988 [SD: 0.025] g/cm2, *P* < 0.001) and BMD z-score (−0.35 [SD: 0.15] to −0.28 [SD: 0.17], *P* = 0.020) Improvement in LBM from 37.12 [SD: 1.43] kg to 38.75

	[SD: 1.61] kg, *P* = 0.012), but not in LBM z-score. Improvement in muscular endurance tasks: number of sit-up repetitions from 19.32 (SD: 5.82) to 21.0 (SD: 6.53), (*P* = 0.024), back

extension repetitions from 27.39 (SD: 12.09) to 38.27 (SD: 16.1), ($P < 0.001$), push-up repetitions from 17.37 (SD: 6.67) to 24.59 (SD: 7.58**),** $P < 0.001$), squat repetitions from 22.10 (SD: 4.87) to 24.88 (SD: 6.23),

										P < 0.001). and time holding the plank position from 81.0 (SD: 46.26) s to 114.34 (SD: 74.06) s P < 0.001); No change in physical activity and disease activity.
Van Erp *et al*[23],	Pilot study, The	25	With severe fatigue	21, 3, 1	40%	45 (SD: 2.6)	Remission (*n* = 25)	N/A	Aerobic and progressiv	N/A	Fatigue (CIS), HRQOL	Improvement of CIS (105 [SD:

2021	Netherlands	e resistance training, 3 sessions/ wk (60 minutes) for 12 wk	(IBDQ), VO_2max and WRpeak (CPET) all at wk 12	17] to 66 [SD: 20], *P* < 0.001) and IBDQ (156 [SD: 21] to 176 [SD: 19], *P* < 0.001) after 12 wk. No significant change in VO_2max after 12 wk. Significant change in WRpeak from 2.4 (SD: 0.5)

											W/kg to 2.7 (SD: 0.5) W/kg after 12 wk (P = 0.002)
Watters *et al*[84], 2001	Exploratory follow-up study of Robinson et al[82] United Kingdom	117	Adult patients	117, 0, 0	59%	N/A for total sample	N/A	N/A	Floor-based, progressive, dynamic resistance training (n = 53), 2 sessions/wk for 12 mo	Usual care (n = 54)	Positive and negative psychological wellbeing (HADS, AIS, SWLS) at 12 mo	No difference in HADS, AIS, and SWLS between IG and CG. Correlation between baseline AIS scores and number of exercise

											sessions completed at 12 mo (r=0.376, *P* < 0.01)
Zhao *et al*[71], 2022	RCT, China	28	Adult patients with low nutritional risk state [RT + WP intervention (*n* = 15), RT + placebo intervention (*n* = 13)]	N/A	31%	44.1	Remission (*n* = 3), or mild (*n* = 12), moderate (*n* = 9), or severe (*n* = 4) active disease	N/A	Unsupervised resistance training (*n* = 28), 3 sessions/wk for 8 wk	ASM/H^2 (BIA), blood tests, BMI, calf/waist/hip circumference, 3-meter walk speed, HGS, chair-stand-test.	ASM/H^2 changed from 5.98 (SD: 0.52) m/s to 7.03 (SD: 0.74) m/s in the RT + WP group after 8 wk, but not in RT + placebo group; Albumin

increased in RT + WP group (38.0 [SD: 5.1] to 39.4 [SD: 5.0]) and in RT + placebo group (39.4 [SD: 5.0] to 42.0 [SD: 5.0]) after 8 wk, while hemoglobin and creatinine only increased in the RT +

WP group (131.8 [SD: 18.3] to 143.9 [SD: 9.7] and 64.0 [SD: 10.9] to 74.7 [SD: 7.2], respectively). Calf circumference increased in the RT + placebo group (33.5 [SD: 3.5] cm to 36.3 [SD:

					3.7] cm) after 8 wk, but not in RT + WP group. ESR, CRP, BMI, waist-, and hip circumference, waist-to-hip ratio, 3-meter walk speed, HGS, and 5-time chair-stand test

				did not change after 8 wk (P < N/A)

AIS: Acceptance of illness scale; ASM/H[2]: Height-adjusted appendicular skeletal muscle mass; BDI-II: Beck depression inventory-II; BMD: Bone mineral density; BMI: Body mass index; CAFT: Canadian aerobic fitness test; CD: Crohns disease; CG: Control group; ChilD-S: Child depression screener; CI: Confidence interval; CIS: Checklist individual strength; CPET: Cardiopulmonary exercise testing; CRP: C-reactive protein; DEXA: Dual energy X-ray absorptiometry; EEG: Electroencephalogram; ESR: Erythrocyte sedimentation rate; EF: Elbow flexor; EQ-5D; EuroQol-5 dimension; EQ-5D-5L: EuroQol-5 dimension-5 levels; FACIT-F: Functional assessment of chronic illness therapy – fatigue; GAD-7: General anxiety disorder-7; HAD: Hospital anxiety and depression scale; HC: Healthy controls; HHD: Hand-held dynamometry; HIIT: High-intensity interval training; HGS: Handgrip strength; HRQOL: Health-related quality of life; IBD: Inflammatory bowel disease; IBD-DI: Inflammatory bowel disease disability index; IBD-F: Inflammatory bowel disease – fatigue; IBD-U: Inflammatory bowel disease unclassified; IBDQ: Inflammatory bowel disease questionnaire; IG: Intervention group; IL: Interleukine; IPAQ: International physical activity questionnaires; IQR: Interquartile range; ISI: Insomnia severity index; KE: Knee extensor; LBM: Lean body mass; MCS: Mental component summary; MFI: Multidimensional fatigue index; MICT: Moderate-intensity continuous training; N/A: Not available; PA: Physical activity; PCS: Physical component summary; PHQ-9: Patient health questionnaire-9; PSQI: Pitsburgh sleep quality index; PSS-10: Perceived stress scale-10; QOL: Quality of life; QS: Quadriceps strength; RCT: Randomized controlled trial; sIBDQ: Short inflammatory bowel disease questionnaire; sIPAQ: Short international physical activity questionnaire; SD: Standard deviation; SF-12: Short form health survey 12; SF-36: Short-form health survey 36; SQUASH: Short questionnaire to assess health-enhancing physical activity; STAI:

State-trait anxiety inventory; SWLS: Satisfaction with life scale; TNF-α: Tumor necrosis factor α, UC: Ulcerative colitis; VO_2max: Maximal oxygen uptake; VO_2peak: Oxygen uptake at peak exercise; WRpeak: Work rate at peak exercise; 6MWT: 6-min walk test.

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